Peer-reviewed and Open access journal
ISSN: 1804-5006 | www.academicpublishingplatforms.com
The primary version of the journal is the on-line version

BEH - Business and Economic Horizons
Volume 10 | Issue 4 | 2015 | pp.305-319
First online; DOI: http://dx.doi.org/10.15208/beh.2014.24

Interest rates and structural shocks in European transition economies

Rajmund Mirdala
Faculty of Economics, Technical University of Košice
Nemcovej 32, 040 01 Košice Slovak Republic; e-mail: rajmund.mirdala@tuke.sk

European transition economies are still suffering from negative implications of economic crisis. Significant decrease in the key interest rates was followed by reduced maneuverability of central banks in providing incentives into real economies. Responsiveness of short-term interest rates to the structural shocks provides unique platform to investigate sources of their unexpected volatility and associated effects on monetary policy decision making. Moreover, sources of interest rates volatility may help to reveal side effects of the exchange rate regime choice. In the paper we analyze sources of the short-term nominal interest rates volatility in ten European transition economies by employing SVAR methodology. We observed unique patterns of the short-term interest rates responsiveness in countries with different exchange rate arrangements that contributes to the fixed versus flexible exchange rate dilemma.

JEL Classifications: C32, E43, F41

Keywords: Interest rates, structural shocks, exchange rate arrangements, economic crisis, VAR, impulse-response function

Introduction

Nowadays, in the time of economic and debt crisis, many European Union member countries are exposed to the large complex of negative implications of recession, peaking rates of unemployment, increased public debt burden as well as worsen conditions to maintain fiscal sustainability. Moreover, increased uncertainty on the financial markets resulted in higher volatility of market prices/rates reduces predictability of market trends, even in the short period. As a result, increased instability of exchange rates seems to be inevitable but painful implication (Stavarek, 2012). Due to many external causes countries experienced sudden changes in determination potential of exchanges rate especially toward key aspects of macroeconomic performance in countries under flexible exchange rate arrangements.

One of the most controversial implications of different exchange rate arrangements is addressed to their appropriateness and sustainability in countries at different stage of business cycle in short period while reflecting the overall macroeconomic performance (Obstfeld, 1985). Wide range of such implications became highly discussed especially in the group of countries (so called European transition economies[1] which joined European Union in 2004 (Damian, 2011). It may seem that fixed versus flexible exchange rates dilemma in the period of increased global uncertainty and negative trends in the global economy became alive again while discussions on policy issues, challenges and controversies may find it difficult to provide clear suggestions.

* This paper was written in connection with scientific project VEGA no. 1/0892/13. Financial support from this Ministry of Education's scheme is also gratefully acknowledged.

[1] Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Slovenia.

In the paper we analyze sources of the short-term nominal interest rates fluctuations in ten European transition economies. From estimated VAR we compute impulse-response functions to analyze responses of short-term interest rates to the five types of structural shocks (demand shock, liquidity shock, inflation shock, monetary policy shock, exchange rate shock). Results of estimated model are discussed from the perspective of fixed versus flexible exchange rate dilemma (Calvo and Reinhart, 2002). To provide more rigorous insight into the problem of the exchange rate regime suitability we estimate the model for each particular country employing data for two subsequent periods 2000-2007 (pre-crisis period) and 2000-2012 (extended period). Comparison of the results for both models is crucial to investigate the origins and key implications of current economic crisis on the short-term interest rates volatility.

We suggest that our results provide a rigorous insight into short-term interest rates determination potential in ten European transition economies. Relative diversity in the short-term interest rates adjustments under different exchange rate arrangements may reveal disputable implications and associated risks (Dabale and Jagero, 2013) of the breakdown in mutual interconnections between the overall macroeconomic development and the exchange rate leading path.

Overview of the literature

Gerlach-Kristen and Rudolf (2010) compared three monetary operating procedures by examining optimal policy reaction functions, impulse responses and simulated volatilities of inflation, the output gap and the yield curve to examine volatility of interest rates and other main macroeconomic variables. Their results suggest that volatilities in key variables under different monetary-policy framework (commitment vs. discretion) are strongly dependent on general preconditions (normal times vs. financial distress). Eiffinger, Schaling and Vehagen (2000) analyzed the relevancy of the term structure of interest rates for the transmission process of the monetary policy. Authors identified and empirically tested the long-term interest rates as a crucial indicator for monetary policy discretionary changes. Emiris (2006) decomposed long-term interest rates into term premium and inflation premium to investigate the sources of average premium on ten years bonds variability. Author also examined responses of the term premia to the different shocks. Fendel (2009) intended to support the empirical findings on the information content of the term structure of interest rates for monetary policy. Kulish (2007) analyzed two roles (first, as a key determinant in the reaction function of the monetary authority; second, as instruments of policies) that long-term nominal interest rates can play in the conduct of the monetary policy. McGough, Rudebusch and Williams (2005) investigated the problem of short-term versus long-term interest rates suitability to operate as a monetary policy instrument. Authors highlight and discuss a crucial role of inflation expectations and real interest rate for selecting the most appropriate interest rate as a key pillar of a monetary policy framework. Michaud and Upper (2008) identified the origins of interbank interest rates volatility by examining the possible determinants of the risk premium contained in the money market interest rates. Rudebusch, Sack and Swanson (2007) examined the origins and implications of changes in bond term premiums for economic activity to analyze the stability of long-term interest rates. Authors also analyzed empirical relationship between short-term and long-term interest rates.

Econometric model

We implement a VAR methodology to analyze sources of the short-term nominal interest rates volatility in the European transition economies. Identification scheme based on imposing long-run restrictions on the variance-covariance matrix of the reduced-form VAR residuals is employed to identify structural shocks hitting the model.

True model is represented by the following infinite moving average representation:

$$X_t = A_0\varepsilon_t + A_1\varepsilon_{t-1} + A_2\varepsilon_{t-2} + \ldots = \sum_{i=0}^{\infty} A_i\varepsilon_{t-i} = \sum_{i=0}^{\infty} A_i L^i\varepsilon_t = A(L)\varepsilon_t \quad (1)$$

Where X_t represents $n\times 1$ a vector including endogenous variables of the model, $A(L)$ is a $n\times n$ polynomial consisting of the matrices of coefficients to be estimated in the lag operator L representing the relationship among variables on the lagged values, ε_t is $n\times 1$ vector of identically normally distributed, serially uncorrelated and mutually orthogonal errors (white noise disturbances that represent the unexplained movements in the variables, reflecting the influence of exogenous shocks):

$$E(\varepsilon_t)=0, \quad E(\varepsilon_t\varepsilon_t')=\Sigma_\varepsilon=\mathrm{I}, \quad E(\varepsilon_t\varepsilon_s') = [0] \quad \forall t\neq s \quad (2)$$

Vector X_t consists of six endogenous variables - industrial production $(y_{r,t})$, money supply (m_t), core inflation (p_t), short-term nominal interest rates $(ir_{n,t})$ and real exchange rate $(er_{r,t})$. In the five-variable VAR model $(X_t=[ip_{r,t}, m_t, p_t, ir_{n,t}, er_{r,t}])$ we assume five exogenous shocks that contemporaneously affects endogenous variables - demand shock $(\varepsilon_{ip,t})$, nominal shock $(\varepsilon_{m,t})$, inflation shock $(\varepsilon_{p,t})$, monetary policy shock $(\varepsilon_{ir_n,t})$ and exchange rate shock $(\varepsilon_{er_r,t})$.

Structural exogenous shocks from equation (1) are not directly observable due to the complexity of information included in true form VAR residuals. At the same time, the shocks in the reduced form are likely to be correlated so they cannot be considered as true structural shocks. As a result, structural shocks cannot by correctly identified. It is than necessary to transform true model into following reduced form

$$X_t = C(L)Y_{t-1} + e_t, \quad (3)$$

where, $C(L)$ is the polynomial of matrices with coefficients representing the relationship among variables on the lagged values and e_t is a $n\times 1$ vector of normally distributed errors (shocks in reduced form) that are serially uncorrelated but not necessarily orthogonal:

$$E(e_t)=0, \quad \Sigma_u = E(e_te_t') = A_0E(\varepsilon_t\varepsilon_t')A_0' = A_0A_0', \quad E(e_te_s') = [0] \quad \forall t\neq s \quad (4)$$

Relationship between reduced-form VAR residuals e_t and structural shocks ε_t can be expressed as follows:

$$e_t = A_0 \varepsilon_t \tag{5}$$

As we have already noted at the beginning of this section structural VAR (SVAR) approach, is based on decomposing a series into its permanent and temporary components. It imposes long-run restrictions to the reduced-form VAR model. Identification scheme in the SVAR models reflects a long-run neutrality assumption so that we expect the cumulative effect of a certain shock on the certain endogenous variable development is zero.

The equation (6) we can now rewrite to the following form:

$$\begin{bmatrix} 1 & 0 & 0 & a_{14} & a_{15} \\ 0 & 1 & 0 & 0 & a_{25} \\ 0 & a_{32} & 1 & a_{34} & a_{35} \\ a_{41} & a_{42} & a_{43} & 1 & a_{45} \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} u_{y_r,t} \\ u_{m,t} \\ u_{p,t} \\ u_{ir_n,t} \\ u_{er_r,t} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{y_r,t} \\ \varepsilon_{m,t} \\ \varepsilon_{p,t} \\ \varepsilon_{ir_n,t} \\ \varepsilon_{er_r,t} \end{bmatrix} \tag{6}$$

In order to correctly identify the VAR model we have to impose fifteen restrictions. The number of long-run identifying restrictions is given by the simple equation n(n+1)/2, where *n* denotes the number of endogenous variables of the model. Five restrictions we obtain by normalizing the original matrix. Ten remaining long-run restrictions are identified as follows:

- demand shock does not have permanent effect on money supply (1), inflation (2), real exchange rate (3)
- liquidity shock does not have permanent effect on real output (4), real exchange rate (5)
- inflation shock does not have permanent effect on real output (6), money supply (7), real exchange rate (8),
- monetary policy shock does not have permanent effect on money supply (9), real exchange rate (10).

Estimated SVAR model is used to compute impulse response functions to analyze responses of short-term nominal interest rates to the one standard deviation structural shocks in the European transition economies.

Data and results

We employed monthly data for period 2000M1-2007M12 (model A) consisting of 96 observations and with period 2000M1-2012M12 (model B) consisting of 156 observations for the following endogenous variables - industrial production[1] (nominal volume of the industrial product deflated by averaged PPI), money supply (monetary aggregate M2), inflation (core inflation), short-term nominal interest rates (interbank offered rates with 3 months maturity[2]), real exchange rate (real effective exchange rate) and balance of payment's current account.

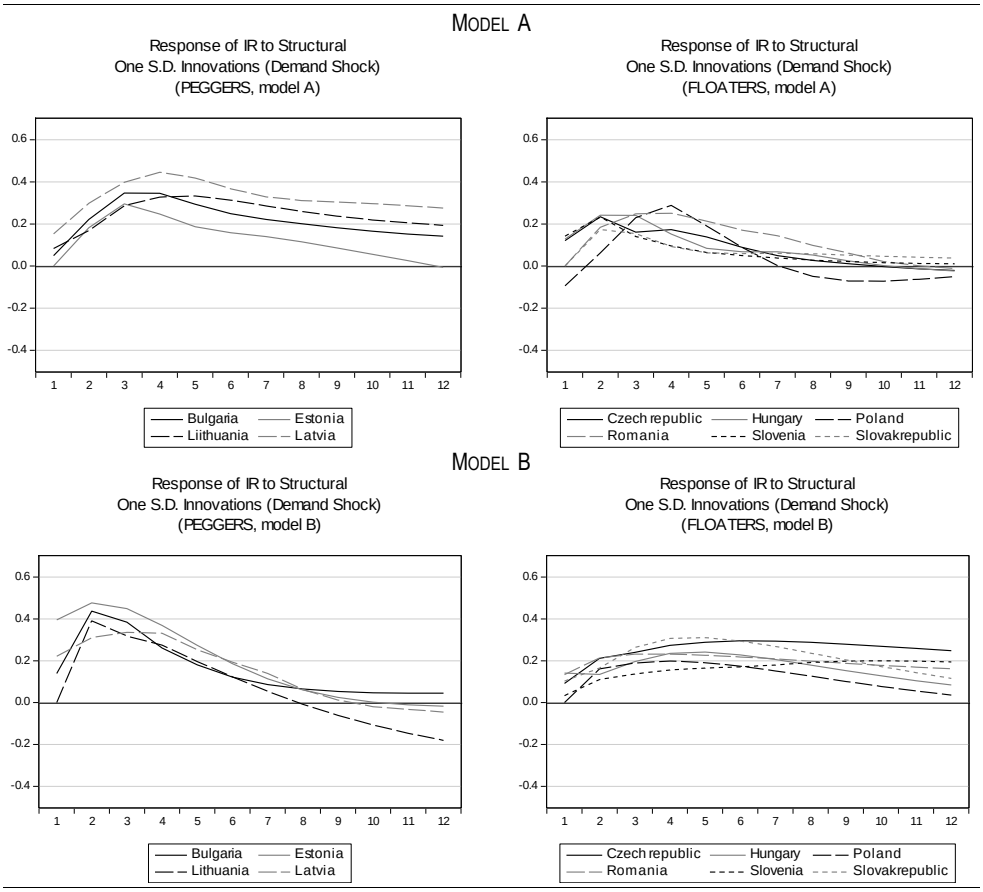
[1] Time series for monthly industrial production were employed due to absence of data on the same basis for real output (GDP).

[2] Short-term interest rates in Estonia, Slovak Republic and Slovenia we replaced by EURIBOR after euro adoption in each particular country (2007, 2009 and 2011).

Estimation of two models is in line with the primary objective of the section to estimate the responses of the short-term nominal interest rates to the demand, liquidity, inflation, monetary policy and exchange rate structural shocks considering possible implications of the crisis period on presented results. Time series for all endogenous variables were drawn from IMF database (International Financial Statistics, March 2014). Time series for industrial production, money supply and inflation were seasonally adjusted.

To correctly identify structural exogenous shocks hitting the model and to compute impulse-response functions it is necessary VAR model to be stationary. To check the model it is necessary to test the time series for unit roots and cointegration.

FIGURE 1. RESPONSES OF INTEREST RATES TO DEMAND SHOCK



Note: Curves represent responses of interest rates (IR) to the positive one standard deviation demand shock in each country from the group of the European transition economies.
Source: Author's calculation.

The augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests were computed to test the endogenous variables for the unit roots presence. Both ADF and PP tests indicate that most of the variables are non-stationary on the values so that the null hypothesis of a unit root cannot be rejected for any of the series (detailed results of unit root are not reported here to save space. Like any other results, they are available upon request from the author). Testing variables on the first differences indicates the time series are stationary so that we conclude that the variables are I(1). Because there are endogenous variables with a unit root on the values it is necessary to the test the time series for

cointegration using the Johansen and Juselius cointegration test (we found reasonable to include variables I(0) for testing purposes following economic logic of expected results). The test for the cointegration was computed using three lags as recommended by the AIC (Akaike Information Criterion) and SIC (Schwarz Information Criterion). The results of the Johansen cointegration tests confirmed the results of the unit root (detailed results of cointegration tests are not reported here to save space. Like any other results, they are available upon request from the author). Both trace statistics and maximum eigenvalue statistics (both at 0.05 level) indicate that there is no cointegration among the endogenous variables of the model. To test the stability of the VAR model we also applied a number of diagnostic tests. We found no evidence of serial correlation, heteroskedasticity and autoregressive conditional heteroskedasticity effect in the disturbances. The model also passes the Jarque-Bera normality test, so that errors seem to be normally distributed. The VAR models seem to be stable also because the inverted roots of the model for each country from the group lie inside the unit.

Following the results of the unit root and cointegration tests we estimated the model using the variables in the first differences so that we can calculate impulse-response functions for all ten European transition economies. In line with the main objective of the section we focus on interpretation of the responses of the short-term nominal interest rates to the positive one standard deviation demand, liquidity, inflation, monetary policy and exchange rate shocks.

Figure 1 summarizes responses of the nominal short-term interest rates to the positive one standard deviation demand shock for the model with time series for the pre-crisis period (model A) and extended period (model B) in the European transition economies.

In general, positive demand shock was followed by an increase in the interest rates in all countries from the group. However, we observed interesting differences among countries according to the detailed characteristics in interest rates response patterns. Leading path of the interest rates response revealed some crucial implications of exchange rate arrangements in the European transition economies.

In the countries with pegged exchange rate regimes (exchange rate serving as the nominal anchor) it seems that interest rates were slightly more vulnerable to the unexpected demand shock. As a result, positive one standard deviation demand shock was followed by a dynamic interest rate increase during first four months after the shock. After reaching its culminating point, interest rates steadily decreased back to their pre-shock levels. However, we examined some differences in the speed of convergence toward long-run equilibrium. Nevertheless, negative effect of the demand shock on the short-term interest rates continuously weakened in the long run and thus revealed its long-run neutrality on the interest rates variability.

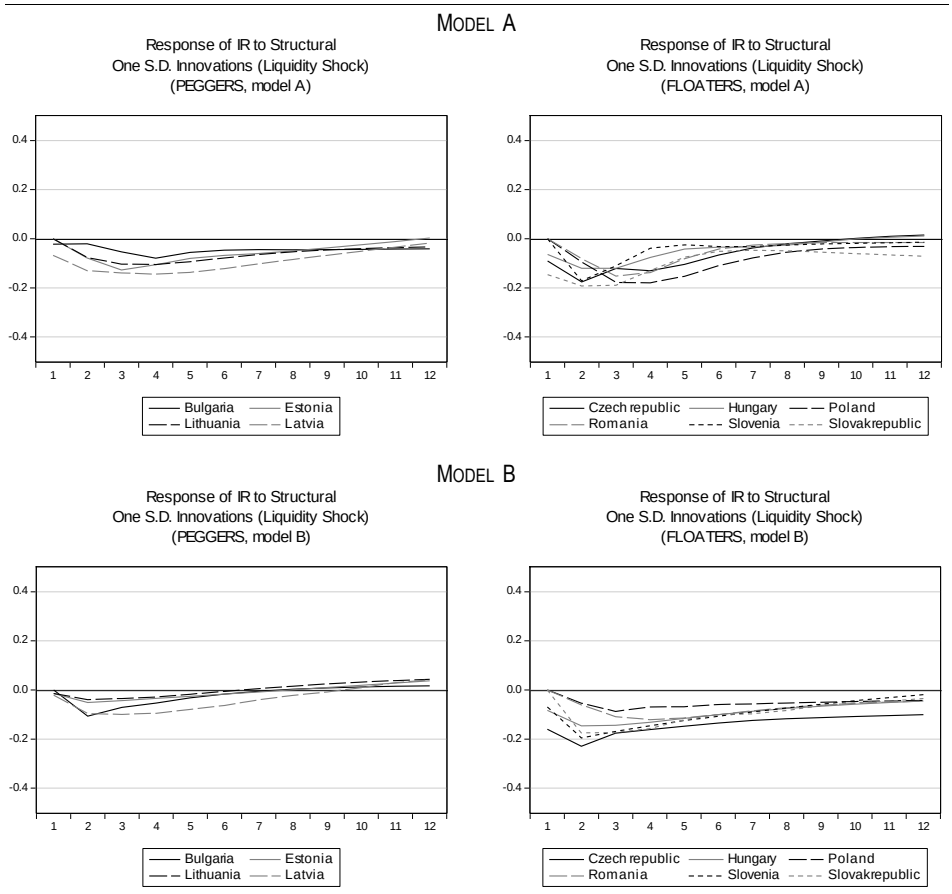
Key features in the short-term interest rates responsiveness pattern in the countries with flexible exchange rate arrangements seem to be similar to those of countries with exchange rate nominal anchor. However, we observed some crucial differences in the short-term interest rates response patterns. Countries with flexible exchange rate regimes experienced, in general, less intensive increase in the short-term interest rates after positive one standard deviation demand shock. Negative effect of the demand shock culminated, similarly, within one year after the shock. At the same time, effect of the shock seems to be less durable and it generally died out till the end of the tenth month since the shock.

In both groups of countries the demand shock has just a temporary effect on the short-term interest rates and resulted in long-term neutrality of the shock. As a result, our analysis of the short-term interest rates responsiveness to the positive demand shock did not provide clear evidence about postulated empirical expectation about its permanent effects on the nominal interest rates. However, negative effect of the demand shock seems to be much more persistent and durable in countries that conducted monetary policy based on nominal exchange rate anchoring. We suggest that higher persistency of the interest rates increase is associated with stabilization effects of higher interest rates according to the distorting effects of demand shocks on the exchange rate stability.

We suggest that less dynamic response of the short-term interest rates to the demand shock in countries with flexible exchange rate arrangements originates in associated exchange rate adjustments followed by the demand shock that intensified the process of convergence toward equilibrium restoration and thus put less intensive pressure on the interest rates increase. Exchange rate flexibility seems to be a convenient precondition for the nominal interest rates stability.

Crisis period affected responsiveness of the short-term interest rates to the positive one standard deviation demand shock. While the overall dynamics of the short-term interest rates increase seems to be comparable during both pre-crisis and extended periods in both groups of countries, detailed investigation of the response patterns revealed some crucial implications of the crisis period. Immediate response of the short-term interest rates in the group of "peggers" slightly increased. As a result, the negative impact of the demand shock culminated earlier (within first 2-3 months) while its effect on the short-term interest rates died out much faster.

FIGURE 2. RESPONSES OF INTEREST RATES TO LIQUIDITY SHOCK



Note: Curves represent responses of interest rates (IR) to the positive one standard deviation liquidity shock in each country from the group of the European transition economies.
Source: Author's calculation.

On the other hand, the positive demand shock was followed by the moderate though much more durable interest rates increase in the group of "floaters". However, in

countries with large economies (Poland and Romania) a durability of the demand shock was generally lower in comparison with the rest of the countries from the group. It seems that the crisis period was associated with distortionary effects that affected the interest rates variability across countries with different exchange rate arrangements.

Figure 2 summarizes responses of the nominal short-term interest rates to the positive one standard deviation liquidity shock for the model with time series for the pre-crisis period (model A) and extended period (model B) in the European transition economies.

In general, positive liquidity shock was followed by a decrease in the interest rates in all countries from the group. However, we observed some interesting differences among countries according to the detailed characteristics in interest rates response patterns. In the group of countries with rigid exchange rate arrangement the positive liquidity shock caused a moderate decrease in the interest rates with less dynamic loading phase.

Negative effect of the shock culminated till the end of the first quarter and was followed by a steady convergence toward pre-shock levels. It seems that short-term nominal interest rates in countries with a nominal exchange rate anchor are less exposed to the liquidity shocks due to their high vulnerability to external (current account[1]) economic imbalances.

We suggest that effects of the liquidity shocks in our sample of countries with nominal exchange rate anchor are thus channeled more likely to the external (current account) disequilibrium. As a result, associated nominal interest rates adjustments are less dynamic, moderate and temporary. Negative effect of the nominal shock to the short-term nominal interest rates died out within one year.

While the similar scenario in the identified nominal interest rates responsiveness to the positive liquidity shock was also observed in the group of countries with flexible exchange rate arrangements, we examined some key differences in the response patterns. Initial load of the shock's effect was intensified revealing more dynamic immediate responsiveness of the nominal interest rates to the liquidity shock in this group of countries. Short-term path of the response patterns also revealed slightly reduced loading phase of negative effect to the nominal interest rates (effect of the shock culminated within 2-3 month since the shock). At the same, the overall durability of negative effect of the liquidity shock to the nominal interest rates was slightly reduced. Main effect of the liquidity shock in the group of "floaters" was less durable and it died out till the end of the eight month. However, negative (though small) effect of the shock in the long-run period never completely died out in most countries from group. As a result, liquidity shock seems to have a permanent effect on the nominal interest rates in countries with flexible exchange rate regime.

Crisis period affected responsiveness of the short-term interest rates to the positive one standard deviation liquidity shock. In general, the overall responsiveness of the nominal interest rates to the positive liquidity shock in countries with rigid exchange rate regimes seems to be reduced. Both intensity as well as durability of the short-term responses of interest rates decreased. It seems that, to some extent, effects of liquidity shocks and associated interest rates adjustments in countries with nominal exchange rate anchoring were diverted through the crisis intensified process of the cross-country expenditure/capital shifting. As a result, the overall responsiveness of the nominal interest rates to the liquidity shock in this group of countries decreased.

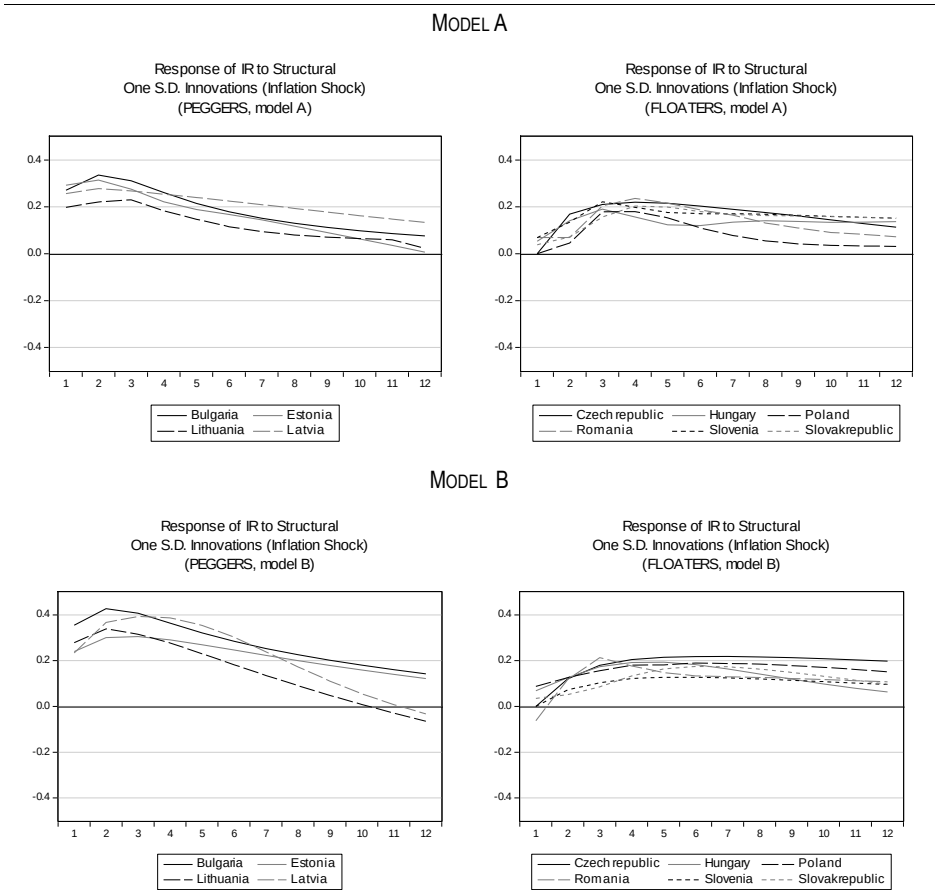
At the same time, we examined slightly increased durability in the nominal interest rates response to the liquidity shock in the group of countries with flexible exchange rate arrangement. Mixed results were obtained considering the overall intensity in the nominal interest rates decrease followed by the liquidity shock. Especially in countries with large economies the loading phase of the interest rates decrease followed by the liquidity shock was generally lower in comparison with the rest of the countries from the group. Long-run effect of the liquidity shock according to the short-term interest rates seems to be

[1] Bulgaria and Baltic countries experienced high current account deficits during the whole pre-crisis period.

neutral in all ten European transition economies. We suggest that the crisis period in the countries with flexible exchange rate arrangement intensified a durability of interest rate vulnerability to the liquidity shocks due to generally lower cross-country exchanging affected by demand contraction followed by increased exchange rate volatility.

Figure 3 summarizes responses of the nominal short-term interest rates to the positive one standard deviation inflation shock for the model with time series for the pre-crisis period (model A) and extended period (model B) in the European transition economies.

FIGURE 3. RESPONSES OF INTEREST RATES TO INFLATION SHOCK



Note: Curves represent responses of interest rates (IR) to the positive one standard deviation inflation shock in each country from the group of the European transition economies.
Source: Author's calculation.

Inflation shock was followed by an interest rate increase in all countries though we observed some notable differences in the interest rate response patterns according to the employed exchange rate arrangement.

Positive inflation shock in the model with time series for a pre-crisis period was followed by an immediate increase in interest rates in the countries that employed nominal exchange rate anchoring. Despite some minor differences among individual countries from this group, an immediate negative effect on the short-term nominal interest rates culminated within first three months since the inflation shock hit the model. After this period an initial effect of the shock continuously and steadily weakened and it completely

died out during the first half of the second year since the shock. Immediate increase of the short-term interest rates to the inflation shock reveals their high vulnerability to the unexpected inflation pressures.

We suggest that higher responsiveness of the short-term interest rates to the inflation pressures under pegged exchange rate regime is caused by increased role of interest rates in maintaining price stability when nominal exchange rate anchoring is adopted. As a result, immediate interest rates increase followed by inflation pressures strengthening should prevent monetary instability and thus help to preserve exchange rate stability.

On the other hand, in the group of countries with flexible exchange rate arrangement we observed slightly different pattern in the short-term nominal interest rates responsiveness to the unexpected inflation shock. Contrary to our finding for the group of "peggers" it seems that nominal interest rates responded to the positive inflation shock with around one month lag. Negative effect of the shock then steadily strengthened and it culminated at the end of the forth month.

While in the group of countries with pegged exchange rate arrangement the long-run effect of the inflation shock to the short-term nominal interest rates leading path seems to be neutral, in countries with smaller economies (Central European countries) from the group of "floaters" the negative effect of the inflation shock seems to be quite persisting even in the long run. We suggest that exchange rate flexibility together with high external openness represents more challenging combination of crucial determinants for monetary authorities that affects the overall price stability in comparison with countries employing pegged exchange rate regime.

It seems that for countries with flexible exchange rate arrangement combined with inflation targeting it is necessary to determine interest rate curve on both short-term and long-term sides to preserve price stability and meet the inflation target. As a result, unexpected positive inflation shock (unexpected increase in inflation) may cause a permanent increase in the short-term nominal interest rates with subsequent negative effects to the long-term interest rates.

Crisis period affected responsiveness of the short-term interest rates to the positive one standard deviation inflation shock in both groups of countries. In countries with pegged exchange rate regime the overall responsiveness of the short-term interest rates increased in the model with time series for extended period. Alongside an increased immediate response of the short-term interest rates to the inflation shock in countries with nominal exchange rate anchoring we also investigated slightly ambiguous results about the durability of the grown effect in interest rates. Overall effect of the inflation shock in the short-term interest rates leading path seems to be neutral. That is why we suggest that mixed results about the time necessary for a negative effect of the inflation shock to completely die out and interest rates to return to their pre-shock levels (according to the results for a pre-crisis period) refer to the spurious implications of the crisis period.

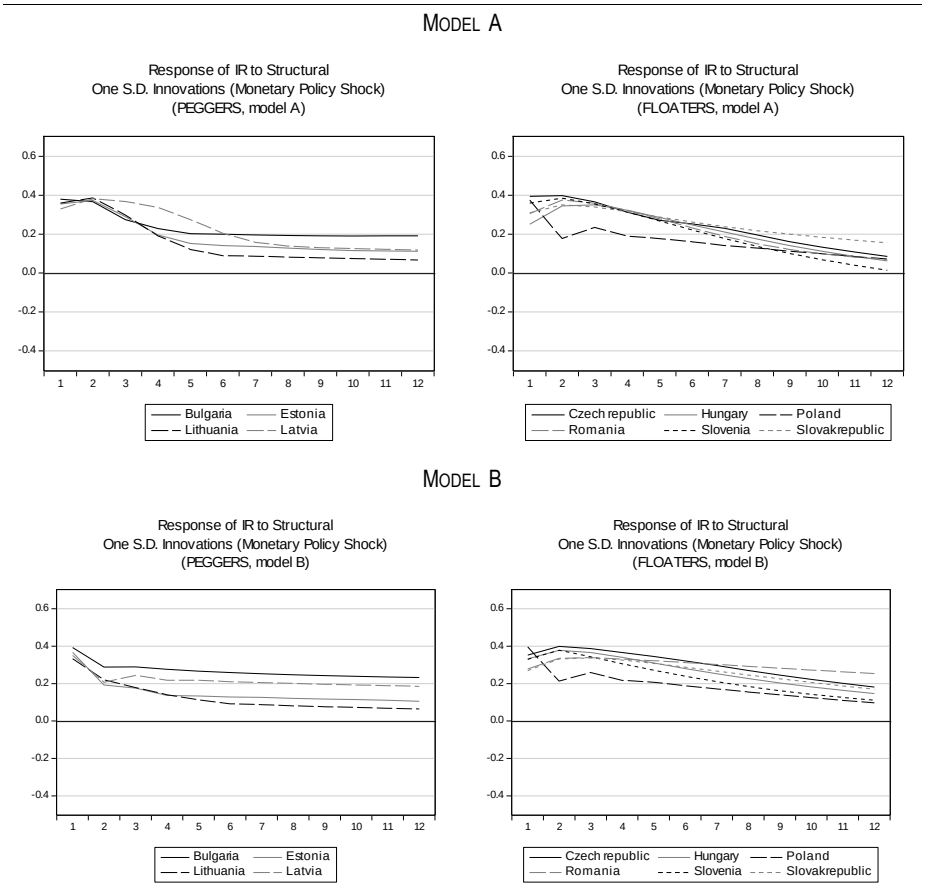
Different patterns in the short-term interest rates responsiveness to the inflation shock during the crisis period was also investigated in the group of countries with flexible exchange rate arrangement. In comparison with the pre-crisis period our results suggest that there is slightly reduced dynamic in the short-term interest rates response during the initial loading phase. On the other hand, we have identified increased medium-term interference between the inflation shock and short-term interest rates. It seems that negative effect of the inflation shock is more durable during the crisis period in most of countries from the group of "peggers". However, despite higher mid-term responsiveness of the short-term interest rates to the inflation shock in these countries we found that the effects of the shock seem to be neutral in the long-run period. As a result, the short-term interest rates tend to converge to their pre-shock levels (though with a different dynamic) and the effect of the shock completely died out in the long-run period.

Figure 4 summarizes responses of the nominal short-term interest rates to the positive one standard deviation monetary policy shock for the model with time series for the pre-

crisis period (model A) and extended period (model B) in the European transition economies.

Monetary policy shock was followed by an immediate nominal interest rates increase in all ten countries though we examined some differences in the short-term interest rates response patterns according to the exchange rate regime that was employed by individual countries.

FIGURE 4. RESPONSES OF INTEREST RATES TO MONETARY POLICY SHOCK



Note: Curves represent responses of interest rates (IR) to the positive one standard deviation monetary policy shock in each country from the group of the European transition economies.
Source: Author's calculation.

As a direct response to the positive monetary policy shock, short-term interest rates immediately increased in the countries with pegged exchange rate arrangement. Our results thus reveal high responsiveness of interest rates to the discretionary changes in the monetary policy stance. On the other hand, initial dynamic response of the short-term interest rates culminated within first two months and then steadily decreased. However, the overall effect of the monetary policy shock did not completely died out, even in the long-run period that is why we consider its effect on the short-term interest rates as permanent. It seems that interest rates adjustments combined with their flexibility in the short run and stability in the long run are crucial for maintaining exchange rate stability and thus pegged exchange rate arrangement sustainability.

We provided clear evidence that discretionary changes in the interest rates (proxied in our model by the unexpected monetary policy shock) in countries with nominal exchange rate anchoring are followed by immediate and dynamic increase in the short-term interest rates while the reduced effect of the shock seems to be generally persisting even permanent in the long-run period.

Similar scenario was investigated in countries with flexible exchange rate arrangement. However, we observed some distinct differences in the short-term interest rates response patterns. Positive monetary policy shock was followed by the immediate short-term interest rates increase in the countries with relative exchange rate flexibility (in this case results are quite similar in both groups - "peggers" and "floaters"). The effect of the shock culminated similarly within first two months after the shock. The only difference was examined in case of Poland where the short-term interest rates steadily decreased immediately after the initial increase. Following the initial negative response to the monetary policy shock, the short-term interest rates steadily and continuously decreased. Convergence toward pre-shock levels is clear with increasing lag. As a result, effect of the monetary policy shock to the nominal short-term interest rates is just a temporary and thus neutral in the long run in countries with flexible exchange rate arrangement.

Crisis period affected responsiveness of the short-term interest rates to the positive one standard deviation monetary policy shock in both groups of countries. The overall effect of the shock clearly changed in countries with nominal exchange rate anchoring especially in the short run. Immediate response of the short-term interest rates was slightly reduced. As a result, we observed less dynamic increase in the interest rates within the period of first two month since the shock hit the model. Initial effect of the shock then subsequently decreased and the negative effect of the monetary policy shock was steadily reduced over time. However, the short-term interest rates never fully converged back to their pre-shock levels. Effect of the shock seems to be permanent (similarly just like in the model A with pre-crisis data).

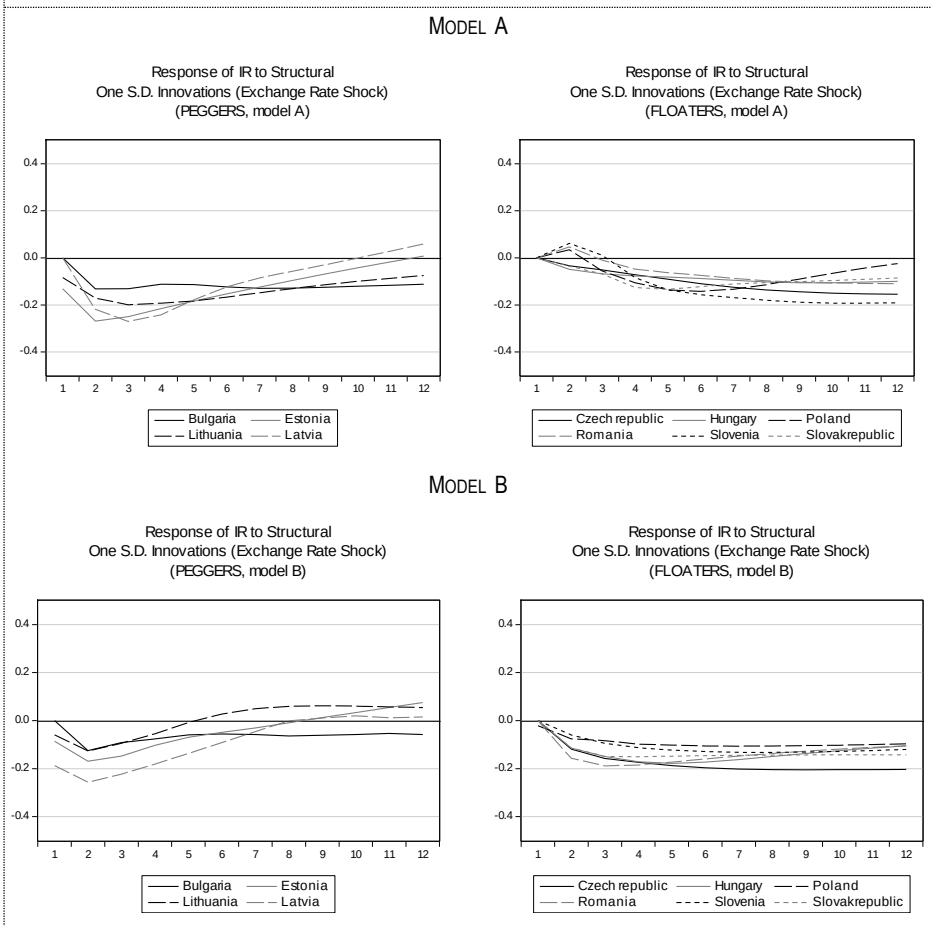
Responses of the short-term interest rates in countries with flexible exchange rate arrangement in the model for extended period seem to be also affected by the effects of the crisis period. However, we observed just a minor change in the overall response pattern of the short-term interest rates in the individual countries. While the overall intensity of the immediate change in the interest rates, in comparison with the pre-crisis period, seems to be just a negligible, subsequent converging path toward pre-shock levels is slightly lagged. As a result, the overall durability of the negative effect of the monetary policy shock to the nominal short-term interest rates slightly increased revealing higher medium-term responsiveness of short-term interest rates to the unexpected discretionary changes (in the key interest rates) conducted by monetary authorities. Short-term interest rates seem to be neutral to the effects of the monetary policy shock in the long run because the negative effect of the shock steadily died out and interest rates retuned back to their pre-shock levels in all countries from the group.

Figure 5 summarizes responses of the nominal short-term interest rates to the positive one standard deviation exchange rate shock for the model with time series for the pre-crisis period (model A) and extended period (model B) in the European transition economies.

Exchange rate shock was followed by an immediate interest rates decrease in all ten countries from both groups. However, we observed some differences in short-term and long-term response patterns according to the relative diversity in the adopted exchange rate regime in individual countries.

In the countries with the nominal exchange rate anchoring we investigated that positive exchange rate shock (exchange rate appreciation) was followed by the interest rate drop with around one month lag. However, we observed some different patterns with regard to the intensity of the interest rate decrease even among countries from the same group ("peggers"). Regardless of this it seems that the short-term interest rates are likely to be responsive to the unexpected exchange rate shocks in countries with the nominal exchange rate targeting.

FIGURE 5. RESPONSES OF INTEREST RATES TO EXCHANGE RATE SHOCK



Note: Curves represent responses of interest rates (IR) to the positive one standard deviation exchange rate shock in each country from the group of the European transition economies.
Source: Author's calculation.

Initial dynamic decrease in interest rates followed by the exchange rate shock culminated during the second month since the shock. After reaching the peak, interest rates tend to converge to their pre-shock levels following the path of steady and continuous though slight increase. However, the speed of interest rates adjustment in the medium term differs. As a result, the overall effect of the positive exchange rate shock was neutralized between tenth (Estonia and Latvia), eighteenth (Lithuania) and twenty-fourth (Bulgaria) month since the shock in group of countries with pegged exchange rate regime.

Following our results we suggest that high short-term (or even immediate) responsiveness of interest rates to the unexpected exchange rate shocks in countries with exchange rate targeting is associated with an increased stabilization role of interest rates to maintain exchange rate stability affected by exchange rate volatility (i.e. due to exchange rate shocks). Immediate higher responses of short-term interest rates in these countries should operate as a convenient vehicle to support the exchange rate on its way back to per-shock equilibrium levels.

Quite different response patterns of the short-term interest rates to the positive exchange rate shock were observed in the group of countries with flexible exchange rate

arrangement. In comparison with the previous group of countries it seems that the immediate responsiveness of interest rates is lagged (by one to three months). Initial load of the exchange rate effect to the short-term interest rates is quite moderate. Interest rates reacted to the unexpected exchange rate shock by a moderate decrease. Effect of the shock intensified during next months. Despite relatively similar features in immediate responses of the short-term interest rates to the positive exchange rate shock in countries with flexible exchange rate arrangement we observed some differences in medium-term responsiveness patterns among individual countries.

Negative effect of the exchange rate shock to the short-term interest rates leading path completely died out within one year after the shock only in Poland. In remaining countries we observed longer response path on the way to the pre-shock equilibrium. As a result, interest rates returned back to their pre-shock levels till end of the second year since the shock hit the model in Hungary, Romania and Slovak Republic. However, negative effect of the exchange rate shock to the short-term interest rates seems to be permanent even in the long run in the Czech Republic and Slovenia.

We suggest that lower immediate responsiveness of interest rates to the unexpected exchange rate shock in countries with flexible exchange rate arrangement results from generally expected interest rates response patterns under interest rate parity conditions. As a result, interest rate differentials affect associated exchange rate adjustments in the medium-term horizons that is why the overall effects of exchange rate shock on interest rates are more durable under flexible exchange rates.

Crisis period affected substantial features in short-term interest rates responsiveness to the unexpected positive exchange rate shock in countries with nominal exchange rate anchoring. Differences in the immediate effects of the shock seem to be biased (in comparison with model A) according to the intensity of the response patterns within first three months. Immediate response path reflects slightly higher vulnerability of interest rates to the shock in some countries, though in some cases it does not change. However, we observed clear reduction in the overall durability of the immediate effect of the shock. As a result, interest rates converged to their pre-shock levels within reduced time period in all countries from the group but Bulgaria (though medium-term interest rate response trajectory reveals slightly reduced vulnerability). At the same time, we investigated increased volatility of interest rates on their medium-term converging path toward long-run equilibrium. Finally, effects of the exchange rate shock died out in the long run and thus short-term interest rates are neutral to the distorting effect of the shock.

Different patterns in the short-term interest rates responsiveness to the exchange rate shock during the crisis period was also recognized in the group of countries with flexible exchange rate regime. Following our results we realize that in comparison with the pre-crisis period there is slightly reduced lag in the immediate response (within first three months) of interest rates during the initial loading phase. At the same time, short-term responsiveness of interest rate clearly increased in all countries from the group of "floaters" emphasizing increased role of the short-term interest rate differentials for exchange rate determination under expectation of higher uncertainty.

The overall durability of the exchange rate shock related interest rate effects slightly increased in all countries. However, similarly to our results for the model with a pre-crisis time series, we received mixed results about the overall durability of the exchange rate shock. The negative effect of the shock seems to be permanent in the Czech Republic, Poland, Slovenia and Slovak Republic while it is just a temporary in Hungary and Romania.

Conclusion

Estimated results of the interest rates impulse-response functions revealed quite distorting effects of the unexpected exchange rate shock to the responsiveness and durability of short-term interest rates according to the employed exchange rate regime as well as

baseline period. We suggest that a relative diversity in results according to the exchange rate arrangement provides important evidence about crucial patterns of adjustment processes under fixed and flexible exchange rates. Our results thus may be contributive to the discussion about side effects associated with the process of monetary integration of European transition economies. On the other hand, comparison of results for pre-crisis and extended periods revealed unique crisis related effects. However, origins of examined crisis related effects in the area of the interest rates determination and distortions in particular contribution of identified shocks to the interest rates leading path may be a subject of further investigation and academic discussion.

Crisis period affected responses of nominal interest rates to demand shocks in both groups of countries. In general, we observed some different short-term interest rates responsiveness patterns in both groups of countries. It seems that responses of interest rates to structural shocks during the crisis period follow different path according to their initial change as well as following adjustment on the way to their long-run equilibrium. Observed changes in the interest rates responsiveness patterns differ not only according to the baseline period but also from the exchange rate arrangement perspective. Our investigation and estimated results thus highlight both crisis related implications in the area of the short-term interest rates determination as well as exchange rate arrangement bias (i.e. fixed versus flexible exchange rates dilemma) particularly in countries from the past Eastern block (European transition economies).

References

Bratu, M., 2011. "Modeling and Forecasting the Exchange Rate in Romania", Romanian Journal of Economics, Institutul de Economie Națională al Academiei Române, 33(2): 56-72

Calvo, G., Reinhart, C., 2002. "Fear of Floating", Quarterly Journal of Economics 117(2): 379-408, http://dx.doi.org/10.1162/003355302753650274

Dabale, W.P., Jagero, N., 2013. "Causes of Interest Rate Volatility and its Economic Implications in Nigeria", International Journal of Academic Research in Accounting, Finance and Management Sciences, 3(4): 27-32.

Damian, M., 2011. "The Comparative Analysis of the Monetary Policy Strategies before the Adoption of the Euro Currency and the Impact upon the Maastricht Criteria", Journal of Applied Economic Sciences, 6(3): 222-229

Eijffinger, S., Schaling, E., Verhagen, W., 2000. "The Term Structure of Interest Rates and Inflation Forecast Targeting", [CEPR, Discussion Paper 2375], London, CEPR

Emiris, M., 2006. "The Term Structure of Interest Rates in a DSGE Model", [National Bank of Belgium, Working Paper Research No. 88] Brussels, National Bank of Belgium

Fendel, R., 2009. "Note on Taylor Rules and the Term Structure", Applied Economics Letters, 16(11): 1097-1101, http://dx.doi.org/10.1080/13504850701367171

Gerlach-Kristen, P., Rudolf, B., 2010. "Macroeconomic and Interest Rate Volatility under Alternative Monetary Operating Procedures", [Swiss National Bank, Working Paper No. 2010-12] Zurich, Swiss National Bank

Kulish, M., 2007. "Should Monetary Policy Use Long-term Rates?" B.E. Journal of Macroeconomics, 7(1): 1-26, http://dx.doi.org/10.2202/1935-1690.1558

McGough, B., Rudebusch, G., Williams, J.C., (2005). "Using a Long-term Interest Rates as the Monetary Policy Instrument", Journal of Monetary Economics 52(5): 855-879, http://dx.doi.org/10.1016/j.jmoneco.2005.07.011

Obstfeld, M., 1985. "Floating Exchange Rates: Experience and Prospects", Brookings Papers on Economic Activity, 1985(2): 369-450, http://dx.doi.org/10.2307/2534443

Rudebusch, G.D., Sack, B.P., Swanson, E.T., 2006. "Macroeconomic implications of changes in the term premium", [Federal Reserve Bank of San Francisco, Working Paper No.46/2006], San Francisco, Federal Reserve Bank of San Francisco

Stavarek, R., 2012. "Exchange Market Pressure in Central European Countries from the Eurozone Membership Perspective", South East European Journal of Economics and Business, 3(2): 7-18