Financial Deepening and Economic Growth in the European Transition Economies

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Abstract:
Various effects of the financial deepening came to the centre of academics as well as policy-makers discussions during last four decades especially in relation to the financial sector development. Together with financial liberalization and international financial integration economists focus their attention to the financial deepening especially due to its potential effects on the real economy. Perspective of the fast and sustainable economic growth at the end of the 1990s increased an attractiveness of the European transition economies (ETE) for the foreign investors that resulted in increased foreign capital inflows to ETE. International capital inflows (especially debt and portfolio capital flows) stimulate financial deepening through higher demand for financial services. As the underdeveloped financial markets obviously constrain domestic capital mobilization, the international financial integration is considered to be very useful vehicle in fostering financial sector advancement. One of the most discussed areas related to the overall effects of the financial deepening is a bi-directional relationship between financial development and economic growth. It is generally expected there is a positive effect of financial development on economic growth. On the other hand especially some country-specific institutional characteristics and different policies may significantly distort positive incentives of the financial deepening.

In the paper we analyze the main aspects of the financial deepening in ten ETE in the period 2000-2010 using vector error correction model (VECM). In order to meet this objective we implement a multivariate cointegration methodology introduced by Johansen (1988, 1991) and Johansen and Juselius (1990) to estimate the relationships between financial depth indicators and real output in the selected group of countries. To find the order of integration of endogenous variables we test the time series for the unit root presence. In order to determine cointegrating (long-run) relationships, we follow a Johansen cointegration procedure to perform the trace test and maximum eigenvalue test. We also test the direction of the causality relationships between financial depth indicators and real output using linear Granger causality test. Using the estimated VEC model, the dynamic responses of the endogenous variables to the money stock, domestic bank deposits and domestic bank loans one standard deviation shocks are computed for each country from the group of ETE.

Keywords: financial deepening, economic growth, vector error correction model, granger causality, impulse-response function

JEL Classification: F43, G14, G15, O16

1. Introduction

Various effects of the financial deepening came to the centre of academics as well as policy-makers discussions during last four decades especially in relation to the financial sector development. Together with financial liberalization and international financial integration economists focus their attention to the financial deepening especially due to its potential effects on the real economy. Size of the financial sector is usually closely related to the overall economic performance of the country. It seems the higher is the per capita income in the country the faster is the growth in the financial assets.

Perspective of the fast and sustainable economic growth at the end of the 1990s increased an attractiveness of ETE[1] for the foreign investors that resulted in increased foreign capital inflows to ETE (Stiglitz, 2000; Rose, 2005). As a result many countries from the group worsened their international debt position. While the effects of the foreign direct investments are well described in the present literature, the role of the portfolio investments is typically underestimated. It is typically the result of the low developed domestic financial markets in ETE (Buiter - Taci, 2002; Blanchard, 1984). In addition to this obvious trend, changes in the external capital portfolio structure reflected the progress in the domestic economic, institutional and financial system reforms, increasing the reliance

[1] To the informal group named as European transition economies we consider new European Union member countries - the former central planning economies including Bulgaria, Czech republic, Estonia, Lithuania, Latvia, Hungary, Poland, Romania, Slovak republic and Slovenia.

of foreign investors to allocate more direct and portfolio equity investments in those countries. In comparison with the old EU member countries the effects of the international capital flows in ETE doesn't necessarily reach the generally expected intensity, while the overall outcome can be distorted or even opposite (Edwards, 2001; Edison - Ross - Luca - Torsten, 2002; Bekaert, 2005).

International capital inflows (especially debt and portfolio capital flows) stimulate financial deepening through higher demand for financial services. As the underdeveloped financial markets obviously constrain domestic capital mobilization, the international financial integration is considered to be very useful vehicle in fostering financial sector advancement.

As the main determinants of continuously rising depth of the domestic financial sector in ETE in the last decade we consider:

- Financial liberalization (consistent releasing of the international capital flows restrictions) started in the second half of the 1990s followed by the macroeconomic stabilisation after the periods of imbalanced economic growth that many ETE experienced in the second half of the 1990s.
- Persisting low domestic capital base (imbalance between domestic savings and investments that resulted in long-lasting current account deficits) stimulated significant foreign capital inflows.
- Rising competition among domestic commercial banks (in many ETE it was especially due to an integration of domestic banks into the international financial groups through the process of their privatisation).
- Improving legislation framework (advancing legal and regulatory framework of the financial system raises its overall efficiency and reliability and thus foster the financial deepening).
- Decreasing domestic interest rates (due to monetary policy conditions softening resulted from macroeconomic stability that all ETE achieved at the certain point of their transition process.

One of the most discussed areas related to the overall effects of the financial deepening is a bi-directional relationship between financial development and economic growth. It is generally expected there is a positive effect of financial development on economic growth. On the other hand especially some country-specific institutional characteristics and different policies may significantly distort positive incentives of the financial deepening.

In the paper we analyze the main aspects of the financial deepening in ten ETE in the period 2000-2010 using vector error correction model (VECM). In order to meet this objective we implement a multivariate cointegration methodology introduced by Johansen (1988, 1991) and Johansen and Juselius (1990) to estimate the relationships between financial depth indicators and real output in the selected group of countries. To find the order of integration of endogenous variables we test the time series for the unit root presence. In order to determine cointegrating (long-run) relationships, we follow a Johansen cointegration procedure to perform the trace test and maximum eigenvalue test. We also test the direction of the causality relationships between financial depth indicators and real output using linear Granger causality test. Using the estimated VEC model, the dynamic responses of the endogenous variables to the money stock, domestic bank deposits and domestic bank loans one standard deviation shocks are computed for each country from the group of ETE.

2. Overview of the literature

The progress in the financial sector development and the financial deepening in the European transition countries (Buiter - Taci, 2003) are considered to be a crucial aspect of the continuously increasing process of the international financial integration. Of course, institutional aspects, heritage from the central planning period and transitional rigidities has fundamentally affected the overall progress as well as durability of partial steps shaping the individual features of the financial sector development and the financial deepening in each particular country. Hence we assume the financial sector development in the European transition countries became even more complicated and country specific when comparing with the financial integration process.

Positive effects of financial deepening are well documented in both theoretical and empirical literature. On the other hand it is not clear how to estimate general linkage and relationship between (a) the financial sector development and the financial deepening and (b) the international financial integration. For example Eichengreen (1997) suggests that the financial integration leads to the financial deepening (to more active, liquid and efficient domestic financial markets), and that the financial deepening encourages higher investments, faster growth and more rapidly rising living standards. The linkage between the financial integration and the financial deepening is evident from the fact that countries facing relatively large capital inflows have seen disproportionate growth in the volume of transactions on their stock markets, disproportionate growth in stock market capitalization, and disproportionate growth in bank loans to the private sector.

Rousseau and Wachtel (2007) emphasizes that in order to get benefits from the financial deepening associated with the foreign capital inflows the country should liberalize capital account transactions only when the legal and regulatory institutions were successfully well developed.

Hasan, Wachtel and Zhou (2007) argue that the financial deepening and the international financial integration is not necessary accompanied only with the positive influence on the domestic transition economy (i.e. economic growth) and the overall effect is largely determined by the financial deepening features and the structure of the foreign capital inflows. While the capital market depth has usually a strong influence on the growth the bank credits may have non-significant or sometimes even negative impact on the growth. At the same time the equity and debt capital inflows have obviously positive influence on the economic growth.

Mohan (2006) assumes that the financial deepening has usually overall positive macroeconomic outcomes, but on the microeconomic level it is rather questionable, whether such performance incentives also extend to small and medium enterprises. He also emphasizes that it is rather inconclusive, whether intensified financial intermediation usually coupled with the financial deepening also includes small and medium enterprises. On the other hand the international financial integration is usually coupled with broad set of the microeconomic collateral benefits, i.e. increased quality of institutions and the corporate governance.

Calderón (2002) employed the Geweke decomposition test (Geweke, 1982) on pooled data of 109 developing and industrial countries from 1960 to 1994 to examine the direction of causality between financial development and economic growth. The paper finds that (1) financial development generally leads to economic growth; (2) the Granger causality from financial development to economic growth and the Granger causality from economic growth to financial development coexist; (3) financial deepening contributes more to the causal relationships in the developing countries than in the industrial countries; (4) the longer the sampling interval, the larger the effect of financial development on economic growth; (5) financial deepening propels economic growth through both a more rapid capital accumulation and productivity growth, with the latter channel being the strongest.

Christopoulos - Tsionas (2004) investigated the long run relationship between financial depth and economic growth, utilizing the data in the most efficient manner via panel unit root tests and panel cointegration analysis for 10 developing countries. Threshold cointegration tests were also implemented together with dynamic panel data estimation for a panel-based vector error correction model. The long run relationship was estimated using fully modified OLS. Their analysis confirmed an idea that there exists a unique cointegrating vector between growth, financial development and ancillary variables. The empirical evidence also points to the direction that there is no short run causality between financial deepening and output, so the effect is necessarily long run in nature.

Rachdi - Mbarek (2011) investigated the direction of causality between finance and growth using panel data cointegration and GMM system approaches. Their empirical analysis is based on a sample of 10 countries, 6 from the OECD region and 4 from the MENA region during 1990-2006, reports the following results: a panel data cointegration analysis confirms a long-term relationship between financial development and economic growth for the OECD and the MENA countries. Results support the idea that the causality is bidirectional for the OECD countries and unidirectional (economic growth - financial development) for the MENA countries.

Apergis - Filippidis - Economidou (2007) examines whether a long-run relationship between financial development and economic growth exists employing panel integration and cointegration techniques for a dynamic heterogeneous panel of 15 OECD and 50 non-OECD countries over the period 1975–2000. Their findings support the existence of a single long-run equilibrium relation between financial deepening, economic growth and a set of control variables.

Pradhan (2010) analyzed the long run equilibrium nexus between financial deepening, foreign direct investment (FDI) and economic growth in India during 1970-2007. Using Johansen's cointegration technique, the author investigated that financial deepening; foreign direct investment and economic growth are cointegrated, indicating the continuation of long run equilibrium relationship between them. The ECM further confirmed the presence of bidirectional causality between foreign direct investment and economic growth and a unidirectional causality from financial deepening to foreign direct investment.

Abu-Bader - Abu Quarn (2006) examined the causal relationship between financial development and economic growth in five Middle Eastern and North African (MENA) countries for different periods ranging from 1960 to 2004 implementing VAR framework. Authors employed four different measures of financial development and applied Granger causality tests using cointegration and VEC methodology. Their results showed weak support for a long-run relationship between financial development and economic growth.

3. Econometric model

In order to analyze the effects of the financial deepening on the economic growth in ten ETE we estimate a vector error correction model. The paper implements a multivariate cointegration methodology introduced by Johansen (1988, 1991) and Johansen and Juselius (1990) to estimate the relationships between financial depth indicators and real output in the selected group of countries. Johansen method is applied to the unrestricted vector autoregression (VAR) model that can be written by the following moving average representation of n non-stationary variables containing p lagged values:

$$Y_t = \mu + A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_p Y_{t-p} + \varepsilon_t \tag{1}$$

where Y_t is a $n\ x\ 1$ vector of the contemporaneous endogenous variables, μ is a $n\ x\ 1$ vector of the constants, A_i are $n\ x\ n$ polynomial variance-covariance matrix, $\varepsilon_t \sim N_n\left(0, \Sigma_\varepsilon\right)$ is a $n\ x\ 1$ normalized vector of exogenous shocks (innovations) to the model representing unexplained changes in the variables.

If at least two of the variables are cointegrated of the order one (I(1)) the VAR representation in the equation (1) can be rewritten by subtracting Y_{t-1} to the following vector error correction model (VECM):

$$\Delta Y_t \ = \ \mu \ + \ \Pi Y_{t-1} \ + \ \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} \ + \ \varepsilon_t \tag{2}$$

where ΔY_t is a $n\ x\ 1$ vector of the first differences of stochastic variables Y_t, $\Pi = \sum_{i=1}^{p} A_i - I$, $\Gamma_i = -\sum_{j=i+1}^{p} A_j$, I is $n\ x\ n$ identity matrix.

Presented VECM contains information on both short-term and long-term adjustments to changes in Y_t included in estimated Γ and Π respectively. Γ is a $n\ x\ n$ vector that represents the short-term dynamic - adjustments to changes in Y_t. Π is a $n\ x\ n$ vector which represents a matrix of the long-run coefficients - the cointegrating relationships (cointegrating vectors) and of the error correction term. Π can be decomposed as follows:

$$\Pi = \alpha\beta' \tag{3}$$

where α represents $n\ x\ r$ a vector of loading matrices containing coefficients that describe the contribution of the r long-term (cointegrating) relationships in the individual equations and denotes the speed of adjustment from disequilibrium, while β is a $n\ x\ r$ matrix of long-run coefficients and represents the r linearly independent cointegrating vectors (each column of β is the cointegrating vector). The number of cointegrating relations among variables of Y_t is the same as the rank (r) for the matrix Π. If it has a full rank, the rank $r = n$ and it means there are n cointegrating relationships and that all variables are I(0). If a vector Y_t is a vector of endogenous variables that are I(1), then all terms in equation (2) are I(0), and ΠY_{t-1} must be also stationary for $\varepsilon_n \sim I(0)$ to be white noise. If the matrix Π has reduced rank, $r < n$, there are $n-1$ cointegrating vectors and even if all endogenous variables in the model are I(1), the level-based long-run component would be stationary. VECM requires there exists at least one cointegrating relationship.

In order to find a presence of cointegrating (long-run) relationships, we use the trace test and maximum eigenvalue test. Determination of rank and estimation of the coefficients are computed as maximum likelihood estimation. The corresponding likelihood-ratio test statistics are:

$$\lambda_{trace}(r) = -T \sum_{i-r+1}^{n} \ln\left(1-\hat{\lambda}_i\right) \qquad \lambda_{\max}(r, r+1) = -T \ln\left(1-\hat{\lambda}_{r+1}\right) \tag{4}$$

where r is the number of cointegrating vectors under the null hypothesis and $\hat{\lambda}$ is the estimated value for the *ith* ordered eigenvalue from the Π matrix. Under the trace statistic, the null hypothesis that the number of cointegrating vectors is less than or equal to r is tested against the alternative that there are more than r vectors. Whereas under the maximum eigenvalue test the null hypothesis that there are r cointegrating vectors is tested against the alternative of $r+1$ cointegrating vectors.

Once we estimate VECM, the short-run relationships can be calculated implementing impulse-response functions (IRF). IRF shows the response of each variable in the system to the shock in any of the other variables. In order to calculate the IRF it is necessary to apply a transformation matrix, B, to the innovations so that they become uncorrelated. The IRF should be calculated from the following moving average representation of the VECM:

$$Y_t = \sum_{i=0}^{\infty} A_i \varepsilon_{t-i} \qquad t = 1, 2, ..., T \tag{5}$$

where T is a number of usable observations and $n \, x \, n$ coefficient matrices $A_i \left(i = 2, ..., p\right)$ are recursively calculated using the following expression:

$$A_i = \Phi_1 A_{i-1} + \Phi_2 A_{i-2} + ... + \Phi_p A_{i-p} \tag{6}$$

with $A_0 = I_n$; $A_i = 0$ for $i < 0$; $\Phi_1 = I + \Pi + \Gamma_1$, $\Phi_i = \Gamma_i - \Gamma_{i-1}$ $\left(i = 2, ..., n\right)$.

The Cholesky method uses the inverse of the Cholesky factor of the residual covariance matrix in order to orthogonalize the impulses. This method imposes an ordering of the variables and attributes all of the effect of any common component to the variable that comes first in the system. Responses can change if the ordering of the variables change.

Before estimating the model we have to test the time series for stationarity. Due to Engle and Granger (1987) it is necessary that all variables within the cointegration relationship must have the same order of integration. In addition, the time series should not be I(0), since this will lead to trivial cointegrating vectors.

We also test the direction of the causality relationships between financial depth indicators and real output using linear Granger causality test defined by the following expression:

x_t is said to does not Granger-cause y_t, if

$$E\left(y_{t+p}\left|\Omega_t\right.\right)=E\left(y_{t+p}\left|\Omega_t-x_t\right.\right) \qquad \left(\forall p>0\right) \tag{7}$$

where x_t and y_t are two times series, Ω_t is all the information available at time T and $\left(A|B\right)$ is the conditional distribution of A given B.

The expression (7) can be also explained as follows: x_t is said to not Granger-cause y_t if cannot help predict future y.

Using the estimated VEC model, the dynamic responses of the endogenous variables to the money stock, domestic bank deposits and domestic bank loans one standard deviation shocks are computed for each country from the group of ETE. In order to meet the objective of the article to estimate the main aspects of the financial deepening in ETE in the period 2000-2010 we focus our attention to interpret the responses of the real output to the stock of money, domestic deposits and domestic loans one standard deviation innovation.

4. Data and results

We use quarterly data ranging from 2000Q1 to 2010Q4 (44 observations) for the financial depth indicators (represented by the shares of broad money stock M2 (*m*), domestic bank deposits (*d*) and domestic bank loans (*l*) to GDP), GDP (*y*), inflation (*p*) represented by the adjusted domestic consumer price index (indicator of core inflation), nominal effective exchange rate (NEER) (*e*), and short-term interest rates (*i*) (Table 1).

[Insert Figure 1 about here]

Time series for broad money supply monetary aggregate M2, domestic bank deposits, domestic bank loans and GDP are seasonally adjusted and together with NEER are expressed as indexes with base line year 2005. Core inflation and interest rates are calculated as an annual percentage change of adjusted consumers' price index expressed on the quarterly base.

Before estimating the model we test the time series for stationarity. To determine the order of integration of the variables we use both the augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. Both test were computed to test the endogenous variables for the existence of the unit roots. A test designed to determine whether a time series is stable around its levels (trend-stationary) or stable around the differences in its levels (difference-stationary). As we already pointed for VECM it is necessary that all variables included in the model must be non-stationary and have the same order of integration. The augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests were computed to test the endogenous variables for the existence of the unit roots.

Knowing all the endogenous variables order of integration it is necessary to the test the time series for cointegration using the Johansen cointegration test. The purpose of the cointegration test is to determine whether a group of non-stationary time series are cointegrated or not (following Johansen cointegration procedure in case some endogenous variables are I(0), they must be excluded from cointegration testing). An appropriate lag length for endogenous variables is selected according to the AIC (Akaike Information Criterion) and SIC (Schwarz Information Criterion).

To test the stability of the VEC 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 passed the Jarque-Bera normality test, so that errors seem to be normally distributed. The VEC models seem to be stable also because the inverted roots of the models for each country lie inside the unit circle, although several roots are near unity in absolute value (figure 2).

[Insert Figure 2 about here]

Following the results of the unit root tests and cointegration tests we perform Granger causality test and estimate the model using the variables in the first differences so that we can calculate impulse-response functions (we focus on the responses of real output in the selected group of ETE to the selected financial depth indicators' one standard deviation in each country. In order to estimate the responses of the real output to the money stock, domestic deposits and domestic loans shocks we estimate following three models for each individual country - model A ($Y_t = [m_t, y_t, p_t, e_t, i_t]$), model B ($Y_t = [d_t, y_t, p_t, e_t, i_t]$) and model C ($Y_t = [l_t, y_t, p_t, e_t, i_t]$) for each of the individual country from the group of ETE.

A. Unit root Test

The results of ADF and PP tests for unit roots presence in the endogenous variables are reported in the Table 1.

[Insert Table 1 about here]

Both ADF and PP tests indicate the variables are non-stationary on the values so that the null hypothesis of a unit root presence cannot be rejected for any of the series. Testing variables on the first differences indicates the time series are stationary (null hypothesis can be rejected at 1% level of confidence is most cases) so that we conclude that the variables are I(1). As non of the time series is I(0) all variables can be tested for cointegration.

B. Cointegration Test

Although time series in all models are stationary at first differences it doesn't necessarily mean that the endogenous variables are also cointegrated. To test the time series that are integrated at order 1 for cointegration it is important to observe whether linear combination of two or more non-stationary time series is stationary.

In order to test endogenous variables that contain a unit root on the values for cointegration we employ the Johansen cointegration test. The tests 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 (Table 2) seem to be clear though they divided ten ETE in two groups.

[Insert Table 2 about here]

Both trace statistics and maximum eigenvalue statistics (both at 0.05 level) clearly indicate the presence of unique cointegrating vector in Bulgaria (for model A, B, C), Estonia (for model A, B, C), Lithuania (for model A, B), Poland (for model C), Romania (for model A, B, C) and Slovenia (for model C). Mixed results of cointegration analyses indicate both tests in Hungary (for model A, B, C), Latvia (for model A, B, C), Lithuania (for model C) Poland (for model A), Slovak republic (for model A, B) and Slovenia (for model A). In these countries one test statistics indicate the presence of unique cointegrating equation while the other test statistics denotes there is no cointegration among variables. Finally both test statistics indicate no cointegration among the endogenous variables in the Czech republic (for model A, B, C), Poland (for model B), the Slovak republic (for model C) and Slovenia (for model B). In addition trace statistics indicate two cointegration equations in Estonia (for model A, B), Lithuania (for model A, B), Poland (for model C) and Romania (for model C).

C. Granger Causality Test

To test for evidence of causality between the variables we employ Granger causality test. In a system of variables, a variable is said to be Granger-caused by another, if the second one helps in the prediction of the first one, or equivalently, if the coefficients on the lagged are statistically significant. For example, if two variables are cointegrated, that is, they have a common stochastic trend, and then causality in the Granger (temporal) sense must exist in at least one direction. We say that the first variable does not Granger cause the second if the lags of the first variable and the error correction term are jointly not significantly different from zero. Two-way causation is also possible and frequent.

The results of Granger causality test are shown in table 3.

[Insert Table 3 about here]

Granger causality test results almost precisely follow the results of Johansen cointegration test. Expected long-run causality between all three financial depth indicators and economic growth was confirmed in Estonia, Latvia and Romania only. It seems money stock, domestic deposits and domestic loans granger cause economic growth so that economic development in these countries seems to be causally dependent of financial deepening. As Latvia and Romania are among four countries with lowest GDP per capita from all ten ETE, it seems the financial deepening stimulates economic growth especially in less developed countries.

On the other hand no causality between financial depth indicators and real output was detected in the Czech republic, Hungary, Slovak republic. Even though Poland is not included in these group of countries it seems financial deepening is not directly responsible for economic growth in the long-run in most developed ETE (here again according to the GDP per capita) we've included in the test.

Finally, mixed results from Granger causality test were obtained in Bulgaria, Lithuania, Poland and Slovenia. In Bulgaria Granger causality test indicate money stock and domestic deposits foster economic growth. Surprisingly, while domestic loans don't granger cause economic growth, causality between these two variables seems to be present in opposite direction, so that economic growth causes domestic loans to growth. This observation might be explained the way economic growth simply stimulates demand for new loans as the real economic activity accelerate investment demand. While domestic deposits and domestic loans seem to affect real economic activity in Lithuania in the long run, Granger causality test doesn't indicate that real economic activity is determined by money stock causation. Quite interesting results were obtained from the results of Granger causality test in Poland. While money stock doesn't seem to granger cause economic growth, causality between these two variables was observed in opposite direction. It might be explained similar way as in case of Bulgaria that is to say real output determined investment demand and/or long-run consumption. At the same time no causality was observed between domestic loans and real output (in both directions). Finally, domestic loans seem to granger cause real output in Poland. While causality between domestic loans and real economic activity were also present in Slovenia, money stock as well as domestic deposits doesn't seem to granger cause real output in this country.

To summarize estimated per country results we may conclude the causality between economic growth and financial depth indicators doesn't seem to be clear for the whole group of ETE.

D. Impulse-Response Function

Responses of real output to the Cholesky financial depth indicators' one standard deviation shocks in the selected group of ETE are depicted in the figure 3. While Granger causality test estimates long-run causality among variables of the model, impulse-response analysis outlines responses of the endogenous variables to the shocks hitting the model in the short-run.

[Insert Figure 3 about here]

As we expected one standard deviation shocks from the financial depth indicators determined real economic activity in all ETE in the short-run only though the time they needed to die out differs significantly among countries. Similarly, the results seem to be different when we focus on the initial response as well as overall intensity during the period while the one standard deviation shocks of financial depth indicators affected real output.

From the impulse-response analysis of money stock shock we may conclude that a response of real output to the one standard deviation shock of money stock reached its peak within ten quarters after the shock in all ETE. In all countries but Poland (and partially in the Slovak republic) immediate real output response to this shock was positive. The longest durability of positive effect of money stock shock to real output we observed in Lithuania, Romania and the Slovak republic.

Responses of real output to one standard deviation shock of domestic deposits indicate quite uncertain results in Hungary and Slovenia. The longest durability of domestic deposits shock was observed in the Czech republic, Romania and the Slovak republic. Real output responded to the domestic deposits shock with one year lag in Poland. This finding is quite similar to the finding we observed in this country in case of money stock shock.

Finally, one standard deviation shock of domestic loans clearly increased real output in all countries from the group of ETE. The longest durability of domestic loans shocks was observed in the Czech republic and the Slovak republic. We found that real output in Bulgaria increased apparently lesser in comparison with two previous shocks. At the same time the shock of domestic loans increased real output with quite higher intensity in Hungary and Slovenia in comparison with money stock and domestic deposits shocks.

5. Conclusion

In the paper we have analyze the main aspects of the financial deepening in ten ETE in the period 2000-2010 using vector error correction model (VECM). We have implemented a multivariate cointegration methodology to estimate the relationships between financial depth indicators and real output in the selected group of countries. ADF and PP tests were implemented to find the order of integration of endogenous variables. To determine the rank of cointegration we have followed a Johansen cointegration procedure to calculate the trace test and maximum eigenvalue test. We have also tested the direction of the causality relationships between financial depth indicators and real output using linear Granger causality test. Using the estimated VEC model, the dynamic responses of the endogenous variables to the money stock, domestic bank deposits and domestic bank loans one standard deviation shocks were computed for each country from the group of ETE.

Comparing the result for each country from the group of ETE we may summarize our findings as follows: (1) Especially countries with lower GDP per capita seem to benefit from financial deepening as the financial deepening indicators affects real economic activity with higher intensity in the short-run and Granger cause real output in the long-run; (2) While short-run effects of financial depth indicators' shocks on the real output development differs in intensity, durability as well as in initial response, overall positive impact is almost clear in all ETE.

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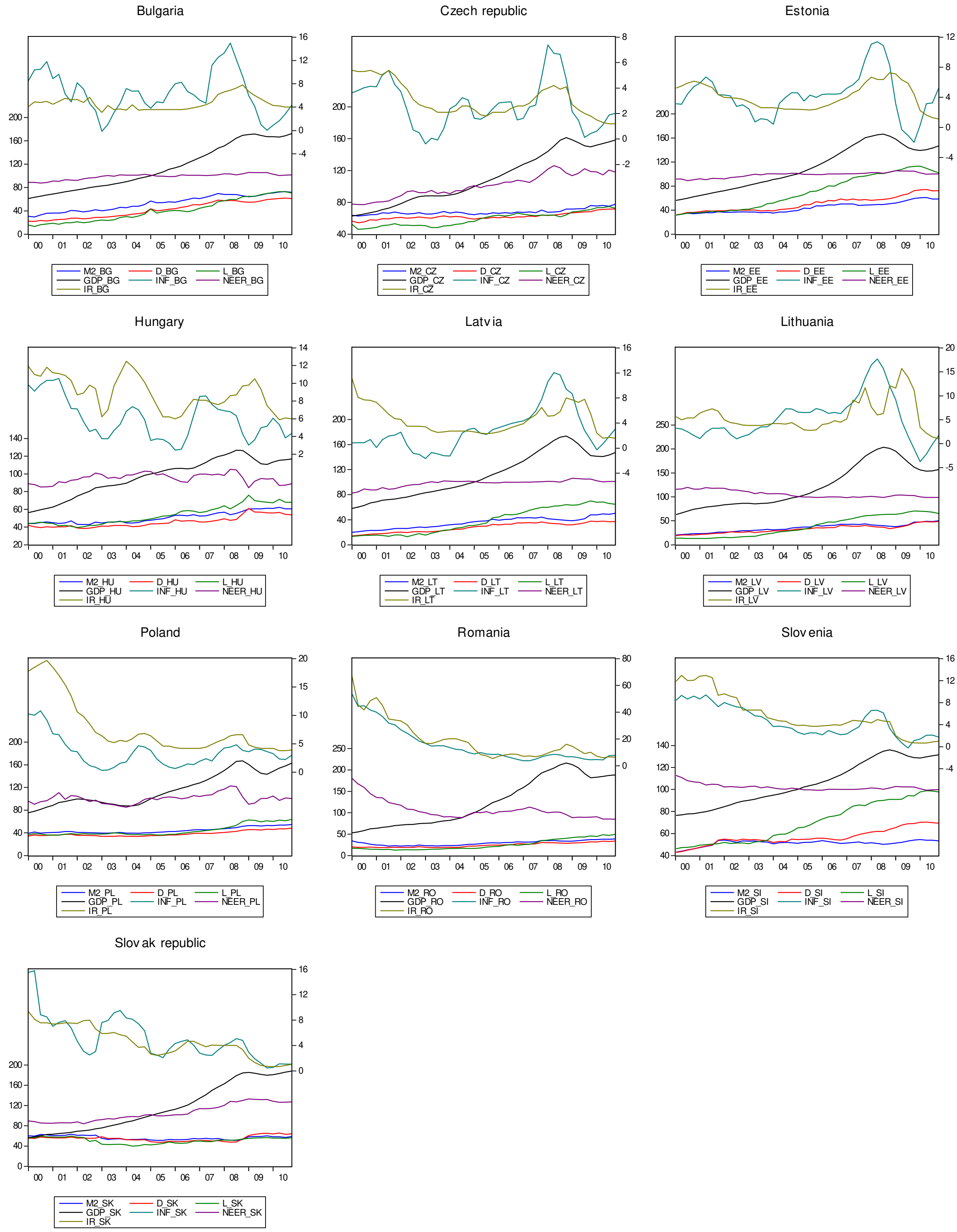
Appendix A

Figure 1. Variables



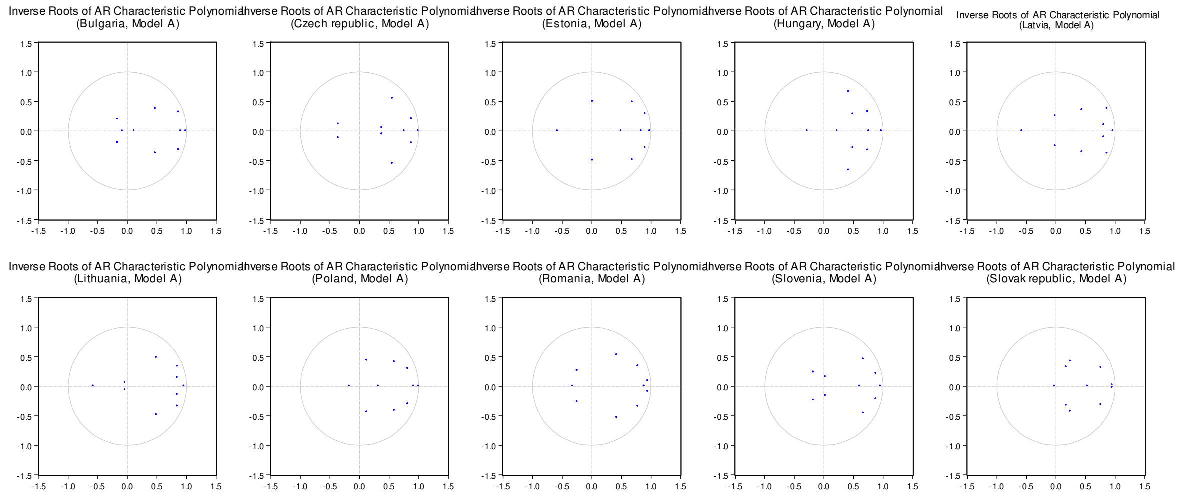
Note: money supply (M2), domestic deposits (D), domestic loans (L) are expressed as GDP shares (left axis in figures), gross domestic product (GDP), nominal effective exchange rate (NEER) are expressed as indexes (left axis in figures) (2005=100), inflation (INF), interest rates (IR) are expressed in percentage (right axis in figures).

Source: Compiled by author based on data taken from IMF - International Financial Statistics (May 2011).

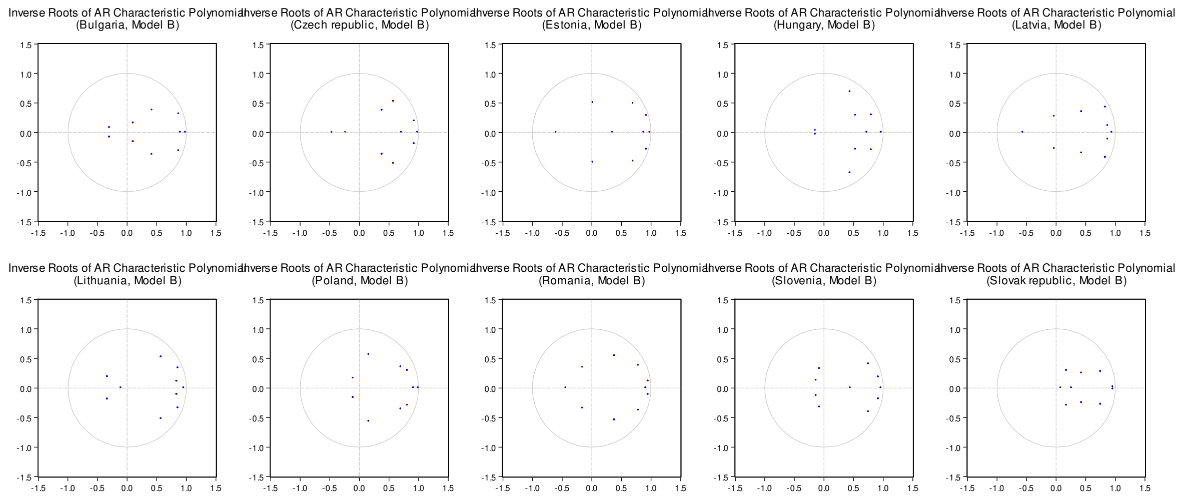
Appendix B

Figure 2. *VEC stability condition check*

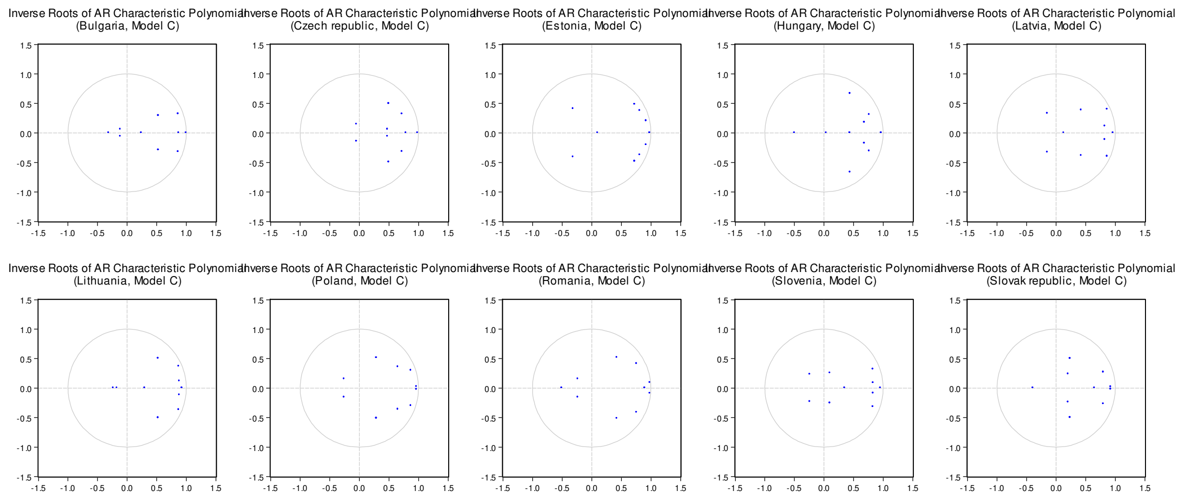
Model A



Model B



Model C



Source: Author's calculations.

Appendix C

Table 1. *Tests for Unit Roots*

Bulgaria

		M2_BG		D_BG		L_BG		GDP_BG		INF_BG		NEER_BG		IR_BG	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
model A	values	-0.962	-0.987					0.516	0.785	-1.114	-1.768	-0.437	-0.664	-0.962	-1.326
	1.dif.	-6.584*	-6.618*					-3.878**	-3.376**	-4.886*	-5.270*	-4.879*	-5.043*	-5.765*	-5.995*
model B	values			-0.755	-0.486			0.516	0.785	-1.114	-1.768	-0.437	-0.664	-0.962	-1.326
	1.dif.			-0.606*	-0.562*			-3.878**	-3.376**	-4.886*	-5.270*	-4.879*	-5.043*	-5.765*	-5.995*
model C	values					-0.239	-0.543	0.516	0.785	-1.114	-1.768	-0.437	-0.664	-0.962	-1.326
	1.dif.					-5.774*	-0.603*	-3.878**	-3.376**	-4.886*	-5.270*	-4.879*	-5.043*	-5.765*	-5.995*

Czech republic

		M2_CZ		D_CZ		L_CZ		GDP_CZ		INF_CZ		NEER_CZ		IR_CZ	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
model A	values	-0.596	-0.326					0.217	0.586	-0.781	-0.933	-1.156	-1.061	-2.089	-1.868
	1.dif.	-4,176**	-3.983**					-3.718**	-3.990*	-4.806*	-5.095*	-5.462*	-5.287*	-4.299*	-4.167**
model B	values			-0.899	-1.177			0.217	0.586	-0.781	-0.933	-1.156	-1.061	-2.089	-1.868
	1.dif.			-4.748*	-4.905*			-3.718**	-3.990*	-4.806*	-5.095*	-5.462*	-5.287*	-4.299*	-4.167**
model C	values					-0.165	-0.251	0.217	0.586	-0.781	-0.933	-1.156	-1.061	-2.089	-1.868
	1.dif.					-5.017*	-5.438*	-3.718**	-3.990*	-4.806*	-5.095*	-5.462*	-5.287*	-4.299*	-4.167**

Estonia

		M2_EE		D_EE		L_EE		GDP_EE		INF_EE		NEER_EE		IR_EE	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
model A	values	-0.785	-0.658					0.289	-0.188	-0.267	-0.471	-1.774	-1.328	-1.771	-1.407
	1.dif.	-3.995**	-4.780*					4.179*	3.766**	-4.289*	-4.762*	-6.919*	-6.547*	-5.669*	-5.117*
model B	values			-1.267	-1.089			0.289	-0.188	-0.267	-0.471	-1.774	-1.328	-1.771	-1.407
	1.dif.			-5.173*	-4.846*			4.179*	3.766**	-4.289*	-4.762*	-6.919*	-6.547*	-5.669*	-5.117*
model C	values					-0.514	-0.388	0.289	-0.188	-0.267	-0.471	-1.774	-1.328	-1.771	-1.407
	1.dif.					-4.781*	-4.668*	4.179*	3.766**	-4.289*	-4.762*	-6.919*	-6.547*	-5.669*	-5.117*

Hungary

		M2_HU		D_HU		L_HU		GDP_HU		INF_HU		NEER_HU		IR_HU	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
model A	values	-0.177	-0.375					-0.054	-0.165	-0.686	-0.475	-1.045	-0.655	-0.657	-0.338
	1.dif.	-5.107*	-5.335*					-5.885*	-5.914*	-5.997*	-5.538*	-5.886*	-5.327*	-5.171*	-5.053*
model B	values			-0.993	-1.047			-0.054	-0.165	-0.686	-0.475	-1.045	-0.655	-0.657	-0.338
	1.dif.			-5.835*	-5.991*			-5.885*	-5.914*	-5.997*	-5.538*	-5.886*	-5.327*	-5.171*	-5.053*
model C	values					-1.268	-0.952	-0.054	-0.165	-0.686	-0.475	-1.045	-0.655	-0.657	-0.338
	1.dif.					-4.883*	-4.366*	-5.885*	-5.914*	-5.997*	-5.538*	-5.886*	-5.327*	-5.171*	-5.053*

Latvia

		M2_LT		D_LT		L_LT		GDP_LT		INF_LT		NEER_LT		IR_LT	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
model A	values	-0.885	-0.482					-0.773	-0.319	-1.290	-1.118	-0.663	-0.718	-1.003	-0.548
	1.dif.	-5.775*	-5.117*					-5.005*	-4.487**	-6.252*	-6.005*	-5.664*	-5.295*	-4.616*	-4.114**
model B	values			-1.226	-0.799			-0.773	-0.319	-1.290	-1.118	-0.663	-0.718	-1.003	-0.548
	1.dif.			-4.791*	-4.226*			-5.005*	-4.487**	-6.252*	-6.005*	-5.664*	-5.295*	-4.616*	-4.114**
model C	values					-0.771	-0.665	-0.773	-0.319	-1.290	-1.118	-0.663	-0.718	-1.003	-0.548
	1.dif.					-5.279*	-5.078*	-5.005*	-4.487**	-6.252*	-6.005*	-5.664*	-5.295*	-4.616*	-4.114**

Lithuania

		M2_LV		D_LV		L_LV		GDP_LV		INF_LV		NEER_LV		IR_LV	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
model A	values	-0.551	-0.843					0.337	0.189	-1.536	-1.114	-0.774	-0.252	-0.881	-0.714
	1.dif.	-4.725*	-4.915*					-4.277*	-4.014**	-6.381*	-6.005*	-5.279*	-4.881*	-5.227*	-5.024*
model B	values			-1.377	-1.158			0.337	0.189	-1.536	-1.114	-0.774	-0.252	-0.881	-0.714
	1.dif.			-5.003*	-4.574*			-4.277*	-4.014**	-6.381*	-6.005*	-5.279*	-4.881*	-5.227*	-5.024*
model C	values					-0.292	-0.115	0.337	0.189	-1.536	-1.114	-0.774	-0.252	-0.881	-0.714
	1.dif.					-4.836*	-4.390*	-4.277*	-4.014**	-6.381*	-6.005*	-5.279*	-4.881*	-5.227*	-5.024*

Poland

		M2_PL		D_PL		L_PL		GDP_PL		INF_PL		NEER_PL		IR_PL	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
model A	values	-1.036	-0.712					-0.478	-0.276	-1.025	-1.388	-0.553	-0.870	-0.763	-0.709
	1.dif.	-5.652*	-5.196*					-5.873*	-5.489*	-6.003*	-6.588*	-4.857*	-4.994*	-5.199*	-5.443*
model B	values			-0.551	-0.917			-0.478	-0.276	-1.025	-1.388	-0.553	-0.870	-0.763	-0.709
	1.dif.			-4.885*	-5.338*			-5.873*	-5.489*	-6.003*	-6.588*	-4.857*	-4.994*	-5.199*	-5.443*
model C	values					-0.014	-0.366	-0.478	-0.276	-1.025	-1.388	-0.553	-0.870	-0.763	-0.709
	1.dif.					-5.553*	-5.892*	-5.873*	-5.489*	-6.003*	-6.588*	-4.857*	-4.994*	-5.199*	-5.443*

Romania

		M2_RO		D_RO		L_RO		GDP_RO		INF_RO		NEER_RO		IR_RO	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
model A	values	-0.991	-0.651					-0.117	-0.279	-0.887	-0.549	-1.287	-1.118	-0.441	-0.769
	1.dif.	-5.188*	-4.991*					-5.881*	-5.584*	-4.891*	-4.417**	-5.885*	-5.274*	-4.879*	-4.992*
model B	values			-1.227	-1.003			-0.117	-0.279	-0.887	-0.549	-1.287	-1.118	-0.441	-0.769
	1.dif.			-5.299*	-5.178*			-5.881*	-5.584*	-4.891*	-4.417**	-5.885*	-5.274*	-4.879*	-4.992*
model C	values					-0.881	-0.415	-0.117	-0.279	-0.887	-0.549	-1.287	-1.118	-0.441	-0.769
	1.dif.					-6.611*	-6.228*	-5.881*	-5.584*	-4.891*	-4.417**	-5.885*	-5.274*	-4.879*	-4.992*

Slovak republic

		M2_SK		D_SK		L_SK		GDP_SK		INF_SK		NEER_SK		IR_SK	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
model A	values	-0.991	-0.437					0.414	0.774	-0.668	-0.789	-0.276	-0.559	-0.490	-0.328
	1.dif.	-4.865*	-4.289*					-3.995**	-3.515**	-4.884*	-4.995*	-5.662*	-5.769*	-4.054*	-3.685**
model B	values			-0.327	-0.659			0.414	0.774	-0.668	-0.789	-0.276	-0.559	-0.490	-0.328
	1.dif.			-4.541*	-4.890*			-3.995**	-3.515**	-4.884*	-4.995*	-5.662*	-5.769*	-4.054*	-3.685**
model C	values					-0.331	-0.545	0.414	0.774	-0.668	-0.789	-0.276	-0.559	-0.490	-0.328
	1.dif.					-4.651*	-4.717*	-3.995**	-3.515**	-4.884*	-4.995*	-5.662*	-5.769*	-4.054*	-3.685**

Slovenia

		M2_SI		D_SI		L_SI		GDP_SI		INF_SI		NEER_SI		IR_SI	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
model A	values	-0.766	-0.326					-0.189	-0.658	-0.661	-0.482	-0.414	-0.265	-0.663	-0.843
	1.dif.	-5.780*	-5.228*					-5.227*	-5.876*	-4.062*	-3.996**	-3.995*	-3.592**	-4.817*	-4.961*
model B	values			-0.875	-0.721			-0.189	-0.658	-0.661	-0.482	-0.414	-0.265	-0.663	-0.843
	1.dif.			-5.955*	-5.434*			-5.227*	-5.876*	-4.062*	-3.996**	-3.995*	-3.592**	-4.817*	-4.961*
model C	values					-0.687	-0.332	-0.189	-0.658	-0.661	-0.482	-0.414	-0.265	-0.663	-0.843
	1.dif.					-4.945*	-4.433*	-5.227*	-5.876*	-4.062*	-3.996**	-3.995*	-3.592**	-4.817*	-4.961*

Source: Author's calculations.
Note: Data represents the results of t-statistics. Null hypothesis can be rejected at 1% level of confidence (*), 5% level of confidence (**), 10% level of confidence (***).

Appendix D

Table 2. *Johansen and Juselius cointegration rank tests*

Hypothesized No. of CE(s)	Bulgaria						Czech republic					
	model A		model B		model C		model A		model B		model C	
	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat
r=0	93.238*	53.789*	91.933*	51.758*	93.184*	34.936*	68.566	32.866	69.199	31.491	67.407	31.449
r≤1	45.341	26.375	43.176	25.680	48.248*	23.477	45.670	26.620	46.707	26.839	45.959	25.109
r≤2	28.114	15.477	26.495	14.628	24.780	15.964	20.079	12.459	22.869	13.513	20.850	14.598
r≤3	14.759	13.591	11.868	11.045	8.816	8.503	7.620	6.849	9.356	9.350	6.252	6.098
r≤4	1.167	1.167	0.822	0.822	0.313	0.312	0.771	0.771	0.006	0.006	0.153	0.153

Hypothesized No. of CE(s)	Estonia						Hungary					
	model A		model B		model C		model A		model B		model C	
	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat
r=0	103.296*	51.718*	105.391*	42.767*	96.066*	44.847*	82.397*	33.727	88.117*	32.969	98.345*	30.866
r≤1	51.579*	23.123	52.624*	26.937	44.219	24.100	44.670	27.217	43.148	23.326	46.479	25.696
r≤2	28.455	16.736	27.686	20.664	25.119	21.496	21.452	10.635	19.822	11.569	26.783	20.085
r≤3	11.718	10.482	14.022	12.991	12.623	9.692	10.817	9.568	8.253	7.471	6.698	5.938
r≤4	1.236	1.236	1.032	1.032	1.003	1.003	1.249	1.249	0.783	0.783	0.760	0.760

Hypothesized No. of CE(s)	Latvia						Lithuania					
	model A		model B		model C		model A		model B		model C	
	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat
r=0	94.267*	32.323	107.017*	31.450	96.436*	31.910	110.807*	64.999*	117.206*	47.815*	92.492*	29.718
r≤1	45.943	25.347	46.566	26.019	44.526	25.893	55.809*	23.926	59.391*	26.411	42.774	24.969
r≤2	27.596	18.302	27.547	17.841	23.633	14.493	21.882	14.240	22.981	15.821	25.805	16.132
r≤3	12.294	12.384	13.494	13.023	10.140	13.283	7.642	5.885	7.160	5.961	13.799	10.189
r≤4	1.910	1.910	1.682	1.682	1.856	1.856	1.757	1.757	1.199	1.199	2.611	2.611

Hypothesized No. of CE(s)	Poland						Romania					
	model A		model B		model C		model A		model B		model C	
	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat
r=0	113.585*	32.506	67.820	31.571	120.551*	36.504*	81.112*	36.116*	82.606*	36.553*	91.181*	36.092*
r≤1	46.079	23.942	43.249	25.700	70.046*	24.589	44.996	18.578	46.053	23.779	55.089*	27.109
r≤2	21.137	13.411	24.549	16.042	28.458	19.497	26.418	13.902	22.274	9.138	27.979	16.831
r≤3	7.726	6.775	8.506	6.407	8.960	8.905	12.516	7.041	13.135	8.620	11.148	6.710
r≤4	0.951	0.951	2.099	2.099	0.055	0.055	2.475	2.475	2.516	2.516	1.439	1.439

Hypothesized No. of CE(s)	Slovak republic						Slovenia					
	model A		model B		model C		model A		model B		model C	
	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat
r=0	84.091*	28.635	85.686*	30.430	67.299	31.137	84.810*	30.324	66.771	31.382	94.329*	37.311*
r≤1	45.456	23.410	45.256	24.563	46.162	25.978	44.486	23.604	42.389	25.694	45.018	24.003
r≤2	19.045	11.488	19.693	13.241	18.184	9.531	23.882	15.683	26.695	17.237	27.017	16.179
r≤3	7.557	7.021	6.452	6.429	8.653	6.169	9.199	8.938	11.458	13.391	13.838	9.297
r≤4	0.536	0.536	0.022	0.022	2.485	2.485	1.161	1.161	1.066	1.066	1.541	1.541

Note: Critical values for trace statistics at the 5% level of confidence for r=0 is 69.819; for r≤1 is 47.856; for r≤2 is 29.797; for r≤3 is 15.495; for r≤4 is 3.841. Critical values for maximum eigenvalue statistics at the 5% level of significance for r=0 is 33.877; for r≤1 is 27.584; for r≤2 is 21.131; for r≤3 is 14.264; for r≤4 is 3.841.
Source: Author's calculations.

Appendix E

Table 3. *Granger causality tests*

Bulgaria

null hypothesis		lags	obs.	prob.	decision
model A	M2_BG does not Granger Cause GDP_BG	3	41	0.0004	reject
	GDP_BG does not Granger Cause M2_BG	3	41	0.5718	do not reject
model B	D_BG does not Granger Cause GDP_BG	3	41	0.0007	reject
	GDP_BG does not Granger Cause D_BG	3	41	0.5790	do not reject
model C	L_BG does not Granger Cause GDP_BG	3	41	0.2652	do not reject
	GDP_BG does not Granger Cause L_BG	3	41	0.0419	reject

Czech republic

null hypothesis		lags	obs.	prob.	decision
model A	M2_CZ does not Granger Cause GDP_CZ	3	41	0.4781	do not reject
	GDP_CZ does not Granger Cause M2_CZ	3	41	0.2546	do not reject
model B	D_CZ does not Granger Cause GDP_CZ	3	41	0.2507	do not reject
	GDP_CZ does not Granger Cause D_CZ	3	41	0.2541	do not reject
model C	L_CZ does not Granger Cause GDP_CZ	3	41	0.2278	do not reject
	GDP_CZ does not Granger Cause L_CZ	3	41	0.4690	do not reject

Estonia

null hypothesis		lags	obs.	prob.	decision
model A	M2_EE does not Granger Cause GDP_EE	3	41	0.0021	reject
	GDP_EE does not Granger Cause M2_EE	3	41	0.2444	do not reject
model B	D_EE does not Granger Cause GDP_EE	3	41	0.0040	reject
	GDP_EE does not Granger Cause D_EE	3	41	0.5622	do not reject
model C	L_EE does not Granger Cause GDP_EE	3	41	0.0005	reject
	GDP_EE does not Granger Cause L_EE	3	41	0.4906	do not reject

Hungary

null hypothesis		lags	obs.	prob.	decision
model A	M2_HU does not Granger Cause GDP_HU	3	41	0.2175	do not reject
	GDP_HU does not Granger Cause M2_HU	3	41	0.4401	do not reject
model B	D_HU does not Granger Cause GDP_HU	3	41	0.1919	do not reject
	GDP_HU does not Granger Cause D_HU	3	41	0.2004	do not reject
model C	L_HU does not Granger Cause GDP_HU	3	41	0.4451	do not reject
	GDP_HU does not Granger Cause L_HU	3	41	0.2072	do not reject

Latvia

null hypothesis		lags	obs.	prob.	decision
model A	M2_LT does not Granger Cause GDP_LT	3	41	0.0010	reject
	GDP_LT does not Granger Cause M2_LT	3	41	0.4742	do not reject
model B	D_LT does not Granger Cause GDP_LT	3	41	0.0005	reject
	GDP_LT does not Granger Cause D_LT	3	41	0.2747	do not reject
model C	L_LT does not Granger Cause GDP_LT	3	41	0.0120	reject
	GDP_LT does not Granger Cause L_LT	3	41	0.4099	do not reject

Lithuania

null hypothesis		lags	obs.	prob.	decision
model A	M2_LV does not Granger Cause GDP_LV	3	41	0.0005	reject
	GDP_LV does not Granger Cause M2_LV	3	41	0.0129	reject
model B	D_LV does not Granger Cause GDP_LV	3	41	0.0007	reject
	GDP_LV does not Granger Cause D_LV	3	41	0.1940	do not reject

model C	L_LV does not Granger Cause GDP_LV	3	41	0.0007	reject
	GDP_LV does not Granger Cause L_LV	3	41	0.5107	do not reject

Poland

null hypothesis		lags	obs.	prob.	decision
model A	M2_PL does not Granger Cause GDP_PL	3	41	0.6762	do not reject
	GDP_PL does not Granger Cause M2_PL	3	41	0.0060	reject
model B	D_PL does not Granger Cause GDP_PL	3	41	0.8100	do not reject
	GDP_PL does not Granger Cause D_PL	3	41	0.3627	do not reject
model C	L_PL does not Granger Cause GDP_PL	3	41	0.0193	reject
	GDP_PL does not Granger Cause L_PL	3	41	0.3254	do not reject

Romania

null hypothesis		lags	obs.	prob.	decision
model A	M2_RO does not Granger Cause GDP_RO	3	41	0.0306	reject
	GDP_RO does not Granger Cause M2_RO	3	41	0.2979	do not reject
model B	D_RO does not Granger Cause GDP_RO	3	41	0.0168	reject
	GDP_RO does not Granger Cause D_RO	3	41	0.6066	do not reject
model C	L_RO does not Granger Cause GDP_RO	3	41	0.0080	reject
	GDP_RO does not Granger Cause L_RO	3	41	0.5669	do not reject

Slovak republic

null hypothesis		lags	obs.	prob.	decision
model A	M2_SK does not Granger Cause GDP_SK	3	41	0.4900	do not reject
	GDP_SK does not Granger Cause M2_SK	3	41	0.4795	do not reject
model B	D_SK does not Granger Cause GDP_SK	3	41	0.3607	do not reject
	GDP_SK does not Granger Cause D_SK	3	41	0.5193	do not reject
model C	L_SK does not Granger Cause GDP_SK	3	41	0.3309	do not reject
	GDP_SK does not Granger Cause L_SK	3	41	0.3247	do not reject

Slovenia

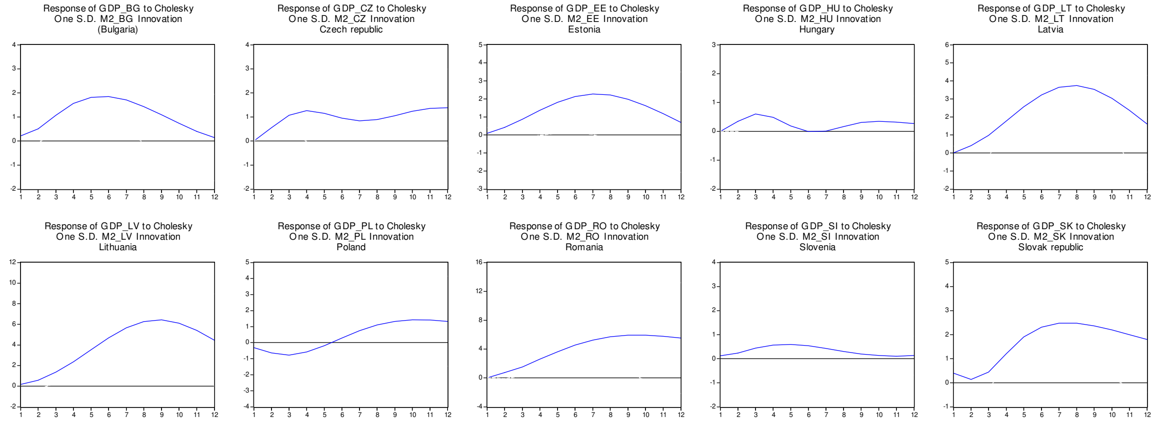
null hypothesis		lags	obs.	prob.	decision
model A	M2_SI does not Granger Cause GDP_SI	3	41	0.9650	do not reject
	GDP_SI does not Granger Cause M2_SI	3	41	0.3700	do not reject
model B	D_SI does not Granger Cause GDP_SI	3	41	0.2835	do not reject
	GDP_SI does not Granger Cause D_SI	3	41	0.2562	do not reject
model C	L_SI does not Granger Cause GDP_SI	3	41	0.0347	reject
	GDP_SI does not Granger Cause L_SI	3	41	0.4842	do not reject

Source: Author's calculations.

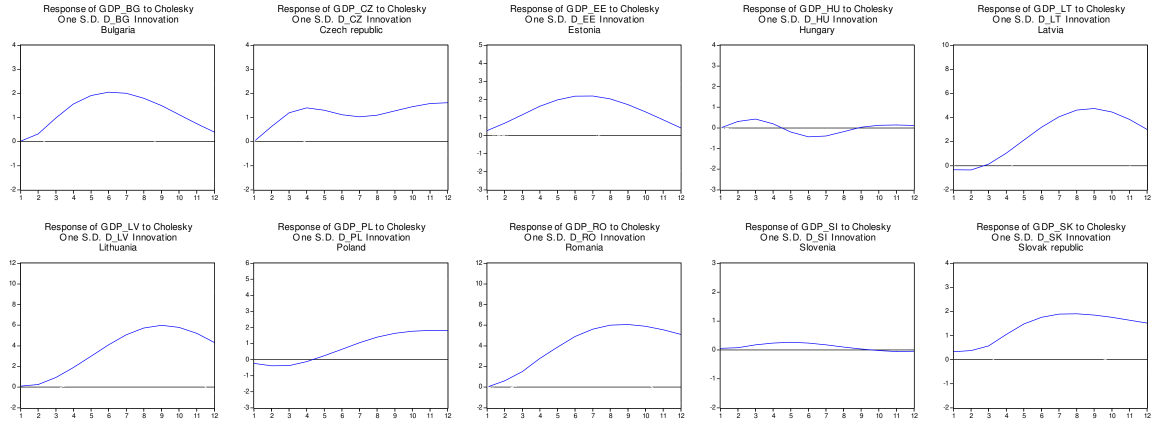
Appendix F

Figure 3. *Impulse-response functions*

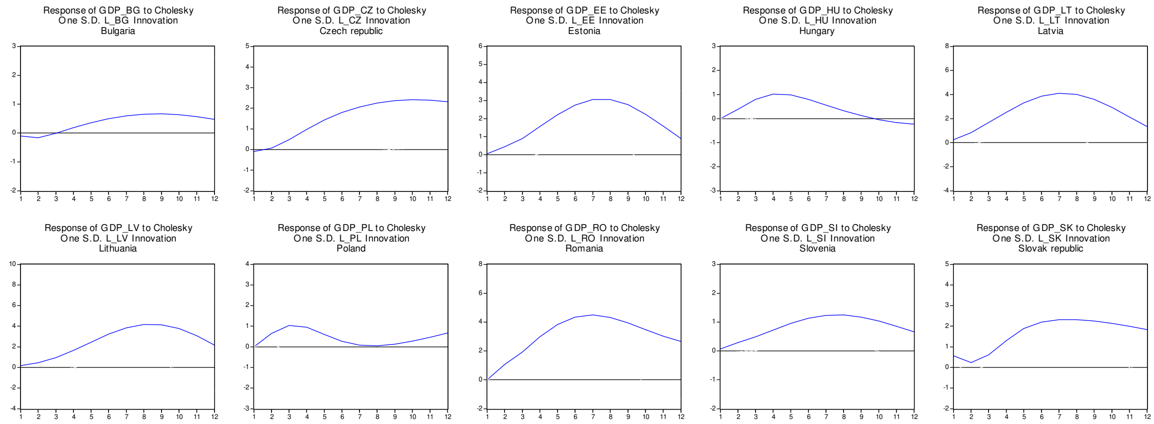
Model A - responses of GDP in ETE to one S.D. shock of money stock



Model B - responses of GDP in ETE to one S.D. shock of domestic deposits



Model C - responses of GDP in ETE to one S.D. shock of domestic loans



Source: Author's calculations.