EUROPEAN CENTRAL BANK

EUROSYSTEM

MEASURING FINANCIAL INTEGRATION IN NEW EU MEMBER STATES

by Markus Baltzer, Lorenzo Cappiello,
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€10 banknote.

CONTENTS

EXECUTIVE SUMMARY

In light of the recent accession of new countries in the European Union (EU) and their future entry in the euro area, it has become increasingly important to follow developments in these markets. This study provides a comprehensive overview on the state of financial integration in the new EU Member States. These countries comprise the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, and Slovakia, which joined the EU on 1 May 2004, and Romania and Bulgaria, which joined on 1 January 2007. Since the bulk of the analysis covers the period from 1996 until 2006, we also consider EU member states, Slovenia (which joined the euro area on 1 January 2007), as well as Cyprus and Malta (which joined on 1 January 2008).

Monitoring these countries' economies is not only relevant from a policy-making point of view, but is also interesting in itself owing to their specific characteristics. For instance, on the real economy side, many of these countries went from being centrally planned economies, through market economies, to fully open economies, taking about twelve years to become members of a free trade area. Moreover, these economies experienced very rapid development and liberalisation of their financial markets undergoing these changes at roughly the same pace. Finally, since the new EU Member States will eventually join the euro area, it is important to monitor developments in their financial markets as well as links with the euro area from a monetary policy perspective.

To assess the degree of financial integration of the new EU Member States (plus Cyprus, Malta and Slovenia), this paper adopts a methodology developed previously by Baele et al. (2004). Subject to data availability, this paper replicates the indicators used in that study. This allows us to build on an already established methodology and, at the same time, directly compare developments in the new EU Member States (plus Cyprus, Malta and Slovenia) with those in the euro area. Some of the results we obtain need to be interpreted with caution due the lower quality of some data for the countries included in the analysis. However, after the entry in the European Union, the availability and reliability of data has been gradually improving.

The study considers three broad categories of financial integration measures: (i) price-based, which capture discrepancies in asset prices across different national markets; (ii) news-based, which analyse the impact that common factors have on the return process of an asset; (iii) quantity-based, which aim at quantifying the effects of frictions on the demand for and supply of securities.

This paper finds that financial markets in the new EU Member States (plus Cyprus, Malta and Slovenia) are significantly less integrated than those of the euro area. Nevertheless, there is strong evidence that the process of integration is well under way and has accelerated since accession to the EU.

According to the indicators adopted in the paper, money and banking markets are becoming increasingly integrated both among themselves and vis-à-vis the euro area. However, it should be noticed that the process of financial integration in the new EU Member States (plus Cyprus, Malta and Slovenia) is probably driven by different factors than those behind the euro area. The transition from planned to market economies has led to rapid financial developments, which has been further boosted by a strong foreign, mainly EU, banking presence. For instance, the percentage of asset shares of foreign-owned banks (relative to total bank sector assets) increased from 30% in 1997 to around 75% in 2005.

As for government bond markets, only the largest economies (the Czech Republic, Poland and to a lesser extent Hungary) exhibit signs of integration. These results need to be interpreted with caution, as the liquidity of the underlying markets may distort the measures.

Finally, the evidence for equities suggest a relatively low level of integration. However, we find that stock markets are increasingly affected by euro area shocks, especially after the accession date (May 2004).

I INTRODUCTION

Developments in financial markets have shaped the economic and policy debate in recent years. Financial integration issues have played an important role in this debate, not least because a well integrated financial system reduces the cost of capital and improves the efficient allocation of financial resources.

The European Central Bank (ECB) is closely monitoring the state of integration of euro area financial markets (see, for instance, ECB 2005a, 2006a and 2007). In the light of the recent accession of new countries to the EU and their future entry in the euro area, it has become increasingly important also to follow developments in these markets. Although a number of papers exist on this subject, they either focus on certain market segments, or follow specific methodologies.[1] Instead, this paper follows very closely the framework adopted by Baele et al. (2004). This allows us to build on an already established methodology and, at the same time, directly compare developments in new EU Member States with those in the euro area. Subject to data availability, we replicate the indicators of that study, providing a comprehensive overview of the state of financial integration in new EU Member States, namely the Czech Republic (CZ), Estonia (EE), Hungary (HU), Latvia (LV), Lithuania (LT), Poland (PL), and Slovakia (SK), which joined the EU on 1 May 2004, and Romania (RO) and Bulgaria (BG), which joined on 1 January 2007. Since the bulk of the analysis covers the period from 1996 until 2006, we also consider EU member states, Slovenia (SI), which joined the euro area on 1 January 2007, as well as Cyprus (CY) and Malta (MT), which joined on 1 January 2008.

Monitoring these countries' economies is not only relevant from a policy-making point of view, but is also interesting in itself owing to their specific characteristics. For instance, on the real economy side, many of these countries went from being centrally planned economies, through market economies, to fully open economies, taking about twelve years to become members of a free trade area. Moreover, these economies experienced very rapid development and liberalisation of their financial markets undergoing these changes at roughly the same pace. Finally, since the new EU Member States will eventually join the euro area, it is important to monitor developments in their financial markets as well as links with the euro area from a monetary policy perspective.

The measures of financial integration adopted are based on the definition given by Baele et al. (2004): the market for a given financial instrument and/or service is considered fully integrated if all economic agents with the same relevant characteristics acting in that market face a single set of rules, have equal access, and are treated equally.

While the above definition describes an ideal state of perfect integration and as such its conditions are rarely met in practice,[2] it provides a useful benchmark against which one can assess the degree of financial integration, underpinning the analytical and empirical analysis of this study.

A number of existing contributions (see, for instance, Adam et al., 2002) adopt the law of one price to assess the degree of financial integration. According to the law of one price, assets with identical risk and return characteristics should have the same price regardless of where they are traded. It is easy to see that the law of one price is in fact an implication of the above definition: if all agents face the same rules, have equal access and are treated equally, any price difference between two identical assets will be immediately arbitraged away. Still, there are cases where the law of one price is not directly applicable. For instance, an asset may not be allowed to be listed on another region's exchange, which according to our definition would constitute an obstacle to financial integration. Another example is represented by assets such as equities or corporate bonds.

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1   See, for example, ECB 2002, 2005b; Dvorak and Geiregat, 2004; Reininger and Walko, 2005; and Cappiello et al., 2006.

2   Euro area overnight money markets are one such exception.

These securities are characterised by different cash flows and very heterogeneous sources of risk, and as such their prices are not directly comparable. Therefore, alternative measures based on stocks and flows of assets (quantity-based measures) as well as those investigating the impact of common shocks on prices (news-based measures) may usefully complement measures relying on price comparisons (price-based measures).

Our analysis is strongly limited by data availability for all market segments.[3] For instance, government bond markets for the new EU Member States as well as Cyprus, Malta and Slovenia started relatively late, towards the beginning of 2000. Data for corporate bonds are not available for longer periods. Furthermore, some of these markets are characterised by relatively low liquidity, resulting in many stale quoted prices. This in turn may impact the reliability of some of the indicators which we compute.

The findings show that, not surprisingly, financial markets in the new EU Member States together with Cyprus, Malta and Slovenia are significantly less integrated than those of the euro area. Nevertheless, there is strong evidence that the process of integration is well under way and accelerated following accession to the EU. According to the indicators used, money and banking markets are becoming increasingly integrated both among themselves and vis-à-vis the euro area. However, it should be noticed that the process of financial integration in the countries included in the analysis is probably driven by different factors than those in the euro area. As mentioned above, the transition from planned to market economies has led to rapid financial developments, which has been further boosted by a strong foreign, mainly EU, banking presence. For instance, the percentage of asset shares of foreign-owned banks (relative to total bank sector assets) has increased from 30% in 1997 to around 75% in 2005.[4]

As for government bond markets, only the largest economies (the Czech Republic, Poland and to a lesser extent Hungary) exhibit signs of integration. These results need to be interpreted with caution, as the liquidity of the underlying markets may distort some of the integration measures. Finally, the evidence for equities suggest a relatively low level of integration. However, we find that stock markets are increasingly affected by euro area shocks, especially following the accession date (May 2004).

The paper is structured as follows. Section 2 describes the indicators that will be used in the empirical analysis which are grouped into three categories, namely price-based, news-based and quantity-based indicators. Sections 3 to 6 present the empirical results for money, government bond, banking and equity markets and section 7 concludes.

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3   Some of the results we obtain need to be interpreted with caution due the lower quality of some data for the new EU Member States. However, after the entry in the European Union, the availability and reliability of data has been gradually improving.
4   See "Transition Report 2006: Finance in Transition," European Bank for Reconstruction and Developments.

2 MEASURES OF FINANCIAL INTEGRATION

Financial integration is measured following the approach adopted by Baele et al. (2004). The idea is to use the definition of financial integration discussed in the introduction and to assess the impact that existing barriers or frictions have on the functioning of different markets.

The framework aims at measuring the current level of financial integration, as well as identifying possible developments in the financial markets of new EU Member States as well as Cyprus, Malta and Slovenia. We consider three broad categories of financial integration measures:

(i) price-based, which capture discrepancies in asset prices across different national markets;

(ii) news-based, which analyse the impact that common factors have on the return process of an asset;

(iii) quantity-based, which aim at quantifying the effects of frictions on the demand for and supply of securities.

Data availability for the new EU Member States (plus Cyprus, Malta and Slovenia) is much more limited than for euro area countries. Therefore, only a subset of the measures proposed in Baele et al. (2004) can be implemented here. In the rest of the section we describe the indicators used.

2.1 PRICE-BASED MEASURES

According to the law of one price, assets with identical cash flow and risk characteristics should have the same price, independently of the location where they are traded. The cash flow and risk characteristics of money and government bond markets are, for instance, sufficiently comparable to allow for the law of one price to be tested. For example, the euro area money markets, where, with the common monetary policy and the elimination of the exchange rate risk, yields have perfectly converged across countries. Similarly, for government bonds, increasing financial integration should imply yield convergence, once credit and liquidity risks are taken into account. On the other hand, corporate bond yields, retail interest rates and equity returns are not directly comparable, as they are characterised by different cash flows and very heterogeneous sources of risk.

Several recent papers use changes in returns dispersion to test the law of one price (see, for example, Solnik and Roulet, 2000, Adjaouté and Danthine, 2004, Baele et al., 2004, Byström, 2006, and Eiling and Gerard, 2006). The hypothesis is simple: If returns are highly correlated, then more often than not they will move together on the up side or on the down side. If they do, the instantaneous cross-sectional variance of these returns will be low. Conversely, lower correlations mean that returns often diverge, inducing a high level of dispersion. Hence dispersions and correlations are inversely related.

For fixed-income securities, we consider indicators based on nominal yields.[5]

MONEY, GOVERNMENT BOND AND CREDIT MARKET INTEGRATION MEASURES

This section describes the indicators which are especially appropriate for money, government bond and credit markets.

1. Spread between the yield on a local asset and a benchmark asset:

$$S_{i,t} \equiv y_{i,t} - y_{B,t},$$

where $y_{i,t}$ and $y_{B,t}$ represent the yields to maturity at time t for country i and the benchmark asset, respectively.

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5 With increasing coordination of monetary policy and real macroeconomic convergence, financial integration implies convergence in both nominal and real yields. We look at nominal yields to be consistent with the analysis of Baele et al. (2004).

2a. Cross-sectional dispersion in yield spreads:

$$\sigma_t^s \equiv \sqrt{I^{-1} \sum_{i=1}^{I} \left(S_{i,t} - \bar{S}_t\right)^2}$$

where I is the number of countries in the analysis, and $\bar{S}_t$ is the cross-sectional average of all yield spreads at time t.[6]

2b. Cross-sectional dispersion in yields relative to the benchmark:

$$\tilde{\sigma}_t^y \equiv \sqrt{I^{-1} \sum_{i=1}^{I} \left(y_{i,t} - y_{B,t}\right)^2}$$

3. Beta-convergence:

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

where $\Delta S_{i,t}$ represents the change in yield spread. L denotes the number of lags and in the empirical applications is set equal to 2. The coefficients are estimated with a panel regression with fixed effects (α_i). A negative β indicates that securities with high spreads have a tendency to converge to the benchmark yield more rapidly than securities with low spreads. In addition, the absolute magnitude of β measures the average speed of convergence in the overall market.

2.2 NEWS-BASED MEASURES

Although the thinking behind dispersion measures is appealing, it may be misleading in dynamic environments in which volatilities and exposure to common shocks change over time. This is a serious issue as the evidence of time variation in total returns and idiosyncratic volatility is ample and continuously growing (see, for example, Campbell et al. 2001). This may limit the reliability of changes in dispersion as an indicator of market integration. To illustrate our concern, consider a set of countries whose financial and goods markets are fully segmented and uncorrelated, and subject to time varying idiosyncratic risk. Also, assume that mean expected returns are zero. In this scenario

a decrease in return dispersion by itself only indicates a decrease in average idiosyncratic volatility and not an increase in the degree of market integration.

A complementary strategy is to consider more sophisticated measures of comovements (see, for instance, Cappiello et al. 2006, and Gerard et al. 2006). In integrated markets, local shocks can be effectively diversified away and prices are mainly driven by common factors. In line with this logic, news-based measures examine how national returns depend on returns on a (common) benchmark asset. Ceteris paribus, the greater the proportion of price variation explained by common factors, the greater the degree of integration. A key step in the implementation of this measure is the specification of the common factor. For example, in the case of 10-year government bond markets the benchmark may be given by the corresponding German bond. For equities, the choice depends on an assumption relating to the factor structure of the return process.

FIXED INCOME SECURITIES
Indicators of convergence may be derived by running the following regression:

$$\Delta y_{i,t} = \delta_{i,t} + \theta_{i,t} \Delta y_{B,t} + \varepsilon_{i,t},$$

where $y_{i,t}$ is the yield on a government bond for country i, while $y_{B,t}$ is the yield on the benchmark government bond, and Δ is the time difference operator. The coefficients are made time varying using moving average regression techniques. In this paper, parameters are estimated using a window of eighteen months of data. As markets become more integrated $\delta_{i,t}$ should converge to zero, $\theta_{i,t}$ to one and the proportion of the variance explained by the common factor should converge to one as well. If we denote the OLS estimates of equation (1) with $\hat{\delta}_{i,t}$ and $\hat{\theta}_{i,t}$, the following indicators can be defined.

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6   Notice that this indicator is identically equal to the cross-sectional dispersion in yields, i.e. $\sigma_t^s \equiv \sqrt{I^{-1} \sum_{i=1}^{I}(y_{i,t} - \bar{y}_t)^2}$, where $\bar{y}_t$ is the cross-sectional average of all yields at time t.

4a. Dispersion of intercepts:

$$\sigma_t^\delta \equiv \sqrt{I^{-1}\sum_{i=1}^{I}\hat{\delta}_{i,t}^2},$$

4b. Dispersion of slope coefficients:

$$\sigma_t^\theta \equiv \sqrt{I^{-1}\sum_{i=1}^{I}\left(\hat{\theta}_{i,t}-1\right)^2}.$$

These two indicators represent a time varying aggregate measure of market integration. As the individual country coefficients converge to their limiting values, the associated dispersion should converge to zero.

4c. Variance ratio:

$$VR_{i,t}=\frac{\hat{\theta}_{i,t}^2 Var(\Delta y_{B,t})}{Var(\Delta y_{i,t})}.$$

As integration increases, yields across countries should increasingly be correlated and therefore the proportion of national yield variation explained by the common factor should become larger.

EQUITIES

Integration in equity markets is measured by evaluating to what extent variation in national equity index returns is driven by common components. The approach is similar to that adopted by Bekaert and Harvey (1997). We distinguish between a euro area wide and a global common component. As a proxy for world news we use innovations from a model on US equity returns, while euro area news are derived from a model for Eurostoxx.

The estimation procedure is based on three steps. First, we estimate an equity return equation for the US:

$$R_{US,t} = \mu_{US,t} + \varepsilon_{US,t},$$

where $\mu_{US,t} = \alpha_{US} + \gamma_{US} R_{US,t-1}$ and the error term follows an asymmetric generalised

autoregressive conditionally heteroskedastic (A-GARCH) process, i.e.

$$E_t\left(\varepsilon_{US,t}^2\right)\equiv\sigma_{US,t}^2=\zeta_{US,0}+\zeta_{US,1}\varepsilon_{US,t-1}^2+$$
$$\zeta_{US,2}I\left(\varepsilon_{US,t-1}<0\right)\varepsilon_{US,t-1}^2+\zeta_{US,3}\sigma_{US,t-1}^2.$$

$E_t(.)$ denotes the expectation operator conditional on the information set available at time t and $I(\cdot)$ the indicator operator which takes on value one if the argument is true and zero otherwise.

Second, we estimate a similar equation for the euro area equity market:

$$R_{EU,t} = \mu_{EU,t} + \varepsilon_{EU,t},$$

$$\varepsilon_{EU,t} = \beta_{EU}^{US}\varepsilon_{US,t} + e_{EU,t},$$

where $\mu_{EU,t} = \alpha_{EU} + \gamma_{EU} R_{EU,t-1}$ and the error term $e_{EU,t}$ follows an A-GARCH, i.e.

$$E_t\left(e_{EU,t}^2\right)\equiv\sigma_{EU,t}^2=\zeta_{EU,0}+\zeta_{EU,1}e_{EU,t-1}^2+$$
$$\zeta_{EU,2}I\left(e_{EU,t-1}<0\right)e_{EU,t-1}^2+\zeta_{EU,3}\sigma_{EU}^2$$

Third, we estimate the model for individual country returns as follows:

$$R_{i,t} = \mu_{i,t} + \varepsilon_{i,t},$$

$$\varepsilon_{i,t} = \beta_{i,t}^{US}\varepsilon_{US,t} + \beta_{i,t}^{EU}e_{EU,t} + e_{i,t},$$

where $\mu_{i,t} = \alpha_i + \gamma_i R_{i,t-1}$ and the error term $e_{i,t}$ follows an A-GARCH, i.e.

$$E_t\left(e_{i,t}^2\right)\equiv\sigma_{i,t}^2=\zeta_{i,0}+\zeta_{i,1}e_{i,t-1}^2+$$
$$\zeta_{i,2}I\left(e_{i,t-1}<0\right)e_{i,t-1}^2+\zeta_{i,3}\sigma_{i,t-1}^2$$

The beta coefficients in the last equation are made time varying using time dummies which identify historical periods in the countries under study.

On the basis of the estimated parameters, $\beta_{i,t}^{EU}$ and $\beta_{i,t}^{US}$, we compute the following variance ratios, which give, respectively the proportion of variance for country i equity

returns explained by euro area wide and global factors:

5a. Euro area variance ratio:

$$VR_{i,t}^{EU} = \frac{\left(\hat{\beta}_{i,t}^{EU}\right)^2 \sigma_{EU,t}^2}{\sigma_{i,t}^2}.$$

5b. Global variance ratio:

$$VR_{i,t}^{US} = \frac{\left(\hat{\beta}_{i,t}^{US}\right)^2 \sigma_{US,t}^2}{\sigma_{i,t}^2}.$$

2.3 QUANTITY-BASED MEASURES

Quantity-based indicators can be constructed from data on cross-border financial flows of the euro area vis-à-vis the new EU Member States (plus Cyprus, Malta and Slovenia). As pointed out, for example by Guiso et al. (2005), regional financial integration should increase the supply of finance in the less financially developed countries of the integrating area. The process of integration should increase cross-border investments among countries which join the EU and are in the process of joining the European and Economic Monetary Union (see, for instance, De Santis and Gerard, 2006).

In developing the indicators, we need to determine whether the capital inflows to the new EU Member States (plus Cyprus, Malta and Slovenia) are coming from countries inside or outside the euro area. If the share of euro area investment in the countries under investigation increases relative to that of the rest of the world, this will suggest an enhancement in financial integration. To control for global trends, capital inflows from developed countries [7] to five main developing regions are also identified, (1) the new EU Member States (plus Cyprus, Malta and Slovenia); (2) other developing European countries, including Turkey and Russia; (3) Africa and Middle East; (4) Latin America and Caribbean; and (5) developing Asian and Pacific economies. This gives an indication of the extent to which increasing trends in capital flows are of a global nature. Suppose, for example, that the flow of capital from the euro

area to the new EU Member States increases relative to other developing regions.

Again, this will be consistent with a greater degree of integration between the euro area and the new EU Member States.

We adopt two measures to gauge the proportion of cross-border portfolio flows. First, we compute the amount of capital that residents of developed countries invest in developing economies relative to the total foreign assets held by residents in developed countries.

6a. International investment relative to total foreign assets:

$$Q_{ir,t}^{I} = \frac{Outstock_{ir,t}}{TOutstock_{r,t}},$$

$i \in set\ of\ developing\ regions$, $r \in set\ of\ developed\ regions$, where $Outstock_{ir,t}$ denotes the value of assets issued by residents of the developing region i and held by residents in region r; and $TOutstock_{r,t}$ is the total foreign assets held by residents in region r.

Second, we consider the same amount of capital invested by developed countries, but relative to their total portfolio.

6b. International investment relative to total domestic assets:

$$Q_{ir,t}^{T} = \frac{Outstock_{ir,t}}{TOutstock_{r,t} + MKT_{r,t} - TInstock_{r,t}},$$

where $MKT_{r,t}$ stands for market capitalisation in region r; and $TInstock_{r,t}$ is the total foreign liabilities of region r.

As for bank loans, we use the flows of commercial banks loans. The use of flows rather than stocks has the advantage that the computed measures exclude changes in the indices due to exchange rate evaluation changes.[8]

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7 We consider developing countries' assets held by residents (excluding central banks) of the euro area, the UK, the US and the whole set of developed countries.
8 Note that this indicator may be sensitive to asset price changes.

6c. International bank loans investment relative to total foreign bank loans investment:

$$Q_{ir,t}^{L} = \frac{Outstock_{ir,95} + Outflows_{ir,t}}{TOutstock_{r,95} + TOutflows_{r,t}},$$

where $Outstock_{ir,95}$ and $Outflows_{ir,t}$ denote respectively the value of the stock of loans as at the end of 1995 and the cumulated flows of loans over time to the developing region i from countries/region r; $TOutstock_{r,95}$ and $TOutflows_{r,t}$ are respectively the total value of the stock of loans as at the end of 1995 and the cumulated flows of total loans over time to the rest of the world from countries/region r.

3 MONEY MARKETS

The money market covers debt instruments with maturity up to one year. We analyse overnight, 1-month, 12-month interbank lending rates, as well as the 1-year swap rate.
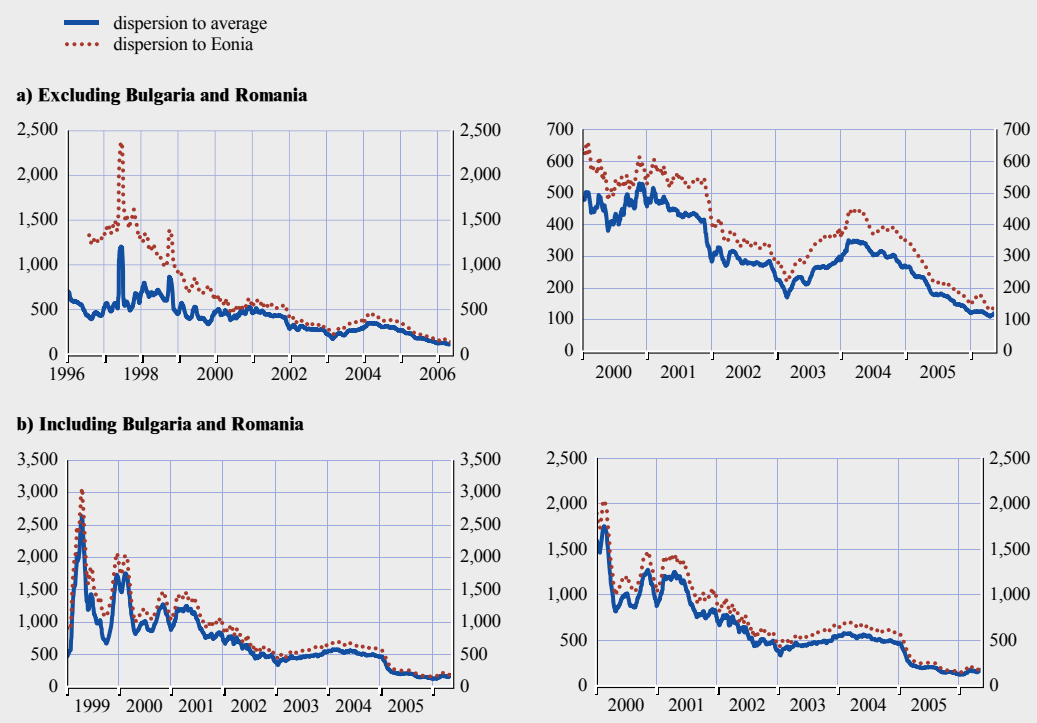
Charts 1a and 1b plot the dispersion of overnight lending rates relative to the cross-sectional average and to the EONIA rate excluding and including Bulgaria and Romania, respectively, which joined the EU as of 1 January 2007. We report the two measures of dispersion as per indicators no. 2a and 2b. Chart 1a shows a gradual but continuos reduction of cross sectional dispersion. The two spikes observed in May 1997 and October 1998 reflect outliers in the Czech and Slovakian overnight rates, respectively. In May 1997 the Czech financial markets plunged into an unprecedented crisis with severe currency turbulences.[9] This crisis was mainly due to a large trade deficit, as well as high real wage inflation associated with a slowing economy. Then, in October 1998, Slovakia experienced a severe currency crisis as a result of a large domestic fiscal deficit, as well as possible contagious effects stemming from the turmoil experienced in the Czech Republic and Russia in 1997 and 1998, respectively.[10] Chart 1b shows more pronounced volatility in the dispersion measure in the first half of the sample and higher average dispersion. Nevertheless, chart 1b exhibits a pattern that is broadly similar to that of chart 1a.

9 At the end of the month, the Czech National bank removed the fluctuation bands for the koruna and announced that the currency would only be fixed daily against the Deutsche Mark, which led to an immediate drop in the value of the currency.
10 Similarly to the Czech case, the crisis resulted in a change of the exchange rate regime and a subsequent depreciation of the Slovak crown.

Chart 1 Dispersion of overnight lending rates

— dispersion to average
····· dispersion to Eonia

a) Excluding Bulgaria and Romania

b) Including Bulgaria and Romania

Sources: Datastream, ECB, Global Financial Data and authors' calculations.
Note: Charts 1a and 1b plot the standard deviations of overnight lending bidrates relative to the cross-sectional average (blue line) and to overnight benchmmark rate (red dotted line). The lines represent 30-day moving average in basis points. The benchmark rates are the German Fibor before 1999 the Eonia afterwards. The countries included are: CZ, HU, LT (from Jan. 1999 to Dec. 2005), LV (from Dec. 1997), PL, SI, SK (chart 1a). BG (from Feb. 2003) and RO (from Feb. 1999) are only included in chart 1b.
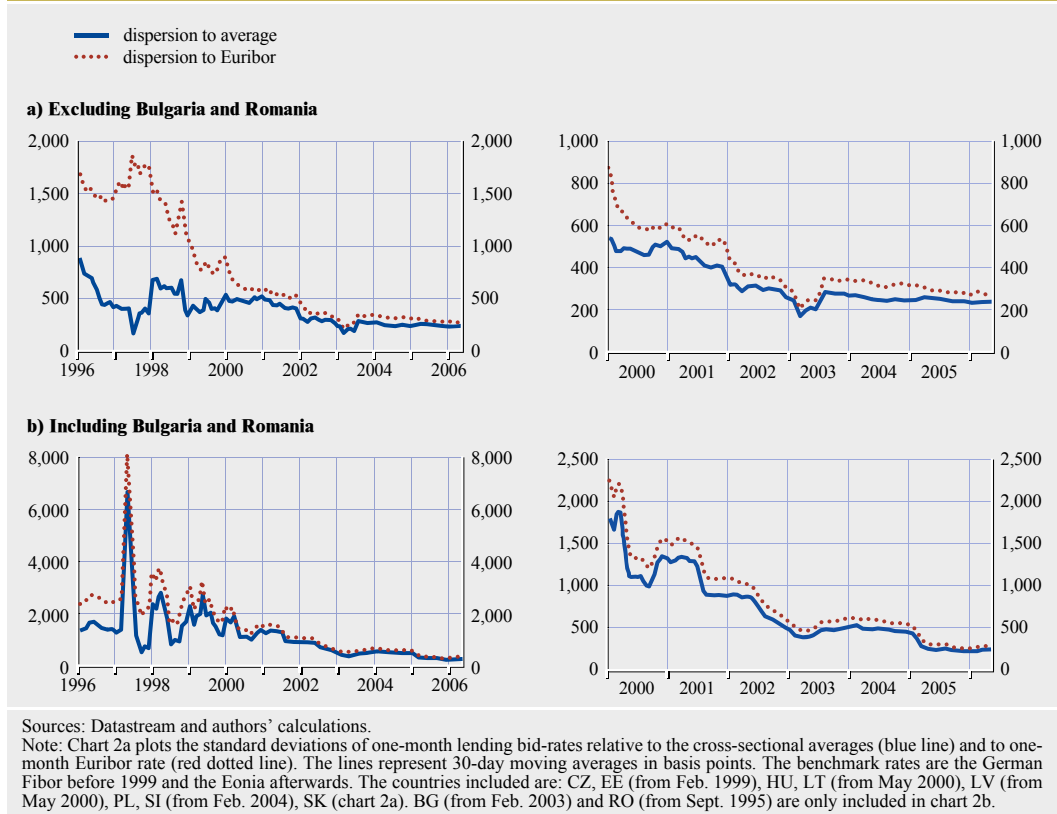
Chart 2 Dispersion of one-month lending rates

— dispersion to average
····· dispersion to Euribor

a) Excluding Bulgaria and Romania

b) Including Bulgaria and Romania

Sources: Datastream and authors' calculations.
Note: Chart 2a plots the standard deviations of one-month lending bid-rates relative to the cross-sectional averages (blue line) and to one-month Euribor rate (red dotted line). The lines represent 30-day moving averages in basis points. The benchmark rates are the German Fibor before 1999 and the Eonia afterwards. The countries included are: CZ, EE (from Feb. 1999), HU, LT (from May 2000), LV (from May 2000), PL, SI (from Feb. 2004), SK (chart 2a). BG (from Feb. 2003) and RO (from Sept. 1995) are only included in chart 2b.

Chart 1a shows that, until the end of 1990s, the dispersion vis-à-vis the Fibor rate[11] was much larger than the corresponding dispersion relative to the cross-sectional average. This indicates that the money market rates of the new EU Member States (plus Cyprus, Malta and Slovenia) were closer to each other than to the EONIA. After 2000 the divergence between the red dotted and blue lines diminishes and almost disappears towards the end of the sample.

According to chart 1a, the degree of convergence has been substantial over the past ten years, since the indicators dropped from about 1500 basis points in the second half of the 1990s' to around 100 basis points over the past few years. The speed of convergence was particularly high towards the end of the 1990s'. To put these figures into perspective, it is worth noticing that the corresponding indicator for the euro area was hovering around 100 basis points in 1998, before

dropping to almost zero with the introduction of the euro (see chart 1 of Baele et al., 2004). Of course, part of the remaining dispersion for the new EU Member States (plus Cyprus, Malta and Slovenia) may reflect the presence of exchange rate risk.

Charts 2a and 3a show a pattern similar to that of the overnight rate indicator. The trend is decreasing, suggesting that integration is taking place. As for charts 2b and 3b, we notice that the inclusion of Romania generates a substantial increase in the dispersion of the first part of the sample (with dispersion spikes well above 6000 basis points), while convergence seems to take place over the last couple of years.[12]

11 Before 1999 Eonia did not exist and is proxied with the Fibor rate.
12 In the first half of 1997 the Romanian leu depreciated sharply as a result of liberalisation of the foreign exchange market and relatively higher inflation rates. Note that chart 3b does not include Bulgaria due to lack of data.
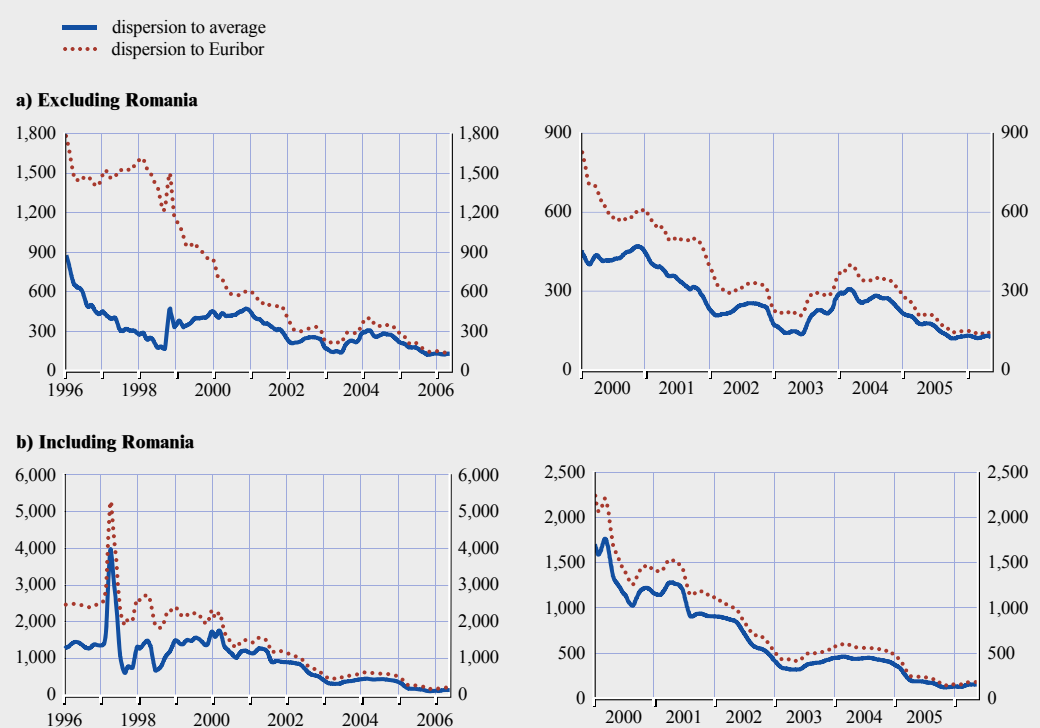
Chart 4 reports the development of the dispersion in the one year swap rates. The pattern of the indicator, and in particular the increase in dispersion around the year 2004, reflects an increase in the Hungarian and to a less extent in the Polish rates. Increases in these rates are in line with the other money market indicators for Hungary and Poland. After the ratification of the Nice Treaty at the end of 2002, which primarily reformed the institutional structure of the European Union to withstand the planned eastern enlargement, in Hungary there were fundamental concerns about the fiscal discipline and continously elevated inflation expectations.

Figures at the end of the sample of charts 2-4 are roughly comparable with those of the corresponding euro area markets in the run up to the EMU (see charts 3 and 7a of Baele et al, 2004).

Chart 4 Dispersion of swaps

- dispersion to average
- ...... dispersion to Euribor
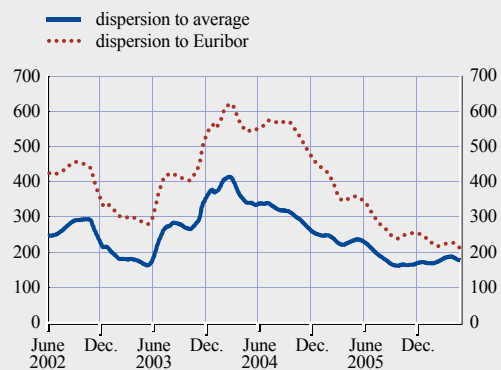
Sources: Datastream and authors' calculations.
Note: Chart 4 plots the standard deviations of 1-year swap rates relative to the cross-sectional averages (blue line) and to the 1-year Euribor swap rate (red dotted line). The lines represent 30-day moving averages in basis points. The countries included are: CZ, HU, PL.

4 GOVERNMENT BOND MARKETS

For the new EU Member States (plus Cyprus, Malta and Slovenia), bond markets started relatively late, towards the beginning of 2000. This partly reflects the low level of inherited debt and the sound fiscal policy stance during the post communist period (see, for example, Caviglia, Krause and Thimann, 2002).[13] In some countries, secondary markets are missing, since bonds are mostly bought and held by banks. Lack of other institutional market participants, such as pension funds and insurance companies, provide another reason for the underdevelopments in these markets (see Fink, Haiss, Vuksic, 2004). Thus, compared to the EU-15 countries, most of the new EU Member States' bond markets are rather small and illiquid. Nevertheless, the bond markets of the new EU Member States have already experienced strong development. From 2000 to 2004 the ratio of outstanding government debt relative to GDP more than doubled (see table 21 in Allen, Bartiloro, and Kowalewski, 2005). While the proportion of domestic government debt securities relative to GDP in 2004 was 80% for the EU-15, the weighted average of the 10 new EU Member States (plus Cyprus, Malta and Slovenia and excluding Bulgaria and Romania) was less than 55%. Yet, new EU Member States' bond markets are still characterised by significant structural differences.[14]

Chart 5 shows the spread between ten-year government bond yields of new EU Member States (plus Cyprus, Malta and Slovenia) and Germany (indicator no. 1). The picture

Chart 5 Yield spread for 10-year government bonds
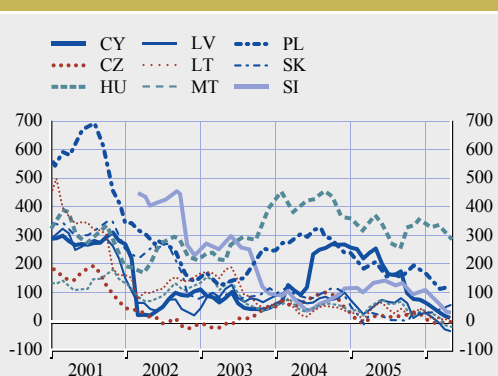
Sources: ECB and authors' calculations.
Note: Chart 5 plots the spreads between yields of individual countries government bonds and Germany (10-year maturity), which is our benchmark. Calculations are in basis points. The countries included are: CY, CZ, HU, LV, LT, MT, PL, SK, SI (from March 2002).

indicates that most new EU countries have been converging in recent years to the German benchmark. In particular, between the beginning of 2001 and mid-2003, government bond yields and yield spreads relative to the German benchmark declined substantially. Afterwards, spreads remained mostly stable or decreased even further, with the exception of Cyprus, Hungary and Poland. The increase in Hungarian and Polish spreads which took place between 2003 and 2004 partly reflects the internal and external imbalances of those countries (see Reininger and

13 Notice, however, that some countries were running substantial quasi-fiscal deficits and mis-using state-owned companies or banks to finance government activities (see, for instance, Brixi, Ghanem and Islam, 1999, and Tang, Zoli and Klytchnikova, 2000).
14 Note that Bulgaria and Romania are not included in the analysis due to lack of reliable data.

Table I Average yield spreads of government bonds

	CY	CZ	HU	LV	LT	MT	PL	SK	SI
2001	283	152	315	278	336	139	588	325	
2002	91	9	230	63	128	104	257	215	396
2003	67	5	275	83	125	97	171	92	233
2004	176	72	415	82	47	65	286	99	65
2005	181	16	325	52	35	120	187	17	45
2006	35	-2	319	-6	13	65	131	37	9

Source: See chart 5.
Note: The table reports the average annual yield spreads of 10-year government bonds relative to the German benchmark for each individual country year by year. Calculations are in basis points.

Chart 6 Average yield spread for government bonds with different maturities
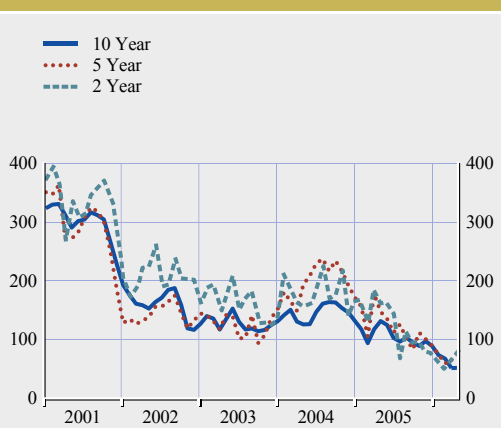
- 10 Year
- 5 Year
- 2 Year

Sources: ECB; benchmarks: German 10-year and French 5-, and 2-years government bonds; available data: *10 Year average*: CY, CZ, HU, LV, LT, MT, PL, SK, SI (from 3/02); *5 Year average*: CY (with gaps), CZ, HU, LV, LT (with gaps), MT, PL, SK (with gaps), SI (with gaps); *2 Year average*: CY (with gaps), CZ (till 9/01), HU (till 12/01), LV (till 11/01), LT (with gaps), MT, PL, SK (with gaps), SI (with gaps).
Note: Chart 6 plots the average spread in basis points between yields in the new EU member states and the French and German benchmarks' government bond markets.

Chart 7 Slope coefficients of the regression $\Delta y_{i,t} = \delta_{i,t} + \theta_{i,t}\Delta y_{B,t} + \varepsilon_{i,t}$

- CY
- CZ
- HU
- LV
- LT
- MT
- PL
- SK
- SI
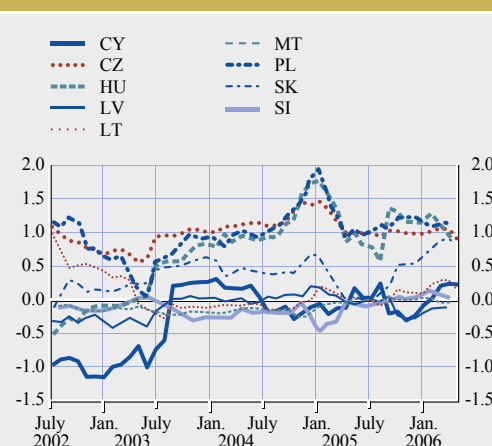
Sources: See chart 5; and authors' calculation.
Note: Chart 7 reports the evolution of the estimated slope coefficients of the regression $\Delta y_{i,t} = \delta_{i,t} + \theta_{i,t}\Delta y_{B,t} + \varepsilon_{i,t}$ through time. The changes in interest rates of individual countries' government bond markets (10 year maturity) are regressed on the change of the German benchmark.

Walko, 2005). Table 1 reports yearly average spreads for individual countries from 2001 to 2006.

Chart 6 represents indicator no. 2b, which provides the cross-country dispersion of 2, 5, and 10-year government bonds relative to the corresponding benchmarks. We use French bonds for the 2 and 5-year maturity benchmark, and German bonds for the 10-year maturity benchmark. Consistently with the message conveyed by chart 5, dispersion decreases over time from 300 basis points at the beginning of 2001 to about 50 basis points in 2006. Analogous measures for euro area countries show that spreads have followed similar developments, hovering around 200 basis points around 1996, before plunging towards zero in the run up to the EMU (see charts 9 and 10 of Baele et al. 2004).

Chart 7 plots the slope coefficients of regression (1). These are the coefficients resulting from regressing changes in national yields on changes in German yields. When markets are fully integrated bond yields should

react only to news that is common to all markets and the slope coefficients should converge to one. Perfect convergence, however, presupposes identical systematic risks across countries. To the extent that differences in credit and liquidity risks persist in individual markets, the slope coefficients may differ from one even under full integration. For the three countries with the most liquid bond markets, namely the Czech Republic, Hungary and Poland, the slope coefficients fluctuate around one.[15] With regard to the other economies, slope coefficients tend to be close to zero, suggesting that these bond markets do not react in a systematic fashion to shocks in the German benchmark. These indicators suggest that government bond markets are considerably less integrated than the corresponding euro area markets (see chart 11 of Baele et al., 2004). However, these results need to be interpreted with caution as they may be particularly affected by lack of liquidity: shallow markets tend to be

15 Most existing studies mainly focus on the three largest and most liquid sovereign debt markets in the Czech Republic, Hungary and Poland, since they are comparable with each other and with the EU-15 markets.

Chart 8 Average distance of slope coefficient/intercept from values implied by complete integration

dispersion in Betas (left-hand scale)
dispersion in Alphas (right-hand scale)
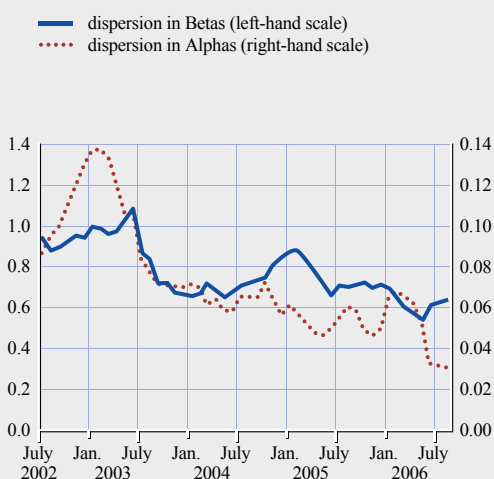
Sources: See chart 5; and authors' calculation.
Note: Chart 8 reports the average distance of the betas (left-hand scale) relative to one, as well as the average distance of the intercepts (right-hand scale) from zero of the regression $\Delta y_{i,t} = \delta_{i,t} + \theta_{i,t}\Delta y_t^B + \varepsilon_{i,t}$. The countries included are: CY, CZ, HU, LV, LT, MT, PL, SK, and SI.

Chart 9 Variance ratio for 10-year new Member States' (plus Cyprus, Malta and Slovenia) government bond yields

CY   MT
CZ   PL
HU   SK
LV   SI
LT
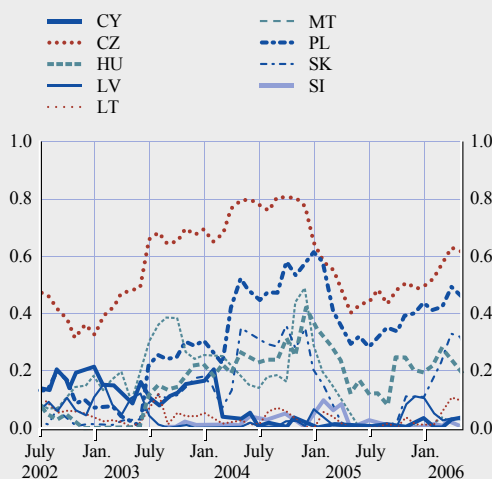
Sources: See chart 5; and author's calculation.
Note: Chart 9 plots the proportion in local yield changes for 10-year government bonds yields explained by German benchmark.

more noisy and therefore produce less reliable regression coefficients. These results are consistent with Reininger and Walko (2005), who show that yield level-based and news-based measures of bond market integration lead to contrasting conclusions when applied to new EU Member States.

Chart 8 reports indicators 4a and 4b, which measure the dispersion of the intercept and slope coefficients around the respective theoretical values implied by the case of full integration. Consistent with chart 7, dispersion in slope coefficients – although slowly declining – remains relatively high. This is evident when comparing

chart 8 with chart 12 of Baele et al. (2004), where the dispersion decreases steadily from 0.7 in 1997 to about 0.2 in 2003. The dispersion in the intercepts, on the other hand, is low and stable throughout the sample. As discussed, this result may be a consequence of the low level of liquidity in some of these markets.

Chart 9 plots the variance ratios (indicator 4c) over time, while table 2 reports average variance ratios per country and per year. They give the proportion of variance in local yield changes that is explained by changes in the German benchmark. Most of the variance ratios are pretty low, reflecting the low slope coefficients

Table 2 Variance ratios per country and per year

	CY	CZ	HU	LV	LT	MT	PL	SK	SI
2002	0.15	0.40	0.04	0.07	0.07	0.10	0.13	0.02	
2003	0.13	0.55	0.08	0.06	0.04	0.24	0.15	0.07	0.01
2004	0.05	0.76	0.25	0.01	0.03	0.24	0.44	0.25	0.02
2005	0.00	0.49	0.21	0.03	0.01	0.06	0.39	0.06	0.03
2006	0.02	0.56	0.23	0.05	0.06	0.01	0.44	0.23	0.01

Sources: See chart 5; and authors' calculation.
Note: Table 2 reports average proportion of local variance of 10-year government bonds yields per country and year explained by German benchmark.

dispersion to average
dispersion to Euribor
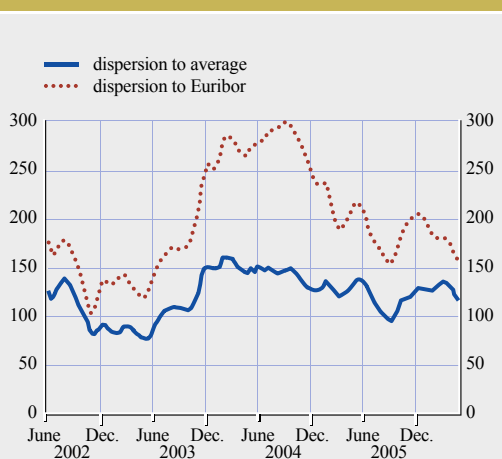
Sources: Datastream and authors' calculations.
Note: Chart 10 plots the standard deviations of 10-year swap interest rates against the cross-sectional averages (blue line) and the Euribor 10-year swap (red dotted line). The lines represent 30-day moving averages in basis points. The countries included are: CZ, HU, PL.

observed in chart 7. Noticeable exceptions are the Czech Republic, Poland and to a lesser extent Slovakia and Hungary. The Czech and Polish bond markets are the most integrated with the euro area. This is consistent with Lommatzsch and Orlowski (2006), who find that Czech bond yields react more to ECB rates than to those of the Czech central bank. Similar results hold for the Polish government bond market. Adopting a different methodology based on volatility transmission, Baklaci (2003) argues that the Polish government bond market is even more integrated with the EU-15 than the Czech one. By contrast, there is consistent evidence that the Hungarian bond market is the least integrated of the three largest markets.

Chart 10 plots the cross-sectional standard deviations of 10-year swap interest rates among Czech Republic, Hungary and Poland, and vis-à-vis the euro area (indicators 2a and 2b). After an initial decline, the indicators increase during 2003 and 2004, and diminish again towards the end of the sample. This pattern is broadly in line with that of 10-year government bond yields. Since the indicators are constructed on the basis of only three countries, the hump shape mainly reflects the deterioration of fiscal and external

balances of Hungary and Poland. The overall level is similar to that of the corresponding indicator for the euro are in the years preceding the introduction of the single currency (see chart 7b of Baele et al., 2004).

When looking at the share of cross-border activity, indicator 6a shows that euro area countries steadily increased their holdings of new EU Member States' (plus Cyprus, Malta and Slovenia) international bonds (as a share of their global international portfolio) from 1.28% in 1997 to 2.74% in 2004 (see chart 11).

At the same time, we notice that capital outflows from the euro area to all other developing countries declined (see first five columns of table 3). Furthermore, table 3 shows that relative international bond allocation from developed to developing countries has been declining over the 1997-2004 period. For instance, foreign investments decreased from 9.09% to 6.91% for the euro area, from 10.21% to 2.52% for the UK, and from 26.78% to 14.26% for the United States. The same developments can be observed when computing indicator 6b (see last five columns of table 3). In short, we can conclude

(in percentages)

1997
2001
2002
2003
2004
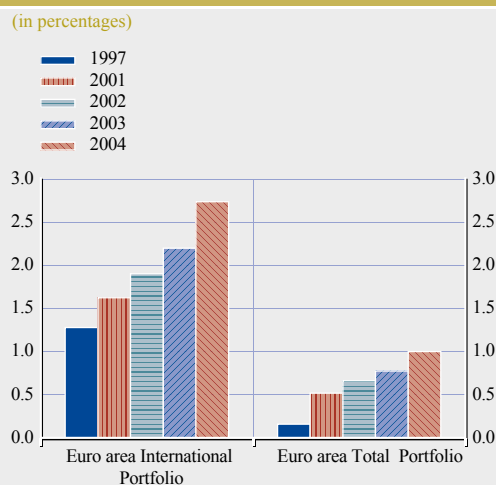
Sources: IMF, Datastream and authors' calculations.
Note: Euro area' holdings of foreign bonds issued by new EU member states as a share of euro area total foreign holdings and total portfolio (in percentage). New EU member states include BG, CY, CZ, EE, HU, LT, LV, MT, PL, RO, SI and SK.

that the region comprising the new EU Member States is the only developing region which has attracted an increasing amount of foreign capital. This is consistent with previous evidence of increasing financial integration between the euro area and the new EU Member States.

Table 3 International bond portfolio allocation

(percentages)

from	to	International Portfolio					Total Portfolio				
		1997	2001	2002	2003	2004	1997	2001	2002	2003	2004
Developed countries	New member States	0.98	0.78	0.91	1.02	1.23	0.13	0.14	0.18	0.22	0.29
	Other Developing Europe, Turkey and Russia	1.06	0.76	0.68	0.67	0.59	0.14	0.14	0.13	0.14	0.14
	Developing Latin America and Caribbean	6.32	3.1	2.41	2.38	2.3	0.85	0.57	0.48	0.51	0.54
	Developing Africa and Middle East	0.75	0.58	0.65	0.63	0.53	0.1	0.11	0.13	0.14	0.12
	Developing Asia and Pacific	2.81	1.17	1.01	0.84	1.03	0.38	0.22	0.2	0.18	0.24
	Developing countries	11.91	6.39	5.66	5.55	5.68	1.6	1.17	1.12	1.2	1.33
	Total holdings (USD billion)	2,448	3,770	4,593	5,820	7,045	18,188	20,507	23,192	26,973	30,126
Euro area	New member States	1.28	1.63	1.9	2.2	2.74	0.16	0.52	0.66	0.78	1
	Other Developing Europe, Turkey and Russia	1.03	1.21	0.94	0.95	0.91	0.13	0.38	0.33	0.34	0.33
	Developing Latin America and Caribbean	5.28	3.28	2.09	2.13	2.23	0.66	1.05	0.73	0.75	0.82
	Developing Africa and Middle East	0.22	0.33	0.35	0.36	0.34	0.03	0.11	0.12	0.13	0.12
	Developing Asia and Pacific	1.28	0.58	0.45	0.57	0.69	0.16	0.18	0.16	0.2	0.25
	Developing countries	9.09	7.01	5.74	6.22	6.91	1.13	2.24	1.99	2.19	2.53
	Total holdings (USD billion)	527	1,220	1,547	2,104	2,621	4,249	3,821	4,455	5,965	7,163
United Kingdom	New member States	1.21	0.51	0.74	0.61	0.43	0.81	0.52	0.83	0.76	0.55
	Other Developing Europe, Turkey and Russia	1.78	0.48	0.65	0.56	0.01	1.2	0.49	0.73	0.7	0.01
	Developing Latin America and Caribbean	4.02	1.61	1.47	0.95	0.79	2.7	1.63	1.66	1.18	1
	Developing Africa and Middle East	1.16	0.68	0.72	0.68	0.26	0.78	0.69	0.81	0.85	0.33
	Developing Asia and Pacific	2.03	1.16	0.65	0.53	1.03	1.36	1.17	0.74	0.66	1.31
	Developing countries	10.21	4.44	4.23	3.33	2.52	6.85	4.51	4.77	4.14	3.2
	Total holdings (USD billion)	483	667	789	896	1,118	721	658	701	719	881
United States	New member States	1.19	0.79	0.63	0.5	0.49	0.07	0.04	0.04	0.04	0.04
	Other Developing Europe, Turkey and Russia	0.95	1.38	1.26	1.3	1.55	0.06	0.07	0.08	0.09	0.12
	Developing Latin America and Caribbean	16.94	9.24	7.74	8.27	8.07	1.06	0.5	0.49	0.6	0.62
	Developing Africa and Middle East	1.82	1.92	2.12	2.13	2.16	0.11	0.1	0.13	0.15	0.16
	Developing Asia and Pacific	5.87	2.15	2.28	1.68	1.99	0.37	0.12	0.14	0.12	0.15
	Developing countries	26.78	15.48	14.03	13.89	14.26	1.67	0.83	0.88	1	1.09
	Total holdings (USD billion)	543	555	705	869	985	8,703	10,318	11,257	12,029	12,880

Sources: IMF, Thomson Financial Datastream and authors' calculations.
Note: Countries' holdings of foreign bonds in a given region as a share of their total foreign holdings and total portfolio (in percentage). Countries included in the "New EU member states" category are CY, CZ, HU, LT, LV, PL, SI, SK, BG and RO.

5 BANKING MARKETS

With regard to the banking markets of new EU Member States (plus Cyprus, Malta and Slovenia), data on interest rates on mortgage loans, consumer loans, as well as short, medium and long-term loans to enterprises are analysed.

Over the past decade, foreign banks have significantly expanded their presence in the new EU Member States (ECB 2005c). In 2003, on average more than 70% of bank assets were foreign-owned ranging from more than 95% in the Czech Republic, Estonia, Lithuania and Slovakia to 36% in Slovenia and 12% in Cyprus. The most common foreign presence is in the form of subsidiaries, while the number of branches remains very limited. Nordic banks have become active in the Baltic States, and Austrian and Italian banks are operating in neighbouring central European countries (the

Czech Republic, Hungary and Slovakia). The strong foreign (mainly European) presence in the new EU Member States is widely believed to be beneficial for the banking systems due to the transfer of technology and human capital, which increases the operational capacity of local banks and accelerates convergence with western standards (ECB 2006b, Moody's 2004).

Charts 12a-b and 13a-c plot the loans' cross-sectional standard deviations since the second half of the 1990's. The data for Bulgaria are reported separately, since they all exhibit large spikes around 1996. In that year, the country suffered from a severe crisis of confidence in the banking system, which led to a currency collapse.[16] Since the spikes affect the overall scale of the charts, for comparability purposes, the indicators for the last part of the sample are
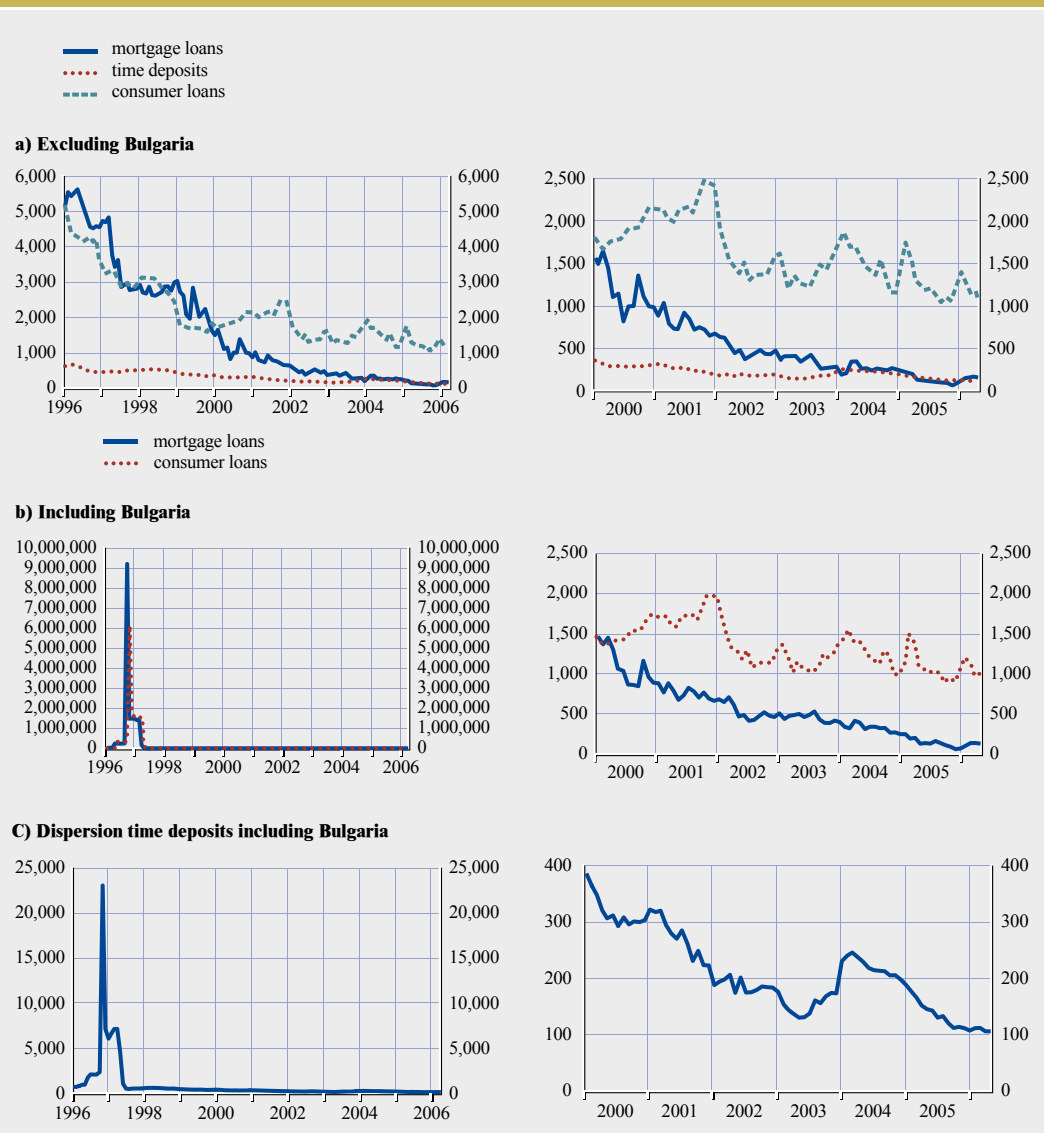
16 Data for Romania are not available.

Chart 12 Dispersion of loans to enterprises

a) Excluding Bulgaria

b) Including Bulgaria
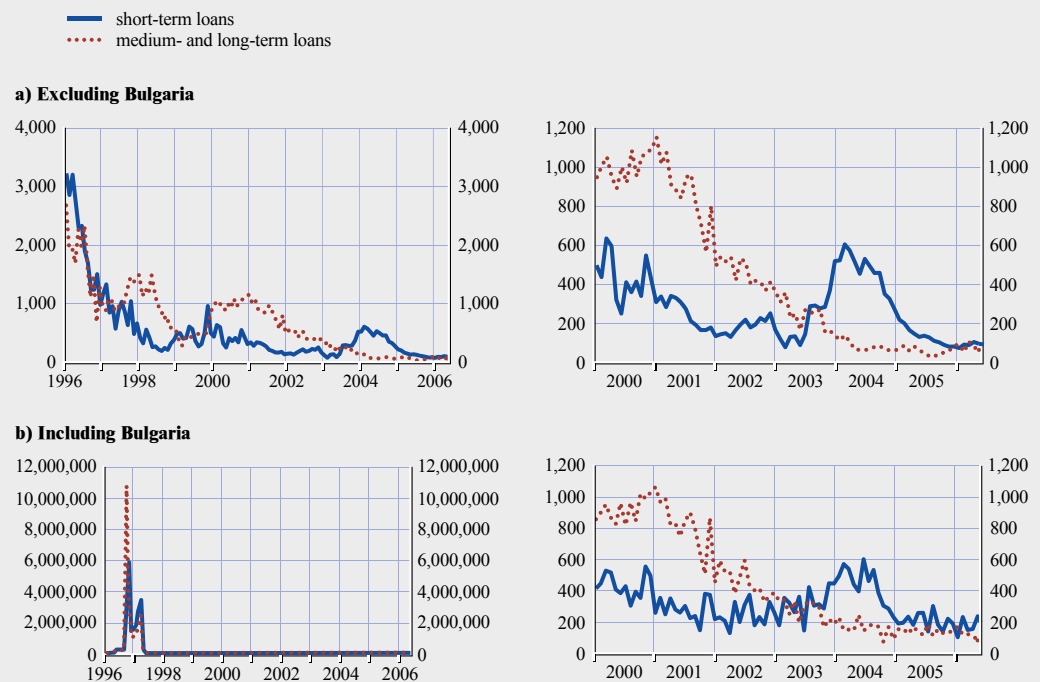
Sources: Global Financial Data and authors' calculation.
Note: Charts 12a and 12b plot average cross-sectional standard deviations (in basis points) of interest rates on short and long-term loans to enterprises relative to the cross-sectional averages. Data for short-term loans are available for: CZ, EE, HU, LT, LV (chart 12a). BG is only included in chart 12b. Data for medium and long-term loans are available for CZ, EE, LT, LV, MT (from Jan. 2000), SI, SK (chart 12a). BG is only included in chart 12b.

Chart 13 Dispersion of household loans and time deposits

— mortgage loans
····· time deposits
- - - consumer loans

a) Excluding Bulgaria

— mortgage loans
····· consumer loans

b) Including Bulgaria

C) Dispersion time deposits including Bulgaria

Sources: Global Financial Data and authors' calculations.
Note: Charts 13a -13c plot average cross-sectional standard deviations (in basis points) of interest rates on consumer and mortgage loans, and time deposits relative to the cross-sectional averages. Data for mortgage loans are available for: CY, CZ (from Jan. 2002), HU, LV (from May 1997), MT, PL (from March 2002), SI (chart 13a). BG is only included in chart 13b. Data for time deposit are available for: CY, CZ, HU, LV, LT, MT, PL, SI, SK (chart 13a). BG is only included in chart 13c. Data for consumer loans are available for: CY, CZ (from Jan. 2002), HU, LT (from Oct. 2004), PL (from Dec. 1996), SK (chart 13a). BG is only included in chart 13b.

reported in separate charts. Standard deviations broadly decrease for all the loan rates from 1995 onwards (the same holds true for the statistics that include Bulgaria). Decrease in dispersion indicates that rates across new EU Member States (plus Cyprus, Malta and Slovenia) have become progressively more homogeneous, suggesting that integration across these markets is increasing.

The hump shape observed around 2004 is similar to that observed for swap rates in charts 4 and 10. This is due to an increase in Hungarian rates, which in turn reflects the deterioration of Hungary's fiscal and external balance.[17]

17 There is no hump in the medium and long-term loans indicators since they do not include Hungarian data.

Table 4 Beta convergence before and after November 2001

	Beta pre 11/2001	Beta post 11/2001	Statistically different?*	Countries	# obs
	Lending rates				
Short-term loans	-0.127*	-0.201*	Yes	CZ, EE, HU, LT, LV	708
Medium and long-term loans	-0.188*	-0.163*	No	CZ, EE, LT, LV, MT, PL,SI, SK	
Consumer loans	-0.030*	-0.033*	No	CY, CZ, HU, LT, PL, SK	510
Mortgage loans	-0.049*	-0.102*	Yes	CY, CZ, HU, LV, MT, PL, SI	684
	Deposit rates				
Time deposits	-0.043*	-0.055*	No	CY, CZ, HU, LV, LT, MT, PL, SI, SK	1,184

Sources: See charts 13a and 13b.
Note: * denotes statistical significance at 10% confidence level. Dependent variables (first rows) are taken in first difference. The estimated model is a panel with country-fixed effects, the spread lagged once and the dependent variable lagged twice. The test for different convergence speeds is based on F-statistics. Standard errors are heteroskedasticity and autocorrelation consistent.

Tables 4 and 5 report indicator 3 (including and excluding Bulgaria). 'Beta convergence' measures the speed at which loan rates converge to the German benchmark. A negative estimate indicates that convergence is taking place. The panel regression with fixed effects has been run for the different lending and time deposit rates. The first two columns of the tables report the estimated beta coefficients before and after November 2001.[18] The asterisk denotes significance at the 10% level. The third column reports whether the two coefficients before and after November 2001 are statistically different from each other. We also report the number of countries included in the panel regression, as well as the total number of observations.

It should be noticed that all the estimated beta coefficients in table 4 are negative and statistically different from zero (time deposit

18 In November 2001 the news of future accession in the EU of new member states was announced.

Table 5 Beta convergence before and after November 2001 including Bulgaria

	Beta pre 11/2001	Beta post 11/2001	Statistically different?*	Countries	# obs
	Lending rates				
Short-term loans	-1.31*	-2.00	No	BG, CZ, EE, HU, LT, LV	849
Medium and long-term loans	-1.81*	-1.99	No	BG, CZ, EE, LT, LV, MT, PL, SI, SK	1,139
Consumer loans	-0.66*	-0.65*	No	BG, CY, CZ, HU, LT, PL, SK	616
Mortgage loans	-1.81*	-1.63	No	BG, CY, CZ, HU, LV, MT, PL, SI	799
	Deposit rates				
Time deposits	-2.11*	-1.37	No	BG, CY, CZ, HU, LV, LT, MT, PL, SI, SK	1,316

Sources: See charts 13a and 13b.
Note: * denotes statistical significance at 10% confidence level. Dependent variables (first rows) are taken in first difference. The estimated model is a panel with country-fixed effects, the spread lagged once and the dependent variable lagged twice. The test for different convergence speeds is based on F-statistics. Standard errors are heteroskedasticity and autocorrelation consistent.

Chart 14 Dispersion of banks' margins for lending to households
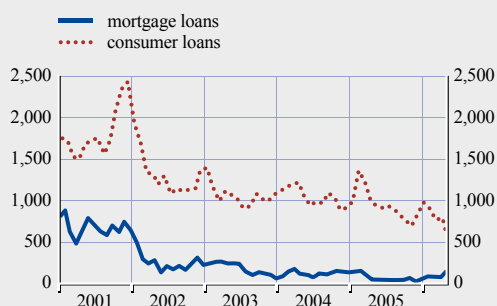
Sources: Datastream, Global Financial Data, ECB and authors' calculations.
Note: Chart 14 plots the cross-sectional standard deviations of banks' margins for mortgage and consumer loans relative to cross-sectional averages in basis points. Data for mortgage loans are available for: CY, CZ (from Jan. 2002), HU, LV, MT, PL (from March 2002), SI (from March 2002). Data for consumer loans are available for: CY, CZ (from Jan. 2002), HU, LT (from Oct. 2004), PL, SK. No data are available for BG.

Chart 16 Dispersion of banks' margins for time deposits including Bulgaria

Sources: Global Financial Data and authors' calculations.
Note: Charts 15 and 16 plot the cross-sectional standard deviations of banks' margins for time deposits relative to cross-sectional averages in basis points. The countries included are: CY (from March 1999), CZ, HU, LV (from Jan. 1998), LT (from Jan. 1999), MT (from Apr. 1996), PL, SI, SK (from Nov. 1998) (chart 14b). BG (from Jan. 1998) is only included in chart 14c.

rates after November 2001 being the only exception). Furthermore, for short-term loans to

Chart 15 Dispersion of banks' margins for time deposits

Source: Global Financial Data and authors' calculations.
Note: Charts 15 and 16 plot the cross-sectional standard deviations of banks' margins for time deposits relative to cross-sectional averages in basis points. The countries included are: CY (from March 1999), CZ, HU, LV (from Jan. 1998), LT (from Jan. 1999), MT (from Apr. 1996), PL, SI, SK (from Nov. 1998) (chart 14b). BG (from Jan. 1998) is only included in chart 14c.

enterprises and mortgage loans to households, the speed of convergence increases in a statistically significant way after November 2001. When Bulgaria is included in the analysis (table 5), all the betas remain negative, but are not always significant after 2001. All in all, these results suggest that the loan rate markets are becoming increasingly integrated.

Retail rates are typically affected by both macro (e.g. market interest rate levels) and micro factors (e.g. market power of local banks) - see, for instance, Cabral et al. 2002 for further discussion. In line with Baele et al. 2004, to distinguish between macro and micro factors, the spreads between bank interest rates and comparable market rates are examined. Convergence of these margins provides indication of ongoing integration, although it may also result from an increase in competition. Margins are computed using 10-year government bond yields for medium to long-term loan rates, and the 3-month money market rate for the short term loan rates.

Charts 14-16 and 17-18 plot the cross-sectional standard deviations of the margins over time, excluding and including Bulgaria, respectively.[19]

19 Bulgarian data on banks' margins for lending to households are not available.
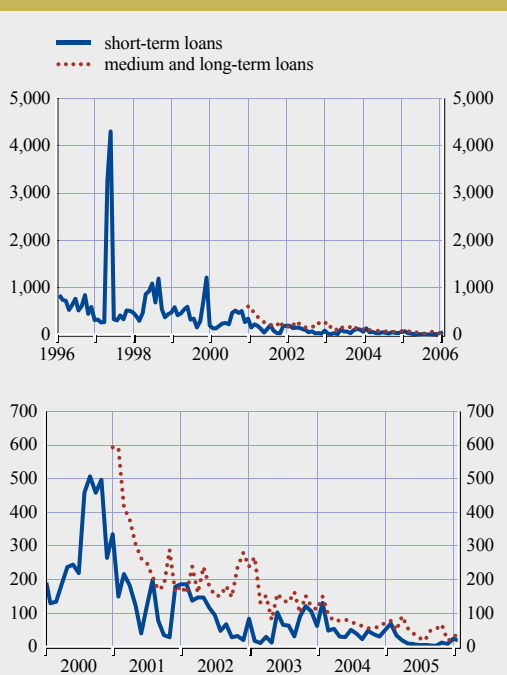
short-term loans
medium and long-term loans

Sources: Global Financial Data and authors' calculations.
Note: Charts 17 and 18 plot the cross-sectional standard
deviations of banks' margins for lending to enterprises relative to
cross-sectional averages in basis points. Data for short-term loans
are available for: CZ, EE, HU, LV (from Jan. 1998), LT (from
Jan. 1999) (chart 13d). BG (from Jan. 1998) is only included
in chart 13e. Data for medium- and long-term loans are
available for: CZ, LV, LT, MT, PL, SK, SI (from March 2002)
(chart 13d).

Chart 18 Dispersion of banks' margins for
short-term lending to enterprises, including
Bulgaria

Sources: Global Financial Data and authors' calculations.
Note: Charts 17 and 18 plot the cross-sectional standard
deviations of banks' margins for lending to enterprises relative
to cross-sectional averages in basis points. Data for short-term
loans are available for: CZ, EE, HU, LV (from Jan. 1998),
LT (from Jan. 1999) (chart 13d). BG (from Jan. 1998) is
only included in chart 13e. Data for medium- and long-term
loans are available for: CZ, LV, LT, MT, PL, SK, SI (from
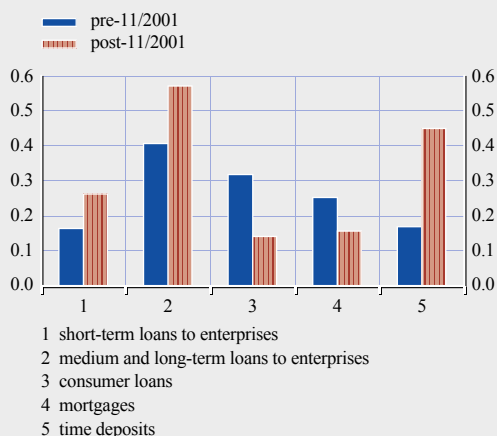March 2002) (chart 13d).

Dispersion measures become less volatile around
2001 and decrease afterwards, supporting the
previous findings that integration is taking place.

Charts 19-20 show the proportion of loan and time
deposit rate changes explained by the relevant
benchmark before and after November 2001
(indicator 4c). As usual we distinguish between
the sample excluding and including Bulgaria. The
benchmarks are the same interest rates employed
in the construction of the margins of charts 14a-e.
To the extent that retail rates are comparable
across countries, higher degrees of integration
imply a greater impact of common factors and
higher variance ratios.

We observe that for short, medium and long-term
loans to enterprises, as well as for time deposits,
the proportion of variance explained by common
factors increases over time, reaching levels
comparable to those documented for the euro
area countries (see chart 25 in Baele et al. 2004).
In line with the findings in the euro area, levels
of integration in consumer loans and mortgage
markets appear to be consistently lower than
for the other markets. This result may reflect
a lack of standardisation of these products, as
well as legal and consumer protection barriers
in the different national markets. When Bulgaria
is included in the analysis, the proportions of
variance explained by common factors decreases
substantially, suggesting that Bulgarian
markets are characterised by a larger degree of
heterogeneity.

A review of quantity-based indicators
(indicator 6c) shows that the region comprising
the new EU Member States (plus Cyprus,
Malta and Slovenia) is the only one among
developing countries that has been receiving
a steadily increasing percentage of bank loans
(see Chart 21). This development is entirely
due to the expansion of credit from euro area
banks, as shown in charts 22-24. According
to chart 22, the percentage share of euro area
outstanding loans vis-à-vis the new EU Member
States increased from 1.5% at the end of 1995 to
2.0% right before the Russian crisis at the end of
1998, and up to 3.6% at the end of 2005. On the

pre-11/2001
post-11/2001

1 short-term loans to enterprises
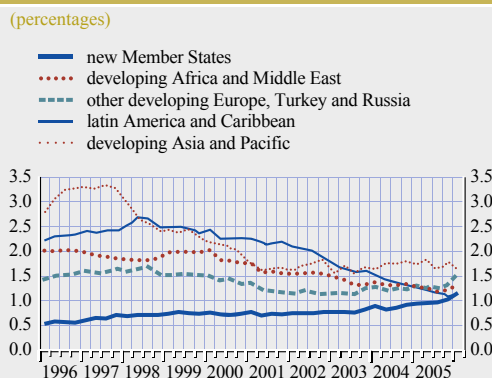2 medium and long-term loans to enterprises
3 consumer loans
4 mortgages
5 time deposits

Sources: See charts 14-18.
Note: Charts 19 and 20 report the average proportion of variance explained by the German benchmarks.

Chart 21 Share of developed countries' international claims vis-à-vis developing countries

(percentages)

new Member States
developing Africa and Middle East
other developing Europe, Turkey and Russia
latin America and Caribbean
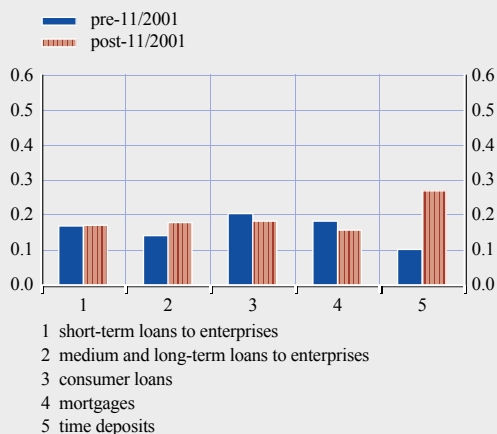developing Asia and Pacific

Sources: BIS and authors' calculations.
Note: Charts 21 and 22 report the share of developed countries' and euro area's international claims vis-à-vis developing countries (in percentage; end-of-period; quarterly data). The last observation refers to 2005Q4. Countries included in the "New EU member states" are BG, CY, CZ, EE, HU, LT, LV, MT, PL, RO, SI and SK.

contrary, the analog indicator has been declining for the UK (see chart 23) and close to zero for the United States (see chart 24). Furthermore, the share allocated in other developing regions either declines or does not show any clear trend.

The available evidence clearly indicates that the integration of banking activities among euro area countries and the new EU Member States

is taking place and deepening. This statement is even more significant if one considers the cross-border investment at country level. The euro area has been increasing the share of its international claims vis-à-vis each individual new EU Member State (plus Cyprus, Malta and Slovenia), with the Czech Republic, Hungary and Poland being the most important recipient countries (see chart 25).

Chart 20 Proportion of variance of various interest rates explained by common factors including Bulgaria

pre-11/2001
post-11/2001

1 short-term loans to enterprises
2 medium and long-term loans to enterprises
3 consumer loans
4 mortgages
5 time deposits

Sources: See charts 14-18.
Note: Charts 19 and 20 report the average proportion of variance explained by the German benchmarks.

Chart 22 Share of euro area's international claims vis-à-vis developing countries
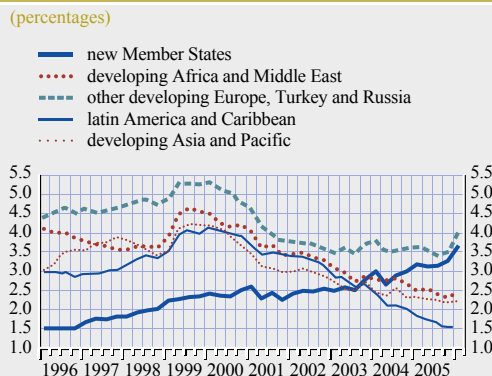
(percentages)

new Member States
developing Africa and Middle East
other developing Europe, Turkey and Russia
latin America and Caribbean
developing Asia and Pacific

Sources: BIS and authors' calculations.
Note: Charts 21 and 22 report the share of developed countries' and euro area's international claims vis-à-vis developing countries (in percentage; end-of-period; quarterly data). The last observation refers to 2005Q4. Countries included in the "New EU member states" are BG, CY, CZ, EE, HU, LT, LV, MT, PL, RO, SI and SK.

Chart 23 Share of United Kingdom's international claims vis-à-vis developing countries

(percentages)

— new Member States
···· developing Africa and Middle East
--- other developing Europe, Turkey and Russia
— latin America and Caribbean
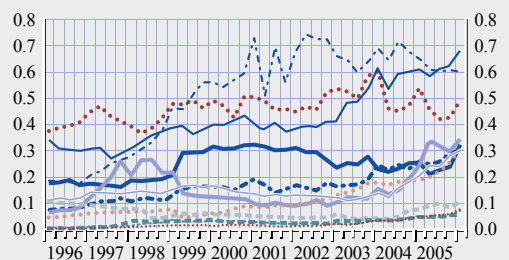···· developing Asia and Pacific
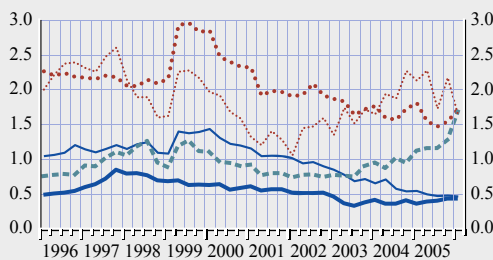
Sources: BIS and authors' calculations.
Note: Charts 23 and 24 report the share of United Kingdom's and United States' international claims vis-à-vis developing countries (in percentage; quarterly data). The last observation refers to 2005Q4. Countries included in the "New EU member states" are BG, CY, CZ, EE, HU, LT, LV, MT, PL, RO, SI and SK.

Chart 25 Share of Euro Areas's international claims vis-à-vis new Member States

(percentages)

— Cyprus   ···· Malta
···· Czech Republic   --- Poland
--- Estonia   — Slovak Republic
— Hungary   ···· Slovenia
···· Latvia   --- Bulgaria
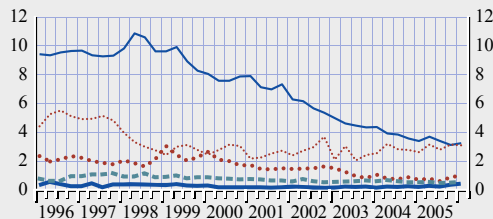--- Lithuania   — Romania

Sources: BIS and authors' calculation.
Note: Chart 25 reports the share of Euro Areas's international claims vis-à-vis individual countries (in percentage; quarterly data). Last observation refers to 2005Q4.

Chart 24 Share of United States's international claims vis-à-vis developing countries

(percentage)

— new Member States
···· developing Africa and Middle East
--- other developing Europe, Turkey and Russia
— latin America and Caribbean
···· developing Asia and Pacific

Sources: BIS and authors' calculations.
Note: Charts 23 and 24 report the share of United Kingdom's and United States' international claims vis-à-vis developing countries (in percentage; quarterly data). The last observation refers to 2005Q4. Countries included in the "New EU member states" are BG, CY, CZ, EE, HU, LT, LV, MT, PL, RO, SI and SK.
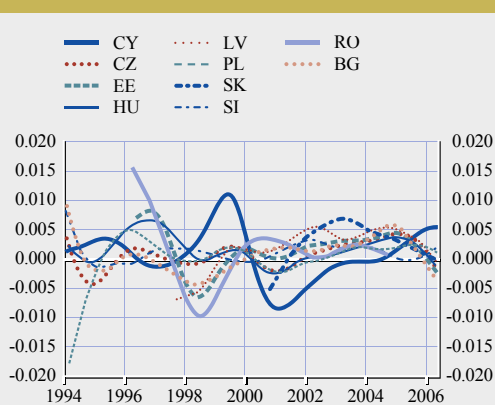
6 EQUITY MARKETS

Equity markets of new EU Member States (plus Cyprus, Malta and Slovenia) have developed along two different lines. The Czech Republic adopted mass privatization schemes, whereas Estonia, Hungary, Latvia, Poland and Slovenia first established a legal framework for trading and next listed the enterprises. By and large, the second approach had a better outcome, as the former approach resulted in a loss of confidence caused by the delisting of unsuccessful companies (see Caviglia, Krause and Thimann, 2002).

The importance of the stock exchanges can be measured by the market capitalization as a percentage of GDP.[20] At the end of 2001, stock market capitalization of new EU Member States (plus Cyprus, Malta and Slovenia) ranged between 5% and 30% of GDP with the exception of Cyprus which had a stock market capitalisation of about 70% of GDP. These percentages are well below the euro area levels. For instance, at the end of 2001 the stock market capitalization for Germany was approximately equal to 60% of its GDP. In our sample, the three largest stock markets are Poland, the Czech Republic and Hungary. Their stock market capitalization approximately reflects their GDP weight in the region.

Chart 26 plots the Hodrick-Prescott (HP) filtered series for equity market returns. Observations span from January 1994 to September 2006.[21] The filter shows that equity markets were mostly diverging in the 1990s and have become more synchronised over the past few years. This evidence is consistent with the fact that new EU Member States (plus Cyprus, Malta and Slovenia) equity markets are increasingly driven by common factors.

The HP filter plots are not informative about the underlying factors driving of the return co-movements. To overcome this difficulty, we estimate the model discussed in section 2.2. The model assumes that national equity market returns are driven by two common factors, namely the innovations from euro area and US equity market

Chart 26 HP filtered equity returns

Sources: Datastream and authors' calculations.
Notes: Chart 26 reports weekly Hodrick-Prescott filtered returns for individual equity markets. All price indices are computed by Datastream with the exception of EE, LV, SK, and SI where the respective benchmark indices have been used. The countries included are: BG (from Nov. 2000), CY, CZ, EE (from June 1996), HU, LV (from Apr. 1996), PL, RO (from Sept. 1997), SK, and SI.

returns, whereas the latter is taken as a proxy for the global factor. In equation (2) we allow for time-varying "beta" coefficients, which capture the exposure of national markets to the common factors. The idea is that as economic and financial integration increases over time, the importance of national factors should decrease. This in turn implies that the amount of variance explained by euro area and global factors should increase.

The "beta" coefficients are made time-varying using time dummies as follows: $\beta_{i,t}^{EU} = \xi_{0,i} + \xi_{1,i} D_{1,t} + \xi_{2,i} D_{2,t}$. A similar specification is used for the exposure to US shocks. The dummies ($D_{1,t}$ and $D_{2,t}$) identify three subperiods, from the beginning of the sample to October 2001, from November 2001 to April 2004, and from May 2004 to the end of the sample. The choice of dates reflects important economic events. In November 2001 the future accession of new Member States to the EU was announced,

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20 Although market capitalisation is an important indicator of equity market development of an economy, other indicators may be considered as well. For instance, liquidity measures or the number of listed companies may be useful complements (see Hartmann et al., 2007, and Levine and Zervos, 1996, for more extensive discussions).

21 See the note in Charts 19-20.

Chart 27 Euro area and US shock spillover intensity

(percentages)

- ■ US schock spillover intensity
- ▥ EU shock spillover intensity

a) Excluding Romania

b) Including Romania
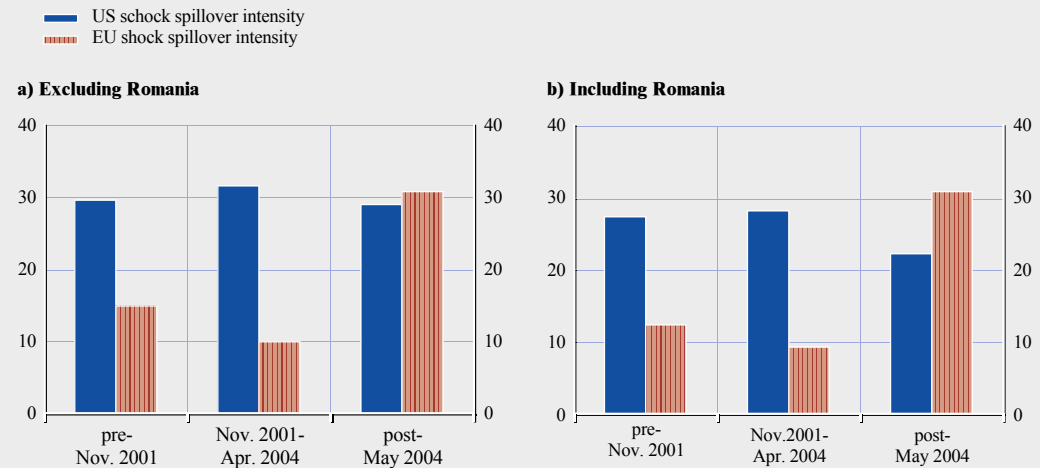
Source: See chart 26.
Note: For each period, the first (second) column reports the unweighted average intensity of the transmission of U.S. (EU) equity market shocks to new EU member states' (plus Cyprus, Malta and Slovenia) markets in percentage.

while in May 2004 the accession actually took place.

Charts 27a-b plot the average estimated coefficients of regression (2). The sensitivities of national market returns to the euro area common factor increases substantially after the accession date (May 2004). There is no change to the results if Romania is included in the analysis. Charts 28a-b report instead the variance ratio (indicators 5a and 5b). We notice that while the importance of the euro area factor increases, most of the variance of national markets is explained by global factors. A quick look at the disaggregated results shows that the Polish market is the most influenced by global factors. This is consistent with the findings

Chart 28 Proportion of variance explained by European and US shocks

(percentages)

- ■ US shocks
- ▥ European shocks

a) Excluding Romania

b) Including Romania
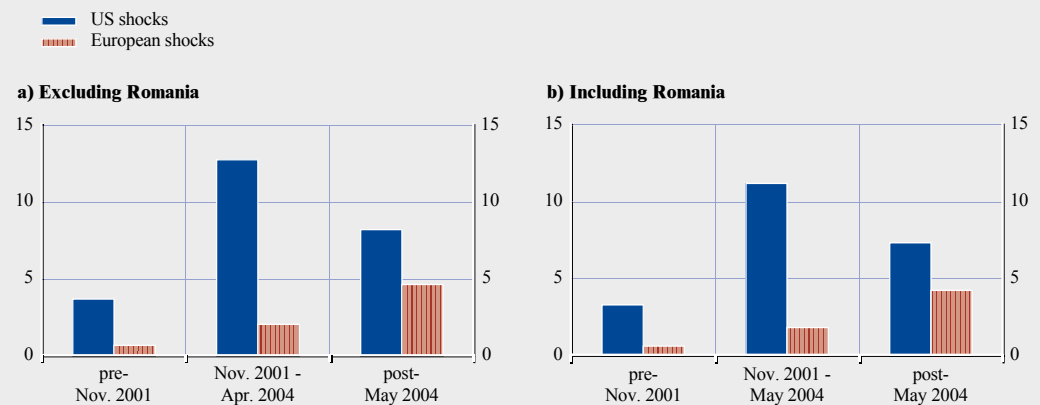
Sources: See Chart 26; and author's calculation.
Note: For each period, the first (second) column shows the unweighted average of the percentage of U.S. (EU) equity market fluctuations for the variance of new EU member states' (plus Cyprus, Malta and Slovenia) equity market indices.

Table 6 International portfolio equity allocation

(percentages)

from	to	International portfolio					Total portfolio				
		1997	2001	2002	2003	2004	1997	2001	2002	2003	2004
Developed countries	New Member States	0.41	0.19	0.31	0.30	0.42	0.06	0.03	0.06	0.06	0.09
	Other developing Europe, Turkey and Russia	0.75	0.34	0.54	0.64	0.59	0.11	0.06	0.11	0.13	0.13
	Developing Latin America and Caribbean	4.81	2.03	1.73	1.87	2.00	0.70	0.34	0.34	0.39	0.45
	Developing Africa and Middle East	1.02	0.82	0.96	1.00	1.16	0.15	0.14	0.19	0.21	0.26
	Developing Asia and Pacific	2.46	3.43	3.53	4.68	4.99	0.36	0.57	0.7	0.96	1.12
	Developing countries	9.45	6.8	7.06	8.49	9.15	1.37	1.13	1.41	1.75	2.05
	Total holdings (USD billion)	2,470	3,662	3,592	5,015	6,340	17,085	22,061	18,047	24,339	28,270
Euro area	New Member States	0.49	0.24	0.53	0.56	0.70	0.06	0.04	0.16	0.15	0.20
	Other developing Europe, Turkey and Russia	0.25	0.33	0.48	0.63	0.77	0.03	0.06	0.14	0.17	0.22
	Developing Latin America and Caribbean	4.08	1.11	1.20	1.06	1.32	0.50	0.21	0.36	0.28	0.38
	Developing Africa and Middle East	0.69	0.46	0.67	0.58	0.75	0.08	0.08	0.2 0	0.16	0.22
	Developing Asia and Pacific	1.07	1.80	2.22	3.24	3.72	0.13	0.33	0.66	0.87	1.08
	Developing countries	6.59	3.94	5.09	6.08	7.25	0.80	0.73	1.52	1.62	2.11
	Total holdings (USD billion)	328	700	966	1,229	1,607	2,687	3,765	3,239	4,601	5,523
United Kingdom	New Member States	0.27	0.21	0.19	0.17	0.34	0.06	0.06	0.06	0.05	0.12
	Other developing Europe, Turkey and Russia	0.32	0.34	1.03	0.63	0.59	0.07	0.09	0.31	0.2 0	0.20
	Developing Latin America and Caribbean	2.33	1.73	1.19	1.55	1.52	0.53	0.48	0.36	0.48	0.52
	Developing Africa and Middle East	0.50	0.29	0.73	0.57	0.75	0.12	0.08	0.22	0.18	0.26
	Developing Asia and Pacific	2.59	4.35	4.48	5.88	5.97	0.59	1.21	1.34	1.84	2.05
	Developing countries	6.01	6.91	7.62	8.8	9.17	1.38	1.93	2.28	2.75	3.15
	Total holdings (USD billion)	462	558	493	664	879	2,011	2,003	1,647	2,125	2,560
United States	New Member States	0.51	0.21	0.29	0.27	0.39	0.07	0.03	0.04	0.04	0.07
	Other developing Europe, Turkey and Russia	1.21	0.44	0.59	0.83	0.65	0.16	0.06	0.08	0.14	0.12
	Developing Latin America and Caribbean	7.37	3.22	2.95	3.12	3.36	0.98	0.42	0.42	0.51	0.60
	Developing Africa and Middle East	1.63	1.33	1.59	1.72	1.87	0.22	0.17	0.23	0.28	0.33
	Developing Asia and Pacific	2.64	4.10	4.51	6.02	6.29	0.35	0.53	0.65	0.98	1.12
	Developing countries	13.36	9.31	9.93	11.97	12.54	1.78	1.21	1.43	1.94	2.23
	Total holdings (USD billion)	1,197	613	1,385	2,080	2,560	8,990	12,439	9,638	12,819	14,412

Sources: IMF. Thomson Financial Datastream and authors' calculations.
Note: Countries' holdings of foreign equities in a given region as a share of their total foreign holdings (in percentage). Countries included in the "New EU member states" category are CY, CZ, HU, LT, LV, PL, SI, SK, BG and RO.

of other studies on the integration of the bond markets (see, for instance, Kim, Lucey and Wu, 2006 and section 4).

When looking at the share of cross-border activity in equity securities, indicators 6a and 6b show that the euro area, the United Kingdom and the United States initially decreased their portfolio weights vis-à-vis the new EU Member States (plus Cyprus, Malta and Slovenia) over the period 1997-2001, thereafter going on to steadily increase them (see chart 20 and first five columns of table 6).[22] This is a global trend that

22 The initial decrease is likely to be due to the financial market turbulences which occured between 1997 and 2001 (Asian-Latin American-Russian crises and the burst of the dotcom bubble).

Chart 29 The degree of equity securities issued by new EU Member States (plus Cyprus, Malta and Slovenia) and held by euro area
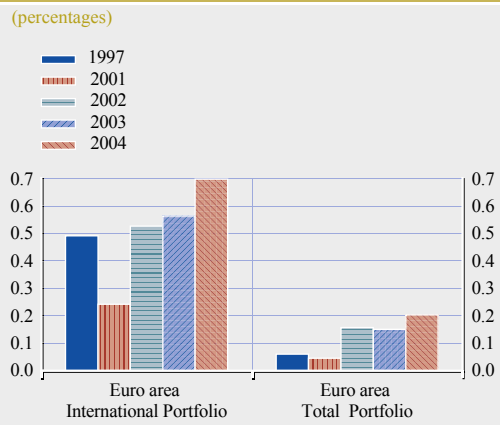
(percentages)

- 1997
- 2001
- 2002
- 2003
- 2004

Sources: IMF, Datastream and authors' calculations.
Note: Euro area' holdings of foreign equities issued by new EU Member States (plus Cyprus, Malta and Slovenia) as a share of euro area total foreign holdings and total portfolio (in percentage).

is not specific to euro area countries and new EU Member States. Since 2002 most developing countries have been receiving equity inflows from developed economies. Therefore, these figures do not signal an increase in integration that is specific to Europe.

7 CONCLUSION

In this paper, the degree of financial integration in the new EU Member States (plus Cyprus, Malta and Slovenia) is measured in accordance with the framework adopted by Baele et al. (2004). By replicating the indicators of that study, not only can we describe developments in the new EU Member States, but we can also directly compare them with those in the euro area. The analysis is limited by data availability. In particular, there was no data for corporate bonds, and many markets are characterised by relatively low liquidity, which may affect the reliability of some of our measures.

Our main findings are as follows: (1) Financial markets in the new EU Member States (plus Cyprus, Malta and Slovenia) are significantly less integrated than those in the euro area; (2) There is strong evidence that the process of integration is well under way and accelerated following accession to the EU; (3) Money and banking markets are becoming increasingly integrated both among themselves and vis-à-vis the euro area; (4) In government bond markets only the largest economies (the Czech Republic, Poland and to a lesser extent Hungary) exibit any signs of integration; and (5) Equity markets are less integrated, although they are increasingly affected by euro area shocks.

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