

# Economic and Financial Integration of CEECs: The Impact of Financial Instability

Claudiu T. Albulescu\*

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**Abstract** The recent financial crisis had a powerful impact upon the European countries' economies, in particular on those from Central and Eastern Europe, with some small exceptions. Thus, applying a panel data approach for a large sample of CEECs, we demonstrate that financial instability negatively influences these countries economic and financial integration. If instability is measured by means of a financial instability index, we have used two classical indicators for the economic integration, namely trade openness and trade intensity index. Indicators such as the interest rates co-movement and the asset share of foreign-owned banks were chosen to calculate financial integration. We highlight the fact that the crisis events hinder the process of CEECs' integration into the EU, deepening the economic gaps between more and less developed EU members.

**Keywords** Financial instability, financial instability index, economic and financial integration, Central and Eastern Europe

**JEL classification** C33, F15, F36, G01

## 1. Introduction

The degree of economic and financial integration is of substantial interest to both academics and policymakers because of its implications on economic efficiency and risk-sharing, especially at the European Union (EU) level (see Bekaert and Harvey 2000; Henry 2000; Demyanyk and Volosovych 2008). In this context, the recent priorities of EU policies have been to accelerate integration and to reduce transaction costs in financial markets.

The Central and Eastern European Countries (CEECs) have in their turn made important steps towards their integration within the European Union economy. Some of these countries (Slovenia and Slovak Republic) are nowadays part of the euro zone. Others, such as Estonia, will join the euro area in the near future. The favourable global economic climate facilitated the financial and economic integration and the catching-up process as compared to the Union's developed countries. However, the present financial crisis significantly affected the economies of these states and implicitly their integration process, situation which should cause the authorities to pay increased attention to the stability policy.

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\* "Politehnica" University of Timișoara, P-ta. Victoriei No. 2, 300006 Timișoara, Romania. Poitiers University, CRIEF, 93 Avenue du Recteur Pineau, 86022 Poitiers Cedex, France. Phone: +40 743 089 759, Email: claudiu.albulescu@ct.upt.ro.

Practically, the stability of the financial systems represents an element which favours and ensures the sustainability of the integration process and mitigates at the same time the exposure of these countries to asymmetric shocks. In other words, the measures undertaken by the authorities and which are aimed at facilitating the integration process do not have to leave aside the need to guarantee the financial stability. We emphasize this by means of several empirical tests applied to panel data corresponding to the CEECs. We demonstrate that the financial turmoil, measured by a financial instability index (*FII*), negatively affects both the economic and the financial integration of these countries.

In order to assess the degree of economic integration, we have appealed to a classical indicator, namely the trade openness and also to the trade intensity index described by the World Bank. For financial integration, we have concentrated on aspects related to the banking sector and monetary policy. Thus, the indicators retained for the assessment of the financial integration level are represented by the ratio between the foreign-owned banks assets and the total assets of the banking sector and the monetary policy interest rates correlation index. The main explanatory variable, the financial instability index, was computed taking into account different aspects characterizing the stability of a financial system, as follows: the development degree, its vulnerability to shocks and the soundness of the banks—an important element, having in mind the architecture of CEECs' financial sector.

The main contributions of this paper consist in the assessment of financial instability, using a financial instability index, identifying and mirroring at the same time its impact upon the CEECs' economic and financial integration. The article has the following structure: Section 2 describes the theoretical aspects associated with the determinants of economic and financial integration and depicts the role of financial stability, Section 3 is focused on the calculation of the financial instability index, Section 4 emphasizes the outcomes of the econometric tests associated to the impact of instability on the integration process and Section 5 underlines the findings of the analysis.

## **2. Theoretical considerations**

The economic and financial integration was intensely scrutinized in literature, both at global (Lane and Milesi-Ferretti 2003; Lothian 2006; Vo and Daly 2007; Claessens and Schmukler 2007; Chambet and Gibson 2008; Spiegel 2009) and at regional level (Lemmen and Eijffinger 1996; Click and Plummer 2005; Cheung et al. 2008; Ryan and Horsewood 2009). Moreover, different criteria have been developed to evaluate the degree of economic and financial integration (Kalemli-Ozcan et al. 2008; Cheung et al. 2008). These criteria can be broadly classified in two categories, quantity-based and price-based measures. The quantity-based category includes measurements of openness and restrictiveness in trade and financial transactions, capital flows, output correlation, savings-investment correlation and consumption correlation. The price-based category consists of tests derived from price differentials in goods and financial markets.

The determinant factors of economic and financial integration can also be grouped,

according to El Hedi (2006), in local factors, associated with the development of the markets, the volatility of the exchange rate, the inflation rate, the economic growth, the foreign capital flows, and in global factors such as the international economic climate or the country risk.

Analysing the integration process determinants is of particular interest in the European Union (EU) and the CEECs' financial markets can be seen as an excellent sample to elaborate the researches. The market economy transition process and the integration of the new EU members is a long-lasting phenomenon. One of the main problems faced by the CEECs after 1990 was the collapse of the international trade, as exports and imports were based on the Council of Mutual Economic Assistance—an economic organisation of command economies (Ryan and Horsewood 2009). After the negotiations for the EU accession, a modification of the institutional framework, but also of the financial sector structure, occurred in these countries, facilitating their integration into the EU. The nominal and real convergence of the new member states with the older members of the EU accentuated after 2000.

The studies dedicated to the analysis of the CEECs' economic and financial integration are of a large variety, but their number still remains reduced as compared to the importance of the subject. Podraza (1998) analysed the main instruments of CEECs' integration into EU. Di Mauro (2001) studied the integration level between the EU members and the candidate countries, stating that the main channel for the integration process is represented by the foreign direct investment (FDI) flows. De Benedictis and Tajoli (2007) investigated the similarities in the trade structure, comparing the older EU members and the CEECs, as a factor of economic integration. Babecký et al. (2008) studied the financial integration of stock markets among four new EU member states and the Euro Area, while Ryan and Horsewood (2009) have recently analysed the role of banks in the financial integration of the CEECs.

To our knowledge, none of the studies analysed the role of financial stability in assuring the sustainability of the CEECs' integration process. We will fill in this gap referring both to the economic and to the financial integration. We resort to a quantity-based measure for the economic integration, namely the trade openness and the trade intensity index. To estimate financial integration, we employ a quantity-based measure, namely the ratio between the foreign-owned banks assets and the total assets of the banking sector and also a price-based measure, more precisely the correlation index of the CEECs' central banks key interest rates with the European Central Bank's key rate. We have to mention that financial integration is not directly observable, but most proxies are based on the law of one price, for example the cross-sectional variation of interest rates across countries (Baele et al. 2004).

To validate the impact of our constructed financial instability index upon the integration process, we considered both control variables describing the local economic environment, as the natural log of the FDI inflows, as well as variables characterizing the general economic context, as the economic sentiment indicator (*ESI*).

Other factors which can favour the integration process and which were investigated in literature were the financial intermediation degree and the portfolio investments as percentage to GDP (Vo and Daly 2007), the inflation, the budgetary deficit and the com-

panies performances (Claessens and Schmukler 2007), the economic growth which acts as a stimulant for private capital flows into emerging countries (Edison et al. 2002; Phylaktis and Ravazzolo 2002; Vo and Daly 2007) and the country risk (Chuah 2004; El Hedi 2006). Practically, an important part of these determinant factors are included, as we will see in the next section, in the financial instability indicator we have developed. Therefore, in order to avoid the collinearity problems, we have kept only the FDI inflows and the *ESI* as control variables.

Establishing the role of financial instability in impending upon the integration is essential for our study. Yet, defining and measuring financial instability is not an easy job. As Cerna et al. (2008) state, there is no equivalence between the notions of financial instability and financial fragility or vulnerability. Any financial system is more or less fragile and vulnerable no matter it passes through a stability period or an instability one. Instability is usually associated with the lack of normality or of financial stability.

The importance the stability plays for the integration process is recognized by specialists such as Grahl (2006) and Cheung et al. (2008). Other specialists asserted that financial integration associated to the emergent economies was adversely affected by the financial crises (see Chambet and Gibson 2008). But how does a stable climate really favour the integration process and especially how does an instability period negatively affect the economic and financial integration process?

First, a stable financial system encourages the employment and the economic development (Grahl 2006). The importance of this aspect was also noticed by the EU decision-makers who focused on macro-prudential measures to prevent the crises (see Lamfalussy Report in this respect).

Second, financial and economic integration is achieved through capital flows and foreign direct investment flows. As Bénassy-Quéré et al. (1999), Aubin et al. (2006) and Choi and Jeon (2007) demonstrated, sound macroeconomic fundamentals (stable exchange rate policies, low inflation and sustained growth) influence the investment decisions. In a stable financial system, the credit policy sustains investment decisions and the regulation policies contribute to a sound banking sector which promotes financial integration. According to the financial stability theory, this “public good” can be ensured by ameliorating the institutional performances and the systemic risks monitoring (qualitative frame) and also by reducing financial system vulnerabilities, by obtaining an adequate level of financial system development or by securing financial institutions (quantitative frame). The stability creates a favourable perception to investors and reflects the economy’s capacity to function close to the optimal level. On the other side, an instable financial system (underdeveloped and vulnerable) does not have the necessary power to help the revival of the economic activity.

Third, an important role in financial integration is played by the banking sector. The soundness of banks (capitalization, liquidity, profitability and risk mitigation) offers important information on the quality of the credit activity. Sound banking institutions enjoy good risk management skills and can also offer advises to their clients, upholding the investment process and the integration.

In addition, an instable financial system is not capable of guaranteeing the commercial contracts (encumbering thus the economic integration), nor does it facilitate

the investments and the fulfilment of the monetary policy objectives (affecting therefore the financial integration). We will further on empirically demonstrate this reality, but not before proceeding to the construction of a financial instability index to measure the instability degree of the CEECs' financial systems. The built up financial instability index allowed us to assess the instability level in a dynamic manner, as compared to the most common early warning systems (EWS) or stress-tests methods, which capture financial stress at one point in time.

### 3. Measuring financial instability in CEECs

#### 3.1 Related literature

There are different techniques to compute an instability index (or a stability index—its opposite). One simple method is that enabling a mechanic comparison between the individual indicators characterizing different financial systems and it consists of a hierarchy of individual indicators values (the aggregate index components). The inconvenience of this non-parametric method comes from the minimum differences between the values of the indicators having the same weight within the aggregate index.

A second method consists in the construction of an aggregate index, based on daily financial market data. Nelson and Perli (2005) described such an index, called “financial fragility index”, while Illing and Liu (2003) constructed a “financial stress index” for the Canadian financial system using market data too. A more complex approach ranging in this category consists in combining market data and balance sheet data into a “stress index” for the banking sector (see Hanschel and Monnin 2005). Swiss National bank (2006) has built a stress index for the banking system of Switzerland using this technique.

A third method consists in the construction of a financial stress index by calculating the default rate for the entire financial system, using the Merton approach (van den End and Tabbae 2005). A similar index, assessing the systemic risk based on the stochastic distribution of individual financial institutions default, was also proposed by Čihák (2007). The advantage of this method is the interconnection between financial perturbations and business cycle.

The aggregate index can also be built as a weighted average of individual indicators (Rouabah 2007), method at which we subscribe as well. An ample presentation of this method is carried out by Geršl and Heřmánek (2007). We consider that this method is the most appropriate for the CEECs' case, due to a high degree of data harmonisation and to the fact that financial market data do not show great relevance for these countries, taking into consideration their capital markets poor development level.

No matter the selected technique, the construction of a financial instability index usually supposes to run over several steps. In the first phase, the individual indicators able to reflect the financial instability level have to be chosen. They usually highlight the financial system development, the banks performance or the macroeconomic context. Then, in order to be included into a synthetic index, the individual indicators have to be quantified. The values of the indicators have thus to be normalized—step which stands for the second phase of the instability index construction. Several normalization

methods can be taken into account, as none of them is satisfactory enough. The most common normalization methods are the standardisation (z-scores), re-scaling (min-max method), distance to a reference and the methods for cyclical indicators (OECD 2008). These particular techniques can be included in broader categories as the statistical normalization, the empirical normalization, the axiological normalization and the mathematical normalization (for a description of these methods see Albulescu 2010). For example, the re-scaling method is considered an empirical normalization and it was applied by Călin (2004).

The next step in the index development is the aggregation of individual indicators. We can choose either to give the same importance to all the variables or to apply different weights, based on decision making criteria or on statistical calculations (see OECD 2008 for a presentation of advantages or inconvenient of each aggregation techniques). The standard procedure, consists in giving the same weight to all the variables which are included in the composite or aggregate index (the *FII* in our case). Another possibility is to transform the variables in percentiles, using their sample cumulative distribution function (Illing and Liu 2006; Rouabah 2007). In this case, the last percentile corresponds to a high instability period, while the value of the first percentile characterizes a low stress level. The other values around the median reflect an average risk level.

Considering the aforementioned aspects, we will hereunder construct an instability index for the financial systems of the CEECs.

### **3.2 The construction of the financial instability index for CEECs**

In order to build a financial instability index for the ten CEECs retained in our analysis, namely Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia and Slovak Republic, we have used annual data. The individual indicators which reflect the dimensions of financial instability (underdevelopment, vulnerability and banking fragility) are presented in Table 1.

The selected indicators (a total of 15) characterise the financial system underdevelopment, the financial vulnerability, the macroeconomic conditions and the fragility of the banks. The financial instability can be associated either with a high or with a low value, depending on the indicators nature. For example, financial instability is linked with a high value of non-performing loans and with a small value of banking profitability (return on assets, ROA). Due to the fact that the banking sector stands as the sector with the most significant importance within the CEECs financial systems, most of the indicators refer to credit institutions.

As pointed out by Rajan (2006) and Ferguson et al. (2007), financial development will improve financial stability and it is mainly associated with financial deepening. That is why the first indicator retained in the analysis is the “domestic credit to GDP ratio, as percentage of the Euro Area level”. The higher this level is, more developed and more mature the banking system is considered (see the financial deepening of the EU older members compared with the new members’ condition). Thus, a small level of financial intermediation could represent a sign of instability because the banking institutions are not capable to communicate and to offer financial and consultancy support

**Table 1.** Individual indicators for the financial instability analysis

Individual indicators	Databases
Domestic credit / GDP (% Euro area level)	National Central Banks, Eurostat
Interest rate spread	EBRD
Banking reform & interest rate liberalisation	EBRD
Inflation rate	Eurostat
General budget deficit (% GDP)	EBRD
Current account deficit (% GDP)	EBRD
REER excessive depreciation or appreciation	Eurostat
Domestic credit (% change)	EBRD
Loans to deposits ratio	Eurostat, National Central Banks
Deposits / M2 (variation %)	Eurostat, National Central Banks
Non-performing loans / Total loans	IMF, National Central Banks
Equity to total assets	IMF, National Central Banks
Capital adequacy ratio (CAE)	IMF, National Central Banks
Return on assets (ROA)	IMF, National Central Banks
Liquidity ratio (Liquid assets / Total assets)	IMF, National Central Banks

to companies. Furthermore, a reduced level of financial intermediation is associated to poor economic conditions where the financial disequilibrium can manifest easier.<sup>1</sup>

The “interest rate spread”, calculated as the difference between the average lending rate and the average borrowing rate, represents another indicator which reflects the underdevelopment of the financial system. In the context of increased competition and penetration of important financial groups on the Eastern European banking market, the interest rate spread shows a decreasing trend, even if a few years ago its level was quite high. An increased interest rate spread can indicate financial instability periods, when credit institutions usually undertake additional protection measures against potential risks.

The last indicator in this category, reflecting the financial system underdevelopment, is an indicator calculated by the European Bank for Reconstruction and Development (EBRD), indicator which shows the status of banking reforms and the interest rate liberalisation. A small value of this indicator is related to an increase of financial instability.

The starting-point in assessing the vulnerability of the financial systems is represented by the analysis of the indicators that the International Monetary Fund (IMF) presents in the country reports. In this set of indicators we can distinguish a group which characterizes the macroeconomic conditions and another group which describes the credit activity.

The first indicator retained in this category is the “inflation rate” which represents a macroeconomic vulnerability indicator. A high level of this indicator negatively affects the investors’ confidence and the financial stability. Another macroeconomic indicator

<sup>1</sup> We mention that we have considered here the level, and not the growth rate, of the domestic credit, which is directly associated with the financial instability as we will see further on.

which describes the government performance is the “general budget deficit to GDP”. If the budget deficit is high, investors lose their confidence in the government’s capacity to ensure a future sustainable economic growth. A high budget deficit will imply further corrections as well.

The third vulnerability indicator is the ratio “current account deficit to GDP”. An important current account deficit shows a macroeconomic imbalance which supposes a future correction, affecting thus the financial stability. Of course, a more detailed analysis of the current account deficit determinants could provide more information about the severity of this disequilibrium, but this is a residual problem. Even if it can be considered as characteristic to CEECs and to developing countries in general, sooner or later its correction will amplify financial instability through currency depreciation. Thus, a high level of the current account deficit can not be considered either normal or desired and the present crisis is a relevant proof in this respect.

The next indicator linked with financial vulnerability is the excessive appreciation or depreciation of the real effective exchange rate (REER).<sup>2</sup> A considerable volatility of the REER shows that the economy undergoes major corrections by means of the exchange rate.

The last three vulnerability indicators retained in our analysis have the capacity to generate signals about an eventual financial crisis. The credit boom is associated with an irrational exuberance, characterising a financial instability environment. Thus, a sharp increase in domestic credit might prove unsustainable, leading to financial disequilibrium. Furthermore, a high level of loans, which is not accompanied by an expansion of deposits, shows a potential imbalance within the financial system (the confidence in the national currency diminishes; the domestic banks depend on the mother banks’ financial support; etc.). The “deposits to money supply (M2)” ratio reflects the relation between savings and consumption. If this ratio is small, the confidence in the banking system is reduced.

The credit institutions’ fragility can be illustrated by analysing the financial soundness indicators, proposed and used by the international financial institutions in assessing financial system soundness exercises. The first soundness indicator is the “NPL to total loans ratio” and it reflects the loans’ quality. Even if the indicator shows an improvement in the last years, we have to signal the fact that the volume of non-performing loans considerably increased once the credit boom occurred in the CEECs and especially after the crisis onset. The second indicator in this category, “equity to total assets”, reveals the capitalization level of the banking system. The third indicator is the “capital adequacy ratio” (CAE) which characterizes the banking sector capitalization, but the most important information offered by this indicator is related to the solvability of the banking institutions. If CAE is small, the financial instability increases.

The “return on assets” (ROA) is the next indicator retained in our analysis. A small value of this indicator reflects the financial fragility of the banks. Finally, we considered

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<sup>2</sup> This indicator—deflated real effective exchange rate—is calculated by Eurostat, taking into consideration the 41 most important commercial partners of each country. The REER aims to assess a country’s price or cost competitiveness relative to its principal competitors in international markets.

the “liquidity ratio” (liquid assets / total assets), an indicator computed by the IMF in its country reports. The liquidity index offers important information on financial system instability because an unstable financial system suffers from the lack of liquidity.

The selection of the individual indicators was made taking into account the multiple dimensions of financial stability, as well as the features and particularities of CEECs’ financial systems (e.g., underdevelopment and vulnerability). Usually, the literature resorts to several consecrated indicators, like those proposed by Kaminsky and Reinhart (1999), indicators which behave differently during instability periods. Yet, such behaviour depends on the sample of analysed countries and on the reporting periods and, as a result, it is not opportune to consider the same indicators in all the analyses. Thus, we have preferred using a wider range of individual indicators, amongst those proposed by IBRD, World Bank and IMF (2005).

If we look at the indicators in Table 1, we notice that some of them provide divergent information. For example, a high interest rate spread corresponds to a significant underdevelopment degree and, implicitly, to a high financial instability, whereas the connected profitability (measured in our case by ROA) indicates a low instability level. Nevertheless, the analysis is balanced by the very use of such indicators, because the signals they transmit compensate each other and the stronger prevails.

For the second step in the index construction, a re-scaling approach was employed to normalise the individual indicators’ values, for each country retained into analysis.

$$I_{ijc}^n = \frac{I_{ijc} - \min(I_i)}{\max(I_i) - \min(I_i)}, \quad (1)$$

where  $I_{ijc}$  represents the indicator  $i$  during the period  $j$  corresponding to the country  $c$ ,  $\min(I_i)$  and  $\max(I_i)$  represent the best value and, respectively, the worst value registered by the indicator  $i$  during the analysed period (1998–2008) in all the countries and  $I_{ijc}^n$  is the normalised value of the indicator.

The re-scaling method retains the worst and the best of the values reached by the corresponding indicator for the whole period in all the analysed countries. The normalised indicators receive values ranging in the interval  $[0, 1]$ .

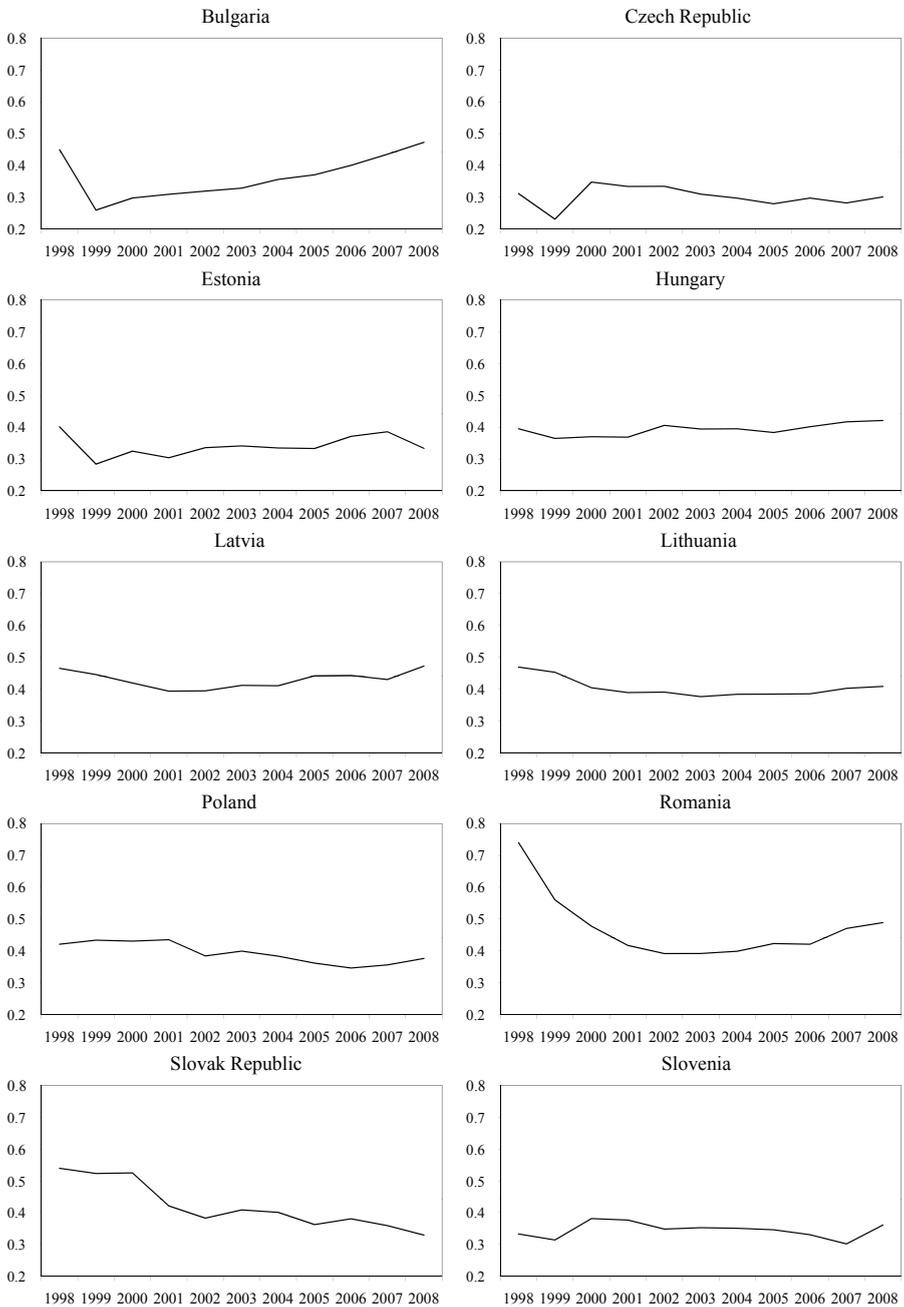
In the third phase, the  $FII$  for each country is calculated as an arithmetic mean of the data available for the 15 normalised individual indicators:<sup>3</sup>

$$FII = \frac{\sum_{i=1}^{15} I_{ij}}{15} \quad (2)$$

Thus calculated, the evolution of the financial instability index is presented in Figure 1.

As we can observe when analysing the figure, the  $FII$  indicates a high financial instability level at the beginning of the analysed period in all the considered countries. A particular situation can be noticed for Romania, which experienced a banking crisis in

<sup>3</sup> We have selected this simple weighting technique because it is difficult to justify the assignment of different weights to the individual indicators. At the same time, the more rigorous principal components analyses can be criticised due to the fact that some indicators with high volatility during certain crisis periods show a different behaviour in different instability episodes. However, selecting the individual indicators and determining the weights based on the PCA method, could represent an alternative which may be subject to future research.



**Figure 1.** Financial instability index in CEECs

the period 1998–1999. The status of the CEECs’ financial systems progressively improved at the beginning of the years 2000s, remaining relatively constant up to 2007, when, in the context of the onset of the subprime crisis, the systemic stability deteriorated. Except for Estonia and the Slovak Republic, all the CEECs show a higher instability index level in 2008 as compared with the previous period, endangering their integration within the EU. For Hungary and Bulgaria, the instability index level registered in 2008 is higher compared to the ‘90s.

#### 4. Testing the relation between financial instability and economic and financial integration

##### 4.1 Data

###### 4.1.1 Dependent variables

As we have already stated in the first part of our study, the integration of the CEECs within the EU was a continuous process during the last years. In order to examine the reasons for which the financial instability adversely affects this integration process, it is useful to distinguish between economic integration and financial integration.

The classical indicator for measuring economic integration is the trade openness. According to Lane and Milesi-Ferretti (2003), the trade openness reflects the integration process due to several reasons. First, the trade in goods directly results in corresponding financial transactions such as trade credit, transportation costs and export insurance. Second, the trade openness may increase the willingness to conduct cross-border transactions, reducing financial home bias (a “familiarity” effect). The classical method for computing the trade openness ( $TO$ ) is to use the commercial transactions (exports and imports) to GDP ratio.

$$TO = \frac{EX + IM}{GDP} \quad (3)$$

An alternative for the trade openness is to calculate the commercial integration level using the trade intensity index ( $TII$ ) proposed by the World Bank, the same as Aminian et al. (2008). It is defined as the share of one country’s exports going to a partner divided by the share of world exports going to the same partner (in our case, the partner is the EU).

$$TII = \frac{X_{ij}/X_{it}}{X_{wj}/X_{wt}}, \quad (4)$$

where  $X_{ij}$  and  $X_{wj}$  denote the values of country  $i$ ’s exports and of world exports to country  $j$  (EU in this case),  $X_{it}$  and  $X_{wt}$  denote country  $i$ ’s total exports and total world exports, respectively.

In respect of financial integration, a much more complex process, we have calculated two indicators describing this process, as follows: the foreign-owned banks assets to banking sector total assets ratio and the correlation index of monetary policy interest rates, with the key interest rate of the European Central Bank (ECB).

According to Baele et al. (2004), the market for a given set of financial instruments and/or services can be regarded as fully integrated if all potential participants on the market present the same relevant characteristics: (i) face a single set of rules when they decide to deal with those financial instruments and/or services, (ii) have equal access to the above-mentioned set of financial instruments and/or services and (iii) are treated equally when they are active in the market. This definition encompasses the law of one price which is typically considered as the benchmark for measuring financial integration (Kalemli-Ozcan et al. 2008).

A simple way to describe the progress of integration in the banking market is to examine whether barriers to entry have been progressively reduced. In principle, the absence of barriers to entry and the threat of new entries should discourage the decision-makers from charging prices in excess. Quantity-based indicators of banking integration are based on measures of cross-border activities. Consequently, we have used an indicator calculated by the European Bank for Reconstruction and Development (EBRD), namely asset share of foreign-owned banks (*ASFOB*), to compute the integration of the banking sector:

$$ASFOB = \frac{FOBA}{BSTA} \quad (5)$$

where *FOBA* denotes foreign-owned banks assets and *BSTA* banking sector total assets.

We have used the interest rate co-movement to assess the degree of monetary policy integration, as Cheung et al. (2008). Specifically, our measure of financial integration in this case is defined by:

$$IRCI_{i,ze,t} = corr(IR_{i,t}, IR_{ze,t}), \quad (6)$$

where  $IRCI_{i,ze,t}$  is the correlation index of the monetary policy interest rates in the country  $i$  with the ECB key interest rate over a rolling window of 3 years,  $IR_{i,t}$  is the monetary policy interest rate for the country  $i$ , and  $IR_{ze,t}$  denotes the ECB key interest rate.

In order to compute the correlation index of the interest rate, we have used a moving window of 3 years. As we have stated before, we have calculated the monetary policy interest rates correlation. Another possibility would have been to include in the exercise the government debt yield or the credit interest rates, as De Guevara et al. (2007). In their turn, Kalemli-Ozcan et al. (2008) used in this respect the cross-sectional standard deviation of the overnight lending rates.

The descriptive statistics of the dependent variables are presented in the Table 2.

#### 4.1.2 Independent variables

Besides the financial instability index calculated in the previous section, our paper encompasses, as independent control variables, the volume of foreign direct investment inflows (UNCTAD data) and the economic sentiment indicator computed by the European Commission for each member state.

On the one side, the FDI inflows are one of the most representative indicators for explaining economic and financial integration. Lane and Milesi-Ferretti (2003) and

**Table 2.** Descriptive statistics of dependent variables (1998–2008)

	<i>TO</i>		<i>TII</i>		<i>ASFOB</i>		<i>IRCI</i>	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Bulgaria	0.94	0.18	1.55	0.06	0.70	0.18	0.40	0.61
Czech Republic	1.14	0.16	2.15	0.04	0.73	0.23	0.43	0.64
Estonia	1.19	0.10	1.97	0.06	0.97	0.04	0.44	0.49
Hungary	1.18	0.12	1.98	0.02	0.72	0.11	-0.20	0.72
Lithuania	0.93	0.12	1.81	0.10	0.78	0.22	0.20	0.83
Latvia	0.75	0.07	1.89	0.07	0.62	0.12	0.24	0.63
Poland	0.58	0.11	2.05	0.05	0.65	0.18	0.15	0.70
Romania	0.62	0.07	1.79	0.08	0.56	0.21	-0.15	0.81
Slovak Republic	1.33	0.16	2.20	0.06	0.74	0.31	0.33	0.64
Slovenia	0.99	0.12	1.78	0.05	0.18	0.08	0.44	0.66

Vo and Daly (2007) considered the aggregate stock of foreign direct investment as a determinant of international financial integration. Di Mauro (2001) reckoned in his turn that the FDI flows represent one of the main channels for achieving the integration between the CEECs and the older EU members. In addition, Phylaktis and Ravazzolo (2002) also discussed on the relationship between foreign investment restrictions and the integration of capital markets.

On the other side, the economic sentiment indicator (*ESI*) emphasizes the connection between the economic and financial integration and the economic climate. All financial systems are interconnected and a deterioration of this indicator entails a negative impact on the integration process. The descriptive statistics of the independent variables are presented in the Table 3.

**Table 3.** Descriptive statistics of explanatory variables (1998–2008)

	<i>FII</i>		<i>FDI</i>		<i>ESI</i>	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Bulgaria	0.36	0.07	2.95	2.90	1.03	0.07
Czech Republic	0.30	0.03	6.30	2.78	1.02	0.08
Estonia	0.34	0.03	1.10	0.93	1.03	0.09
Hungary	0.39	0.02	4.31	1.83	1.01	0.09
Lithuania	0.40	0.03	0.87	0.59	1.02	0.09
Latvia	0.43	0.03	0.70	0.68	1.04	0.07
Poland	0.39	0.03	9.76	5.32	0.97	0.09
Romania	0.47	0.10	4.27	3.94	1.01	0.05
Slovak Republic	0.42	0.07	2.35	1.29	1.01	0.08
Slovenia	0.35	0.02	0.63	0.54	1.02	0.07

## 4.2 Econometric tests and results

As an econometric method, we have resorted to a panel data analysis. Certainly, the time series analyses have the advantage of better responding to the particularities of each financial system and possible structural breaks can be identified for the indicators retained into the analysis. However, most of the times, CEECs have been regarded as a homogenous group of states. In addition, these countries do not have a long tradition of statistical collection, recommending once more the panel data analyses.

Moreover, panel data sets for economic researches possess several major advantages over conventional cross-sectional or time-series data sets (Hsiao 2003). Panel data usually give the researcher a large number of data points, reducing the collinearity among explanatory variables—hence improving the efficiency of econometric estimates. If panel data are available, the inter-individual differences can be used to reduce the problem of collinearity. This allows to drop the ad hoc conventional approach of constraining the lag coefficients and to impose a different prior restriction to estimate an unconstrained distributed-lag model. Besides, the advantage is that panel data allow to construct and to test more complicated behavioural models than purely cross-sectional or time-series data. The use of panel data also provides a means of solving or reducing the magnitude of a key econometric problem that often arises in empirical studies, namely, the often heard assertion that the real reason for which one finds (or does not find) certain effects is the presence of omitted (mismeasured or unobserved) variables that are correlated with explanatory variables.

Panel data involve both a cross-sectional dimension (the investigated markets differ one from the other) and a time-series dimension (the status of each market varies from one period to another). In general, panel data analyses suppose the use of a pooled OLS model, a fixed-effects model or a random effects model. The first model is used seldom in recent literature, because it does not exploit the heterogeneity between countries, which may result in an omitted variable bias.

Therefore, it is preferable to use a fixed effects regression which will reduce the omitted variable bias. In particular, the persistent part of unobserved variables is proxied by country effects, which may be specified as fixed or as random effects. While random effect model is more efficient than the fixed effect model, it may be biased if random effects are correlated with other explanatory variables, as can be expected for our data set. Actually, this was confirmed by the Hausman test, which rejects the null of consistency of random effects. Therefore, we use only fixed effects for further analysis.

Furthermore, country effects reduce also the possible endogeneity problems, which rise because more open countries may be also more influenced by external financial developments. The permanent part of this interdependence is absorbed by the fixed effects. In addition, we include also the economic sentiment indicator in order to deal with possible impact of economic development. The estimated coefficient of *FII* shows the partial effects of financial developments given already the development of economic sentiment.

As a result, our specification includes fixed effects and two additional control explanatory variables, namely the FDI inflows, expressed in natural log, and the eco-

conomic sentiment indicator. The estimation equation can be stated as:

$$X_{it} = c_i + \alpha FII_{it} + \beta FDI_{it} + \gamma ESI_{it} + \varepsilon_{it}, \quad (7)$$

where  $X_{it}$  are the variables measuring the degree of economic and financial integration ( $TO$ ,  $TII$ ,  $ASFOB$ ,  $IRCI$ ),  $FII_{it}$  represents the financial instability index,  $FDI_{it}$  is the natural logarithm of the volume of the FDI inflows,  $ESI_{it}$  stands for the economic sentiment indicator, and  $\varepsilon_{it}$  are the errors of the model. The results of the econometric tests are presented in the Table 4 below.

**Table 4.** Results of econometric tests

	<i>TO</i>	<i>TII</i>	<i>ASFOB</i>	<i>IRCI</i>
<i>FII</i>	-0.4497 **	-0.2181 *	-1.3147 ***	-2.3019 *
<i>FDI</i>	0.0523 ***	-0.0313 ***	0.0562 **	0.1545
<i>ESI</i>	0.7539 ***	0.1399	0.8275 ***	2.2717
Fixed Effects				
Bulgaria	0.2707	1.5178	0.2836	1.5622
Czech Republic	0.4006	2.1280	0.1814	0.8207
Estonia	0.5726	1.8928	0.5614	1.3203
Hungary	0.4997	1.9666	0.3012	0.8224
Lithuania	0.3442	1.7450	0.4756	1.2110
Latvia	0.1944	1.8177	0.3447	1.3648
Poland	-0.0855	2.0705	0.2542	0.9465
Romania	0.0156	1.7927	0.2805	1.0530
Slovak Republic	0.6922	2.1765	0.4234	1.3121
Slovenia	0.4898	1.6914	-0.1715	1.7437
$R^2$	0.90	0.91	0.74	0.18
$DW$	0.85	1.46	0.75	1.90

Note: \*, \*\* and \*\*\* mean statistic relationship significant at 10%, 5%, 1%, respectively.

Some general findings are emphasized by the outcomes displayed in Table 4 above. First, the results of the four econometric specifications show that the financial instability index negatively influences the CEECs' economic and financial integration.

Second, the control variables sustain our findings in almost all the cases (except for the last one). The FDI flows play an important role in facilitating and encouraging commercial transactions, but also in the direction of financial integration. However, in the second test, the sign of the FDI inflows coefficient is negative, contrary to our expectations. The role of the economic sentiment indicator in favouring the integration process is positive, but it does not appear as significant in all the cases.

Third, taking into account the fact that we have used panel data, the explanatory capacity of the tested models, measured by means of  $R^2$ , can be considered as acceptable. Only the model relative to the influence of the  $FII$  on the key interest rate correlation index has a reduced explanatory power ( $R^2 = 0.18$ ).

## 5. Conclusion

The economic and financial integration process registered by the CEECs was important at the beginning of the years 2000s. The methods for assessing this phenomenon, as well as the factors influencing the integration, are of a different nature. However, the whole registered evolution seems to be adversely affected by the triggering of the recent financial crisis. Therefore, it is necessary to guarantee the financial stability in order to facilitate and encourage the integration process.

The relation between financial stability and integration is very important. A stable financial system promotes the employment and the economic development, which favour the integration process. An important role in financial integration is played by the banking sector. Thus, the stability of this sector sustains the integration process, especially in the CEECs case, where the banking sector is placed in the heart of the financial system. At the same time, instability periods affect both economic and financial integration.

Our research provides an empirical investigation aimed at identifying the negative influence of financial instability (measured by a financial instability index) on the level of CEECs' economic and financial integration. In addition to other approaches used to estimate financial instability, such as the EWS and the stress-tests, the aggregate index has the advantage of enabling both the dynamic capture of the instability phenomenon and a comparison between different countries. The financial instability index developed in our paper is adjusted to fit the characteristics of the CEECs financial systems, in terms of their financial development, vulnerability and banking sector importance.

We employed two classical indicators to measure the economic integration, namely the trade openness and trade intensity index, while indicators such as the interest rates co-movement and the asset share of foreign-owned banks were used to highlight financial integration. In our study, both the FDI inflows and the economic sentiment index helped validating the obtained results.

We estimated the impact of the financial crisis on economic and financial integration in a panel data analysis with fixed effects. The outcomes proved largely satisfactory, in particular the coefficient of the financial instability index used to measure the financial instability is negative and significant, indicating the effect of instability on the integration process. Consequently, the impact of the financial crisis on the CEECs' economies was important. Therefore, the efforts of the authorities have to focus on carrying forward the economic and financial integration, with particular attention to the stability of these countries' financial sectors, as one of the driving forces of the integration.

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