

Financial Integration among New EU Member States and the Euro Area ^{*}

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Abstract

The paper focuses on integration of financial markets (money, foreign exchange, bond and stock-exchange markets) in five new European Union member states (Czech Republic, Hungary, Poland, Slovakia and Slovenia) and three older EU members (Germany, Austria, Portugal) in comparison with the euro area. The main objective is to test for the existence and determine the degree of financial integration among these countries relative to the Euro Area (EU-12). The analysis is performed by means of the (i) application of the concept of beta convergence (through the use of time series, panel, and state-space techniques) to identify the speed of integration; and (ii) the application of so-called sigma convergence to measure the degree of integration. We find evidence of financial integration in all markets, strongest in the bond market followed by the foreign exchange, money and stock markets.

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1. Introduction

In a monetary union, integration of financial markets (e.g. money, foreign exchange, bond, and stock-exchange markets) plays the key role in assuring the effective transmission of a common monetary policy. The importance of conducting an assessment of the degree of financial integration across the euro area member countries is stressed by the European Central Bank (2007) – also see (Baele et al., 2004). Joining the euro area without a sufficient degree of financial market integration can cause problems in terms of transmission of a common monetary policy and common shocks. A high degree of financial market integration implies that euro-area wide shocks dominate; hence, a common monetary policy can be effectively applied to react to common shocks. On the other hand, in the case of weak financial market integration local (i.e. country-specific) shocks prevail, which diminishes the effectiveness of a common monetary policy. In the case of new EU member states, which are committed to adopting the euro at some point, it is especially important to analyze the alignment of their markets including the financial ones with those of the euro area countries.

Financial market integration should take place when financial assets having similar risk factors and yields are priced identically by the markets no matter where they are traded. This follows from the law of one price.¹ The more the individual segments of the financial markets of countries planning to adopt the euro become integrated with the European market, the more financial asset prices will be affected by global (European) factors associated with symmetric shocks rather than by local (national) effects associated with asymmetric shocks. Such shocks may be due to any factors capable of affecting asset prices. It can be assumed that with increasing integration the individual financial market segments will become a less likely source of asymmetric shocks. These reasons make it desirable for monetary policy makers to know the degree of, and trends in, integration of financial market segments. This analysis focuses on the integration of the money, foreign exchange, bond and stock markets.

2. Beta and sigma convergence

Adam et al. (2002) used the concepts of beta-convergence and sigma-convergence to demonstrate the process of financial market integration in the euro area countries.² The

¹ If the law of one price did not apply, there would be scope for arbitrage. If we assume a fully integrated market with no barriers (economic, legal, cultural, etc.), then any investor will be able to use this arbitrage opportunity, causing the law of one price to apply again.

² The terms beta-convergence and sigma-convergence originate from the literature on economic growth and its dynamics; see, for example, Barro and Sala-i-Martin (1992).

concept of beta-convergence enables identification of the speed at which shocks are eliminated on the individual financial markets. A negative beta coefficient signals the existence of convergence, and the magnitude of the beta coefficient expresses the speed of convergence, i.e. the speed of elimination of shocks to the yield differential vis-à-vis the euro area. The higher the absolute value of the beta coefficient, the higher the speed of convergence.

For quantification of beta-convergence, it is useful to apply common regression analysis or the panel estimate method, in the form of the equation:

$$\Delta R_{i,t} = \alpha_i + \beta R_{i,t-1} + \sum_{l=1}^L \gamma_l \Delta R_{i,t-l} + \varepsilon_{i,t}, \quad (1)$$

where $R_{i,t} = Y_{i,t} - Y_{i,t}^B$ is the difference between the asset yields of country i and a selected reference territory (a benchmark, European stock index) at time t , Δ is the difference operator, α_i is a dummy variable for the respective country, L is the maximum lag and $\varepsilon_{i,t}$ is a random member. The size of coefficient β may be interpreted as a direct measure of the convergence speed. A negative beta coefficient indicates occurrence of convergence, and the absolute value of the beta coefficient indicates the convergence speed. The β coefficient can take values ranging from 0 to -2. The closer the absolute value of the β coefficient to 1, the higher the speed of convergence, and if $\beta = 0$ or $\beta = -2$, no convergence is observed. β values from 0 to -1 indicate monotonous convergence, while fluctuating convergence occurs for values from -1 and -2.

The concept of sigma-convergence captures the differences between the yields on identical assets in different countries at a given time, identifying the degree of integration vis-à-vis the euro area achieved in the individual financial market segments in the countries under review at that time. Sigma-convergence arises if and when the sigma coefficient falls to zero. Beta-convergence may be accompanied by sigma-divergence, so both concepts must be tracked concurrently in order to prove financial integration. For quantification of sigma-convergence, a calculation is used of the (cross-section) standard deviation (σ), according to the formula:

$$\sigma_t = \sqrt{\left(\frac{1}{N-1}\right) \sum_{i=1}^N [\log(y_{it}) - \log(\bar{y}_t)]^2}, \quad (2)$$

where y is the asset yield, \bar{y} is the mean value of the data-set over time t and i stands for separate countries ($i = 1, 2, \dots, N$). For the purposes of this analysis, we introduce $N = 2$, i.e.

we examine the evolution of sigma-convergence over time between the euro area and one of the countries under review. σ takes only positive values in theory. The lower is σ , the higher is the level of convergence. In theory, full integration is reached when the standard deviation is zero, while high (several digit) values of σ reflect a very low degree of integration.

3. Data

The calculations were made using weekly data (averages of daily data) from Bloomberg, covering January 1995 to July 2007 for the foreign exchange and stock markets, 2001–2007 for the money market and 2002–2007 for the bond market – see Table 1. Three-month interbank rates were used for the money market, national currencies quoted against the US dollar for the foreign exchange market, five-year government bonds for the bond market and national stock indices for the stock market.

Table 1: Data sources

	Money market	Foreign exchange market	Bond market	Stock market
	1999-2007	1995-2007	2002-2007	1995-2007
CZ	PRIB03M INDEX	CZK CURRENCY	CZGB5YR INDEX	PX INDEX
AT	n.a.	n.a.	EC504050 GOVT	ATX INDEX
DE	n.a.	n.a.	GDBR5 INDEX ^B	DAX INDEX
PT	n.a.	n.a.	GSPT5YR INDEX	BVLX INDEX
HU	BUBOR03M INDEX	HUF CURRENCY	GHGB5YR INDEX	BUX INDEX
PL	WIB03M INDEX	PLN CURRENCY	POGB5YR INDEX	WIG INDEX
SI	961658 Index ^a	SIT CURRENCY ^b	n.a.	SVSM INDEX
SK	BBOR3M INDEX	SKK CURRENCY	CTSKK5YR GOVT	SKSM INDEX
EU-12	EUR003M INDEX ^B	USEU CURRENCY ^B	n.a.	SX5P INDEX ^{B, c}

Notes: ^B – benchmark, n.a. – data not available, ^a – data from January 2002 onwards, ^b – data up to end-2006, ^c – SX5P comprises the following weights of the national stock indices of the selected euro area countries (34.9% France, 23.3% Germany, 13.5% Spain, 12% the Netherlands, 11.8% Italy, 3.5% Finland and 0.9% Ireland).

Source: Bloomberg.

4. Results

The results of a beta-convergence analysis, as applied to individual financial market segments, are given in Table 2.

Table 2: Beta coefficients

	Money market			Foreign Exchange market			Bond market	Stock market		
	1999-2007	1999-2000	2001-2007	1995-2007	1995-2000	2001-2007	2002-2007	1995-2007	1995-2000	2001-2007
CZ	-0.57	-0.61	-0.60	-0.86	-0.86	-0.87	-0.91	-0.79	-0.74	-0.89
AT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-0.87	-0.85	-0.91	-0.87
DE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	B	-0.75	-0.79	-0.72
PT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-0.60	-0.89	-0.85	-0.95
HU	-0.79	-0.54	-0.83	-0.83	-0.80	-0.87	-0.84	-0.82	-0.78	-0.87
PL	-0.68	-0.69	-0.64	-0.87	-0.88	-0.86	-0.75	-0.87	-0.86	-0.92
SI	-0.57 ^a	n.a.	-0.57 ^a	-0.92 ^b	-0.82	-1.04 ^b	n.a.	-0.78	-0.77	-0.85
SK	-0.75	-0.77	-0.77	-1.0	-1.08	-0.84	-0.78	-0.71	-0.71	-0.78
EU-12	B	B	B	B	B	B	n.a.	B	B	B

Notes: B – benchmark, n.a. – data not available, ^a – data from January 2002 onwards, ^b – data up to end-2006. All estimations were significant at the 1% level.

Source: Author's calculation based on Bloomberg.

The table shows that yields on the Czech stock and bond markets are converging towards those on corresponding euro area financial instruments relatively quickly, at a pace similar to that observed in Portugal and Austria. The speed of elimination of shocks on the Czech stock market has recently increased. As regards the foreign exchange market, the speed of the Czech Republic's convergence is comparable to other new Member States except Slovenia, but it is lower on the money market.³ Yield convergence towards the euro area (towards Germany in the case of bond markets) occurs in all the countries under review. The absolute values of the beta coefficient are close to one for all the countries and markets except the money market, which means that the levelling of newly arising differences in yield differentials between the relevant national economy and the euro area can be labelled as fast. A comparison of the periods 1995–2000 and 2001–2007 reveals that the pace of beta-convergence of the stock markets of the new EU Member States under review has increased

³ Yields on money market assets are affected to a certain extent by the monetary policy decisions of the state in question, which somewhat reduces the validity of the law of one price. Therefore, the speed of beta convergence is lower on the money market than on the other markets.

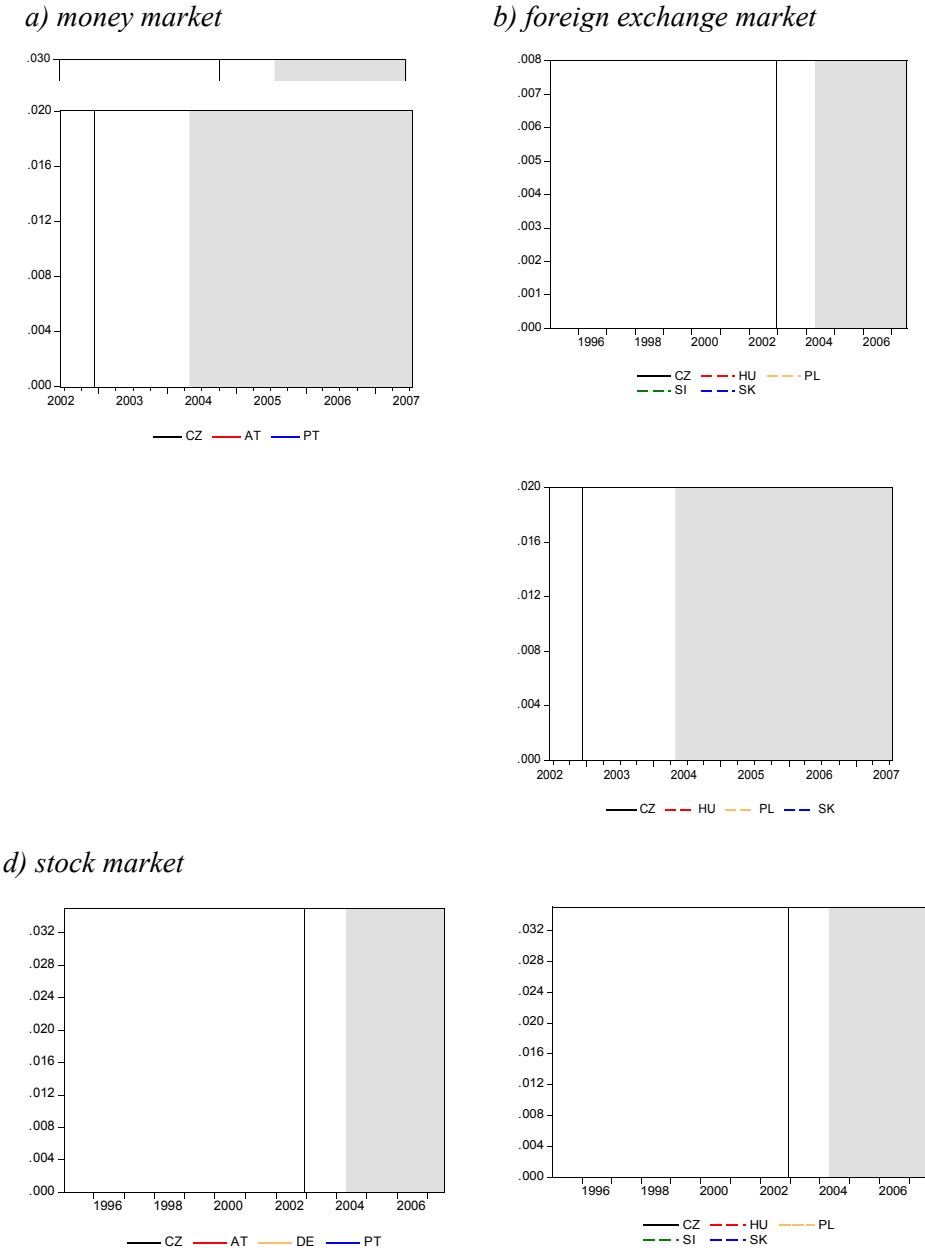
over time. As regards the money and foreign exchange markets, it rose only in Hungary, but the new Member States generally achieve high levels of beta-convergence of their financial markets towards the euro area.

The results of sigma-convergence analysis for the individual segments of the financial market and the countries under review vis-à-vis the euro area (Germany⁴ for the bond markets) are shown in Figure 1.⁵ Compared to the markets of other new Member States, the Czech financial market appears more integrated (especially in the case of the foreign exchange and stock markets). Only the Slovenian money and foreign exchange markets achieved a higher degree of integration, which is connected with the adoption of the euro. However, significant differences in the yields on the Slovenian stock market persist. Foreign exchange markets may seem more volatile, but the sigma values are very low here, reflecting the relatively strong integration of these markets. As regards stock markets, the degree of integration achieved in the Czech Republic is comparable to that observed in Portugal, Austria, and Germany, but this is not yet the case for bond markets. Overall, it can be seen that gradual trend sigma-convergence of stock, bond and money markets has been taking place in all the observed countries since 2001. This may be linked with the announcement of EU enlargement (12–13 December 2002).

⁴ Interpretation of the values for Germany should also take into account the fact that the data for Germany have a significant weight in the calculation of the data for the euro area.

⁵ For chart type expression, the results were filtered using the Hodrick-Prescott filter with the recommended weekly time series coefficient $\lambda = 270\,400$.

Figure 1: Developments in sigma coefficient values



Note: Lower standard deviation values (vertical axis) correspond to a higher convergence level. The grey area represents EU enlargement on 1 May 2004 and the vertical line represents the announcement thereof on 12–13 December 2002.

Source: Author’s calculation.

5. Conclusion

In this paper we study the speed (by means of the beta-convergence) and level (by means of the sigma-convergence) of the financial integration in the five new EU member states (Czech Republic, Hungary, Poland, Slovakia and Slovenia) and three older EU members (Germany, Austria, and Portugal) in comparison with the euro area as a whole. The results show both strong beta-convergence and sigma convergence in all markets. The most integrated financial market seems to be the bond market followed by the foreign exchange, money and stock markets.

Next, we do not find a major impact of either EU enlargement or the announcement thereof on beta-convergence. In fact, the high speed of beta-convergence was achieved much earlier, during the 1990s. Furthermore, the patterns of the sigma-convergence for the countries considered suggest an overall decrease in volatility.

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