Perspectives on Euro introduction in the Romanian economy

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Abstract

This paper offers a first quantitative glance at the possible effects of preparing for Euro adoption, as well as at the ex-post effects of actual adoption. Although the complexity of the models considered gradually increases, nevertheless all the simulations provide the same general picture in which (short and sometimes medium term) restrictiveness is revealed. The results show that for Romania, fulfilling the Maastricht criteria implies short-term economic slowdown and restrictiveness, followed by economic recovery and growth in the medium term and especially the long run. Quantitative estimates of these effects are provided. The most important negative evolutions are to be found for the labour market and investment.

JEL classification codes: E17, E27
Keywords: effects of European monetary integration, models, simulations, impulse responses

1. Introduction and literature background

On 1 January 2007, Romania joined the European Union. As an implicit aspect, Romania will have to replace its own currency, the RON, with the Euro. The common currency raises a series of problems, both before and after adoption. It is important not only to fulfil the convergence criteria, but also to study the economic and social effects of this step.

For a country like Romania, situated at the end of most European rankings in the economic and social fields, a careful assessment of the monetary integration process is more needed than in the case of other EU countries. Romania is one of the biggest countries in the European Union, both in area and in population, being the second largest after Poland among the East

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European members. Therefore, controlling the efficiency of adoption policies is expected to be more difficult compared to a smaller country (for example Slovenia, Slovakia or Estonia). On the same lines, it is common understanding that a smaller country in the post-adoption era may benefit more from the protection umbrella provided by the Euro Area than a larger country (a size effect also occurs in the case of the economic problems a country might encounter). These specific features of Romania (compared to other Euro Area candidates) and the way they influence the convergence process are analyzed in studies such as Matiș and Nagy (2007). Mare and Marcu (2010) emphasize a lack of convergence at inflationary level between Romania and the Euro Area. The latter aspect is very important, as the inflation rate is the main criterion taken into account for assessing convergence; it is the cornerstone of monetary integration. And even though the international subprime crisis has led to discussions regarding changes in the way the inflation rate criterion is considered and computed (see Darvas and Szapary, 2008), Romania still has to put significant efforts towards fulfilling this particular criterion. The process has already proved to be very difficult, considering the fact that only in 2007 was the inflation rate in Romania within the targets of the NBR.

Yet, the nominal convergence criteria are a small part of the whole monetary integration process. Also important are aspects regarding real and structural convergence, as the evolution of real convergence may have a greater impact upon citizens. Trying to fulfil the nominal criteria may enter into contradiction with real convergence and lead to negative evolution of the national economy in many fields. The consequence might be represented by costs that would outbalance the benefits of a single European currency. Using the UK test related to economic integration, Mare (2010) has come to the conclusion that most sectors of the Romanian economy are not yet ready to join the Eurozone. In the same study, Mare (2010) also approximates that only around 20% of what should be done for monetary integration is complied with.

The present study subscribes to the economic literature that investigates the process of monetary integration of the candidate countries into the Euro Area. Such studies have now been conducted for several years for the newcomers in the European Union. The central banks of the candidate countries are in the front line of research that aims to provide a detailed picture of what the integration process really implies for the national economy (see the research conducted within the central banks of Poland, Latvia, and Hungary). In 2004, Bitans and Kauzens studied the effect of Euro adoption on the Latvian economy. Focusing on descriptive analysis combined with time series econometric methods, the authors emphasize the status of the Latvian economy and some possible effects of Euro adoption, at different levels. The main conclusion is that in the case of Latvia, a small economy, the indicators of real convergence differ substantially from those of the larger (Euro Area candidate) members, while the Latvian economy displays greater similarity to the Eurozone. The main conclusion is that, at the time of the study, monetary integration would have been a net benefit for Latvia. Relevant for the present study is the research conducted by Borowski et al. in 2004 for Poland. Also using a progressive approach, like the present paper, the authors investigate the status of the Polish economy and the effects that Euro adoption might have on different layers of the national economy, emphasizing both the costs and the benefits related to the process. An important conclusion drawn from the analysis is that fiscal impulses are more effective than
monetary impulses. Other relevant studies are the convergence process reports of the National Bank of Hungary (2006, 2008). From the methodological point of view, an interesting paper is that of Mojon and Peersman (2001). This emphasizes that the vector autoregressive (VAR) approach is the most widely used in assessing monetary issues in a country. Our study employs VECM analysis to assess the macroeconomic effects of preparing for euro adoption. The present work offers a first quantitative glance at the possible effects of preparing for Euro adoption, as well as at the ex-post effects for Romania of actual adoption. The complexity of the models considered gradually increases, although all the simulations provide the same general picture in which (short and sometimes medium term) restrictiveness is revealed. Nevertheless, this field of literature lacks studies on the Romanian economy. Moreover, the present study contributes to creating a general picture on the challenges that candidate countries face on their way to Euro adoption. It also provides a series of methodological steps and techniques that could be used to assess the effects of monetary integration, not only for Romania, but also for other candidates.

The rest of the paper is structured as follows. Section 2 presents the data and discusses methodological aspects. Section 3 presents the simulation results on all the models considered. Section 4 concludes the paper.

2. Data and methodology

2.1 Data

The data concern the Romanian economy from 1997 (q1) to 2009 (q4). In this analysis we used quarterly data from the Statistical Bureau of the European Union – Eurostat and OECD – concerning inflation rate, GDP, interest rate\(^4\), the RON/EUR exchange rate, real governmental expenditures\(^5\), the growth rate of real output, total employment, the monthly net wage, real investments, and net exports.

The data were seasonally adjusted and most of the variables are used in the analysis in their logarithmic form so that, where applicable, the first differences of the variables have the usual growth rates interpretation. The seasonal adjustment was based on the multiplicative moving average method, and the adjusted variables were afterwards transformed into their logarithmic form. This formatting of the data is used throughout all the following analysis.

Table A1 presents the way the variables are coded in the models analyzed in the Results section. The table is relegated to the Appendix.

2.2 Methodological aspects

The paper is based on a progressive approach, from simple (two variables) models to more complex models. The first part of the quantitative analysis deals with the very short and short

\(^4\) For which the real money market interest rate for 12-month maturity is used as a proxy.

\(^5\) As a proxy for fiscal criteria.
term effects on GDP of fulfilling the inflation rate criterion. It is a partial equilibrium analysis of the relationship between the GDP gap and the inflationary gap (see equation 1 in the Results section). It has as a starting point the applied work of Borowski et al. (2004), with theoretical background represented by the work of Lucas (i.e., aggregate supply function, Lucas 1972, 1973) and Okun’s law (1962), which together are combined in a well known version of the Phillips curve⁶. The aggregate supply function (Lucas, 1973) and the Phillips curve (Phillips, 1958) are expressed in terms of deviations of the actual values of the variables from the “natural”, expected ones. To approximate the latter, we use the Hodrick – Prescott (HP) filter (see Hodrick and Prescott (1997)). This procedure allows computing the gap (inflationary gap, output gap) by defining it as the deviation from the HP trend. (For example, when considering the GDP variable denoted by Yt, we compute the gap as: \( Y_{\text{GAP}}t = Yt - HPTREND\_Yt \).)

Generally, the HP filter has an end-point problem. Identification of an output gap is difficult as potentially an ‘outlier’ can have big effects on the output gap estimate. Kaiser and Maravall (1999) point to the aggravating influence of the end-point bias problem. One way to solve the problem is to extend the series, for example with ARIMA forecasts. Thus the interesting point is no longer at the end of the series. Applying this method to our data gives virtually identical results as with the simple application of the HP filter (see subsection 3.1 for results of the analysis of the relationship between the HP gaps of the GDP and inflation rate).

The second part of the quantitative analysis is a step forward, bringing for evaluation more complex relationships between the macroeconomic variables. This has theoretical roots in neo-Keynesian macroeconomic models in which several equilibrium equations are generated. The econometric model takes into account the five nominal criteria that have to be fulfilled by Romania in order to join the Eurozone (The Maastricht Treaty, 1992), plus other macroeconomic variables. The latter group consists of the most important real and structural criteria, such as output, total employment, wages, and investments.

The time series associated with the analyzed variables are usually non-stationary and this can affect the results of the econometric estimation by returning spurious relationships among them. However, the concept of cointegration indicates that while different variables have stochastic trends and associated short-run random divergences, they develop in a coherent way in the long run. Several time variables are cointegrated if they are individually non-stationary, but at least one combination of them is stationary (note that we consider only integration of at most order one for the variables). Thus, these variables cannot drift apart, having achieved a certain level of convergence.

We followed the standard steps of estimation of vector autoregressive models. First, the variables were tested for the integration order with the help of the Augmented Dickey-Fuller test (ADF). Second, cointegration tests were run (Engle-Granger (1987), Johansen (1988)). If variables are I(0), a VAR model in levels can be constructed, while if they are I(1), a vector

⁶ Also called the expectations – augmented Phillips curve.
error correction model (VECM) is estimated. Usual residual tests were employed to assess the appropriateness of the resulting models.\(^7\)

The VAR and VECM models allow for impulse response and variance decomposition analysis. The impulse response function shows the evolution of one variable following a shock in another variable of the model. It relies on the assumption that a shock to a variable of the model not only affects the future evolution of the same variable, but also the future evolutions of all the other endogenous variables of the model. This is due to the dynamic characteristic of the VAR or VECM in time. If the impulse response function shows the intensity that a current innovation is transmitted into the model, the variance decomposition provides information regarding the relative importance of the innovations. That is, the variance decomposition shows how much of the variation in an endogenous variable is given by a shock in another variable of the model (the explained part) and how much of it depends on other variables or other shocks (the residual value).

The third part of the quantitative analysis considers a semi-structural model. It has as theoretical background the model of Gali and Monacelli (2005) and the implementable version offered by Furlani et al. (2009). (One can also see the semi-structural model in Bank of Poland, 2004). The model employed in the present paper maintains the behavioural equations between the variables, while the structural parameters have been dropped and replaced with estimated ones. With respect to the above mentioned related literature, the specifications have been slightly modified to incorporate more complex dynamics for the exchange rate, allowing for a direct impact of the terms of trade and of the interest rate, and also for a direct positive response of GDP to exchange rate depreciation (see Table A2 for the form and structure of the equations for this model).

The equation of the model that stands for the IS curve relates the GDP level to its expected future value, as well as to the real interest rate, the rate of increase of terms of trade and the exchange rate, and also to foreign GDP. The equation can be rewritten so that it relates the expected growth rate \(\Delta Y_{t+1}\) (of national GDP) to the expected growth rate \(\Delta Y^*_{t+1}\) (of the foreign GDP) and current growth rate \(\Delta Y_t\), with positive expected signs. While terms of trade movements influence the exchange rate, we have included both factors for explaining GDP because the corresponding channels are qualitatively different. Moreover, although no reaction function is based on the exchange rate, in Romania this variable is not completely driven by the terms of trade variable. It sometimes plays the unofficially recognized role of a policy instrument. Inflation is represented by a neo-Keynesian Phillips curve, where prices react to excess demand, to terms of trade, although not to the exchange rate. The central bank’s reaction function closes the model and has a Taylor rule specification. The interest rate reacts positively and significantly to excess demand. It is noteworthy that the directions of the

\(^7\) It is noteworthy that the residuals of the cointegration equations (which are the equations associated with long run equilibrium) were tested for stationarity using MacKinnon cointegration critical values (MacKinnon, 1991) and not the regular Dickey – Fuller values (see Greene, 2008). Many macroeconometric papers on Romanian data, and not only, neglect this aspect. The researchers simply use the ADF test and declare their equations and models valid, neglecting the cointegration aspect. That is, the residuals of the equations are values strictly influenced by the correlations and the interconnections in the original variables.
causal relationships presented above are confirmed by the sign of the estimated parameters. That is, the expected signs from theory are confirmed by the data.

The next section discusses the qualitative and quantitative results of the econometric estimations and economic simulations of the present paper.

3. Results

Economic research has tried to emphasize the positive and negative effects of a common currency. On the one hand, the exchange rate implies a series of transaction costs which could be invested in other parts of the activity after entering the EMU. Additionally, employees involved in such operations would be relocated to more productive sectors and activities, leading to higher profits. Eliminating the exchange rate risk, the interest rate will diminish by an amount equal to the exchange rate risk premium and the direct effect will be lower cost of capital on the national financial market.

For Romania, giving up the RON means to be far less exposed to exchange rate crises. On the other hand, renouncing its own currency makes a country less prepared to manage (asymmetric) shocks in the real economy. In fact, these opposite effects may occur regardless of considering Romania, Poland, Latvia, or any other candidate country for the Euro Area. However, the positive effects of entering the EMU are very much emphasized by the Romanian authorities when compared with mentioning the possible negative effects of fulfilling the Maastricht criteria, for the short or medium term.

Based on several simulations, this section presents possible evolutions of Romanian economic life on its way to joining or after joining the EMU. As the main convergence criterion is the level of inflation rate, the first part of the section deals with the short term effects that fulfilment of this criterion would have on GDP. The goal of the second part is to estimate brief vector models of the Romanian economy, and based on these to analyze several possible evolutions caused by the monetary integration process. The shocks applied to the model are based on the convergence criteria that have to be fulfilled by Romania in order to enter the ERM II and then the EMU, as well as on the main lines drawn by different political and administrative entities in accordance with this goal. Emphasis is put on development of the labour market and evolution of investment flows on the way to and after euro adoption. At the end of the section we consider a stylized model driven from DSGE models. The model has been estimated and then simulations were performed in order to understand the medium term behaviour of the variables behind three nominal criteria (i.e., inflation, interest rate and exchange rate) in relation with real output components, on our path to Euro adoption.

3.1. The short term implications of fulfilling the inflation rate criterion

For each of the candidate countries to the Euro Area, one of the most difficult things to achieve is equilibrium between price stability (the inflation rate) and price convergence. The latter may show a fast pace, thus creating pressure upon the inflation rate criterion. Moreover,
countries have to combat speculative attacks that usually appear in a period of fixed exchange rates, therefore creating additional pressure on fulfilment of the inflation rate criterion. At the end of the ERM II period, the NBR has to find the proper way to reduce inflation in order to comply with the Maastricht reference value. But how would the Romanian economy react to such an evolution of inflation? This part of the analysis provides a snapshot of the very short and short term effects on Romania’s GDP of fulfilling the inflation rate criterion. Following the methodology used in the literature in the field (Borowski et al, 2004) we have obtained the GDP gaps and inflation rate using the Hodrick – Prescott filter and then used the gaps to model the effects.

When analyzing the relationship between GDP and the inflation rate in Romania, the following short term equation was obtained:

$$\text{GDPGAP} = 0.69*\text{GDPGAP}(-1) + 0.0022*\text{HICPGAP}(-1) + 0.0035*(\text{HICPGAP-HICPGAP}(-1)) + \varepsilon \quad (eq. 1)$$

| Table 1. Coefficients and their statistical significance for the short term equation: |
|-----------------------------------------------|----------------|----------------|
| Variable                      | Coefficient     | t-statistic    |
| GDPGAP(-1)                      | 0.6900***       | 4.51           |
| HICPGAP(-1)                     | 0.0022**        | 1.97           |
| HICPGAP-HICPGAP(-1)            | 0.0035**        | 1.97           |

Remarks on Table 1: ***significant at 1%, **significant at 5%, *significant at 10%.

The equation shows a positive relationship between the GDP gap level and the inflation rate gap in Romania. In the short term, a 1 percentage point decrease in inflation would lead to a 0.22 percentage points drop in the GDP gap. Thus, a delay of 1 quarter appears between changes in the inflation rate and changes in GDP. At the same time, the variation of the inflation rate from one quarter to the next would produce a variation of 0.35 in the GDP level. Therefore, bringing the inflation rate close to the target would lead GDP towards its natural, equilibrium value. The GDP results show that fulfilling the inflation rate criterion in the very short term would not result in a significant drop in national welfare. Thus, the relationship between the inflation rate and the GDP level in Romania does not appear to be quantitatively significant. This result might be explained by the fact that the historical data on Romania (on which our estimations were run) reveal high levels of inflation (above 200%) and low levels of GDP for certain periods.

Analysis of the residuals shows stationarity and non-serial correlation in the estimated residuals of the equation (the former is an obvious result since the HP gaps of the inflation and output variables are stationary in practice). The Q-statistics correlogram and the Q-statistics for squared residuals show no serial correlations for residual values up to high lags of more than 20 (with very high probabilities). The quantitative conclusion of the first estimated equation is that a constant decrease in the inflation rate (achieved by the authorities in order to

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8 The lag of the dependent is chosen by AIC/SIC criteria.
9 Measured quarterly by GDP.
fulfill the price stability criterion) would not lead to a major economic slowdown in the short run. The variation in the inflation rate from one quarter to another would not be perceived as an unbearable burden by the population. In the very short term, fulfilling the inflation rate criterion would not be followed by too strong a loss of welfare.

### 3.2. Macroeconomic effects of preparing for Euro adoption - a VECM approach

The reaction of GDP to short term changes in inflation rate was assessed above. In this subsection we consider five variables that are associated with the five nominal convergence criteria – inflation rate, interest rate, exchange rate and public expenditure, together with real output, total employment, wages, and real investment. Clear reasons exist for our choice of variables of real convergence. First, real output is the most important variable expected to attain convergence in the long run: it is the main indicator of the status of a national economy. Second, Romania has to comply with the convergence criteria, but also other European regulations and targets have to be taken into account, among which the most important concern international competitiveness and development of the labour market. Moreover, integration theory clearly states that once monetary policy is lost as an adjustment mechanism, the labour market and fiscal policy remain as policy decision instruments.

Several scenarios were constructed based on differences between current levels in Romania for the nominal criteria and the theoretical values that should be achieved. The differences were then applied as impulses in the vector models to assess how the macroeconomic variables will react.

Romania is presently under the Excessive Deficit Procedure. This means it has to reduce its budget deficit according to the EU calendar. By 2012 the deficit has to decrease below 3% of GDP. Thus, in the hypothesis of constant evolutions of GDP and of budgetary revenues\(^{10}\), the government should diminish budgetary expenditure by an average of 1.5% yearly. A monetary scenario is hard to define as not enough data are available for Romania to assess the long term interest rate criterion. What can be analyzed in relation to this criterion are the interest rate levels for different maturities and the effects of the NBR’s monetary policy decisions. However, some literature in the field suggests that the fiscal impulse of reducing governmental expenditure would have a more rapid and intense effect than increasing the degree of monetary policy restrictiveness (see the report of the National Bank of Poland, 2004). Usually, a reverse relationship exists between the two types of action – when monetary policy is more restrictive and the National Bank uses higher monetary policy interest rates, fiscal policy is more lax. An impulse of 1% per year was also applied to the interest rate.

For the main criterion, which is the inflation rate, its level in 2009 in Romania was 5.6%, above the NBR target of 3.5%, +/- 1 percentage point. In 2010, the inflation rate increased to 6.1%, according to Eurostat reports. The innovations applied to the inflation rate are based on two hypotheses. First is considered the NBR target of 3% in 2011, +/- 1 percentage point. In

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\(^{10}\) Both international and national economic forecasting institutions forecast a very slow recovery of Romania from the crisis, meaning almost constant revenues to the general budget and an almost constant GDP.
this scenario, the reduction would be made slowly in the next couple of years, while proportionally accelerating as the established deadlines approach. The latest figures from the European Union render the average of the best three EU performers in terms of inflation at a level of -0.73% for 2010. Therefore, as a second scenario for inflation impulses we considered a constant reduction of the inflation rate by 2 percentage points a year in order to enter the ERM II in 2012 and by 1 percentage point yearly if the official deadline is postponed to 2014. The inflation rate is not a policy instrument for central banks, while controlled inflation is usually an output of their policy decisions. The reason for applying an impulse in the inflation rate is that very efficient laws to increase competition on the Romanian markets combined with NBR efforts to target inflation may be viewed as a direct influence of the authorities on this variable.

All the variables were tested for stationarity/non-stationarity and proved to be first order integrated. A VECM was constructed11. The Johansen cointegration test found 2 cointegration equations between the variables, which are consistent and statistically significant. Moreover, the model is stable, as all the unit roots are within the unit circle. A decrease of public expenditure by 1.5% yearly implies a reduction by 0.375% quarterly. To such an innovation, the analyzed variables react differently. Thus, total employment would first drop by more than 0.016% in the next quarter after the impulse and then increase again, although to a lower value than before reduction of public expenditure. In three years time, it would stabilize at a level lower by 0.005% than the initial value. If, at the beginning, this innovation is not very important in the variation of total employment, its effect increases in time. Thus, after one year the shock would be responsible for almost 35% of the variation in the level of employment in Romania.

Negative evolutions can also be found in the case of investment and the inflation rate. The shock would cause a reduction in investment in general, with the lowest level of -0.16% in the first quarter. This is very important as the flow of FDI very much depends on the fiscal policy adopted by the national government12. The intensity and rapidity with which the fiscal negative impulse affects the economy is best seen in the reaction of the inflation rate. Here appears the deepest drop – the inflation rate reduces by 0.2 percentage points in the quarters after the shock. The rest of the variables all react positively to the negative innovation in government expenditure. The variation of the average monthly net wage is quite negligible – with a peak of around 0.01% after more than a year from the innovation.

Except for an increase in the unemployment rate and in the interest rate, the Romanian economy would benefit from reduction of the budgetary deficit according to the European Commission’s provisions. It would help in reducing inflation towards the targets established for monetary integration, it would provide a positive growth rate of real GDP and an improvement in Romania’s position on international markets and of trust in the Romanian economy (in the medium term, the RON appreciates against the Euro).

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11 The equations for the VECM are available upon request.
12 Almost 30%, according to variance decomposition analysis.
Figure 1. Response of variables to a user specified innovation of -0.375% in public expenditure.

The difficulties of analyzing the effects of fulfilment of the interest rate criterion have been underlined above. However, the implications of an innovation of 1% per year, namely 0.25% quarterly, are analyzed below. When conducting this quantitative exercise, we assume that the NBR will use the interest rate as a trigger instrument for inflation adjustment, although it is well understood that an increase in the monetary policy interest rate may have detrimental effects on the interest rate criterion, besides the positive effects given by the fact that Romania may be credited with more trust. As expected, the response of the inflation rate to the monetary impulse is weaker than to the fiscal impulse described above. An increase in the level of interest rate has the expected effect – it restricts FDI flows and national investment. Consequently, both employment and real GDP fall. The effects of an innovation on all variables are not as strong as in the case of reducing the budgetary deficit.

The results of this part of the study show that monetary impulses need longer periods to be felt in the economy in comparison with fiscal ones. This statement is also sustained by the variance decomposition, which emphasizes low importance of interest rate innovations in affecting the variables in the model. For example, variations in the level of total employment are given only in a proportion lower than 0.15% by variations in the interest rate.

Source: Authors’ illustration
As mentioned above, there are two possible ways to comply with the inflation criterion. The first implies a gradual approach, while in the second deflation is constant until ERM II entry. The nearest target for Romania is to enter the ERM II in 2012. This implies reduction of the inflation rate accordingly. Up to the moment, the inflation rate in Romania has been quite high compared to those of the other members. To reach this goal, the authorities should find ways to reduce inflation by 2% each year. The necessary impulse applied was of -0.5% a quarter. If the deadline for ERM II entry is postponed, the necessary innovation reduces and so do the short and medium term effects. As expected, such an action would have a beneficial impact upon the Romanian economy in the medium term. After a slowing down in the next quarters after the reduction (see Figure 4 for decrease of employment, of real GDP and of the monthly average net wage), the economy enters an ascending path in the medium term. The strongest reaction is the increase in investment by around 0.2%.

When simultaneously applying the above shocks, the reaction of total employment is the most severe in the first quarters after the impulse: a reduction by 0.023% in the next quarter and then a significant recovery. (We do not report here the impulse response graphics for such combined shocks; however they are available upon request.) While both the net wage and real
output react positively to the shock, investment shows a significant fluctuation. A contraction by 0.14% is followed by an increase in FDI by 0.16% towards the end of the analyzed period, when it stabilizes around this value.

**Figure 3.** Response of variables to a user specified innovation of -0.5 percentage points in the inflation rate

![Graphs of variable responses](image-url)

**Source:** Authors’ illustration

### 3.3. Macroeconomic effects of preparing for Euro adoption – simulations on a semi-structural model

The particular forms of the equations, as derived from the data analysis, are presented in Table A2 in the Appendix. The codes used for solving and analyzing the model have been written in the programming language Matlab\(^{13}\) and the economic modelling specific functions are part of the Iris toolbox\(^{14}\).

We analyze reactions to different shocks around the steady state, where the impact of all past shocks has died out. At steady state, GDP growth with technology, the inflation rate, interest rate, exchange rate and terms of trade are constant. The steady state of the model is set

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\(^{13}\) Release 2006a.

to match the situation in which the economy fulfilled the nominal criteria. Impulses of 1 pp innovation in three Maastricht parameters were applied (inflation, interest rate and exchange rate). Interpretation of such positive innovations is simple: considering that we are away from the steady state at a “distance” represented by the innovation, then we are interested in development of the economy on its way to achieve the steady state. Therefore, combined shocks were also considered, starting from differences between Romania’s real levels and the target values of the EMU.\textsuperscript{15}

**Figure 4.** Combined shock on interest rate and inflation rate in the semi-structural model (7.67 pp, 4.21 pp respectively)

![Diagram of combined shock on interest rate and inflation rate in the semi-structural model](image)

*Source: authors’ calculations.*

As for the general properties of the model, the reaction function is very tight, which determines strong increases in the interest rate. Under high capital mobility, the exchange rate reacts quickly to changes in interest rates. These further negatively affect output growth. Under this model, increases in the interest rate determine persistent cyclical movements in the rest of the variables, due to strong monetary policy. From a policy perspective, it is very important how the economy adjusts after an interest rate shock. For temporary shocks, the inflation rate reacts temporarily as well, while the exchange rate appreciates for a long period.

\textsuperscript{15} The variables were considered for their values in 2009.
due to persistence in exchange rate dynamics. We can see a drawback of the model, because the terms of trade do not react to the exchange rate, even though exchange rate deviation from the steady state is long lasting. Regarding exchange rate shocks, they impact GDP, which further transmits them into inflation and interest rates.

Analyzing here just the effects of the combined shocks on inflation and interest rates, the results are as expected. The large distance of the Romanian economy from the Maastricht targets implies restrictions at national level in order to enter the EMU within the schedule. The real output growth rate will decrease. For example, in the case of a combined shock on inflation rate and interest rate as depicted in Figure 5, the growth rate of real output in the first quarter after the innovation will decrease by 1.2 pp. The negative trend will continue in the medium term, arriving in q3 at -1.5 pp. Bearing in mind that the analysis is made quarter-on-quarter, the short term yearly effect will be significant. Only after one year of an abrupt descending slope will output growth enter a positive path. Complying with the EMU criteria diminishes the output gap (in the first quarter after the innovation by -3.5 pp), which indicates restrictiveness as well.

4. Discussions and conclusions

Econometric analysis using the VAR/VECM methodology proposes certain scenarios about the short term effects of preparing for Euro introduction and of effective Euro adoption. Monetary integration has as outcomes in the short term a sensible economic slowdown, followed in the medium term by recovery and economic growth. The most negatively affected among the studied variables are investment flows. For example, a reduction of budgetary expenditures by 0.375% in one quarter causes a rate of change of -0.18% in the volume of investment in Romania in the following quarter. In conclusion, monetary integration may have important influences upon the Romanian economy, and at least in the short term one should expect a generalized restrictiveness in the economic environment. This image is also confirmed by a simulations run on the stylized semi-structural model.

The results are much influenced by the degree of competitiveness present in the country. The EU brings with it a series of convergence types that internationally affect the level of competitiveness and the position of a country. The EU area is better ranked, which redounds upon the members, too. But each member individually has to find ways of preserving its individual position. For Romania this would be very hard. Wages are increasing gradually, tending towards the levels in the rest of the Union. Consequently, the part of competitiveness related to the cost of the labour force is lost. Investors will withdraw their funds from Romania unless they can find something else there to attract them. Fluctuations in employment may be neutralized by increased specialization of the labour force that, for the moment, is too rigid. This analysis focused on small models with emphasis on specific sectors of a national economy.

The goal for future research is to provide more complex models and see whether the conclusion of the present study is preserved, that is replacing the RON with the EUR implies short
term economic slowdown and restrictiveness, followed by economic recovery and growth in the medium term if the present premises are preserved. In this study, no matter the method used, this conclusion remained valid, at least in qualitative terms.

Reduction of the inflation rate has, as an immediate consequence, a drop in the level of GDP in the short term. After a while, based on income expectations and the price setting behaviour of firms, Romanian real output is expected to increase in the medium term. The stickiness of the labour market leads to significant employment reductions as a consequence of monetary integration. Rigid wages and wage legislation, combined with the demands of the unions, prevent the labour market from adapting through other channels than unemployment. Romanians are not willing to accept wage reductions against job creation. The most affected by the whole process will be the labour market, through a rise in unemployment, and a drop in investment.

The scenario analysis shows that the best channel for reducing inflation is fiscal. When applying fiscal impulses, the effects were more intense than in the case of monetary innovations. When budgetary expenditures are high, the national banks usually increase the monetary policy interest rate and vice-versa. And, as the present trend of the NBR is to reduce the interest rate in order to stimulate investment and economic growth, the best alternative is to restrict governmental expenditure (and decrease the budgetary deficit) by reducing the unproductive components of such expenditure.

A concluding policy implication that our results suggest is that for Romania it would be more suitable to postpone Euro adoption to a moment when the effects of such a decision are expected to be less harmful for the economy. In the case of adopting the Euro in the near future, the most affected in a negative way would be exactly the remaining adjustment mechanisms after losing the exchange rate – the labour market (directly) and investment (indirectly). Investment is needed in order to modernize the country and increase the value added in the economy, in order to pass from low value added sectors to high tech sectors. The goal is to strengthen the national economy, which should become less unstable in the face of international shocks. Moreover, in a labour intensive economy as in Romania, negative shocks on international markets have an appreciable pass-through effect on the national labour market. This fact, combined with restrictive actions taken in order to fulfil nominal convergence criteria, would increase unemployment, leading to a loss in welfare for the Romanian population. Moreover, on the above described picture the current crisis has an intensifying effect.

While in Romania the labour market and investment flows will be the most affected in a negative way, in Poland the Euro currency would generate an annual increase in investment ranging between 0.5 - 1 percentage points, according to Borowski et al. (2004). Bitans & Kauzens (2004) argue that on most dimensions, joining the monetary area is better than the hypothesis of preserving Latvia’s national currency (in the short term or the long term). On the other hand, a recommendation to postpone Euro Area accession is to be found in the latest convergence reports for the Czech Republic (National Bank of the Czech Republic, 2011).
Nevertheless, the recommendation of the National Bank of the Czech Republic has to do more with the current debt crisis of Western Europe. However, our study did not focus on crisis elements in the argumentation. It only tried to assert the idea that Romania is at a level of economic development that would imply too much restrictiveness in the case of Euro adoption. Thus, probably this step should be postponed for a future time in which Romania would already have reached a higher economic condition.
References


**Appendix:**

**Table A1.** Data description for the models presented:16

<table>
<thead>
<tr>
<th>Variable code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPGAP</td>
<td>GDP gap - authors’ calculations using the HP filter</td>
</tr>
<tr>
<td>HICPGAP</td>
<td>HICP gap - authors’ calculations using the HP filter</td>
</tr>
<tr>
<td>Y</td>
<td>Real output</td>
</tr>
<tr>
<td>R</td>
<td>Money market interest rate for 12-months maturity in Romania (as a proxy for the interest rate criterion)</td>
</tr>
<tr>
<td>Π</td>
<td>Inflation rate in Romania</td>
</tr>
<tr>
<td>X</td>
<td>Real net exports (terms of trade)</td>
</tr>
<tr>
<td>E</td>
<td>Exchange rate RON/EUR</td>
</tr>
<tr>
<td>Y*</td>
<td>Potential real output</td>
</tr>
<tr>
<td>Δ</td>
<td>Inflation rate in the Euro Area</td>
</tr>
<tr>
<td>Y*</td>
<td>Real output for the Euro Area</td>
</tr>
<tr>
<td>Δ</td>
<td>First difference of a variable</td>
</tr>
<tr>
<td>Shk</td>
<td>Shock</td>
</tr>
</tbody>
</table>

**Table A2.** The equations of the semistructural model:

- Dynamic IS curve
  \[ Y = 0.9Y_{-1} + 0.1Y_{+1} - 0.2(r - \pi_{-1}) - 0.48\Delta X_{-1} - 0.09\Delta Y_{-1} + 0.1\Delta e_{-1} + shk_1; \]
- Newkeynesian Phillips curve
  \[ \pi = 0.8\pi_{-1} + 0.2\pi_{+1} + 0.43\Delta X_{-1} - 0.46\Delta Y + 0.2(Y - \overline{Y}) + shk_2; \]
- Taylor rule/Reaction function
  \[ \pi = 0.8\pi_{-1} + 1.2\pi + 1.5(Y - \overline{Y}) + shk_3; \]
- Purchasing Power Parity function
  \[ \Delta e = 0.52\Delta e_{-1} + 0.5\Delta X + (-0.5)r + shk_5; \]
- Terms of Trade dynamics
  \[ \Delta X = 0.36\Delta X_{-1} + shk_6; \]
  \[ \Delta X = (1/1.04)^{Y}(\Delta Y* - \Delta Y) + shk_7; \]
- Definition of GDP growth
  \[ \Delta Y = Y - Y_{-1}; \]
  \[ \overline{Y} = Y_{-1} + shk_8. \]

**Remark:** The index -1 means the first lag of the variable, the index +1 means the first future value of the variable, the coefficients are reported as rounded values with two decimals. The coefficients in bold are estimated or imposed by the steady state existence.

16 For high-frequency data quarterly averages were used. The levels of \( Y, X, \overline{Y}, Y^* \) are in logarithmic form.