THE MONETARY POLICY TRANSMISSION MECHANISM IN THE EMERGENT COUNTRIES, AN ANALYSIS BASED ON THE AUTOREGRESSIVE VECTOR

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Abstract: The integration in the euro area implies a unique monetary policy for the countries from this area. The implementation of a restrictive monetary policy by ECB in order to counter-balance the inflationist pressures could compromise the real convergence process of the euro area new members, while a relaxed monetary policy, adopted to stimulate the economy, can lead to an overheating of the developing economies. Therefore, within this article we proposed to realize an evaluation of the monetary policy transmission channels in the countries from Central and Eastern Europe. For this reason we utilized a model based on the autoregressive vector methodology. From an economical point of view, our model underlines the heterogeneity of the monetary policy transmission mechanism within the four member states of the European Union, in future a homogenization of monetary policies being necessary. In default of a sustainable and efficient economic model, an early adoption of the single currency can create major dysfunctionalities for these countries. Thus, they will not be able to stimulate the economy through the interest rate or through the exchange rate, policies frequently utilized at present.

Key-words: VAR model, monetary policy transmission, euro area, emergent countries

The study premises

Generally, an accurate knowledge of the monetary policy transmission mechanisms within the countries from Eastern and Central Europe proves to be particularly important for the correct application of the Eurosystem's monetary policy strategy. The implementation of a restrictive monetary policy by ECB in order to counteract the inflationist pressure could compromise the real convergence process of the new euro area members, while a more relaxed monetary policy, to stimulate the economy, can lead to an overheating of the developing economies. Therefore, in the paper we propose to study empirically the relative importance of each monetary policy transmission channel, as well as the prices dynamics. These results are obtained with the empirical estimations concerning the monetary policy dynamics in four countries, that is: Czech Republic, Poland, Hungary and Romania.

At the end of the 70s of the previous century the traditional macroeconomic models were criticized due to the limitation of the empirical studies. Sims (1980) proposes an alternative modeling of the structural data whose limits are related to variables choice and to lag numbers. Built on the basis of a reduced number of variables, the VAR models didn't assure a qualitative representation of the macroeconomic fluctuations. However as Cristiano et.al. (1998) underline, the VAR methodology proves to be very pertinent in what concerns the analysis of monetary shocks because it allows to distinct the different effects of a specific monetary shock.

The absence of some sets of data long enough, as well as the extended instability resulted from the transition process towards the market economy represent the main problems in building some solid empirical models for the countries from Eastern and Central Europe. However, these problems cannot be insurmountable. In what concerns the first problem, at this moment, we dispose of sets of data long enough to create significant estimations.

The second problem can be solved by eliminating the first years of transition, where major macroeconomic mutations existed. Thus, our study will be built with data from 1999 until 2010 for Poland and Hungary and with data from 2002 until 2010 for Czech Republic and Romania. In the case of the last two countries, the absence of some data about the variables evolution included in the analysis determined the choice of this year as a starting point. This article, which is part of a more vast research, represents a continuation of some case studies for example those of Maliszewski (1999), Christoffersen et.al. (2001), Boțel (2002), Ganev et.al. (2002), Creel and Levansseur (2005).

Presentation of the utilized econometric model

The frame of our empirical analysis is created around the four mentioned countries. Generally, for each of them we will estimate the next form of the autoregressive vector:

$$Y_t = \sum_{i=1}^{n} A_i Y_{t-1} + BX_t + \mu_t$$

where Y_t is the vector of the endogenous variables, X_t is the vector of the exogenous variables and μ_t is the vector of the normal distributed errors. Y_t is created according to the monthly data concerning the industrial production (y_t), the consumer prices index (p_t) , the interest rate (r_t), the exchange rate of the national currency reported to euro (ex_t), and the M2 monetary aggregate (m_t). The utilized interest rate is the one of the monetary market (three months interbank rate) while the exchange rate is reported to the European single currency. X_t, the vector of the exogenous variables, is created from data concerning the industrial production of the euro area, the three months interbank rate of the euro area and an index of raw materials prices on the international markets. These variables intended to model the external constraints to which the countries included in the analysis are exposed and to take into consideration the supply shocks of any type. Their statute of exogenous variable is consolidated by the classic hypothesis of the open economy model, namely the reduced influence of the small countries' evolutions on the big ones.

All these data are expressed in a nominal shape and come from the International Monetary Fund database (International Financial Statistics) and from the European Central Bank database (Statistical Data Warehouse). The utilization of some monthly data, necessary for consolidating the estimations significance and precision, also made us appeal to industrial production in prejudice of the gross domestic product, the latter not being available in monthly data. The use of some monthly data is imposed because this type of modeling demands an important number of observations. The dimension of a unitary shock differs also according to data frequency. In a model of monthly frequency, a shock simulation has a more important impact than in a model that uses data with quarterly frequency. All the sets of data are expressed in logarithms (excepting the interest rate) and seasonal adjusted (excepting the exchange rate and the interest rate) by means of the Tramo/Seats procedure used by Eurostat to eliminate the seasonal influences on the sets of data.

In order to determine the shocks impact we will utilize a Cholesky recursive identification, the order of the endogenous variables being:

$$Y_t = \left(y_t, p_t, r_t, ex_t, m_t\right)$$

This order reflects the traditional hypotheses that refer to the impact on short term of the monetary shocks on the real sphere. Thus, the shocks of the interest rate, of the exchange rate and of the currency demand don't affect immediately the real sphere, due to the more lent adjustment of the production and prices. The choice of VAR lag numbers was based on the synthesis of the results of

several methods, that is: the sequential testing of the lags signification, the criterion of diminishing the final predictions errors, Akaike, Schwartz and Hannan-Quinn. The numbers of lags suggested in these criteria varied between 1 and 2. In order to preserve at maximum the models homogeneity and to keep the results comparability we will opt for a lag for the set of estimations. We must mention that the variables included in the study are non-stationary and cointegrated, and the VAR model is stable. The appendix through which these studies were realized was not integrated in order not to further pile up the present paper.

Results and comments

The graphs, exposed in the appendix, represent the response functions, estimated by ordinary least squares method. These curves represent the shock effect of a variable on another variable for each country. In the graphs the response functions of the five endogenous variables to a shock of prices index, of interest rate, of exchange rate and of M2 monetary aggregate are comprised.

After an initial analysis of the response functions for the countries included in the research, our study evidence some interesting and important aspects, from our point of view.

Firstly, we must mention the fact that the estimations with the data in logarithm and in differences of natural logarithm don't differ substantially in what concerns the direction of the response function, fact that consolidates the scientific significance of our research. The results are due to confirm, but also to fill the conclusions of other empirical researches from the specialized literature (Ganev et.al. 2002) which underlines the important role of the exchange rate channel and the interest rate difficulties of imposing itself as a genuine monetary policy channel, especially when it is the case of real economy (production and prices). The dimension of the production variation at an interest rate shock varies from a country to another, but it is very weak, being insignificant from a statistical point of view. We should mention the fact that the direction of the production response (its decrease at an interest rate increase) to an interest rate shock is the right one for all the countries included in the analysis. On the other hand, we must be prudent when we interpret the reactions of the industrial production at the monetary shocks, because it doesn't reflect completely the behavior of the gross domestic product. The quantitative channel of the monetary aggregate remains also another important channel through which the monetary shocks are transmitted.

And in what concerns the prices dynamics, the aspects surprised by the effectuated analysis are very interesting. There is a certain heterogeneity in what concerns the prices index response to the different monetary policy shocks, mainly to an interest rate shock. Thus, as we also observe from the presented graphs, the inflation responds always positively and with a significant variation to an exchange rate shock which is translated through a national currency depreciation. Also a monetary aggregate shock will lead to the inflation growth for all the countries included in the analysis. Furthermore, the inflation dynamics is also explicated in the case of Poland and Hungary by an aggregate demand shock, more exactly by an industrial production shock. In the case of the interest rate shock, the prices response function differs from a country to another. Thus for some countries included in the sample we will confront with a paradox very often encountered in the empirical studies which use the Autoregressive Vector methodology, namely the "price puzzle" paradox, that is a growth of the prices general level (or an inflation acceleration) due to the interest rate growth. At first sight, these results seem to reflect the major differences in comparison with other studies estimations which refer to euro area, where an interest rate growth is translated through a significant and temporal decrease of the inflation level, this effect being in accordance with the economic theories (Mojon and Peersman, 2003). On the other hand, taking into consideration the fact that in the analysis we used the interest rate on the money market (three months interbank rate) it is possible that between the monetary policies interest of these countries and the interest rate on the monetary market doesn't exist any strong relation of causality. The "price puzzle" episodes are

also associated to some periods of weak monetary policy, where the central bank doesn't respond sufficiently fast to the inflationist pressures.

In what concerns the interest rate impact on the exchange rate and on the M2 monetary aggregate the results present homogeneity in the case of the countries included in the analysis, excepting the case of Poland. The response of these variables to an interest rate shock is also according to the economic theory. Thus, we observe a national currency appreciation in the case of Czech Republic, Poland, Hungary and Romania against euro at an interest rate growth. Excluding Poland and Romania the monetary aggregate response is negative to an interest rate shock. This result is particularly interesting, because it underlines the presence of a demand for money for a speculative reason, but also a stable relation between the interest rate and the volume of currency in circulation in the economy of these states.

The response functions to the shocks of the exchange rate (a national currency depreciation) and of the M2 monetary aggregate present a big heterogeneity for the countries included in the realized analysis. After we have already mentioned, the only similar response to this variables shocks is the growth of the prices general level both in the case of national currency depreciation and in the case of monetary aggregate increase. To this it is added the interest rate response to the national currency depreciation. Thus, taking into consideration the strong direct causality for these countries between the exchange rate and inflation, the central banks chose to respond significantly and very quickly to national currency depreciation through an interest rate growth in order to counter-balance thus indirectly, through exchange rate, the growth of the prices general level. This type of reaction seems to be underlain, because as we have already mentioned, for all the countries an interest rate growth will lead to a national currency appreciation and thus will stop the exchange rate growth and the positive influence of this on the prices general level. On the other hand, this fact comes to consolidate the persistence of the exchange rate channel in the case of these countries monetary policy. For the response functions of the other variables no general rule can be distinguished. Thus, the national currency depreciation will lead to industrial production decrease in the case of some countries or to industrial production increase in the case of others.

Hereinafter, we will try to highlight, in synthesis and taking into consideration the specificities of each country, the response modalities of the macroeconomic variables included in our study.

In what concerns the Czech Republic, the response functions analysis reveals more interesting particularities in what concerns the real sphere (production and inflation). Thus, a monetary shock's impact, through the interest rate channel, will lead to a quick diminution of the production. On the other hand, the prices index response to an interest rate shock is slower, so that in the first months it seems that we are dealing with a "price puzzle". The estimated effect (the prices general level diminution) of an interest rate growth appears only after six, seven months. The national currency is appreciating due to an interest rate growth, a response according to the economic theory. Concurrently, the interest rate growth will determine a decrease of the M2 monetary aggregate. A national currency depreciation (an exchange rate shock) determines a diminution of the production (or of the competitiveness) after a short period of time and a very quick prices general level growth, which have been sustained through the studied period. We also observe an interest rate quick growth due to an exchange rate shock. When we are dealing with a monetary shock of M2 monetary aggregate, the industrial production will grow according to the economic theory. On the other hand, a quantitative shock on M2 will have the expected shock on the prices level namely their growth. We also observe the positive reaction of the interest rate due to a quantitative shock. In what concerns, an inflation shock, this will have negative effect on the production, in the case of including the M2 monetary aggregate in the analysis. We also remark the interest rate significant growth to a prices level growth, the central bank's fast response being in coherence with the inflation targeting strategy adopted in Czech Republic.

In the case of Poland, an interest rate growth will have the expected effect both on the production, leading to a diminution, and on the prices general level, decreasing after two, three

months. However, the interest rate effect on the prices level must be interpreted prudently, due to the model different response when the data were transformed in differences of natural logarithm. In this case we will confront with a "price puzzle". Overall, we will observe the weak impact of the interest rate channel on the prices level, both for Poland and Czech Republic. The exchange currency will appreciate due to the interest rate shock, while the interest rate impact on the monetary aggregate is insignificant. A positive deviation of the exchange rate (a national currency depreciation) has an effect on production, effect which can be divided in two parts: firstly this will increase, and then it will decrease. In the case of level prices, their response is more uniform: the inflation increase during the analyzed period. In this case we will also observe an interest rate growth due to the national currency depreciation. In the case of a shock of the M2 monetary aggregate we will confront with the same types of responses as in the case of Czech Republic: an industrial production growth and a prices general level growth. A prices index shock will have negative effects on the industrial production leading to its diminution.

Analyzing the response functions of the variables included in the model in the case of Hungary we will observe a permanent and significant contraction both on the industrial production and on the prices general level due to an interest rate shock. And the exchange rate response is according to the economic theory, the national currency appreciating pursuant to the interest rate growth. Also, the interest rate shock will lead to a money supply decrease. The interest rate channel seems more powerful in the case of Hungary, having the expected effects on the majority of variables included in the analysis. On the other hand also in this case a national currency depreciation will lead to a prices level acceleration. The quantitative shock has the expected effects also on the industrial production and on the price index. On the other hand, in the case of a positive deviation of the prices level, the production response will be initially positive and, then, after a short period of time it will disappear.

The response of the M2 monetary aggregate to inflation unexpected growth, in the case of Romania, will determine a money supply growth, unlike theoretical hypotheses which at a prices unexpected growth indicates a money supply decrease. However this contradiction was also observed by Kim and Roubini (2000). As a response to an inflation unexpected growth, the national currency depreciates against euro emphasizing thus the inflationist pressures. This relation reflects the exchange rate incapacity to absorb the shocks inflationist effects. Also the money supply positive variation will determine an inflation growth and a national currency depreciation. The interest rate growth at a money supply shock indicates a restrictive monetary policy, this measure being also an anti-inflationist. A positive aspect which results from the effectuated analysis is represented by the response function of the production and of the inflation to an interest rate positive variation. At an interest rate shock the inflation will decrease significantly, fact that consolidates the interest rate channel and supports the inflation targeting strategy.

Conclusions

It is impossible not to remark the fact that, unlike other studies (Maliszewski, 1999; Horska, 2001; Gottschalk and Moore, 2001) which appeal to the same type of analysis but on a different interval of data that comprises the period before 1999 and which identified "the output puzzles" (the production growth due to an interest rate positive deviation), "price puzzles", and "exchange rate puzzles" (the national currency depreciation due to an interest rate growth) in the case of the above-mentioned countries, our results differ from this point of view. Thus "the output puzzles" and "exchange rate puzzles" has disappeared, and the effect of "price puzzle" has diminished and almost disappeared for some countries. This fact can be also ascribed to the inflation targeting strategy which Czech Republic, Poland and Hungary adopted. But in the conditions in which the integration in the euro area supposes apart from prices convergence, the exchange rate convergence and the interest rate convergence, the inflation targeting strategy adopted by these countries seems to be rather a flexible inflation targeting strategy. In the actual context it seems to be the optimal strategy

to take into consideration the obtained results by this strategy, but a set of measures to homogenize the monetary policy and to reduce the gaps against euro area have to be implemented. Only in such a context a single currency adoption will have benefic effects on prices dynamics and on other important macroeconomic variables. From an economical point of view, our model underlines the heterogeneity of the monetary policy transmission mechanisms within the four member states of the European Union, in future being necessary a homogenization of the monetary policy.

In the end, we must underline the importance and consistency of the exchange rate channel within these countries' monetary policy, as well as the importance which the monetary aggregates channels have in explaining the prices level evolution, but also the difficulties of the interest rate channels of influencing the prices general level in a significant proportion and in the wished direction.

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The response of the variables to an inflation, interest rate, exchange rate and monetary aggregate shock - Czech Republic

Response of LPI_SA to Cholesky
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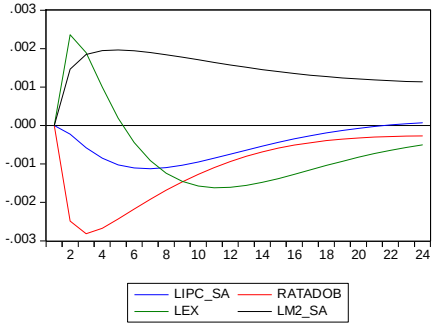

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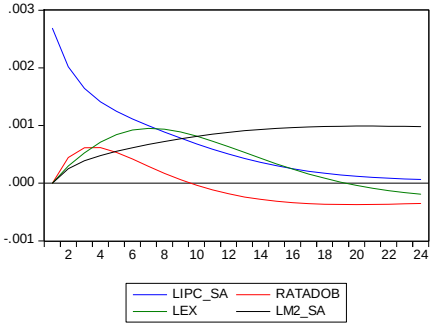

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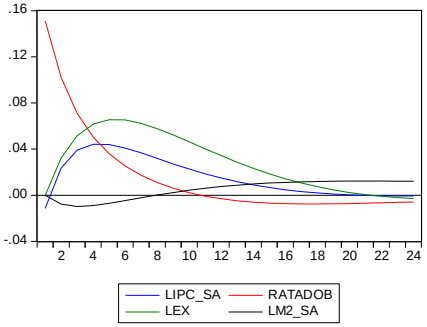

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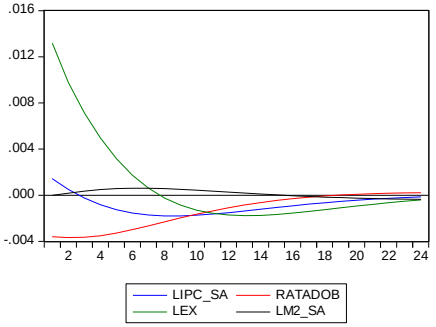

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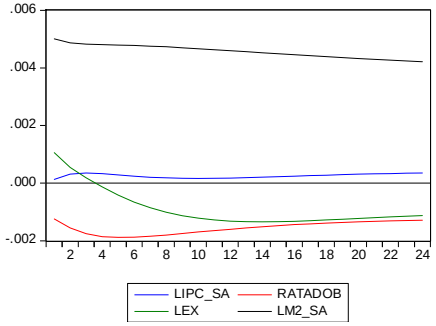

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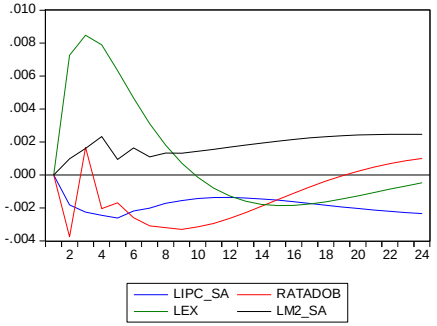

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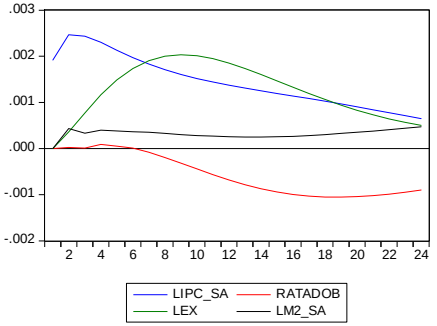

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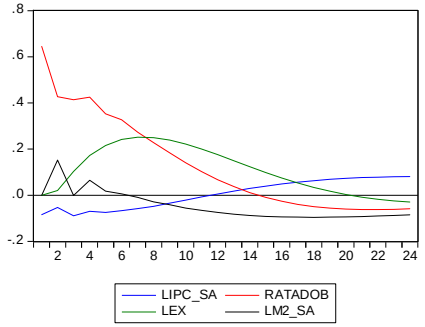

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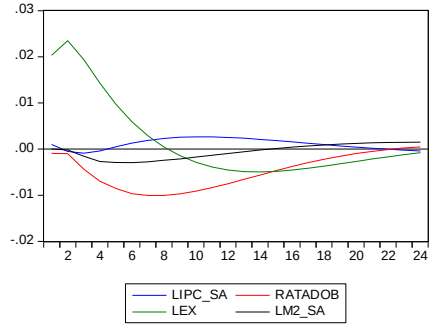

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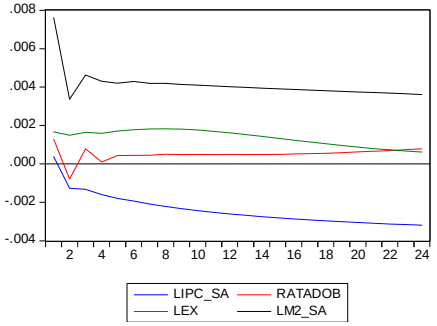

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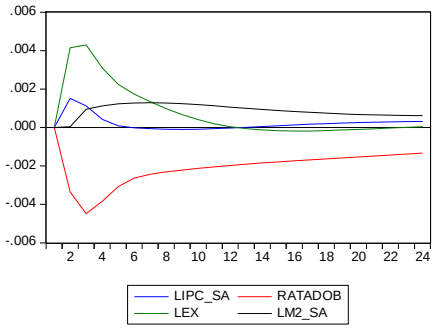

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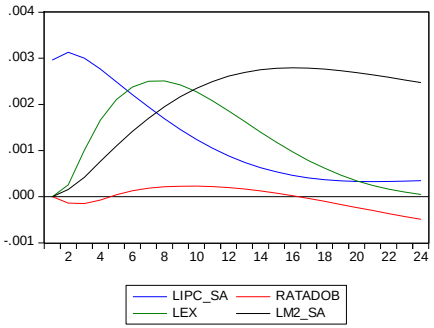

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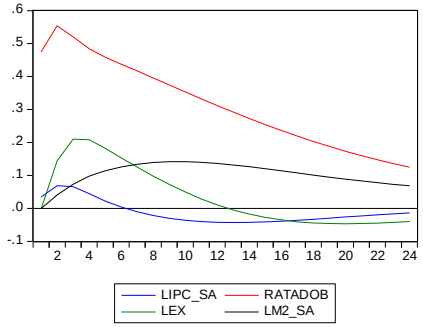

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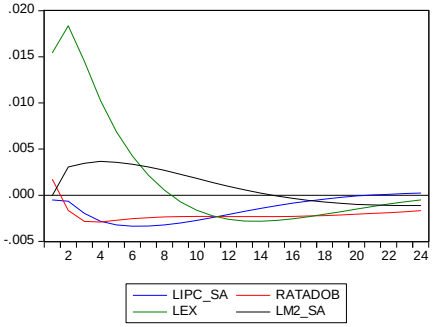

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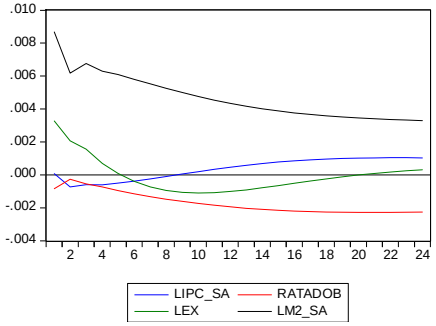

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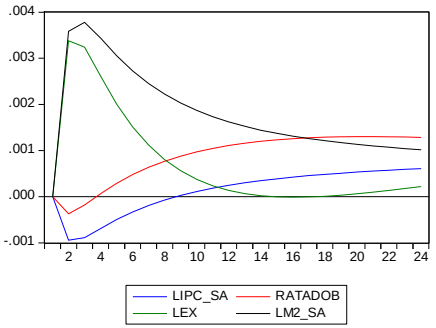

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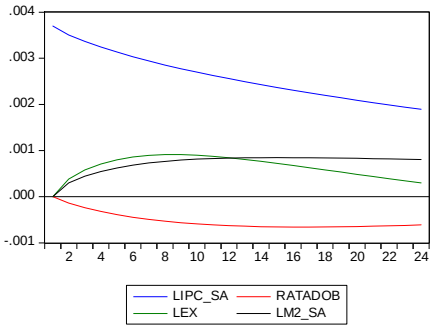

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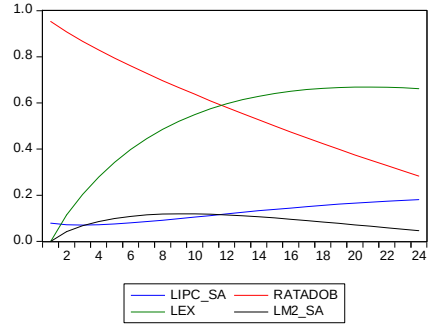

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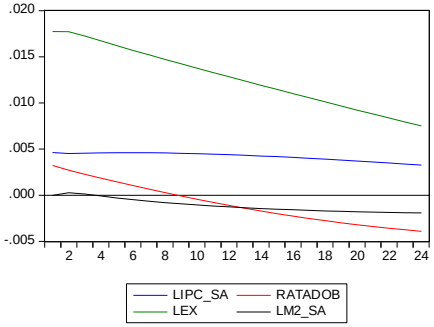

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