



MONETARY POLICY TRANSMISSION MECHANISM IN ROMANIA OVER THE PERIOD 2001 TO 2012: A BVAR ANALYSIS

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Abstract

In this study we intend to highlight the monetary transmission mechanism and how the main economic and monetary variables react to various shocks in Romania over the period 2001 to 2012 using a BVAR model with a KoKo Minnesota/Litterman prior. BVAR models solve the overparameterization of VAR and have advantages in terms of objectivity and flexibility. The analysis reveals important conclusions. The interest rate channel is being more and more consistent in the last years, the positive aspect that emerges from this study being related to the absence of output and price puzzle. Under these circumstances, the role and the responsibilities of the central bank acquires a greater importance, given its ability to control the interest rate in accordance with its objectives. The relationship between inflation and unemployment rate is consistent with the Phillips curve in Romania.

Keywords: monetary policy transmission mechanism, price stability, unemployment rate, BVAR model, inflation

JEL classification: C11, E31, E52

1. INTRODUCTION

Monetary policy and its effects on inflation and real economic activity have been an important subject of debate in the economic literature. Fetai and Izet (2011) consider that in contrast with the conventional theory and the empirical research from the developed economies, the empirical research related to the emerging countries suggest a potential weakness and instability of the conventional monetary policy instruments (i.e. interest rate, monetary base) during the transition period, due to structural and institutional deficiencies from these countries (underdeveloped financial systems, high inflation rate, dollarization/eurorization of the assets and liabilities). Also, the transition is a dynamic process. Therefore, the monetary transmission mechanism can change in time.

Darvas (2009) asserted that the monetary transmission mechanism describes the effects of monetary policy on macroeconomic and financial variables and its analysis is an important part in macroeconomic policy research and is crucial for the conduct of monetary policy. Moreover, in a monetary union it is important to have a similar business cycle and a unitary monetary mechanism transmission for all the countries. Only in such a context a single currency will have positive effects on price level and on other important macroeconomic variables.

Cogley and Sargent (2005) consider that modifications in the economy structure have an impact on the monetary policy transmission mechanism. In our opinion, in Romania, the current account liberalization, the trade deficit, the integration in the European Union, the global financial crisis are some of the processes that affected the structure of the economy. Furthermore, the new monetary policy strategy –inflation targeting- adopted in 2005 by the central bank has influenced the monetary policy mechanism. As a country that intends to join a monetary union, the analysis of monetary policy mechanism can offer important issues regarding the euro-adoption. In these conditions, new pieces of evidence regarding the monetary transmission mechanism in emerging countries are necessary in order to assess as exactly as possible the impact on real economy.

In this study we intend to emphasize the inflation dynamics and persistence, the inflation determinants, to study the impact of a monetary shock on a set of variables, the correlations between the gross domestic product, inflation rate, interest rate, monetary aggregate M2, unemployment rate and wage index in Romania over the period 2001 to 2012. In order to achieve these objectives we use a Bayesian Vector Autoregression (BVAR) model with a Ko Minnesota/Litterman prior distribution, as it was developed in Koop and Korobilis's paper (2009). In our opinion, the contribution of this study to the literature is important, but also original from many points of view. First of all, from our knowledge, a BVAR model with quarterly data wasn't frequently used to analyze Romania's monetary policy. Spulbăr et al. (2011) used a BVAR model to analyse the monetary policy in Romania. In comparison with that paper we are using a different set of variables (i.e. real GDP, unemployment rate and wage index) and quarterly data. Secondly, the results are important for understanding the way in which the monetary policy developed. Thirdly, the time interval covered by the analysis is quite long, comprising significant events that affected Romania's economy.

The paper is structured as follows. Section II reviews the literature on monetary policy transmission mechanism. Section III presents the econometric methodology and the data adopted in this study. Section IV discusses the results. Finally, section V presents the conclusions.

2. LITERATURE ON MONETARY POLICY TRANSMISSION MECHANISM IN TRANSITION COUNTRIES

The use of VAR models to analyze the monetary policy transmission mechanism is widely spread in the economic literature. These models were used both for developed countries and emerging countries.

The VAR models are considered to be the most relevant in the econometric modelling of the monetary policy transmission mechanism. Within the VAR models, the studies based on BVAR techniques have a major importance and are widely used. Furthermore, the VAR methodology was developed in the papers of Gerlach and Smets (1995), Leeper et al.

(1996), Christiano et al. (1999). This latter study offers a detailed analysis of various papers that uses VAR models in order to analyze the monetary policy in USA. In Europe, Angeloni et al. (2003), Peersman and Smets (2001) studied different aspects of the monetary policy transmission mechanism in euro area. Other studies focused on individual member states (Mojon and Peersman, 2001).

The analysis of the monetary policy transmission mechanism using VAR models was widely used for the emerging countries from Central and Eastern Europe. Hereinafter we will highlight some of the studies that focused their analysis on these countries.

Caraiani (2010) used a BVAR model to forecast the dynamics of output for the Romanian economy until Q4 2010. The results showed that the recovery will be slow and gradual. Cocriș and Nucu (2013) evaluated the effectiveness of monetary policy transmission mechanism in Romania using a VECM model. The results indicate an efficiency improvement of the monetary policy impulses via interest rate channel. Popescu (2013) used a VAR model to analyze the monetary policy effects on the real economic aggregates and prices in countries from Central and Eastern Europe. The results showed a high degree of heterogeneity between the transmission of an unexpected monetary policy shock under different monetary policy strategy, which could create important problems a monetary union. Birman (2012) used the VAR analysis to characterize the monetary policy transmission mechanism in Romania over the period 2000 to 2011. The results showed that the central bank was more successful in controlling the transmission mechanism after adopting inflation targeting strategy. Carare and Popescu (2011) analyzed the transmission of monetary policy in Hungary by applying the bayesian estimation of VAR models. The authors stated that most of the monetary policy channels are operational despite of the high level of eurorization and despite of the fact that the most of banks are foreign owned. Franta et al. (2011) investigates the evolution of monetary policy transmission mechanism in Czech Republic over the period 1996 to 2010 using a BVAR model. The results showed that financial shocks are less important for the aggregate economy in an environment of a stable financial system. Spulbăr et al. (2011) used a BVAR model to analyse the monetary policy in Romania. The results reveal that the exchange rate remains an important mechanism that influences significantly the variables of the real economy and the interest rate channel is being robust in the last years.

3. METHODOLOGY AND DATA

Along with its introduction by Sims (1980), the VAR modelling became a standard method of evaluating the properties of the macroeconomic systems. The BVAR models were introduced for the first time by Litterman (1980) as an alternative for VAR techniques. These solve the problem of the degrees of freedom common to VAR techniques, but they also offer more accurate forecast results. Also, they have some advantages in terms of objectivity and flexibility. Félix and Nunes (2002) underline, in an extensive manner, the advantages of BVAR models compared to VAR models. In this study we will investigate the monetary policy transmission mechanism in Romania using a BVAR model with a KoKo Minnesota/Litterman prior distribution. In order to illustrate the methodology we assume the following VAR model:

$$y_t = a_0 + \sum_{i=1}^p A_i y_{t-i} + \varepsilon_t, \quad \varepsilon_t \sim N(0, \Sigma) \quad (1)$$

where y_t is an $m \times 1$ vector of $t = 1, \dots, T$ observations on m variables, a_0 is an $m \times 1$ vector of intercepts, and A_l is a $m \times m$ matrix of regression coefficients for the l th lag with the p maximum number of lags.

The VAR can be rewritten in matrix form in different ways. Koop and Korobilis (2009) proposed the following form:

$$x_t = [1 \ y_{t-1} \ \dots \ y_{t-p}], \quad X = \begin{bmatrix} x_1 \\ \vdots \\ x_T \end{bmatrix}, \quad B = \begin{bmatrix} a_0 \\ A_1 \\ \vdots \\ A_p \end{bmatrix} \quad (2)$$

and $\beta = \text{vec}(B)$; the model (1) can be written:

$$Y_{T \times m} = X_{T \times (mp+1)} B_{(mp+1) \times m} + E_{T \times m}, \quad E \sim N(0, \Sigma) \quad (3)$$

Using this approach the posterior distribution can be easily produced. The choice of prior has always been a contentious issue in Bayesian analysis. In this study we will use the KoKo Minnesota prior distribution as it was developed in the study of Koop and Korobilis (2009). The simplicity of the Minnesota prior is the fact that Σ is assumed to be known. The prior for β is:

$$\beta \sim N(\beta_0, \underline{V}) \quad (4)$$

with $\beta_0 = 0$ and $\underline{V} = 0$. Koop and Korobilis specified the prior covariance matrix \underline{V} as a diagonal matrix with its elements $v_{ij,l}$ ($l = 1, \dots, p$), where:

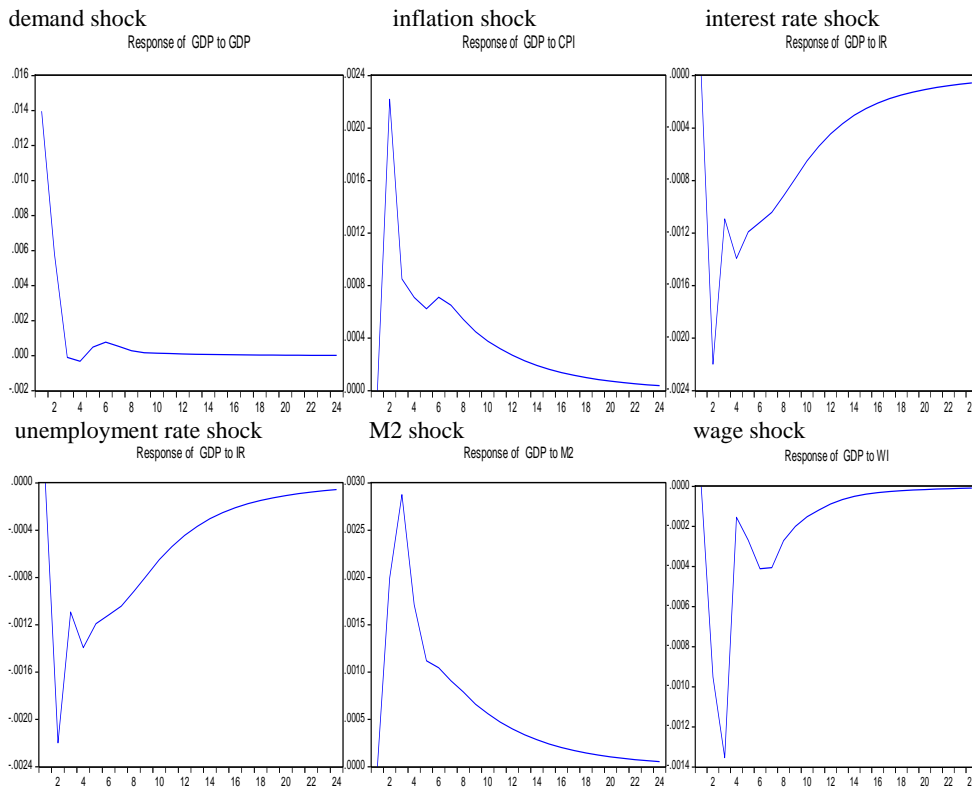
$$v_{ij,l} = \begin{cases} \frac{a_1}{p^2} & \text{for coefficients on own lags} \\ \frac{(a_2 \sigma_i^2)}{(p^2 \sigma_j)} & \text{for coefficients on lags of variable } i \neq j \\ a_3 \sigma_i & \text{for coefficients on exogenous variables} \end{cases} \quad (5)$$

where σ_i^2 is the i th diagonal element of Σ . Koop and Korobilis (2009) provide a detailed analysis on how the conditional posteriors are derived.

In the model we have included the following variables: real gross domestic product; consumer price index; three months short term interest rate; unemployment rate; monetary aggregate M2 and wage index over the period 2001.Q1 to 2012.Q4. The data were extracted from International Financial Statistics database. The data are seasonally adjusted, except short term interest rate, and expressed as logarithmic first differences. The short term interest rate is included in levels. The first three variables represent the minimum set, allowing analysis of a small open economy (Franta et al., 2011). We have included the unemployment rate in the study in order to study the Phillips relationship between inflation and unemployment in Romania. M2 was introduced in the model to capture the relationship between monetary aggregate and real GDP and inflation. Introducing wage index in the model will allow us to study the relationship between labour market, wage and productivity. When using BVAR models nonstationarity is not an issue, because the presence of unit roots in the data does not affect the likelihood function (Sims et al., 1990). The prior mean for the coefficient on the own variable weight and relative cross-variable weight are set to 0.7, assuming a higher degree of persistence, and 0.3, respectively. The scale on the intercepts is set to 100. The results were obtained using the EViews.

4. RESULTS

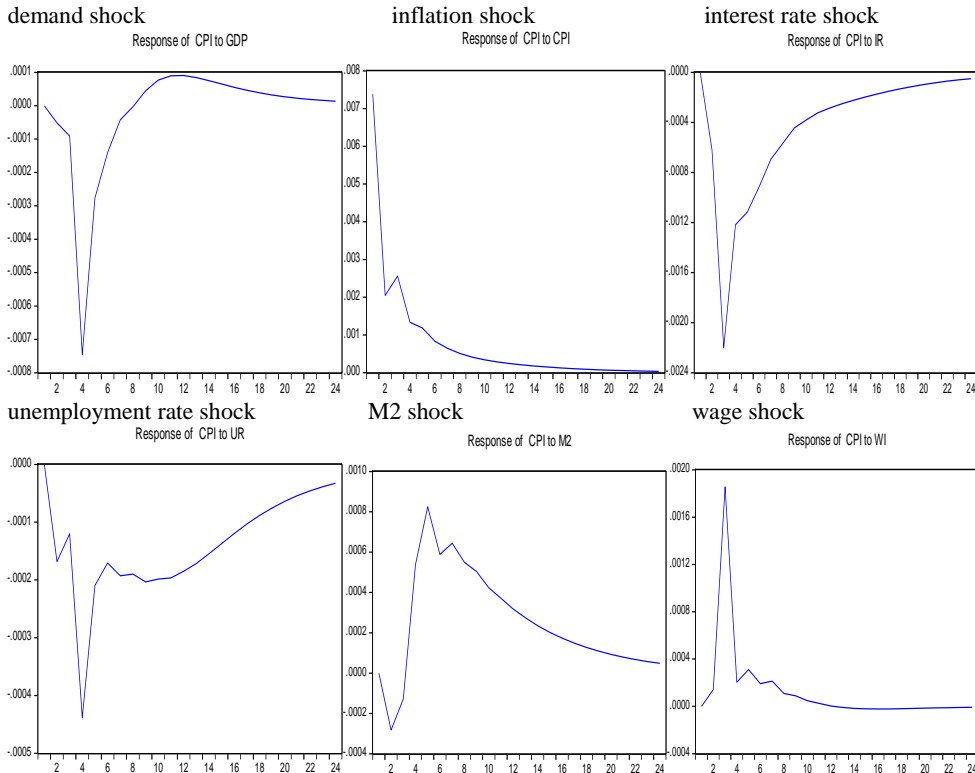
Somewhat counterintuitive a positive inflation shock (i.e. an unexpected growth of inflation) will lead to a gross domestic product growth. This answer is not in line with the economic theory. On the other hand, if we take into consideration the analyzed period, the answer can be valid. Over the period 2000 to 2008 the gross domestic product growth was achieved in a high inflationary environment, compared to other countries in Central and Eastern Europe. A positive aspect emerges from the impulse response of the gross domestic product to an unexpected growth of short term interest rate. Thus, a monetary policy tightening will lead to a gross domestic product decrease. This evidence comes to consolidate the monetary policy transmission channel. In line with intuition, a positive shock of the unemployment rate will lead to a lower demand, and implicitly, to a lower gross domestic product. A positive shock of the monetary aggregate M2 is associated with a GDP growth, while the wage index growth will lead to a GDP decrease. This latest answer is not in line with the economic literature, but it can be valid given when the wage growth isn't positively correlated with the productivity.



Note: horizontal axis indicate the periods (months) after the shock; vertical axis show the deviation from the baseline scenario

Figure no. 1 Response of GDP to:

A positive demand shock (i.e. an unexpected increase of the gross domestic product) will lead to a lower inflation rate. Even if this effect disappears in a relatively short time, it can be explained through the monetary policy reaction function, which implies an interest rate growth when the output is above the economy potential in order to reduce the inflationary pressures. The inflation persistence is quite significant, its effect disappearing after about ten quarters.



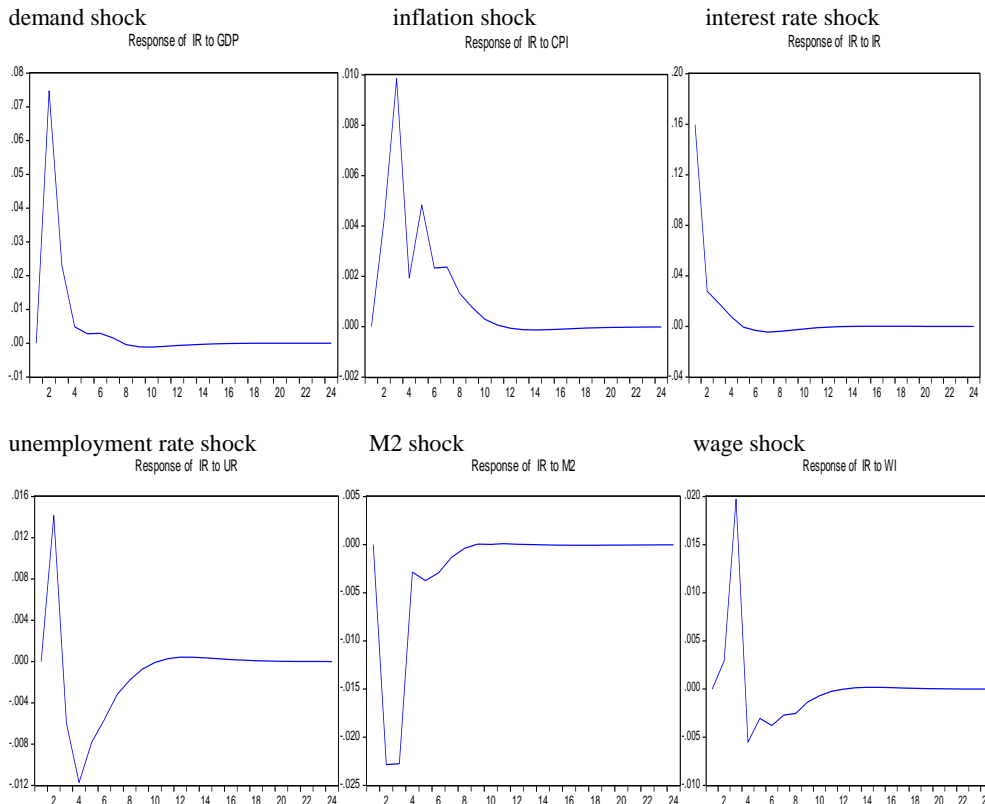
Note: horizontal axis indicate the periods (months) after the shock; vertical axis show the deviation from the baseline scenario

Figure no. 2 Response of inflation to:

The inflation impulse response to an unexpected growth of short term interest rate is negative. Thus, the inflation will significantly decrease and it will come back to its previous level after a long period due to a interest rate growth (i.e. a tighter monetary policy). A interest rate shock will lead to a higher price of the money. Thus, people and business will borrow less for consumption and investment, so both inflation and output will decrease, and will recover gradually when the interest rate shock will disappear. This answer enforces the interest rate channel and supports the inflation targeting strategy. An unexpected unemployment rate shock will lead to a lower inflation rate, in line with the economic theory. A monetary aggregate M2 shock will lead to an inflation and wage growth.

Closely related to a central bank reaction function that adopted inflation targeting strategy and follow a Taylor rule, an unexpected output growth and an inflation shock will lead to an increase of the interest rate. Also, the gradualism in monetary policy is

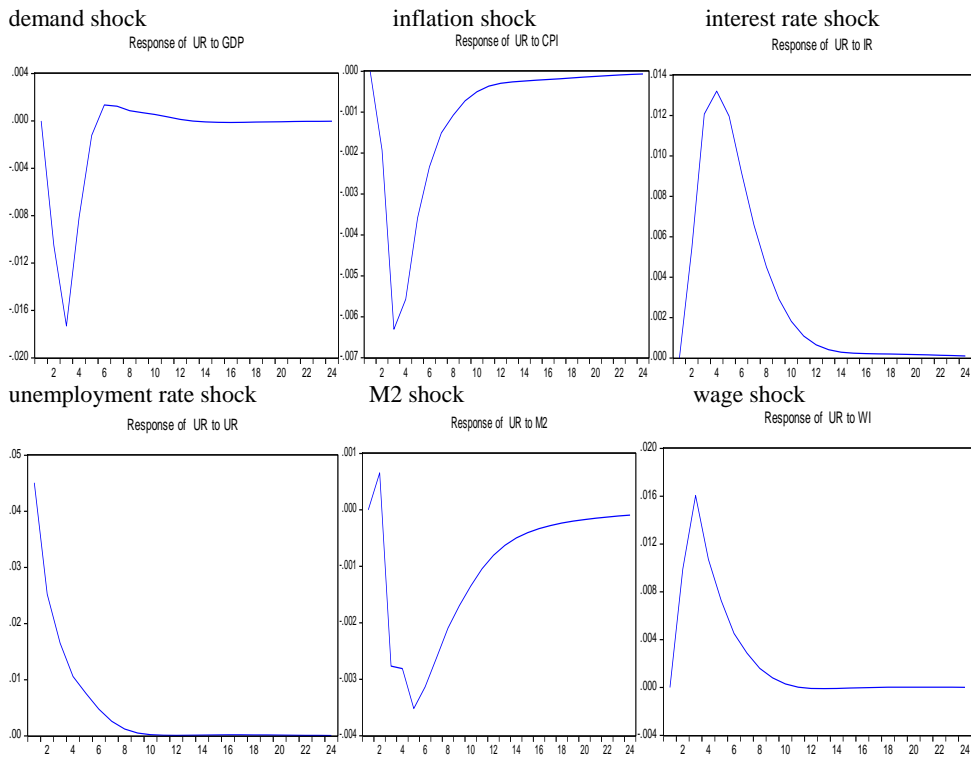
highlighted by the impulse response of the interest rate to an unexpected monetary policy tightening. A positive unemployment rate shock will lead to an interest rate growth. This growth will rapidly disappear and the interest rate will significantly decrease, this latter effect being the predominant one. As a matter of fact, this response is more in line with the intuition if we take into consideration the fact that central banks also pursue, within certain limits, a higher demand. A monetary aggregate M2 shock will lead, on short term, to a lower interest rate diminution, but the effect is on short term. A wage growth will lead to an interest rate growth, but this response will disappear relatively fast.



Note: horizontal axis indicate the periods (months) after the shock; vertical axis show the deviation from the baseline scenario

Figure no. 3 Response of interest rate to:

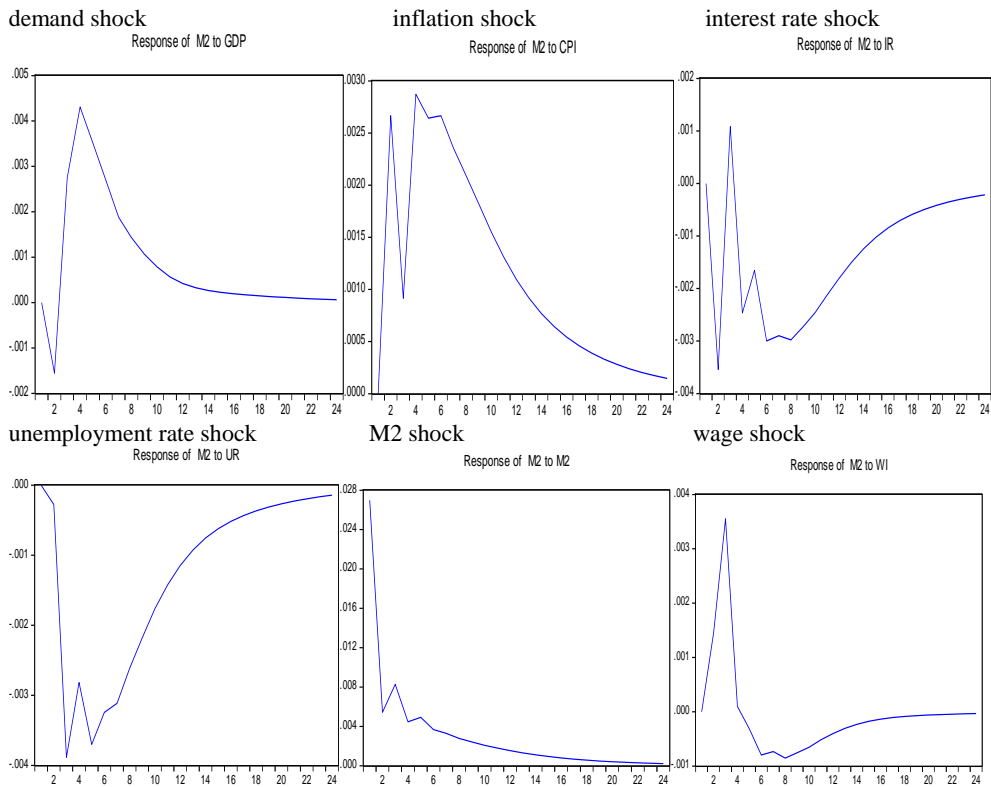
An unexpected growth of the gross domestic product will lead to a lower unemployment rate. Also, in accordance with Phillips curve, an inflation rate growth will determine a lower unemployment rate. An interest rate shock will lead to a higher unemployment rate, response in line with the economic theory. A positive monetary aggregate M2 shock will result in lower unemployment rate, while the unexpected positive variation of wages will lead to an unemployment rate growth.



Note: horizontal axis indicate the periods (months) after the shock; vertical axis show the deviation from the baseline scenario

Figure no. 4 Response of unemployment rate to:

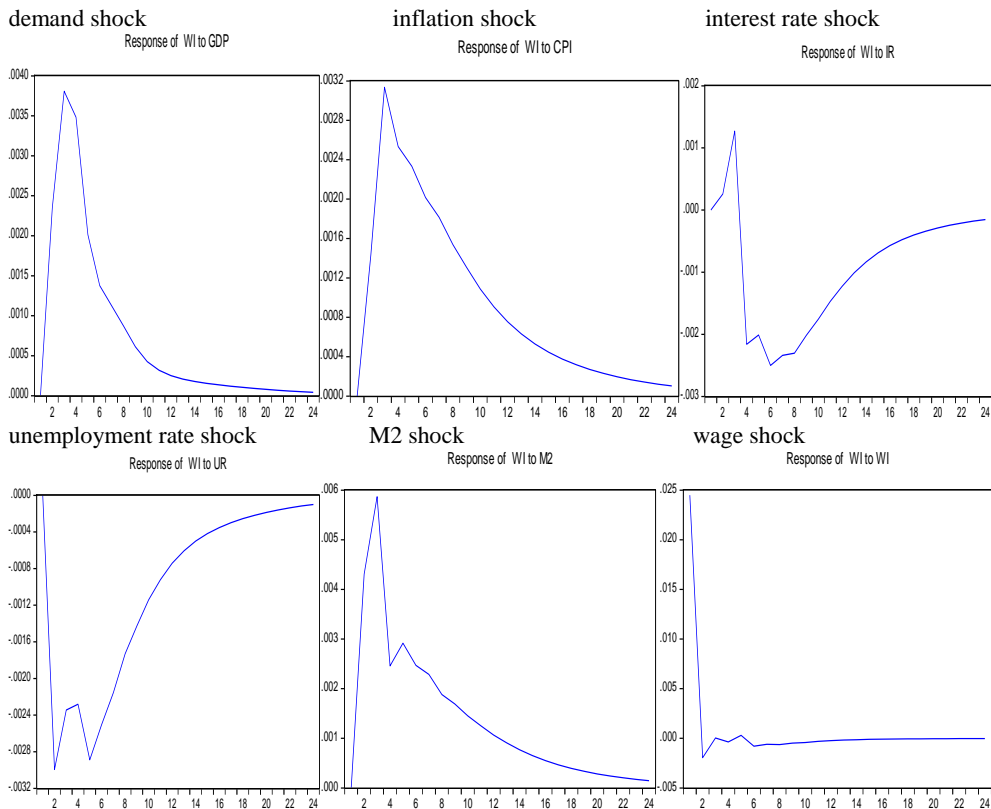
An unexpected growth of the gross domestic product will lead to an increase in the monetary aggregate M2. The impulse response of the monetary aggregate M2 to an inflation growth will lead to a monetary mass expansion, unlike the theoretical hypotheses which indicates a lower monetary aggregate due to higher prices. However, this contradiction was also observed by Kim and Roubini (2000). In line with the economic theory, the monetary aggregate M2 will decrease, following a more restrictive monetary policy. Also, an unemployment rate growth will involve a lower monetary aggregate.



Note: horizontal axis indicate the periods (months) after the shock; vertical axis show the deviation from the baseline scenario

Figure no. 5 Response of M2 to:

A demand shock will lead to a wage growth. A similar impulse response is observed in the case of an inflation shock. This impulse response is in line with the theory, considering the negative effects of the inflation on the revenues level. A positive interest rate shock will lead to lower wages. An unemployment rate growth will lead to lower wages. An unexpected growth of the monetary aggregate will determine a wage growth.



Note: horizontal axis indicate the periods (months) after the shock; vertical axis show the deviation from the baseline scenario

Figure no. 6 Response of wages to:

5. CONCLUSIONS

In this study we provided new empirical evidence on monetary policy transmission mechanisms in Romania using a BVAR model with a KoKo Minnesota/Litterman prior distribution. The objective was to surprise the way in which some monetary and economic variables react to different shocks. Thus, in the model we have included six variables over the period 2001.Q1 to 2012.Q4.

The results showed relevant conclusions. First of all, the effectiveness of the interest rate channel is to be appreciated. Most of impulse responses due to a interest rate shock are in line with the theory. Thus, having in view the absence of the output puzzles (i.e. an output growth due to a tighter monetary policy) and of the price puzzle (i.e. inflation growth due to a tighter monetary policy) the interest rate channel has become more robust in the recent years. Secondly, taking into consideration these facts, we consider that the role and responsibilities of the central bank acquires an increased importance, having in view the fact that it can control the interest rate according to its objectives. Thirdly, the relation between the inflation rate and unemployment rate in Romania is in line with the Phillips curve. In

Romania the inflation was very high in the last two decades. Therefore, the central bank main objective was to reduce the inflation. In our opinion, when the inflation would be in the target range the central bank should pay greater attention to demand side and to the employment rate.

Admittedly, after this study new directions of research appear. In our opinion, it would be relevant to compare this results with those obtained for the countries in Euro Area in order to compare the business cycle and the differences between monetary policy transmission mechanism. We will leave this for future research.

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