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THE CONTAGION EFFECT: EVIDENCES FROM FORMER SOVIET ECONOMIES IN EASTERN EUROPE

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Abstract

This paper analyzes whether or not the contagion effect exists among the seven former-Soviet economies in Eastern Europe: Belarus, Estonia, Latvia, Lithuania, Moldova, Russia and Ukraine throughout the period from November 1996 to December 2009. The evolution of the EU memberships of Estonia, Latvia and Lithuania has been assessed over the membership period (2004:05-2009:12) in comparison to the non-membership period (1995:11-2004:04). Additionally, the economies and the sample period employed in this research give an opportunity to test for two hypotheses on the contagion effect: First, the "*flight to quality*" hypothesis suggested by Favero and Giavazzi (2002) and second, the "*political contagion*" hypothesis offered by Drazen (1999). The contagion effect hypotheses for each economy have been tested using the "*Threshold Test*" proposed by Pesaran and Pick (2007). The econometric method employed in this paper examines only the contagion effect, not the interdependence although the seven economies or groups in the analysis can have interdependence relations. Empirical analysis has highlighted that: (i) the contagion effect exists in the region; (ii) the structure of the contagion mechanism in the region is not stable during the estimation period; (iii) there is an evidence for the validity of "*flight to quality*" hypothesis; (iv) there is no evidence for the validity of the "*political contagion*" hypothesis. These results are consistent with the different regional patterns of the former Soviet countries.

Keywords: contagion; threshold test; Eastern Europe; political contagion; flight to quality.

JEL: C30, G01, G15.

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1. Introduction

Contagion has become one of the most controversial topics both theoretically and empirically in the financial crisis literature since 1994 Mexican Peso Crisis (Tequila Crisis) and especially 1997 East Asian Crisis (Asian flu). Dornbusch *et al.* (2000) stated that the contagion phenomena can be divided into two categories. While the first category so-called "*fundamentals-based contagion*" captures normal interdependence among markets which can be explained by the macroeconomic fundamentals, the other category involves "*irrational phenomena*" which cannot be explained by the macroeconomic fundamentals. On the other hand, the broad definition of the World Bank states that "*Contagion is the cross-country transmission of shocks or the general cross-country spillover effects. Contagion can take place both during "good" times and "bad" times. Then, contagion does not need to be related to crises. However, contagion has been emphasized during crisis times*." In this paper, the term of contagion effect refers to both "*irrational phenomena*" of Dornbusch *et al.* (2000) and broad definition of the World Bank.

Channels of the interdependence or "*fundamentals-based contagion*" consist of spillover effect, monsoonal effect and financial linkages. The spillover effect originates from trade linkages. A competitive devaluation in an economy could -directly and/or indirectly- deteriorate trade balance of the other economy. The monsoonal effect is a result of changes in the macroeconomic policy of industrialized economies which could have a potential to affect the economic conjecture of the world. Finally, the channel of financial linkages stems from density of financial relations, for example the competition in banking credit and the borrowing relations.

The main theoretical papers focused on the contagion debate are: Calvo, S. and Reinhart (1996), Calvo and Mendoza (1997), Masson (1998, 1999a, 1999b), Drazen (1999), Dornbusch, Park and Claessens (2000), Kaminsky and Reinhart (2000), Kaminsky, Reinhart, and Vegh (2003). These papers clarify the meaning of contagion and provide useful discussion about the transmission channels of the financial turbulences across economies. Papers relating to the transmission of financial turbulences have focused on interdependence, especially on spillover during the period between the Tequila crisis and the Asian flu; such as Gerlach and Smetz (1995) and Calvo, S. and Reinhart (1996). After the Asian flu, additional channels were needed to explain the transmission of financial turbulences experienced in many emerging markets. Kaminsky and Reinhart (2000), and Kaminsky, Reinhart, and Vegh (2003) analyzed the trade and financial sector links to the contagion based on fundamentals, and they found evidence that contagion is more regional, non-linear, and shocks can be transmitted to emerging markets more through the financial links than the trade links.

There are alternative approaches to explain the occurrence of the contagion effect. Masson (1998) argued that the monsoonal and spillover effects are not sufficient to understand the spread of contagion, and he suggested formulating the models with multiple equilibria. Masson proposed the term of contagion for discriminating an unobservable transmission channel of financial crises from an observable one. Multiple equilibria, heightened awareness, and portfolio adjustment models can be shown as the examples for the alternative approaches that are discussed in detail by Masson (1999a, 1999b) and the political contagion suggested by Drazen (1999) as well. Multiple equilibria approach to the contagion effect states that a stable equilibrium point on any economy may turn to unstable one as a result of a financial crisis experienced in another economy. The heightened awareness models imply that a financial crisis experienced in anywhere in the world produces a signal for investors to reassess all economies that they held their assets. As a result of this process, investors notice the economies that have poor macroeconomic fundamentals. The portfolio adjustment approach depends on the idea that a financial crisis anywhere in the World may lead to investors to draw back their assets even on the stable economies. Lastly, political contagion approach states that a financial crisis experienced in a potential member of any economic integration increase the probability of experiencing several financial crises in the other potential members of the integration. Masson (1998, 1999a, 1999b) and Dornbusch *et al*. (2000) can be applied for a useful discussion about the transmission channels of the financial turbulences across economies.

This paper analyzes the existence of the contagion effect, which is an additional channel for transmission of financial turbulences, among the seven former-Soviet economies in Eastern Europe: Belarus, Estonia, Latvia, Lithuania, Moldova, Russia and Ukraine for the period of 1995:09-2009:12. The economies and the sample period employed in this research give an opportunity to test for two hypotheses on the contagion effect. The first one is the "*flight to quality*" hypothesis suggested by Favero and Giavazzi (2002). The "*flight to quality*" hypothesis states that the contagion mechanism could work asymmetrically across the economies that can be classified into different groups. The seven economies in this paper are divided into two groups as the EU members and the non-members in order to focus on the "*flight to quality*" hypothesis. The second one is the "*political contagion*" hypothesis offered by Drazen (1999). The "*political contagion*" hypothesis states that the contagion effect could be present across the potential members of any economic integration. In this paper, existence of the "*political contagion*" has been tested for the EU member countries since Estonia, Latvia and Lithuania have joined to the European Union in May 2004. It should be noted that the econometric method employed in this paper examines only the contagion effect but not interdependence. The seven economies or groups in the analysis can have interdependence relations; however, the determination of the interdependence dynamics is beyond the scope of this paper.

Concerning the differences between the EU member and non-member economies, the research questions are settled as follows: (i) Whether or not, any contagion effect exists in the whole region; (ii) Whether or not, the structure of the possible contagion effect in the region has been stable over the period; (iii) Whether or not, the "*flight to quality*" hypothesis is valid for the member and non-member economies; (iv) Whether or not, the "*political contagion*" hypothesis is valid for the EU members, Estonia, Latvia and Lithuania. The research structure has been designed in the following way to examine the research questions. First, a financial pressure index defined as a combination of exchange rate, interest rate and reserve movements has been constructed for each of the economy to determine financial turbulences. Second, it is allowed both for the financial crises (bad times) and manias (good times) for representing negative financial crises after controlling for interdependence. Third, the hypotheses on the contagion effect for each of the economy have been tested via the "*Threshold Test*" suggested by Pesaran and Pick (2007).

Our empirical results reveal that; (i) The contagion effect exists in the region; (ii) the structure of the contagion mechanism in the region has not been stable over the periods; (iii) There are evidences for the validity of "*flight to quality*" hypothesis; (iv) There is no evidence for the validity of the "*political contagion*" hypothesis.

The rest of the paper is organized as follows: In Section 2, we present the literature survey on the contagion effect in brief. Section 3 describes econometric model and data employed in the paper. In Section 4, empirical results are discussed. Finally, we present conclusions and some policy implications in Section 5.

2. The Literature on Measuring the Contagion Effect

Although there are numerous papers concerned with the contagion phenomenon, in this section, we have summarized only the empirical papers suggesting the time series approach to measure the contagion effect. These papers measure the existence of contagion effect using different methodologies.

Eichengreen *et al.* (1996) made the first contribution to test for the existence of contagion effect empirically. In this set up, an exogenous dummy variable, defined with the purpose of representing whether a financial crisis exists in any economy in the sample, has been utilized to explain the dependent dummy variable sorting out the financial and non-financial crises periods. If the exogenous dummy variable is estimated statistically significant, then this is interpreted as the existence of the contagion effect, even though domestic factors are taken under control.

Favero and Giavazzi (2002) suggested an alternative approach so-called the "*Outlier Test*" for the contagion effect. This approach is a VAR-based test and it identifies the periods of financial crisis exogenously. Financial crisis and mania periods are selected by filtering the residuals from a VAR model of order one. In this stage, a specific dummy variable is constructed for the each turbulence. Finally, an over-identified simultaneous equations system with the full information approach is estimated so as to control for interdependence. Then, the existence of contagion effect is not rejected if the defined dummy variables are statistically significant.

Forbes and Rigobon (2002) examined the contagion phenomenon within a correlation analyses framework. According to Forbes and Rigobon (2002), the correlation coefficient between the performance indicators of two economies increases in the crises periods as the correlation coefficient is an increasing function of market volatility. Therefore, Forbes and Rigobon (2002) proposed an adjustment procedure to control the increase in the variance of performance indicator of the economy experienced a financial crisis. In Forbes and Rigobon (2002) set up, the correlation coefficient is calculated for crisis and non-crisis (tranquil) periods separately and the existence of contagion effect is tested by comparing these correlation coefficients.

Bae *et al.* (2003) proposed the "*Co-Exceedance Test*" in order to determine common factors giving rise to emerge financial turbulences in several economies contemporaneously.

Similar to Eichengreen et al. (1996), Bae et al. (2003) defined a dummy variable as the dependent variable, but the dummy variable was multinomial, while Eichengreen *et al.* (1996)'s was binary one. The dependent dummy variable suggested by Bae *et al.* (2003) represents the number of economies experiencing a financial turbulence in the current period. Several covariates were also employed in the model to explain the movements in limited dependent variables in question.

Rigobon (2003) offered another approach that is the" *Determinant of the Change in Covariance Matrix Test*" with the aim of testing for the contagion effect. This test depends on comparison of the covariance matrices over crisis period and tranquil periods after the interdependence is taken under control.

Dungey *et al.* (2005) specified a latent factor model through which they investigated the contagion effect. They jointly modelled all channels that generate the transmission of financial turbulences across economies. The test suggested by Dungey *et al.* (2005) is called "*Factor Test*".

Pesaran and Pick (2007) constructed endogenous dummy variables for each economy, which are defined as the functions of performance indicators of other economies, in order to test for the existence of contagion effect. This test is discussed in detail in the following section.

3. Econometric Method and Data

In this paper, the test applied for the existence of contagion effect is the "*Threshold Test*" (TT) developed by Pesaran and Pick (2007). Pesaran and Pick (2007) tested the existence of contagion effect using the following simultaneous equations system:

$$\mathbf{z_{i,t} = \alpha_{0i} + \alpha_{i1} z_{i,t-1} + \alpha_{i2} z_{i,t-2} + \beta_i^{+} \vartheta_{i,t}^{+} + \beta_i^{-} \vartheta_{i,t}^{-} + \epsilon_{i,t}} \tag{1}$$

where $(\mathbf{z_i})$ is a performance indicator for economy i = 1,2, …, 7, t = 1, 2, …, T $(\boldsymbol{\epsilon_i})$ is an econometric error term, $(\boldsymbol{\vartheta_i^{+}})$ and $(\boldsymbol{\vartheta_{i,t}^{-}})$ are endogenous dummy variables. Endogenous dummy variables are defined as:

$$\boldsymbol{\vartheta_{i,t}^{+} = I\left(\sum_{j=1,J\neq i}^{n} I(z_{j,t} - c_j)\right)} \quad \text{and} \quad \boldsymbol{\vartheta_{i,t}^{-} = I\left(\sum_{j=1,J\neq i}^{n} I(-z_{j,t} - c_j)\right)} \tag{2}$$

where ($\mathbf{c_j}$) is the threshold value for the performance indicator of economy j and $\mathbf{I(A)}$ is an indicator function that takes the value of unity if A>0 and zero otherwise. Following Pesaran and Pick (2007), we set ($\mathbf{c_j}$) to two standard deviations of the performance indicator for economy i for ($\boldsymbol{\vartheta}_i^+$) and ($\boldsymbol{\vartheta}_i^-$), respectively. The variables ($\boldsymbol{\vartheta}_i^+$) and ($\boldsymbol{\vartheta}_i^-$) take the value of zero for non-financial crisis periods and take the value of unity for financial crisis and mania (negative financial crisis) periods, respectively.

Pesaran and Pick (2007) suggested Generalized Instrumental Variables Estimator (GIVE) to estimate the equation (**1**) economy by economy since the OLS estimator is consistent only if the contagion model is recursive (triangular) and there are no interdependencies through the errors. They also suggested that the first and second lags of dependent variables for the economy of interest, i.e. j = 1, 2, …, N, (j ≠ i), must be captured as the instruments for the endogenous dummy variables as well as other instruments presented in (3). In their applications, Pesaran and Pick (2007) constructed powers of the lagged endogenous variables as follows:

$$\mathbf{w_{j,t}(m)} = [\mathbf{z_{j,t-1}}, (\mathbf{z_{j,t-1}})^2, \dots, (\mathbf{z_{j,t-1}})^{\mathbf{m}}, \mathbf{z_{j,t-2}}, (\mathbf{z_{j,t-2}})^2, \dots, (\mathbf{z_{j,t-2}})^{\mathbf{m}}]$$

$$\mathbf{W_{i,t}(m)} = [\mathbf{w_{1t}(m)}, \mathbf{w_{2t}(m)}, \dots, \mathbf{w_{(i-1)t}(m)}, \mathbf{w_{(i+1)t}(m)}, \dots, \mathbf{w_{Nt}(m)}] \tag{3}$$

Pesaran and Pick (2007) considered value of m from 1 to 6 in order to evaluate the robustness of the results to the choice of m. Following Pesaran and Pick (2007), we have considered the value of m from 1 to 6 and tested for the existence of contagion effect on the following hypotheses:

$$\mathbf{H_0}: \boldsymbol{\beta}_i^+(\boldsymbol{\beta}_i^-) = \mathbf{0} \text{ and } \mathbf{H_1}: \boldsymbol{\beta}_i^+(\boldsymbol{\beta}_i^-) \neq \mathbf{0} \tag{4}$$

These hypotheses represent non-existence and existence of the contagion effect for economy i, respectively. In this paper, the contagion coefficients ($\boldsymbol{\beta}_i^+$ and $\boldsymbol{\beta}_i^-$'s) that estimated statistically significant have been identified by comparing the standard deviations ($\boldsymbol{\sigma}_{\mathbf{zi}}$) of the performance indicators. That is:

- The contagion coefficient is identified as low if $|\boldsymbol{\beta}_i^+|(|\boldsymbol{\beta}_i^-|) \leq \boldsymbol{\sigma}_{\mathbf{zi}}$
- The contagion coefficient is identified as moderate if $\boldsymbol{\sigma}_{\mathbf{zi}} < |\boldsymbol{\beta}_i^+|(|\boldsymbol{\beta}_i^-|) \leq 2\boldsymbol{\sigma}_{\mathbf{zi}}$
- The contagion coefficient is identified as high if $|\boldsymbol{\beta}_i^+|(|\boldsymbol{\beta}_i^-|) > 2\boldsymbol{\sigma}_{\mathbf{zi}}$

In this analysis since the two standard deviation of each performance indicator is defined as the threshold level for the financial turbulences, then the contagion effect is low if the contagion coefficient is less than one standard deviation of the performance indicator for economy i. A low contagion effect implies that a crisis or mania experienced in other economies has a relatively and probably small effect on the performance indicator of economy i. If the contagion coefficient is more than two standard deviation of the performance indicator for economy i, then the contagion effect is identified as high. A high contagion effect means that a crisis or mania probably leads also to economy i to experience a crisis or mania. If the contagion coefficient is between the one and two standard deviations of the performance indicator, then it is classified as a moderate contagion effect.

Additionally, symmetric and asymmetric contagion effects have been identified in this paper. A symmetric contagion effect means that a mania (crisis) experienced in other economies leads to economy i to experience a decrease (increase) in its performance indicator. In contrast, asymmetric contagion effect implies that the mania (crisis) leads to economy i to experience an increase (decrease) in performance indicator. If the asymmetric contagion effect from the EU member (non-member) economies to non-member (the EU member) economies is detected, it would be concluded that there exist evidence on the "*flight to quality*" hypothesis of Favero and Giavazzi (2002). That is, the contagion mechanism could work asymmetrically across the two grouped of economies. On the other hand, it has been assumed that detecting a contagion effect between the EU member countries especially for the period of 1995:11-2004:4 provides an evidence for the validity of the "*political contagion*" hypothesis of Drazen (1999).

Eichengreen *et al.* (1996) argued that currency crises cannot be identified only with changes in exchange rates because all speculative attacks cannot be successful. Some of them could have been repelled by the domestic and foreign central banks or government interventions. A financial pressure index has been defined as a combination of exchange rate, interest rate and reserve movements. Following Eichengreen *et al.* (1996), we have considered the exchange market pressure index (**EMP**) so as to define the performance indicator related to financial turbulence(s) for each economy. EMP indexes are constructed as:

$$\mathbf{EMP_{i,t}} = \left[\left(\frac{\sigma_E}{\sigma_{NFA}+\sigma_I+\sigma_E} * \frac{\Delta E_t}{E_{t-1}}\right) + \left(\frac{\sigma_I}{\sigma_{NFA}+\sigma_I+\sigma_E} * \frac{\Delta I_t}{I_{t-1}}\right) - \left(\frac{\sigma_{NFA}}{\sigma_{NFA}+\sigma_I+\sigma_E} * \frac{\Delta NFA_t}{M_{t-1}}\right)\right] * \mathbf{100} \quad \mathbf{(5)}$$

where (**EMP$_i$**) is the exchange market pressure index of economy (**i**), (**E**) is the exchange rate, (**I**) is the domestic interest rate, (**NFA**) is the net foreign assets and (**M**) is the money stock. Accordingly, each performance indicator has been constructed as the sum of the weighted averages of devaluation (or revaluation) rate and percentage change in interest rate minus the contribution of net foreign assets to change in money stock. Standard deviations (σ) have been utilized as the weights in order to capture the most of fluctuations in the performance indicators.

The performance indicators ($\mathbf{z_{i,t}}$) are defined as the first difference of the EMP indexes similar to Favero and Giavazzi (2002) and Pesaran and Pick (2007) because changes in financial pressure are more important than financial pressure itself to identify financial turbulences:

$$\mathbf{z_{i,t} = EMP_{i,t} - EMP_{i,t-1}} \quad \mathbf{(6)}$$

The data sets have been acquired from International Monetary Fund International Financial Statistics database covering the period of 1995:09-2009:12. Estimation period starts from 1995:11 ends in 2009:12 due to definition of the performance indicator ($\mathbf{z_{it}}$). Data description and data codes are presented in the Appendix.

4. Empirical Results

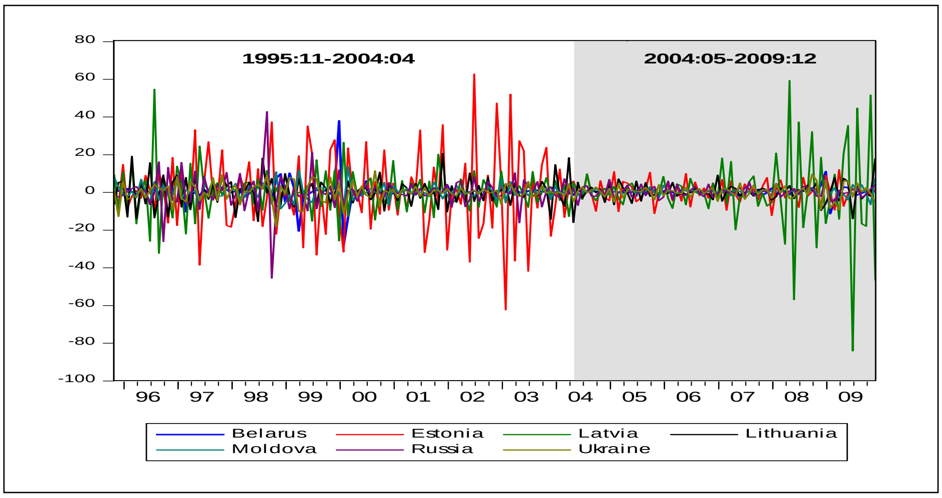
Descriptive statistics are presented in Table 1 for the whole and two sub- sample periods. Sub-periods are 1995:11-2004:04 and 2004:05-2009:12, respectively; viewing the pre and the post membership periods of Estonia, Latvia and Lithuania to the EU. As expected, the means of all performance indicators are near to zero and most of them are not normally distributed along with the Jarque-Bera (JB) test statistics. The highest volatilities in performance indicators are detected for Estonia and Latvia for the whole period. While volatility in Estonian performance indicator decreased during the 2004:05-2009:12 period relative to 1995:11-2004:04 period, Latvian volatility increased after joining the EU. The performance indicators for Belarus, Lithuania, Moldova, Russia and Ukraine do not display high volatility. It is clear that the 1995:11-2004:04 period is more volatile than the 2004:05-2009:12 period for all economies, except for Latvia, as can also be seen in Graph.1.

Table 1: Descriptive Statistics on Performance Indicators

	Belarus	Estonia	Latvia	Lithuania	Moldova	Russia	Ukraine
				Whole Sample			
Mean	0.005	0.002	-0.112	0.052	0.056	-0.012	-0.082
Maximum	37.671	62.487	58.999	20.336	13.332	42.529	11.088
Minimum	-28.500	-62.550	-84.431	-16.204	-9.051	-45.767	-18.550
Std. Dev.	**4.806**	**16.867**	**16.255**	**6.721**	**3.340**	**7.351**	**4.458**
JB	6476.097[a]	35.594[a]	286.445[a]	5.121[c]	47.486[a]	1559.714[a]	28.351[a]
Nr. of Obs.	170	170	170	170	170	170	170
				1995:11 - 2004:04			
Mean	0.013	-0.040	0.011	0.115	0.070	-0.024	-0.094
Maximum	37.671	62.487	54.327	20.336	13.332	42.529	11.089
Minimum	-28.500	-62.550	-32.629	-15.738	-9.051	-45.767	-18.550
Std. Dev.	**5.918**	**21.300**	**11.778**	**7.650**	**4.005**	**9.191**	**4.920**
JB	1881.852[a]	1.143	67.639[a]	0.993	9.092[b]	363.333[a]	16.717[a]
Nr. of Obs.	102	102	102	102	102	102	102
				2004:05 - 2009:12			
Mean	-0.007	0.064	-0.297	-0.043	0.036	0.006	-0.064
Maximum	10.768	11.719	58.999	17.725	7.410	6.637	9.361
Minimum	-11.589	-12.553	-84.431	-16.204	-6.770	-7.179	-9.545
Std. Dev.	**2.336**	**5.807**	**21.385**	**5.070**	**1.988**	**2.992**	**3.692**
JB	510.710[a]	1.082	47.737[a]	20.171[a]	32.079[a]	0.283	1.558
Nr. of Obs.	68	68	68	68	68	68	68

[a], [b], [c]: shows the rejection of the null hypothesis of normal distribution at the 1%, 5% and 10% significance levels, respectively.

Graph 1: Performance Indicators (z)



We have estimated different versions of the equation (1) for each of the economies over the whole period (1995:11-2009:12) and also for the two sub-sample periods (1995:11-2004:04 and 2004:05-2009:12) utilizing the GIVE method. In the first version, the endogenous contagion dummy variables for economy i are constructed by considering the other six economies. First version contagion effect results are summarized in Table 2, and the estimates are presented in Table 5.

Estimation results for the whole sample period reveal that low contagion effects exist for Belarus, Lithuania and Ukraine as the other economies are experiencing mania periods.

The contagion effects are asymmetric for Belarus when m takes the values of 2 and 3; and for Lithuania when m takes the values 1, 5 and 6; but symmetric for Ukraine when m takes the values 4 and 5. Furthermore, two more low asymmetric contagion effects are found for Belarus and Ukraine for the crisis periods when m takes the values of 4 and 2, respectively.

In the 1995:11-2004:04 period, a moderate asymmetric contagion effect is detected for Estonia as m is equal to 3. Manias experiencing in other six economy cause to increase in performance indicator of Estonian economy. The Lithuanian economy is found to be infected by the manias asymmetrically for 1, 2, 5 and 6 values of m and for the OLS regression. Belarusian economy has infected asymmetrically by the crisis in the region for m takes the values of 4, 5 and 6. The contagion effect for Lithuania and Belarus are low.

In the 2004:05-2009:12 period, the empirical results show that there are some evidences for the contagion effect only for non-member economies. As can be seen in Table 5, the contagion dummy variables could not be constructed for Latvia since the threshold level of Latvian economy is much higher than all the observations on other six economies. Estimation results for this sub-period show that Russian economy is open to the effects of manias in the region symmetrically. The contagion effect for Russia is low for all values of m; except for m is 1 as the contagion effect is moderate. A low contagion effect is detected for Moldova. This asymmetric contagion effect is experienced in crisis periods when m is 2 and experienced both mania and crisis periods when m is 3. Similar to Russian economy, Ukrainian economy comprises a low contagion effect in the region when m is 2, 3, 4, 5 and 6. The detected symmetric contagion effect for Ukraine is valid only for mania periods.

Table 2: Contagion Effects for All Economies

	Belarus	Estonia	Latvia	Lithuania	Moldova	Russia	Ukraine
				Whole Sample			
CE	**CA (4^L) MA(2^L, 3^L)**			**MA (1^L, 5^L, 6^L)**			**CA (2^L) MS (4^L, 5^L)**
				1995:11-2004:04			
CE	**CA (4^L, 5^L, 6^L)**	**MA (3^M)**		**MA (0^L, 1^L, 2^L, 5^L, 6^L)**			
				2004:05-2009:12			
CE					**CA (2^L, 3^L) MA (3^L)**	**MS (0^L, 1^M, 2^L, 3^L, 4^L, 5^L, 6^L)**	**MS (2^L, 3^L, 4^L, 5^L, 6^L)**

CE: Contagion Effect; **CA**: Crisis/Asymmetric; **MA**: Mania/Asymmetric; **CS:** Crisis/Symmetric;
MS: Mania/Symmetric; 1, 2,..,6: the degree of m ; **L**:Low CE; **H:** High CE.
Light shaded areas show no contagion effect, dark shaded areas show no contagion dummy.

The second version examines the nature of the EU member and non-member economies, separately for the whole and two sub-sample periods. In this set up, positive (crisis) and negative (mania) contagion dummy variables have been constructed twice for the each economy. For example, the positive and negative contagion dummy variables for the Russian economy have been designed simply in view of the member economies (Estonia, Latvia and Lithuania), titled as *from EU*, and then in view of the non-member economies (Belarus, Moldova and Ukraine), titled as *from NEU*. Second version contagion effect results are summarized in Table.3 and the estimates are presented in Table 6.

Empirical results of this version over the whole period show that the contagion effects for the non-member economies are originated from the non-member economies; except for Moldova. Moldavian economy is infected by the crises experienced in member economies symmetrically when m is 2. The contagion effect is moderate. High contagion effects are detected for Russia, respectively as m is 3, 4, 5 and 6. In addition, the contagion effects are symmetric and originated from manias experienced in the non-member economies. OLS result supports the GIVE results but the contagion effect turns to be low for Russia. There is evidence that Belarusian economy is infected by crisis and manias symmetrically in the non-member economies. Ukrainian and Moldavian economies are found to be open to the infections from the crisis experienced in the non-member economies asymmetrically for some values of m. These contagion effects are low for Moldova and low or moderate for Ukraine.

Empirical results over the period 1995:11-2004:04 are not consistent with the results obtained for the whole sample. The contagion effect detected for Belarus and Ukraine disappeared in this sub-sample. The contagion effects for Russia and Moldova are weaker. However, empirical results connected to the 2004:05-2009:12 period are more consistent with the whole sample results. Belarusian and Russian economies seem affected from both manias and crisis on non-member economies in almost all specifications. The detected contagion effects for these economies are symmetric and low or moderate. For 1 value of m, the contagion effect for Russia turns to be high in crisis periods. For all specifications, except for 1 and 2 values of m, Ukrainian economy is found to be affected by manias symmetrically with a high degree. The contagion effect originated from the member economies to the non-member economies is quite low. Belarusian economy seems infected by crisis on member economies symmetrically with low degree for 5 and 6 values of m. Moldavian economy is found to be affected by crises and manias asymmetrically with low degree for 4 and 6 values of m, respectively. As related to non-member economies, these results imply that the contagious relations among the non-member economies became stronger after 2004:04.

Table 3: Contagion Effects for the Non-Member Economies

	Belarus	Moldova	Russia	Ukraine	Belarus	Moldova	Russia	Ukraine
	from EU				*from NEU*			
Whole Sample								
CE		CS (2^M)			CS (0^L, 1^M) MS (0^M, 3^M, 4^M, 5^M, 6^M)	CA (3^L, 4^L)	MS (0^L, 3^H, 4^H, 5^H, 6^H)	CA (1^M, 2^L, 3^M, 4^L, 5^L)
1996:01-2004:04								
CE		CS (6^L)				CA (4^L)	MS (0^M, 6^M)	MS (0^L)
2004:05-2009:12								
CE	CS (5^L, 6^L)	CA (4^L) MA (6^L)			CS (0^L, 2^M, 3^L, 4^L, 5^M, 6^L) MS (0^L, 2^M, 3^L, 4^L, 5^L, 6^L)		CS (0^M, 1^H, 3^L, 4^L, 5^M, 6^M) MS (0^L, 2^M, 3^M, 4^M, 5^L, 6^L)	MS (0^H, 3^H, 4^H, 5^H, 6^H)

CE: Contagion Effect; **CA**: Crisis/Asymmetric; **MA**: Mania/Asymmetric; **CS:** Crisis/Symmetric; **MS:** Mania/Symmetric; 1, 2,..,6: the degree of m ;**L**:Low CE; **H:** High CE.

The third version examines the contagion effects for the EU member economies, separately for the whole and two sub-sample periods. These estimation results are summarized in Table 4 and estimates are presented in Table 7. It can be seen that there is no contagious relation among the member economies neither for the whole sample nor the sub-samples. According to empirical results related to whole sample, a significant result has emerged for Estonia. Estonian economy is found to be infected by the crises in the non-member economies asymmetrically with a high degree in almost all specifications. The contagion effect for Estonia turns to be moderate but asymmetric when non-member economies experience mania. Estimation result for 1 value of m implies that Lithuanian economy is infected asymmetrically with a high degree by crisis in the non-member economies. Lithuanian economy is found to be open for asymmetric effects of manias in the non-member economies with low degree for 5 and 6 values of m. These results support the validity of "*flight to quality*" hypothesis.

The period of 1995:11-2004:4 gives an opportunity to test for "*political contagion*" hypothesis but the negative contagion dummy related to the member economies for Estonia and positive contagion dummy related to the non-member economies for Estonia could not be constructed due to the high degree of standard deviation of this economy. In this sub-sample, there is a unique evidence for the contagion effect. The contagion effect is with high degree and asymmetric, and originates from crises on non-member economies for Lithuania.

The contagion dummy variables related to member and non-member economies for Latvia could not be constructed for the 2004:05-2009:12 period. As can be seen in Table 1 the standard deviation of Latvian performance indicator is very high in this sub-period even though this economy has joined to the EU. The contagion dummy variables related to the non-member economies for Estonia also could not be constructed for this sub-period. Estimation results for the period of 2004:09-2009:12 imply that Lithuanian economy is found to be affected asymmetrically by the crisis in non-member economies with a high degree for almost all values of m, except for 1. The OLS estimation result also supports this implication of GIVE method. Moreover, this implication is another evidence for the validity of "*flight to quality*" hypothesis. For 3 value of m, there is an evidence for the existence of symmetric contagion effect with moderate degree in mania period in the non-member economies for Lithuania. Furthermore, there is no evidence for the validity of the "*political contagion*" hypothesis.

Table 4: Contagion Effects for the Member Economies

	Estonia	**Latvia**	**Lithuania**	**Estonia**	**Latvia**	**Lithuania**
	from EU			***from NEU***		
Whole Sample						
CE				**CA (1^H, 2^H, 3^H, 4^H, 5^H)** **MA (0^M, 2^H, 3^M, 4^M, 5^M, 6^M)**		**CA (1^H)** **MA (5^L, 6^L)**
1995:11-2004:04						
CE						**CA (1^H)**
2004:05-2009:12						
CE						**CA (0^H, 2^H, 3^H, 4^H, 5^H, 6^H)** **MS (3^M)**

CE: Contagion Effect; **CA**: Crisis/Asymmetric; **MA**: Mania/Asymmetric; **CS:** Crisis/Symmetric;
MS: Mania/Symmetric; 1, 2,..,6: the degree of m ; **L**:Low CE; **H:** High CE.
Light shaded areas show no contagion effect, dark shaded areas show no contagion dummy.

5. Conclusions

In this paper, we have examined the existence of the contagion effect across former Soviet economies in Eastern Europe and tested for the validities of "*flight to quality*" and "*political contagion*" hypotheses by utilizing Threshold Test over the period of 1995:11-2009:12; however, the determination of the interdependence dynamics is beyond the scope of this paper. The dataset includes seven economies, three of which joined to the EU on May 2004, namely Estonia, Latvia and Lithuania. Other four economies are Belarus, Moldova, Russia and Ukraine.

Specifically, our main research questions are ordered as: (i) Whether or not, any contagion effect exists in the region; (ii) Whether or not, the structure of the possible contagion effects in the region have been stable over the period; (iii) Whether or not, the "*flight to quality*" hypothesis is valid for member and non-member economies; (iv) Whether or not, the "*political contagion*" hypothesis is valid for Estonia, Latvia and Lithuania. We have applied the testing analysis to all economies one by one, not only within a group but also across the groups. In addition, the EU memberships of the three economies have been examined separately in order to determine possible changes in the contagion dynamics in the region. As explained in detail in Section 3, two standard deviations of performance indicator of each economy have been utilized as the threshold levels to determine financial turbulences for each of the economy.

It is noteworthy to mention the different regional patterns of the former Soviet countries in order to explore the implications of the results. Russia plays economically and politically leading role for Belarus, Ukraine and Moldova. However, Estonia, Latvia and Lithuania, have avoided any strong ties with the former Soviet economies and joined the EU in May 2004 rather than joining Commonwealth of Independent States. Russia is an important economic and political partner for Ukraine due to historical reasons. Russia and Belarus established the Union of Russia and Belarus in 1999, whereas Moldova and Ukraine was formed a regional organization to facilitate political cooperation and business networks. During the period 1995-2004, Estonia and Latvia experienced large current account deficits, and massive capital inflows which are resulted from a high degree of international financial integration and financial deepening. Large foreign direct investment inflows from Finland, Denmark and Sweden to the three EU member countries increased the economic growth. Between 2000 and 2007, Estonia's output, which was largely driven by private investment boom- mainly real estate, grew faster than all the other countries. Nordic banks played important role in the strong credit expansion in Estonia. However, Estonia is the first country in Europe to enter recession in 2008 as a result of high and volatile capital flows, fragile banking system, decreased exports, and high unemployment rate. From mid-1990s to 2004, Belarus has experienced high growth rates following the IMF economic reform policies; however in 2004, Belarus, Ukraine and Russia signed a regional integration agreement and established common economic space. After 2004, Belarus refused to follow the IMF recommendations; and then Belarusian economy heavily relied on Russian loans and remained heavily dependent on imported oil and gas from Russia. Latvia showed the worst performance in the EU as a result of the latest global crisis. Latvia had an unsustainable growth due to excessive domestic borrowing in Euros and growing real estate bubble.

Main empirical results and their implications can be presented as follows:

(i) One important result is that there exist the contagion effect for Belarus, Estonia Lithuania, Moldova, Russia and Ukraine. Latvian economy appears isolated from the contagion effect. Financial turbulences (manias and crises) experienced in a non-member economy(ies) in the region are non-linearly transmitted to the other non-member economies especially after 2004, however, financial turbulences experienced in the member economies are transmitted non-linearly to the non-members are quite weak. There is no evidence confirming that financial turbulences on the member economies create contagion effect for the member economies; in contrast, Estonia and Lithuania is open for asymmetric contagion effect originating from non-member economies.

(ii) The contagious dynamics among the non-member economies seem to become stronger after Estonia, Latvia and Lithuania joined to the EU in May 2004. Both manias and crises on the non-member economies create symmetric contagion effect for Belarus and Russia during the 2004:05-2009:12 period. This implication is valid for also Ukraine only for mania periods. Moldavian economy is the only exception among the non-member economies because it is closed for the contagion effect originating from financial turbulences in the period of 2004:05-2009:12.

(iii) Estimation results show that the "*flight to quality*" hypothesis is valid on the region in the defined context. Estimation results for 1995:11-2009:12 reveal that crises in the non-member economies lead to decrease in Estonian performance indicator. Similar results have been obtained for Lithuanian economy for the period of 2004:05-2009:12, but the contagion coefficients are smaller. Manias in the non-member economies also infect Estonian economy asymmetrically for whole sample estimation results.

(iv) There is not any support for the "*political contagion*" hypothesis in this context.

(v) The estimation results show that the structure of the contagion effects is not stable.

Overall, the econometric evidence in this paper suggests that the contagion dynamics among the non-member economies in the region seem to become stronger after the accession of the three economies to the EU. The contagion dynamics among the non-member economies in the region have been found symmetric for both crises and manias especially after 2004. However, Lithuania, as a member country, has been infected asymmetrically by the crisis after 2004. This implication for Lithuania is also supported for Estonia over the whole sample period. These results suggest that the economies of interest are divided into two categories- i.e. member and non-member, mainly after 2004. Afterwards, the relationship in each of the groups seems to be symmetric for both crises and manias, but asymmetric across the groups. However, this implication cannot be supported or failed for the member economies since Estonia and Latvia have experienced extremely high volatilities comparative to the other economies. This difficulty restricts the applicability of the econometric method in this paper. However, this fact reveals that the accession of Estonia, Latvia and Lithuania to the EU has not been enough to guarantee the financial stability in these economies by itself. Lastly, the empirical results from this paper also support that the contagion effects detected in the region are nonlinear. These results are consistent with the different regional patterns of the former Soviet countries.

Table 5: Estimation Results for All Economies

	Belarus	Estonia	Latvia	Lithuania	Moldova	Russia	Ukraine
Whole Sample							
OLS							
β^{+}	0.027319	-1.158713	-0.491385	0.970493	0.109759	-0.917000	-0.176904
β^{-}	-0.349675	6.722613	0.516564	1.210998	0.001192	0.888421	-0.553894
GIVE (m=1)							
β^{+}	-0.059421	-25.09850	10.80539	3.928706	-2.064733	-3.099162	-0.800971
β^{-}	4.285587	-12.37631	2.904688	**5.056171**^{b}	-2.408337	1.446164	-0.714010
GIVE (m=2)							
β^{+}	-1.673576	-1.915038	4.522435	1.427044	0.853350	-2.007606	**-2.675904**^{b}
β^{-}	**2.586248**^{b}	11.08661	2.270104	1.661871	0.252764	1.901921	-1.802848
GIVE (m=3)							
β^{+}	-1.315014	4.249438	1.656170	1.234404	0.662631	-2.856232	-1.447600
β^{-}	**2.062683**^{c}	8.884597	3.735218	1.604650	0.900203	1.912038	-1.488161
GIVE (m=4)							
β^{+}	**-2.011702**^{c}	-0.010846	-0.062137	0.969820	-0.124840	-2.672875	-1.149026
β^{-}	1.597929	8.350427	3.954468	1.397822	0.341419	1.662197	**-1.964286**^{b}
GIVE (m=5)							
β^{+}	-1.541992	0.334197	1.561485	0.877032	0.083838	-1.759096	-0.592047
β^{-}	1.177717	9.137075	1.919698	**1.680910**^{c}	0.231680	1.336214	**-2.038125**^{b}
GIVE (m=6)							
β^{+}	-1.105540	2.134740	0.310137	0.678846	-0.254607	-0.585959	-0.250614
β^{-}	0.959657	7.323985	2.374827	**1.799059**^{c}	0.468412	1.743422	-1.098318
1995:11 - 2004:04							
OLS							
β^{+}	-1.512284	-5.776556	0.442117	1.111573	-0.253306	-1.626211	0.340841
β^{-}	0.360225	28.31602	0.609588	**2.291808**^{b}	-0.945801	-1.324029	-0.313322
GIVE (m=1)							
β^{+}	-3.294943	7.609644	9.541181	2.437792	-3.438766	-3.386509	2.898401
β^{-}	2.108645	22.63039	1.278158	**3.371104**^{c}	-3.315387	-0.567101	2.004433
GIVE (m=2)							
β^{+}	-3.050958	-5.470799	0.100630	1.937598	-0.130648	-2.474793	-0.439950
β^{-}	1.600272	26.94754	0.871452	**2.659166**^{c}	-1.033447	0.510740	-0.173743
GIVE (m=3)							
β^{+}	-2.546061	0.737619	-2.116148	0.693388	-0.459486	-3.824714	0.774407
β^{-}	0.259116	**29.40323**^{c}	2.404332	2.014775	-0.048466	1.247569	-0.633651
GIVE (m=4)							
β^{+}	**-3.756265**^{b}	-4.768171	-2.528460	0.649335	-0.927306	-3.980502	-0.039191
β^{-}	-0.400829	27.77714	1.452214	1.677956	-0.760708	0.338801	-1.255418
GIVE (m=5)							
β^{+}	**-2.855587**^{b}	-5.951804	0.949093	1.432051	-1.059798	-3.119050	0.154158
β^{-}	-0.233092	28.41460	1.155694	**2.483262**^{c}	-0.979474	-0.107892	-1.216841
GIVE (m=6)							
β^{+}	**-2.312420**^{c}	-5.053597	0.957329	0.610785	-1.047037	-2.366311	0.188749
β^{-}	-0.248387	28.33380	0.670154	**2.820741**^{b}	-0.954284	-0.533027	-0.343536
2004:05 - 2009:12							
OLS							
β^{+}	0.659218	-1.179299	X	-1.383628	-0.350964	-0.221936	-0.612219
β^{-}	-0.087120	0.915201	X	-0.995452	0.608001	**-1.111159**^{c}	-1.503654
GIVE (m=1)							
β^{+}	-0.574806	-5.221155	X	-4.807324	-0.547056	-3.787755	-1.584904
β^{-}	-0.096422	-1.367442	X	-2.926458	0.501915	**-3.948723**^{c}	-1.678113
GIVE (m=2)							
β^{+}	0.439690	-1.372869	X	-1.471962	**-1.158481**^{c}	-0.454537	-1.815884
β^{-}	0.709188	-0.270208	X	-0.483418	0.651124	**-1.515731**^{c}	**-2.833845**^{b}
GIVE (m=3)							
β^{+}	0.759745	-0.809902	X	-1.189659	**-1.045071**^{c}	-0.149804	-0.976612
β^{-}	0.274566	0.468007	X	-1.115778	**1.130917**^{c}	**-1.183877**^{c}	**-2.575462**^{b}
GIVE (m=4)							
β^{+}	0.572016	-1.060077	X	-1.434965	-0.614152	-0.231225	-0.745907
β^{-}	-0.029881	0.430171	X	-1.176079	0.732848	**-1.239622**^{c}	**-2.004441**^{b}
GIVE (m=5)							
β^{+}	0.591308	-0.988917	X	-1.347856	-0.419264	-0.221677	-0.893086
β^{-}	-0.093367	0.740189	X	-1.049610	0.536023	**-1.102787**^{c}	**-1.822824**^{c}
GIVE (m=6)							
β^{+}	0.659218	-1.179300	X	-1.383628	-0.350964	-0.221936	-0.612219
β^{-}	-0.087120	0.915203	X	-0.995452	0.608001	**-1.111159**^{c}	**-1.503654**^{c}

^{a}, ^{b} and ^{c} refer to 1%, 5% and 10% significance levels, respectively.

β^{+}**:** endogenous positive contagion dummy variable

β^{-}**:** endogenous negative contagion dummy variable

X : No endogenous dummy variables because threshold level of Latvian economy is higher than all observations on other six economies

Table 6: Estimation Results of Non-Member Economies to EU

	Belarus	Moldova	Russia	Ukraine	Belarus	Moldova	Russia	Ukraine
	from EU				*from NEU*			
Whole Sample								
OLS								
β^+	-1.187028	0.352688	-1.119825	0.338678	**2.850111**[b]	-0.430551	1.162550	-0.411659
β^-	0.398529	0.064161	0.878355	-0.590903	**-5.691643**[a]	-0.472112	**-6.789589**[c]	-0.009625
GIVE (m=1)								
β^+	-6.780852	7.710668	-6.464327	-1.220697	**6.970361**[c]	-9.044349	-19.93304	**-7.143168**[c]
β^-	-0.485104	6.905020	-1.926843	-1.063544	1.930414	-2.907146	-23.71705	-2.336815
GIVE (m=2)								
β^+	-2.081086	**3.474121**[c]	0.820678	-0.233555	2.363565	-0.834893	-0.666140	**-4.123988**[c]
β^-	1.785331	2.220499	2.335825	-0.187901	-3.558371	-0.232424	-23.35056	-4.098791
GIVE (m=3)								
β^+	-2.377515	2.114456	-0.288381	-1.936774	1.833783	**-2.108052**[c]	4.614089	**-4.485149**[b]
β^-	1.470059	1.350152	1.682930	-1.145984	**-5.108459**[b]	0.704831	**-39.23711**[b]	1.536551
GIVE (m=4)								
β^+	-2.235138	0.533477	-1.267846	-2.547281[c]	1.613139	**-2.200051**[c]	-0.249989	**-3.479321**[c]
β^-	1.394494	-0.476626	1.658597	-1.349596	**-5.648091**[a]	0.187374	**-38.13541**[a]	1.218694
GIVE (m=5)								
β^+	-1.353120	0.310354	-0.052306	-1.769640	1.497778	-1.025382	0.599645	**-3.007131**[c]
β^-	1.471407	-1.018474	1.282858	-1.577013	**-5.193077**[b]	-0.363256	**-34.31831**[b]	1.331915
GIVE (m=6)								
β^+	-1.312410	0.476716	-0.271253	-1.307362	1.006053	-0.981496	-2.114966	-2.526655
β^-	1.484505	-0.664170	1.047866	-0.583520	**-5.713164**[a]	-0.438692	**-32.72074**[a]	0.901946
1995:11 - 2004:04								
OLS								
β^+	-1.568142	0.219758	-2.175566	0.412256	0.086854	-1.370853	6.874102	1.222550
β^-	0.487096	-0.664378	-1.312625	0.175557	0.327624	-0.290632	**-9.653702**[b]	**-2.873128**[c]
GIVE (m=1)								
β^+	-6.999910	6.002186	1.519177	-2.634530	3.075717	1.152450	-75.17276	-5.629878
β^-	0.549129	4.375192	0.394917	-1.577430	-1.899404	4.029675	13.76352	-3.750747
GIVE (m=2)								
β^+	-4.399266	1.566917	-0.745746	-0.580390	-2.314962	-0.487689	-14.29443	-2.861839
β^-	1.183294	-0.543961	0.472086	-0.219991	-0.869542	1.692038	0.394201	-3.286264
GIVE (m=3)								
β^+	-4.438728	1.853187	-3.123067	-1.953877	-1.258905	-1.658948	-2.788567	-2.426077
β^-	0.179454	-0.429831	1.336486	-1.667327	-0.446576	1.702362	-3.924702	-2.378032
GIVE (m=4)								
β^+	-4.774234	1.835301	-4.178938	-2.390551	-3.915460	**-3.413019**[c]	5.336214	-2.703388
β^-	0.052775	-1.476542	0.381597	-1.361040	0.325277	1.074964	-4.658693	-1.616672
GIVE (m=5)								
β^+	-1.809512	1.960772	-2.420896	-0.609564	-5.787969	-2.757262	9.430183	-2.512837
β^-	0.546721	-1.166432	-0.949823	-1.425705	-0.156116	0.661217	-5.900227	-2.289082
GIVE (m=6)								
β^+	-2.187893	**2.184018**[c]	-3.751696	1.218288	-4.404905	-1.362046	13.28683	-2.454661
β^-	0.306725	-0.898932	-1.374143	0.261656	0.632157	0.621249	**-9.457432**[c]	-2.355905
2004:05 - 2009:12								
OLS								
β^+	0.780375	-0.298588	-0.260456	-0.570206	**1.921915**[b]	-0.238845	**3.128249**[b]	-0.573521
β^-	0.452518	0.719541	-1.007167	-1.041760	**-1.987486**[b]	-0.047337	**-2.533066**[b]	**-8.594633**[b]
GIVE (m=1)								
β^+	7.778760	2.659391	7.043273	5.864434	3.434687	0.229590	**11.36414**[b]	3.317134
β^-	6.367047	4.428367	5.427100	4.948001	0.576008	1.457082	-1.265938	7.186425
GIVE (m=2)								
β^+	2.033795	-0.296085	1.722203	-0.491994	**2.435555**[b]	-0.356000	2.545466	-1.418881
β^-	1.696071	1.509065	1.492789	0.152606	**-2.688931**[b]	-0.328001	**-4.774613**[a]	-6.805274
GIVE (m=3)								
β^+	0.694634	-1.240838	0.549077	-1.604867	**1.960367**[c]	-0.859885	**2.967201**[c]	-1.222829
β^-	1.271516	0.963136	1.262214	0.050657	**-2.184062**[b]	-0.442820	**-3.095922**[b]	**-8.402999**[b]
GIVE (m=4)								
β^+	1.205548	**-1.270140**[c]	-0.102799	0.443967	**2.083470**[b]	-1.202481	**2.425555**[c]	-1.260055
β^-	1.087453	0.679610	0.726661	0.919685	**-1.955799**[b]	-0.858389	**-3.093409**[b]	**-8.494952**[b]
GIVE (m=5)								
β^+	**1.376649**[c]	-0.866286	-0.112408	0.710438	**2.380406**[a]	-0.808401	**3.024041**[b]	-0.781190
β^-	0.741002	1.066951	0.249712	0.256006	**-1.883980**[b]	-0.819983	**-2.916186**[b]	**-8.570982**[b]
GIVE (m=6)								
β^+	**1.456447**[c]	-0.600847	0.250949	-0.082249	**2.320364**[a]	-1.056531	**2.997726**[b]	-0.786313
β^-	1.143589	**1.108651**[c]	0.188642	-0.243205	**-2.074466**[b]	-0.697360	**-2.366309**[c]	**-8.571443**[b]

[a], [b] and [c] refer to 1%, 5% and 10% significance levels, respectively.
β^+: endogenous positive contagion dummy variable
β^-: endogenous negative contagion dummy variable

Table 7: Estimation Results for Member Economies to EU

	Estonia	Latvia	Lithuania	Estonia	Latvia	Lithuania
		from EU			*from NEU*	
			Whole Sample			
OLS						
β^+	0.227880	-1.022139	0.946974	-11.15327	4.518522	1.786709
β^-	-0.447016	0.404891	0.851565	**27.97654**[b]	0.549056	3.331529
GIVE (m=1)						
β^+	-84.13266	10.68914	-7.914576	**-197.1502**[b]	-48.58877	**-25.95407**[c]
β^-	-87.79169	2.932433	-2.027171	41.57179	14.59749	3.206785
GIVE (m=2)						
β^+	-5.599107	6.838952	-4.772841	**-124.1974**[c]	-28.24213	-12.42919
β^-	2.373345	5.498781	-0.852839	**37.26881**[c]	6.758276	4.269700
GIVE (m=3)						
β^+	-1.215843	6.663569	-4.777513	**-114.1172**[b]	6.280334	-8.097626
β^-	-1.670921	5.183165	-1.080077	**29.62476**[b]	0.093626	4.426657
GIVE (m=4)						
β^+	-4.185179	8.508823	-2.418473	**-78.38503**[b]	-6.763687	-7.971090
β^-	-2.042076	4.875724	-0.516747	**26.88844**[c]	0.191955	4.961423
GIVE (m=5)						
β^+	-3.961797	10.79863	-2.805642	**-90.24503**[a]	-0.373856	-4.810326
β^-	-3.090329	3.680051	-0.728499	**27.11729**[c]	0.367859	**5.606710**[c]
GIVE (m=6)						
β^+	-3.512084	10.36425	-2.665488	-30.85193	4.236978	-3.066859
β^-	-4.647299	3.540633	-0.707317	**27.88259**[b]	0.514639	**6.434252**[b]
			1995:11 - 2004:04			
OLS						
β^+	-5.912728	1.986941	1.171656	X	-7.307810	1.958323
β^-	X	1.244931	1.983518	28.34407	0.333079	1.715042
GIVE (m=1)						
β^+	-36.05871	34.64651	-12.27692	X	-10.70626	**-24.19178**[c]
β^-	X	16.09121	-3.488366	16.09422	1.177699	8.217650
GIVE (m=2)						
β^+	-43.68985	9.881389	-8.621182	X	-7.280047	-2.840080
β^-	X	4.750861	-2.637507	25.70730	3.349132	3.754570
GIVE (m=3)						
β^+	-40.44808	5.290367	-2.613086	X	-7.605181	0.269063
β^-	X	3.382739	-1.118158	28.73678	4.540301	3.162836
GIVE (m=4)						
β^+	-29.22468	6.381331	-3.449361	X	-0.692774	-0.986351
β^-	X	3.668673	-1.512365	27.92811	3.721617	3.709793
GIVE (m=5)						
β^+	-20.58748	6.106657	-3.913240	X	3.007525	-1.221955
β^-	X	3.358399	-1.428616	28.21898	3.744336	2.697922
GIVE (m=6)						
β^+	-5.564473	4.366345	-3.907488	X	3.493243	-0.463706
β^-	X	2.271803	-1.524243	28.33141	4.225932	3.423156
			2004:05-2009:12			
OLS						
β^+	-1.179299	X	-0.447086	X	X	**-12.35452**[a]
β^-	0.915201	X	-0.511642	X	X	-7.149209
GIVE (m=1)						
β^+	-14.22003	X	3.188636	X	X	-9.021182
β^-	-8.097100	X	6.763779	X	X	-9.302950
GIVE (m=2)						
β^+	-1.497114	X	-1.599139	X	X	**-13.95702**[b]
β^-	0.164785	X	0.399407	X	X	-5.375211
GIVE (m=3)						
β^+	-2.064472	X	-0.902543	X	X	**-13.67527**[a]
β^-	0.158197	X	0.214833	X	X	**-7.592053**[c]
GIVE (m=4)						
β^+	-2.047915	X	-0.678960	X	X	**-13.91414**[a]
β^-	0.683775	X	-0.092355	X	X	-7.243230
GIVE (m=5)						
β^+	-2.094645	X	-1.300008	X	X	**-12.54614**[a]
β^-	0.657067	X	0.172285	X	X	-7.164673
GIVE (m=6)						
β^+	-2.119025	X	-1.520368	X	X	**-12.37868**[a]
β^-	0.681207	X	-0.970027	X	X	-7.150980

[a], [b] and [c] refer to 1%, 5% and 10% significance levels, respectively.

β^+: endogenous positive contagion dummy variable

β^-: endogenous negative contagion dummy variable

X : No endogenous dummy variables because threshold level of Estonian and/or Latvian economies is higher than all observations on other six economies.

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Appendix: Series Codes and Descriptors of Data[2]

Belarus

Name	**Units**	**Series Code**	**Descriptor**
E	National Currency per US Dollar	913..RF.ZF...	Official Rate, Period Average
NFA	National Currency	91331N..ZF...	Foreign Assets (Net)
I	Percent per Annum	91360P..ZF...	Lending Rate
M	National Currency	91335L..ZF...	Money Plus Quasi Money

Estonia

Name	**Units**	**Series Code**	**Descriptor**
E	National Currency per US Dollar	939..RF.ZF...	Official Rate, Period Average
NFA	National Currency	93931N..ZF...	Foreign Assets (Net)
I	Percent per Annum	93960P..ZF...	Lending Rate
M	National Currency	93935L..ZF...	Money Plus Quasi Money

Latvia

Name	**Units**	**Series Code**	**Descriptor**
E	National Currency per US Dollar	941..RF.ZF...	Official Rate, Period Average
NFA	National Currency	94131N..ZF...	Foreign Assets (Net)
I	Percent per Annum	94160P..ZF...	Lending Rate
M	National Currency	94135L..ZF...	Money Plus Quasi Money

Lithuania

Name	**Units**	**Series Code**	**Descriptor**
E	National Currency per US Dollar	946..RF.ZF...	Official Rate, Period Average
NFA	National Currency	94631N..ZF...	Foreign Assets (Net)
I	Percent per Annum	94660P..ZF...	Lending Rate
M	National Currency	94635L..ZF...	Money Plus Quasi Money

Moldova

Name	**Units**	**Series Code**	**Descriptor**
E	National Currency per US Dollar	921..RF.ZF...	Official Rate, Period Average
NFA	National Currency	92131N..ZF...	Foreign Assets (Net)
I	Percent per Annum	92160P..ZF...	Lending Rate
M	National Currency	92135L..ZF...	Money Plus Quasi Money

Russia

Name	**Units**	**Series Code**	**Descriptor**
E	National Currency per US Dollar	922..RF.ZF...	Official Rate, Period Average
NFA	National Currency	92231N..ZF...	Foreign Assets (Net)
I	Percent per Annum	92260P..ZF...	Lending Rate
M	National Currency	92235L..ZF...	Money Plus Quasi Money

Ukraine

Name	**Units**	**Series Code**	**Descriptor**
E	National Currency per US Dollar	926..RF.ZF...	Official Rate, Period Average
NFA	National Currency	92631N..ZF...	Foreign Assets (Net)
I	Percent per Annum	92660P..ZF...	Lending Rate
M	National Currency	92635L..ZF...	Money Plus Quasi Money

[2] Data was all taken from IMF-IFS December 2008 CD-Rom for the period between 1995:09 and 2008:09 and was all taken from IMF-IFS March 2010 Online Database for the period between 2008:10-2009:12. Data synchronization between the two databases was checked and found to be synchronized.