Is there a trade-off between monetary independence and exchange rate stability in Central and Eastern European economies?

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Abstract

The paper examines the relation between the exchange rate flexibility and monetary independence in Central and Eastern European (CEE) economies. According to the conventional open economy model one of the important advantages of the floating exchange rate regime is that a country can pursue an autonomous monetary policy. Recently the empirical validity of the trilemma has been questioned: H. Rey argued that the choice is between openness to financial flows and monetary independence, 'irreconcilable duo', no matter which exchange rate regime prevails. We derive a contagion model of monetary policy to examine whether the degree of 'policy contagion' is indeed unrelated to the exchange rate flexibility in CEE economies. Our main findings are that: (1) the spillover effect from the euro area monetary policy is strong for the Czech Republic, but rather weak for Hungary, Poland and Romania; (2) the trilemma monetary policy independence indices are rather crude and their informativeness is substantially limited; (3) the CEE countries, except for the Czech Republic, are likely to maintain their monetary independence in the face of future ECB's exit from the zero-interest-rate policy.

Keywords: *monetary policy autonomy, exchange rate regime, open economy macroeconomics, quantitative policy modelling*

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1 Introduction

The macroeconomic trilemma links monetary autonomy, exchange rate stability and openness to international financial flows. It is the trilemma, because one can choose two out of three options. Using this insight Aizenman et al. (2013) constructed the indices that measure the trilemma aspects and demonstrated that emerging market economies have retained some degree of monetary autonomy. More recently, however, Rey (2016, 2015) questioned the validity of the trilemma arguing that 'whenever capital is freely mobile, the global financial cycle constrains national monetary policies regardless of the exchange rate regime.' Empirical evidence on the relevance on Rey's 'irreconcilable duo' hypothesis for emerging market economies so far have remained mixed.

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The objective of this study is to establish whether the exchange rate flexibility contributes to monetary policy autonomy in a small open economy. We examine the case of four Central and Eastern European (CEE) economies. The degree of monetary independence with respect to monetary policy pursued in the euro area is assessed in the period spanning January 2002 to July 2012.

Our study is not the first one to examine monetary independence in the CEE countries. Angeloni et al. (2007) investigated the homogeneity of monetary policy rules of the CEE countries with the euro area and found that rules are broadly similar with some differences in the speed of adjustment only. Unfortunately, they did not include the foreign rate of interest in their regressions, so it was not possible to assess the degree of monetary independence. Goczek and Mycielska (2013), using a VAR approach, found that 'monetary policy in Poland seems to be dependent on the ECB policy.' Using dynamic regressions on country-by-country basis Obstfeld (2015) examined monetary policy independence in 56 countries. Results for the CEE economies were mixed: the long-run relation between domestic and foreign interest rates was found for the Czech Republic and Poland, but not for Hungary and Romania. In a related study Dąbrowski et al. (2015) examined resilience of 41 emerging market economies to the global financial crisis and found that it was not the exchange rate regime *per se* that mattered for the resilience, but the actually adopted monetary policy option.

Table 1. Indices of macroeconomic trilemma in CEE countries, 2002-2012.

Variables	Czech Rep.	Hungary	Poland	Romania
Monetary	0.43	0.56	0.32	0.63
independence	(0.21)	(0.38)	0.61	(0.54)
Exchange rate	0.38	0.29	0.28	0.23
stability	(0.30)	(0.39)	(0.18)	(0.34)
Capital account	1.00	1.00	0.45	1.00
openness	(0.12)	(0.18)	(0.00)	(0.55)
International reserves	0.20	0.19	0.15	0.22
(minus gold, to GDP)	(0.13)	(0.20)	(0.10)	(0.13)

Note: medians; maximum minus minimum in parentheses.

Aizenman et al. (2013) developed indices of macroeconomic trilemma for a large set of countries. Their medians are tabulated for the CEE countries in Table 1 (international reserves-to-GDP ratios are based on data from the World Development Indicators). The index

of monetary independence was calculated on the basis of the correlation of the interest rates between the home country and the base country. The results are far from being unambiguous. For example, Poland had an index of exchange rate stability (0.28) close to that in Hungary (0.29), but substantially less monetary independence (0.32 vs 0.56), even though capital account in Poland was found to be less open than in Hungary (0.45 vs 1.00). More generally, the problem is that the index of monetary independence could be misleading in the face of global shocks (see, e.g. Obstfeld, 2015).

The paper is structured as follows. The following section briefly lays out theoretical issues and describes the data. Empirical methodology is discussed in Section 3, whereas empirical results are reported in Section 4. The final section concludes.

2 The 'contagion' model of monetary policy and data

Dornbusch (1976) demonstrated that the floating exchange rate reaction to foreign monetary policy changes is excessive in the short term in that sense that it overshoots its medium-term level. Since such changes – especially in the face of nominal rigidities – translate into a real economy, the central bank can intend to limit excessive exchange rate volatility. Thus, as pointed by Edwards (2015) it is quite likely that the term in the foreign policy rate will be included in the central bank policy rule.

The line of reasoning can be formalized by reference to the extended monetary policy rule, i.e. the one that includes the term in the exchange rate:

$$i_t = -\alpha(s_{t-1} - E_{t-1}s_t^e) + \gamma' x_{t-1} \quad (1)$$

where i is the domestic rate of interest, s is the actual exchange rate, $E_{t-1}s_t^e$ is the equilibrium exchange rate expected in $t-1$ to prevail in t and x includes other determinants of the interest rate (like deviation of actual inflation from target and/or output gap). Parameters α, γ are positive. Variables on the right hand side of equation (1) are indexed $t-1$ following the assumption that information from the current month is not available to the central bank when making the decision. Thus, we consider the so-called backward-looking interest rate rule. Using the uncovered interest rate parity condition one can demonstrate that

$$i_t = \alpha i_{t-1}^* - \alpha i_{t-1} + \alpha\rho_{t-1} - \alpha E_{t-1}\tilde{s}_t + \gamma' x_{t-1} \quad (2)$$

where i^* is the foreign interest rate, ρ is a foreign currency risk premium, $E_{t-1}\tilde{s}_t$ is the deviation of the actual from equilibrium exchange rate expected in $t-1$ to prevail in t.

In a freely floating exchange rate regime α is zero and the interest rate is set as implied by determinants included in x (γ is statistically different from zero). In a fully credible fixed

exchange rate regime the domestic interest rate is endogenously determined (within the uncovered interest rate parity) by the foreign interest rate and a risk premium only, so other determinants are unimportant ($\gamma = 0$).

Central banks avoid large swings in the interest rate. If we allow for the interest rate smoothing then the equation becomes

$$\Delta i_t = (1-\lambda)[\alpha i_{t-1}^* - (1+\alpha) i_{t-1} + \alpha \rho_{t-1} - \alpha E_{t-1}\tilde{s}_t + \gamma' x_{t-1}] \quad (3)$$

where the degree of interest rate smoothing is measured by the parameter $0 \leq \lambda \leq 1$.

We use monthly data for the four CEE countries: the Czech Republic, Hungary, Poland and Romania, and for the euro area that span the period January 2002 to July 2017. The main variable of interest is the rate of interest. Three-month money market interest rates from the Eurostat database are used. Inflation rates are the CPI changes on annual basis and are from the IMF IFS dataset. Industrial production indices from the Eurostat database are used to proxy for the output gap. Broad indices of the nominal effective exchange rates (NEER) from the Bank of International Settlements are used to derive the deviation of actual from the equilibrium level. The latter is proxied as a cyclically-adjusted component of the NEER (the Hordick-Prescott filter was used). The foreign risk premium is proxied with the Chicago Board Options Exchange's equity option volatility index (VIX) obtained from the Federal Reserve Economic Data.

3 Methodology

The equation we derived in Section 2 is similar to the one used in other studies. For example Edwards (2015) also assumed that the central bank adjusted its policy with a lag and did so gradually. Following Edwards (2015) and Obstfeld (2015) we estimate the dynamic regression model of the form

$$\Delta i_t = \beta_0 + \beta_1 i_{t-1}^* + \beta_2 i_{t-1} + \beta_3 \rho_{t-1} + \beta_4 \tilde{s}_{t-1} + \gamma' x_{t-1} + \\ + \delta_1 \Delta i_{t-1}^* + \delta_2 \Delta i_{t-1} + \delta_3 \Delta \rho_{t-1} + u_t \quad (4)$$

where u_t is assumed to be iid white noise process.

Foreign monetary policy spillover in the short run is given by $\beta_1 + \delta_1$. It is quite likely, however, that it takes some time for the full impact of the foreign interest rate change to be transmitted to the domestic rate. Thus, we calculate long-run policy spillover as well – it is $-\beta_1/\beta_2$. In order to assess statistical significance of both policy spillover effects, the delta method is used (Greene, 2018, p. 78-81).

In order to assess the robustness of results on policy spillover effects, the bootstrap approach is used. The main reason for utilizing the bootstrap is violation of normality

assumption in the regression (4) residuals. There are, however, another advantages of bootstrap, which include: better properties in small samples in comparison to asymptotic approach and feasible inference about smooth differentiable functions of regression parameters (see Kilian and Lütkepohl, 2017). The study use residual-based fixed-design bootstrap approach which allows to infer under stationarity condition, even when randomness of the regressors is present.[4] The only condition that has to be fulfilled is that the residuals of equation (4) are iid. Bootstrap samples are created by utilizing resampled residuals $u_t^{\#r}$ of the fitted model, holding the regressor matrix fixed in every sample. Given a sequence of data $\{\Delta i_t^{\#r}\}_{t=1}^{T}$, and original regressors $[i_{t-1}^*, i_{t-1}, \rho_{t-1}, \tilde{s}_{t-1}, x'_{t-1}, \Delta i_{t-1}^*, \Delta i_{t-1}, \Delta\rho_{t-1}]$ new estimates of $B^{\#r} = [\beta_0^{\#r}, \beta_1^{\#r}, \beta_2^{\#r}, \beta_3^{\#r}, \beta_4^{\#r}, \gamma'^{\#r}, \delta_1^{\#r}, \delta_2^{\#r}, \delta_3^{\#r}]^T$ are obtained. The procedure is repeated $N = 10000$ times.

The covariance matrix of vector parameters is estimated using the Monte Carlo approximation (Efron, 1982 , p. 36):

$$\Sigma^{\#} = (N-1)^{-1} \sum_{r=1}^{N} (B^{\#r} - B^{\#})(B^{\#r} - B^{\#})' \tag{5}$$

where $B^{\#r}$ is the *r*th bootstrap estimate for $r = 1,2,\dots,N$ and $B^{\#} = N^{-1} \sum_{r=1}^{N} B^{\#r}$.

4 Empirical results

We present the results obtained for the sample covering period from January 2002 to July 2012. That choice is motivated by three considerations. First, in the period before 2002 the CEE countries had relatively high and volatile inflation. Moreover, they liberalised their capital accounts not earlier than at the beginning of the 21st century, i.e. in the run-up to the EU membership. Both these factors, i.e. high inflation and barriers to capital flows, could hinder the identification of actual importance of the exchange rate flexibility to monetary independence. Second, the choice of July 2012 is motivated by the decrease of the euro area interest rate close to zero lower bound after the 'whatever it takes' speech by the President of the ECB Mario Draghi.[5]

An additional argument behind the choice of the sample period is that CEE countries maintained relatively fixed exchange rate regimes in 1990s when and shifted towards more

[4] Gonçalves and Kilian (2004) suggest that this algorithm is almost as accurate in finite sample as the recursive-design bootstrap for autoregressive processes.

[5] At the Global Investment Conference in London on 26 July 2012 he said 'Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough' (Draghi, 2012).

flexible exchange rate arrangements at the turn of the centuries. According to the Reinhart-Rogoff classification Hungary widened the band for exchange rate fluctuations in 1999, Poland moved from the crawling band to managed float in 2000, Romania managed to get out from 'freely falling' regime to managed floating in 2001 and only the Czech Republic was classified as a soft pegger with de facto crawling band that was narrower than or equal to +/-2% (Ilzetzki et al., 2017). Moreover, one can observe a shift of these countries to soft peg arrangements at the end of our sample period: Hungary in 2009, Poland in 2012 and Romania in 2007 (and to a de facto peg in 2013).[6]

The main empirical results are presented in Table 2. It includes estimates of coefficients of equation (4). In general, three observations can be made with respect to the results. First, the results are well in line with the conventional interest rate rule. All central banks react positively to output gap (LIPGAP), although the coefficient is insignificant in the Czech case. A rise in inflation (INF) results in a monetary tightening in all CEE countries except for Hungary where the coefficient is negative but statistically insignificant. Second, the deviation of the actual from equilibrium exchange rate (LNERGAP) was highly statistically significant in all countries but Poland. This indicates that the National Bank of Poland was oriented at the exchange rate stability to a considerably smaller extent than the other CEE central banks. Third, a foreign currency risk premium, proxied with the VIX index (LVIXCLS), does not seem to be an important factor behind the interest rate changes as it turned out to be statistically insignificant.

The spillover effect from the euro area monetary policy can be calculated from the regression coefficients for interest rates. The short-run effect is the sum of coefficients on foreign interest rate level and difference (both lagged) and the long-run effect is the ratio of coefficient on (lagged) foreign and domestic interest rates. The results are in the bottom of Table 1. There is no clear pattern in the estimated policy spillover effects. On the one hand a short-run effect is smaller than a long-run one and both work in the expected direction. The only exception is Romania in which there is a negative coefficient on the short-run effect. On the other hand, the long-run coefficients are insignificant (except for the Czech Rep.), which suggests that the transmission of foreign monetary policy is rather short-lived.

[6] For details see Ilzetzki et al. (2017). One should, however, point out that according to the IMF classification or classification developed by Dąbrowski et al. (2017) our CEE countries were floaters for the large fraction of our sample.

Table 2. Interest rate dynamic equations.

Variables	Czech Rep.	Hungary	Poland	Romania
I3_EA(-1)	0.066***	0.065	0.017	0.085
I3_country(-1)	-0.096***	-0.077**	-0.046***	-0.084***
ΔI3_country(-1)	0.030	-0.120*	0.182**	0.483***
ΔI3_EA(-1)	0.181**	0.372	0.352***	-0.933**
INF_country(-1)	0.017**	-0.018	0.043***	0.064***
LNERGAP_country(-1)	-1.765***	-2.732**	-0.471	-4.223**
LIPGAP_country(-1)	0.332	2.849*	1.682***	3.918**
LVIXCLS(-1)	0.029	0.051	-0.031	-0.248
ΔLVIXCLS(-1)	-0.020	-0.158	0.072	0.267
C	-0.073	0.339	0.151	0.852
Obs.	127	127	127	127
Adj. R-squared	0.642	0.629	0.615	0.663
F-statistic	19.827	14.372	21.102	21.687
Durbin-Watson	1.880	2.285	1.920	2.068
Short-run coeff.	0.247***	0.437	0.369***	-0.848*
Long-run coeff.	0.687***	0.843	0.372	1.007

Such results are, to a certain extent, in line with those obtained by Obstfeld (2015). He ran dynamic equations for 56 countries, including our CEE countries, although he used the US interest rate as a foreign rate of interest. He was unable to reject the hypothesis of no long-run relation for Hungary and Romania, but rejected it for the Czech Republic and Poland. Some differences, e.g. with respect to Poland, could be due to the use of different sample period. In fact, Obstfeld (2015) used country-specific samples starting quite early in the 1990s (e.g. July 1991 – February 2014 for Poland), whereas we have used the common sample period that corresponds to the relative exchange rate flexibility.

Our results seem to be at odds with those obtained by Goczek and Mycielska (2013) for Poland. They found that the degree of monetary independence in Poland was rather low. They admitted, however, that the interest rate dependence is not one-for-one and that their approach could 'understate the actual degree of monetary independence offered by the floating exchange rate,' for example because both interest rates could be driven by global shocks.

Statistical significance of the results presented in Table 1 was assessed under the assumption of asymptotic normality of residuals. In order to have normally distributed residuals we used a set of dummies in each regression (either dummies or Jarque-Bera statistics not reported due to space constraints, but available upon request). It could, however, be claimed that even though such an approach removes non-normality, it also hides the true distribution of the residuals. In order to check the robustness of our results we run anew all the regressions using the bootstrap procedure to obtain coefficients and their covariance matrix. The results are reported in Table 3.

Table 3. Interest rate dynamic equations – bootstrap approach.

Variables	Czech Rep.	Hungary	Poland	Romania
I3_EA(-1)	0.059***	0.099*	0.019	0.104
I3_country(-1)	-0.093***	-0.073	-0.052***	-0.119***
ΔI3_country(-1)	0.092	-0.060	0.289***	0.313***
ΔI3_EA(-1)	0.387***	0.913*	0.305**	-1.080**
INF_country(-1)	0.018**	-0.008	0.037***	0.094***
LNERGAP_country(-1)	-1.529***	-5.735***	-0.458	-5.662*
LIPGAP_country(-1)	0.298	1.260	1.347**	6.723**
LVIXCLS(-1)	0.041	0.332*	-0.028	-0.360
ΔLVIXCLS(-1)	0.032	0.166	0.077	-0.011
C	-0.099	-0.586	0.187	1.212
Obs.	127	127	127	127
Adj. R-squared	0.512	0.118	0.581	0.264
F-statistic	15.709	2.870	20.401	6.021
Durbin-Watson	1.879	1.968	2.081	2.127
Short-run coeff.	0.446***	1.012**	0.324***	-0.976
Long-run coeff.	0.628***	1.355	0.371	0.872

The general finding is that the results remained unchanged for the Czech Rep., Poland and Romania. Moreover, the puzzling reaction of the Romanian interest rate disappears: although the short-run spillover effect remains negative, it is no longer significant. The differences can be observed for Hungary: terms in the (lagged) foreign interest rate are now weakly

significant, whereas those in the domestic interest rate are insignificant. This results in the strong and significant short-run (over)reaction to the euro area interest rate with the spillover coefficient slightly more than unity. The long-run coefficient, however, is insignificant like in the previous regression.

Conclusions

According to the macroeconomic trilemma the exchange rate flexibility can bring the interest rate independence in the face of free capital movement. The objective of this study was to examine the dependence between interest rates in four CEE countries and the euro area. The main findings can be summarised in three points. First, the relative exchange flexibility of CEE currencies insulated these economies against euro area monetary policy spillovers to a limited extent. There is evidence of strong monetary policy spillover for the Czech Republic, but rather weak or non-existence for Hungary and Romania. Poland is somewhere between these two extremes with moderate spillover in the short run, but not in the long run. Second, the results obtained do not conform to crude monetary independence indices developed by Aizenman et al. (2013), which is in line with the conjecture that the simple correlation is insufficient to describe monetary independence. Third, using historical evidence we think that the CEE countries, except for the Czech Republic, will be able to retain their monetary independence when the ECB will decide to exit its de facto zero-interest-rate policy.

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