THE EFFECT OF EXCHANGE RATE ARRANGEMENTS ON TRANSMISSION OF INTEREST RATES AND MONETARY POLICY INDEPENDENCE: EVIDENCE FROM A GROUP OF NEW EU MEMBER COUNTRIES

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Abstract

The main objective of this paper is to investigate whether empirical support for the monetary independence hypothesis can be found from eight EU new member countries. Thus, we will analyze which are the consequences of the euro interest rate movements over the interest rates in selected EU new members outside euro zone, in a framework of different exchange rate regimes. We employ 2SLS cross-section fixed-effects estimation on a panel of countries, with a Newey-West estimator, robust against heteroscedasticity and autocorrelation. We find that interest rates in non-Euro area EU members with floating exchange rate arrangements are found to react considerably more to ECB's interest rate shocks than do interest rates in those that have fixed or intermediate exchange rate regimes. The evidence suggest that countries with floating exchange rate arrangements are less independent than the fixed and intermediate exchange rate countries and, furthermore, intermediate arrangements help to preserve better the monetary policy autonomy.

Keywords: exchange rate regime, monetary policy independence hypothesis, interest rate, European integration, European Central Bank
JEL classification: F31, F32, F33, F36

1. INTRODUCTION

The recent turmoil on the international financial markets underlines the importance of contagion effect. Changes in interest rates in certain countries tend to have significant effects on other countries. Under these conditions, some turbulence on certain monetary markets could be reflected in the evolution of interest rates on other country markets. Also, another issue that is worth paying attention is whether the choice of exchange rate regime

affects the sensitivity of local interest rates to international interest rates. According to the "impossible trinity" or open economy trilemma, countries cannot have fixed exchange rates, domestic monetary autonomy and open capital markets all at once. The monetary independence hypothesis originated with Friedman [1953], argues that flexible exchange rates allow countries to pursue independent monetary policies and the domestic interest rate should be less sensitive to changes in international interest rates – other things equal [Frankel et al., 2004]. By the contrast, under pegged exchange rates and unrestricted capital flows, domestic interest rates cannot be set independently, but rather must track closely those prevailing in the country to which the domestic currency is pegged.

Following their accession into the European Union (EU) member countries are expected to join the Economic and Monetary Union (EMU). Under these circumstances, they have to achieve some nominal convergence conditions, as Maastricht Treaty stipulates. The Protocol on the convergence criteria referred to in Article 109j of the Treaty establishing the European Community postulates that the criterion on the convergence of interest rates referred to in the fourth indent of Article 109j(1) of this Treaty shall mean that, "observed over a period of one year before the examination, a Member State has had an average nominal long-term interest rate that does not exceed by more than 2 percentage points that of, at most, the three best performing Member States in terms of price stability". Interest rates is measured on the basis of long term government bonds or comparable securities, taking into account differences in national definitions. Also it is specified that "the normal fluctuation margins provided for by the Exchange Rate Mechanism of the European Monetary System, for at least two years", must be "without devaluing against the currency of any other Member State". In this circumstances, it is considered that the long-term interest rate levels reflect the durability of convergence achieved by the Member State and of its participation in the Exchange Rate Mechanism of the European Monetary System.

The main objective of this paper is to investigate whether empirical support for the monetary independence hypothesis can be found from eight EU new member countries. Thus, we will analyze which (if any) are the consequences of the euro interest rate movements over the interest rate on selected EU new member money markets outside euro zone, in a framework of different exchange rate regimes. From another point of view, we investigate the role of the process of integration into the monetary union on the ability of these countries to pursue independent monetary policies, which is a potential cost of entering the EMU. We adopted in our approach a methodology derived from the one used by Frankel et al. [2002, 2004].

The importance and originality of this paper consist in assessing selected EU new member countries outside euro zone (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania) from the beginnings of Euro to present times (January 1999 – March 2011). In the sample period there were two waves of EU enlargement and the recent international financial crises had appeared. The EU new member countries have been relatively neglected in investigating the monetary independence hypothesis. The empirical evidence did not find by now a clear pattern for interest rate response to external factors according to different exchange rate systems in EU new member countries from CEE. These countries differed from many other emerging market economies that were investigated in previous studies. This is a reason to consider that evidence against the monetary independence from previous studies could not be used for policy prescription regarding the choice of the exchange rate regime in EU new member countries. Also, under the

circumstances of recent international financial crises it is useful to investigate the impact of euro interest rates on non-euro zone EU.

The remainder of this paper is structured as follows. Section 2 is an overview of the theoretical and empirical literature on the monetary independence hypothesis and interest rates transmission. In section 3 we explain the methodology we have used to investigate the consequences of the euro interest rate movements over the domestic interest rate in selected countries. In section 4 we discuss the data. Thereafter, the results of the empirical analysis are presented and discussed in section 5. In the final section, we conclude by drawing implications from our results that lead to suggestions for further research and policy recommendations.

2. LITERATURE REVIEW

There are many empirical regional and single country studies that research on the degree of monetary autonomy of central banks in the framework of liberalization of capital markets and the choice of exchange rate regimes.

Hausmann et al. [1999], who were among the first to study this issue, studying exchange rate regimes in Latin America, discovered that flexible exchange rate regimes did not permit more stabilizing monetary policy and that pro-cyclical monetary measures were actually supported by flexible exchange rate regimes. Frankel [1998] concludes that countries having floating or intermediate regimes (i.e., Mexico after 1994 and Brazil before mid-1998), exhibit much higher interest rate responses than countries with less flexible exchange rate regimes (i.e. Argentina, Hong Kong or Panama). Borensztein, Zettlemeyer, and Philippon [2001], focusing on some countries with currency boards or floating regimes (such as those in Argentina, Mexico, Hong Kong, and Singapore), found some evidence consistent with the traditional view.

Bluedorn and Bowdler compare international interest rate responses under pegged and non-pegged regimes to identified, unanticipated, and exogenous U.S. interest rate changes and realized U.S. interest rate changes. They found important differences in estimated transmission from the two sets of measures - identified interest rate changes demonstrate a greater concordance with the impossible trinity than realized rate changes. Flood and Rose [1995] and Rose [1996] examine trade-offs between exchange rate volatility and measures of monetary divergence. They found either no support or weak support for the trade-offs implied by the trilemma. Miniane and Rogers [2007] identify U.S. interest rate shocks from structural vector autoregressions (SVARs) and estimate their transmission to a range of foreign interest rates. Shambaugh [2004] reports evidence that a peg imposes a constraint on monetary policy in the form of higher interest rate pass-through. By contrast, Frankel et al. [2004], using different exchange rate regime classifications, find that full interest rate pass-through cannot be rejected in many cases, even for non-pegs.

Calvo and Reinhart [2001, 2002] argue that under the modern float there could be limited monetary autonomy. Bordo and Flandreau [2003] discovered that even under the classical gold standard domestic monetary autonomy was considerable. Obstfeld et. al [2004] studies the coherence of international interest rates over more than 130 years. They found that the interest rates of pegged economies react more to changes in the base rate; the base rate can explain more of the changes in the local rate for pegs; also, the pegs react more quickly and have a stronger long run relationship to the base than non-pegs do.

Fratzscher [2002] analyzes the trade-off between exchange rate flexibility and monetary policy autonomy for a group consisting of open emerging market countries and countries under the Exchange Rate Mechanism (ERM), finding no systematic link between exchange rate flexibility and monetary independence.

There are few studies that research on monetary autonomy of central banks from Central and Eastern European (CEE) countries or EU new member states. More than that, comparative analysis including CEE countries do not find a clear pattern for interest rate response to external factors according to different exchange rate systems. Habib [2002] investigates the impact of external factors on daily exchange rates and short-term interest rates in the Czech Republic, Hungary and Poland. The conclusions are that exchange rates and interest rates are not influenced by short-term German interest rates. However, shocks to emerging market risk premia do have an impact on exchange rates in these three countries. Crespo Cuaresma and Wojcik [2006] estimate using a Dynamic Conditional Correlation (DCC) multivariate GARCH model, the degree of time-varying correlation in interest rate shocks with Germany and the U.S. under different exchange rates regimes for three new EU member countries – Hungary, Czech Republic and Poland. They find that the dynamic behaviour of the correlations in interest rate shocks in the Czech Republic appear to be consistent with theory, but they demonstrate no evidence to support the validity of the monetary hypothesis in Hungary and Poland. Scheicher [2000] finds that short-term interest rates in the Czech Republic, Hungary and Poland are segmented at a regional and at a global level and do not interact with the benchmark rate in Germany during the period 1997-98. Darvas and Szapary [1999], including Czech Republic, Hungary and Poland in a sample of emerging economies, consider impossible to differentiate interest rate responses to external shocks according to the exchange rate regime. Căpraru and Ihnatov [2011] examine the degree of monetary policy autonomy of National Bank of Romania (NBR) after adopting a managed floating exchange rate regime on August 2005 and find that the effect of euro interest rate changes on the local interest rate seems to be higher than expected.

3. METHODOLOGY

Our intent is to establish the extent of monetary policy independence in selected CEE countries, members of the European Union. We highlight the empirical regularities regarding the link between their domestic interest rates and the euro interest rate.

We estimate a simple linear model on a CEE countries panel data, as follows:

$$r_{i,t}^{d} = f_i + \beta r_t^{e} + \gamma X_{i,t} + \varepsilon_{i,t} \quad (1)$$

where:

$r^{d}_{i,t}$ – domestic nominal interest rate for the local currency of country *i* at time *t*;

r^{e}_{t} – foreign (euro) interest rate at time *t*;

$X_{i,t}$ – a control variable for country *i* at time *t*;

f_i – country *i* specific effect;

$\varepsilon_{i,t}$ – error term for country *i* at time *t*.

This equation describes the long-run relation between domestic and euro (foreign) interest rates. The β parameter shows the sensitivity of the domestic interest rate to euro interest rate movements.

The average level of the domestic interest rate – α – may be determined as an average of the country-specific effects, f_i (not accounting for the euro interest rate and the control variable), as follows:

$$\alpha = \frac{1}{N}\sum_{i=1}^{N} f_i \qquad (2)$$

We first employed an OLS cross-section fixed-effects estimation on the panel data, under the assumption that the error term is zero mean and cross-country independently distributed. The evidence showed that the residuals are heteroscedastic and serially correlated. The consequence is that OLS estimators are inefficient (though still unbiased and consistent) and the variance estimators of the OLS estimators are biased.

Thus, we changed the methodology by employing a 2SLS cross-section fixed-effects estimation on the panel countries, with a Newey-West estimator, robust against heteroscedasticity and autocorrelation[1].

Our methodology is based on a three step empirical research.

First, we estimate the specification (1) without the control variable. We exclude from our sample the domestic interest rates larger than 20% (see Section 4).

Second, we break our data panel in subsamples using an exchange rate regime dummy. We employ the same 2SLS fixed-effects estimation on specification (1) on all subsamples. The need to deepen our analysis by breaking the data in three regime subsamples is due to the various exchange rate arrangements adopted by the selected countries. There is also evidence that the country effects are different for each regime type. We adopted the Frankel et al. [2002] regime classification approach, grouping the countries in three broad regime types – fixed, intermediate and floating – which include the eight de jure regimes reported by IMF (Table 1).

Third, for the robustness check, we include in the specification the inflation differential (domestic versus euro area) as a control variable. This is a proxy for the variation of the currency risk premium and/or country risk premium, which may determine the cross-country and time variation of the interest rates [Frankel et al., 2002].

Table no. 1 The correspondence between the classification used in this study and the IMF approach

Frankel et al. classification		
Fixed	Intermediate	Floating
IMF classification		
(1) no separate legal tender (2) currency board arrangement (3) other conventional fixed peg	(4) horizontal band (5) crawling peg (6) crawling band (7) managed floating without pre-announced path for exchange rates	(8) independently floating

Source: [Frankel et al. [2002] and IMF, various issues]

We have chosen to use the IMF *de jure* arrangements (and not a *de facto* alternative classification) as CEE countries "remained, with relatively minor and temporary setbacks, on the stabilization track since the early stages of the transition. As a result, the credibility of the monetary authorities and the confidence in national currencies was enhanced […] Undoubtedly, the prospects of EU integration placed external constraints on monetary and fiscal authorities that helped to solve the commitment problem and that provided an anchor

for macroeconomic discipline, institution–building, and structural reforms. In particular, the conditions for accession led to the creation of domestic institutions dedicated to price stability, as legal provisions on central bank independence were strengthened substantially." [Crespo Cuaresma, Wójcik, 2006, 11-12].

For each of the three regime types, we estimate the sensitivity of the domestic interest rate to euro interest rate movements - β in equation (1).

Three main factors determine the extent of domestic and foreign interest rates close correlation [Frankel et al., 2002]: the degree of financial integration of the domestic economy into world market, the degree of business cycles synchronization and the nature of shocks. Assuming a given level of these factors, the economic theory states that a higher degree of exchange rate flexibility should allow a higher degree of monetary policy independence [Hanke, 2008]. The foreign shocks are absorbed especially by the domestic currency exchange rate as long as the flexibility of the exchange rate is higher. Thereby a country with a flexible exchange rate regime has a low sensitivity of the domestic interest rates to the euro (foreign) interest rates (and vice-versa). So, the expected result of our research is $\beta_{fixed} > \beta_{intermediate} > \beta_{floating}$. Assuming the full capital mobility, we should have $\beta_{fixed} = 1$ and $\beta_{floating} < 1$. However the floating regime interest sensitivity may equal or even exceed unity in a situation when monetary authorities choose the same monetary policy rule as the world at large (or a region) and the countries face common shocks or correlated business cycles.

This may be our case, as our panel data contains countries that are EU members heading towards EMU, so the monetary policies may be closely following the European Central Bank policy.

4. DATA

Our sources of data are the International Financial Statistics (IFS) database of the International Monetary Fund (IMF) and the Eurostat database of the European Union. The data sample period is from January 1999 to March 2011.

We use the IFS 60BZF monthly series of the money market rates (3 months maturity) in Bulgaria, Czech Republic, Estonia[2], Latvia, Lithuania, Poland, Romania and Euro Area. As the 60BZF series are not available for Hungary, we use the 60CZF monthly series of the Treasury bill rate instead.

We have chosen to exclude the domestic interest rates larger than 20% from our research. In seven of eight panel countries the domestic interest rates were below this limit for the selected period, except in Poland on February 2001 and in Latvia on June 2009 (Appendix 1). On the other hand, there were periods of time (January 1999 to December 2002, November 2003 to July 2004) when the money market rate in Romania ranged between 20% and about 150%. To avoid an outlier effect of this subsample, we decided to eliminate it from our sample.

As a control variable, we use the HICP monthly rate of change available on the Eurostat webpage.

All interest rates and inflation rates are expressed as continuous compounded variables – $r = 100\% * \ln(1+R)$, where R=10% is expressed as 0.10.

The exchange rate regimes data is built on the IMF's *de jure* classification system, introduced by the Fund in 1999. We collected our data from Grauwe and Schnabl [2004, 23], from the IMF "De Facto Classification of Exchange Rate Regimes and Monetary

Policy Frameworks" (2004-2009 issues) and the IMF "Annual Report on Exchange Arrangements and Exchange Restrictions" (AREAR), various issues from 2004 to 2010. The Appendix 2 lists the exchange rate arrangements prevailing in each country, over the sample period.

5. RESULTS

The results of our basic specification are summarized in Table no. 2. For each regression, we report the slope parameter β and the p-value from the Wald test of the null hypothesis β=1. The first column reports the estimated results on all the panel data and the next three on the regime subsamples.

Table no. 2 Basic specification estimation results

	All	**Peg**	**Intermediate**	**Float**
EuroRate	0.947***	0.781***	0.516***	1.396***
	(0.0507)	(0.0407)	(0.139)	(0.139)
N	1110	580	283	247
adj. R^2	0.215	0.372	0.016	0.347
Test slope=1 (p-value)	0,2922	0.0000	0.0006	0.0048

Newey – West HAC robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The slope coefficient estimate for the entire sample is 0.94 and is not significantly different from unity, which suggests that the panel countries do not develop an independent monetary policy versus the European Central Bank (ECB) on the long run. This may be due to the fact that domestic monetary authorities follow the same monetary rules and/or share a high degree of business cycles synchronization over the sample period in the framework of European integration process.

The results seem to confirm that there are differences due to heterogeneity of the exchange rate arrangements in the selected countries. As expected, the point estimate of the slope value is higher under pegged regimes (0.78) than under intermediate regimes (0.51), but both estimates are significantly different from unity. The result of the Wald test on the pegged exchange regime slope could be due to some lack of capital mobility and/or to the fact that Latvia and Lithuania pegged to the SDR until December 2004 and January 2002, respectively. In the case of the floating exchange rate regime, the point estimate of the slope value is higher and, in the same time, significantly different from unity (1.39), suggesting an over adjustment of domestic interest rates.

The results of our robust specification that includes the control variable are summarized in Appendix 3. After adding the inflation differential in equation (1) we find no change in the empirical estimates.

6. CONCLUSIONS

In this study we analyze which are the consequences of the euro interest rate movements over the interest rate on selected EU new member money markets outside euro zone. We find that the sample countries do not develop an independent monetary policy in relation with ECB's one on the long run, but the results seem to confirm that there are

differences due to heterogeneity of their exchange rate. As expected, the sensitivity of local interest rates is higher under pegged regimes (0.78) than under intermediate regimes (0.51), but in the case of the floating exchange regime, the sensitivity is the highest (1.39), suggesting an over adjustment of domestic interest rates. This finding is consistent with Frankel *et al*. [2004], who demonstrate that the hypothesis of full transmission of interest rate changes is usually not rejected even for countries with floating regimes. This may be due to the fact that domestic monetary authorities follow the same monetary rules and/or share a high degree of business cycles synchronization over the sample period in the framework of European integration process. The countries assessed have small and open economies that are well integrated with the EU economy. From another point of view, these results could suggest that factors like exchange rate pass-through and foreign-currency liabilities prevent monetary authorities of these countries from conducting an independent monetary policy, their exchange rate regime being different from the announced one, and *de facto* importing the monetary policy of Euro area countries. Another question that could rise is: are the floating regime countries not able to pursue their independent monetary policy or rather they choose by their self to follow the ECB's monetary policy?

From another perspective, our results demonstrate that countries with floating exchange rate arrangements are less independent than those with fixed and intermediate exchange rate regimes. Furthermore, intermediate arrangements help to preserve monetary policy autonomy in the framework of the ongoing major financial turbulences, unlike pegged and, surprisingly, floating exchange rate regimes. This evidence suggests that countries with intermediate arrangements may have more to lose from adopting the euro than would those with fixed or floating exchange rate regimes.

It is important to note a caveat of our analysis. A wrong exchange rate classification may lead to the rejection of a valid monetary independence hypothesis. In our case, *de jure* flexible regimes could be *de facto* less flexible, different from what authorities officially declare. In this case, it is recommended to use statistical methods to discern the true exchange rate regimes in non-Euro area EU members. This issue is left for our future research.

Acknowledgement

This work was supported by the project "Post-Doctoral Studies in Economics: training program for elite researchers - SPODE" co-funded from the European Social Fund through the Development of Human Resources Operational Programme 2007-2013, contract no. POSDRU/89/1.5/S/61755.)

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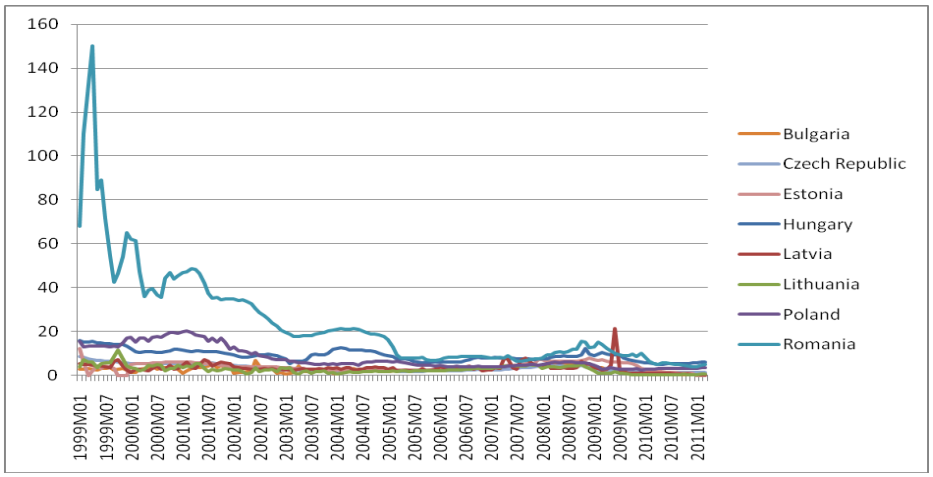
Notes

1. We employ the xtivreg2 Stata module [Schaffer, 2010] which uses by default a Newey-West estimator.
2. Data series available until December 2010, as on January 1st, 2011 Estonia joined the EMU.

Appendix no. 1 Money market rates in selected CEE countries



Source: [International Monetary Fund, International Financial Statistics database]

Appendix no. 2 Exchange rate regimes in selected CEE countries

Year	Bulgaria	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania
1999	2	7	2	6	3 (peg to SDR)	2 (peg to USD)	6	7
2000	2	7	2	6	3	2	8 (since Apr 2000)	7
2001	2	8	2	6 (until Sept 2001)	3	2	8	6
2002	2	8	2	4	3	2 (peg to euro, since Feb 2002)	8	6
2003	2	7(since July 2003)	2	4	3	2	8	6
2004	2	7	2 (ERM II since June 2004, but still maintains the CB arrangement)	4	3	2 (ERM II since June 2004, but still maintains the CB arrangement)	8	6 (until Nov 2004)
2005	2	7	2	4	3 (to euro – since Jan 2005; joined ERM II - since May 2005)	2	8	7
2006	2	7	2	4	3	2	8	7
2007	2		2	4	3	2	8	7
2008	2	8	2	8 (since Feb 2008)	3	2	8	7
2009	2	8	2	8	3	2	8	7
2010	2	8	2	8	3	2	8	7
2011	2	8	Eurozone (since January 2011)	8	3	2	8	7

Source: [IMF, various issues]

Notations
1: exchange rate arrangements with no separate legal tender
2: currency board arrangements
3: other conventional fixed peg arrangements (within a band of most ±1%)
4: pegged exchange rate arrangements within horizontal bands (at least ±1%)
5: crawling pegs (with small, pre-announced adjustment)
6: exchange rates with crawling bands
7: managed floating with no pre-announced path for the exchange rate
8: independent floating (market-determined exchange rate and independent monetary policy)

Appendix no. 3 Robust specification estimation results

	All	Peg	Intermediate	Float
EuroRate	0.927***	0.782***	0.487***	1.393***
	(0.0509)	(0.0408)	(0.142)	(0.138)
InflatDif	0.363***	-0.0116	1.003**	0.353
	(0.101)	(0.0805)	(0.306)	(0.239)
N	1110	580	283	247
adj. R^2	0.224	0.371	0.060	0.348
Test slope=1 (p-value)	0.1496	0.0000	0.0004	0.0049

Newey - West HAC robust standard errors in parentheses
*** $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$**