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Markets of loans provided to household and their integration measured by price indicators

Pavla Vodová¹

Abstract. The aim of this paper is to assess with price indicators the extent to which markets of loans provided to households in Visegrad countries are integrated with euro zone countries. Analysis of alignment and beta and sigma convergence concept showed that mortgage loan markets were much more integrated than consumer loan markets in period from January 2005 to March 2010. Czech and Slovak consumer loans market and Polish and Hungarian mortgage loans market have statistically significant relatively higher speed of convergence. However, barriers of integration are still very important.

Keywords: credit market integration, price indicators, beta convergence, sigma convergence.

JEL Classification: F36, C23, G21

AMS Classification: 62P20

1 Introduction

Measuring of credit market integration is quite complicated. Some studies (for list of them see [1]) came to conclusion that retail and wholesale markets differ in their degree of integration: wholesale markets are usually more integrated than retail markets. Retail banking includes the traditional loan and deposit types, such as consumer and mortgage loans, loans for small and medium-sized companies and demand and savings deposit accounts. Banks' counterparties are mainly households or small companies.

Loans provided to households, mainly mortgage loans and consumer loans, represents very important segment of retail credit market and of banks' credit portfolio as a whole. The aim of this paper is therefore to assess with price indicators the extent to which markets of loans provided to households in Visegrad countries are integrated with euro zone countries.

The paper is structured as follows. First part of the paper defines credit market integration and three methods how to measure it. Next chapter focuses on price indicators. The most common price indicator is the difference of interest rates charged in different countries to borrowers of the same risk class and for the same maturity. Price indicators allow us to analyze the progress towards financial integration with two special measures: beta convergence (it enables us to measure the speed of integration of the specified market segment) and sigma convergence (it measures the degree of financial convergence). Last chapter analyzes the integration of credit markets of Visegrad countries with euro zone countries with price indicators

2 Credit market integration and its measuring

European Central Bank [6] considers the market for a given set of financial instruments or services to be fully integrated, when all potential participants in such market:

- are subject to a single set of rules when deciding to buy or sell those financial instruments or services;
- have equal access to this set of financial instruments or services;
- and are treated equally when they operate in the market.

Adam et al. [1] define financial markets as integrated when the law of one price holds. This states that assets generating identical cash flows command the same return, regardless of the domicile of the issuer and of the asset holder. Otherwise, the arbitrage opportunity exists and it should adjust prices to same level.

Credit markets are integrated when terms of credits (both financial and non-financial) are not influenced by geographical location of the bank.

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In practice, measuring of credit market integration is quite complicated. The key to an accurately measured integration is to find assets, which have the same level of risk and generate identical cash flows. Then it is possible to choose which method to use:

- method based on price indicators, which refer to the definition of integration, based on law of one price (this method is described in next chapter);
- method based on quantity indicators, which should quantify determinants of demand and supply of investment opportunities and capture the importance and size of financial connections between countries (see for example [1], [3], [4] or [9]);
- method based on indicators of new information, which are designed to distinguish the information effects from other frictions or barriers (see for example [3], [5] or [9]).

3 Price indicators

Price indicators as a measure of integration refer to the definition of integration, based on law of one price. According to Cabral et al. [4], prices can refer to investment returns which, in integrated markets, should converge to the same levels, provided that the risk features are identical. In addition, they can refer to bank service charges, which should be similar in integrated markets.

The most common price indicator is the difference of interest rates charged in different countries to borrowers of the same risk class and for the same maturity. This measure can be computed for interest rates on consumer credits, mortgage credits, corporate credits and on public debt as well. If markets are integrated, rates should move together.

Except of the differences of interest rates, Pungulescu [8] recommends some other price indicators. Most important are correlations among interest rates in different countries.

Price indicators allow analyzing the progress towards financial integration with two special measures: beta convergence and sigma convergence (these measures use for example [1], [2], [6] or [7]). Convergence is understood as convergence to an average across the countries in the sample.

3.1 Beta convergence

Beta convergence concept is typically used for the analysis of integration of economic growth when the average growth rate of gross domestic product is regressed on its initial level and a negative correlation is interpreted as a sign of convergence. However, it is possible to apply this methodology on credit market. Beta convergence enables us to measure the speed of integration of the specified market segment with following equation (1):

$$\Delta R_t = \alpha + \beta R_{t-1} + \sum_{k=1}^L \gamma_k \Delta R_{t-1} + \varepsilon_t, \quad (1)$$

where R is the difference between average interest rate in a country and the benchmark interest rate (the benchmark interest rate is usually the average interest rate in selected group of countries, which is based on assumption that the benchmark interest rate signals the level to which interest rates in other countries should converge), Δ is differential operator, α is constant, L means number of periods lagged, t represents time, ε is the error term which denotes exogenous shocks that force interest rate differentials between the considered countries and β is the indicator which signals the speed of convergence.

According to Adam et al. [1], negative β signals convergence (if $\beta = 0$ there is no convergence); furthermore, the magnitude of β denotes the speed of convergence. Komárková et al. [7] state that the more is the value of β closer to -1, the greater is the speed of convergence and that the value of coefficient γ should be close to zero and the error term should have attributes of normal distribution in case of "ideal" estimation.

Country specific effects are captured by the constant α . Such effects could be barriers of integration (legislative, economic or other). High values of α indicates the existence of heterogeneous markets; therefore more integrated markets should have lesser values of α .

3.2 Sigma convergence

To measure the degree of financial convergence, it is possible to use σ -convergence. The cross-sectional standard deviation of interest rates as a measure of σ -convergence and can be calculated with equation (2):

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

where y_{it} is the yield on asset in country i at time t , \bar{y} is the cross-section mean yield at time t and i represents countries ($i = 1, 2, \dots, N$).

The cross-sectional standard deviation can be only positive. The lower the value of cross-sectional standard deviation, the higher degree of convergence has been achieved. If the cross-sectional distribution collapses to a single point and the standard deviation converges to zero, full integration is achieved.

It is important to note that the two convergence indicators have different informational contents: β -convergence does not imply σ -convergence. The reason is that mean reversion does not imply that the cross sectional variance decreases over time (in fact, β -convergence could even be associated with σ -divergence).

However, it should be noted that differences in interest rates can be caused not only by insufficient integration, but as well by:

- different conditions in national economies (such as credit and interest rate risk, size of companies, industrial structure, the degree of capital market development);
- institutional factors (taxation, regulation and supervision, consumer protection law);
- financial structure (whether economic subjects prefer financing through capital markets or bank credits);
- variability of bank products (product are often different in banks and countries, which is caused also by different preferences of customers).

4 Integration of credit markets of Visegrad countries with euro zone countries

The price measures for credit market integration are based on interest rates of credit institutions on new business reported to the European Central Bank, at monthly frequency. The data covered the period from January 2005 to March 2010. Loans provided to nonfinancial companies and to households typically represent the biggest part of banks' credit portfolios. Our analysis is based on monthly values of two interest rates charged for loans to households (interest rate on mortgage loans and consumer loans) and two interest rates for nonfinancial companies (interest rate on short term and long term loans).

4.1 Analysis of alignment

Figure 1 shows interest differentials. As a benchmark, average interest rate in euro zone is used in both cases. It is evident that spreads are significantly lower for mortgage loans. Especially Czech (CR) interest rates on mortgage loans are almost the same as in euro zone. For both types of loans, spreads are very similar for Czech Republic, Slovakia (SK) and Poland (PL) this year. In contrast, Hungarian credit market (HU) is characterized by substantially higher interest rates (the interest differential for consumer loans is even more than 20 %). Beginning in second half of 2008, almost all interest differentials has increased.

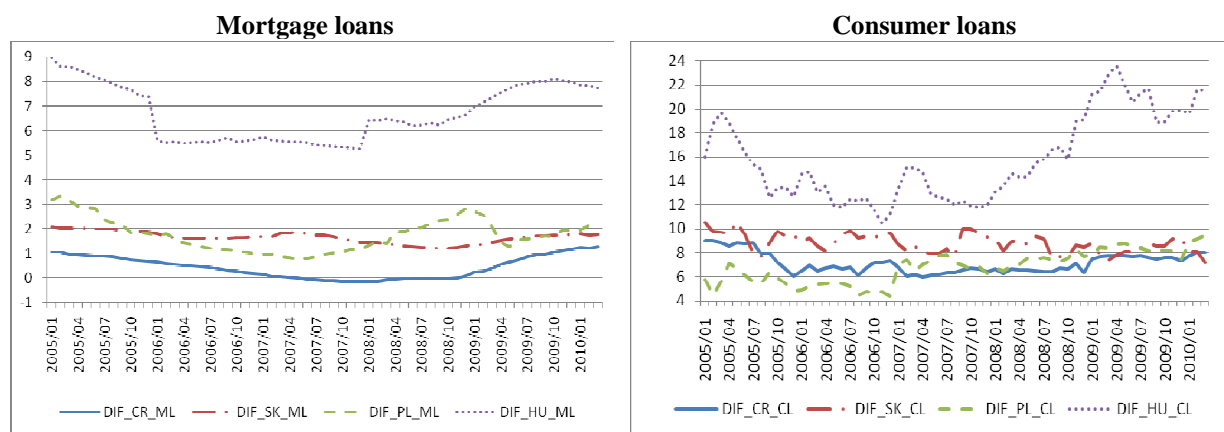


Figure 1 Interest differentials for loans provided to households²

² DIF – differential (the difference between interest rate in a country and interest rate in euro area), ML – mortgage loans, CL – consumer loans.

As shown in Table 1, Slovak and Polish mortgage loan markets and Polish consumer loan market are strongly linked with euro zone. Although Czech and Slovak interest differentials are the lowest, their interest rates appear to be uncorrelated. Hungarian interest rates on both types of loans to households show high correlation with the Czech Republic and Poland, but negative or almost zero correlation with euro zone. The same is true for the Czech Republic.

mortgage loans						consumer loans					
	CR	SK	PL	HU	EU		CR	SK	PL	HU	EU
CR	1	0,12*	0,66*	0,87*	-0,29***	CR	1	0,19*	0,22*	0,58*	0,16*
SK	0,12*	1	0,39*	0,08*	0,67	SK	0,19*	1	-0,33*	-0,31*	0,28*
PL	0,66*	0,39*	1	0,64*	0,43**	PL	0,22*	-0,33*	1	0,68*	0,46
HU	0,87*	0,08*	0,64*	1	-0,17	HU	0,58*	-0,31*	0,68*	1	0,10*
EU	-0,29***	0,67	0,43**	-0,17	1	EU	0,16*	0,28*	0,46	0,10*	1

Table 1 Correlation coefficients of interest rates on loans to households³

4.2 Beta convergence

We estimate Equation 1 both for panel data and as well separately for each country. Therefore we can compare results of these two approaches.

	α constant	β R(-1)	γ $\Delta R(-1)^4$	F-test
mortgage loans	0,1401* (0,0435)	-0,0564* (0,0161)	0,1748* (0,0617)	F = 4,057 Prob = 0,001
consumer loans	0,6343* (0,2425)	-0,0644* (0,0248)	0,0649 (0,0638)	F = 1,601 Prob = 0,161

Table 2 Beta convergence in the Visegrad countries⁵

Table 2 shows the coefficients estimated with a panel regression with fixed effects⁶. Statistically significant negative values of beta coefficients signal that convergence is taking place in both analyzed segments of retail credit market. The size of beta measures the speed of the convergence. The speed of convergence differs: it is higher for consumer loans than for mortgage loans. These results show that market segment with big interest differential (i.e. consumer loans) has high speed of convergence. Conversely, convergence of market segments with low spreads (i.e. mortgage loans) is very slow. Relatively large values of the country specific effects α indicate persistent market segmentation related to variety of barriers of integration.

	α constant	β R(-1)	γ $\Delta R(-1)$	F-test
Czech Republic	0,0048 (0,0071)	-0,0078 (0,0195)	0,7366* (0,0922)	F = 32,05 Prob = 0,000
Slovakia	0,0603 (0,0399)	-0,0379 (0,0241)	0,3913* (0,1162)	F = 7,116 Prob = 0,002
Poland	0,1339** (0,0583)	-0,0859* (0,0316)	0,3410* (0,1149)	F = 8,049 Prob = 0,001
Hungary	0,3566 (0,2344)	-0,0554 (0,0347)	0,0892 (0,1268)	F = 1,481 Prob = 0,236

Table 3 Beta convergence for mortgage loans⁵

³ The starred correlation coefficients are significant at the 1 % (*), 5 % (**) or 10% (***) level.

⁴ The chosen lag length $L = 1$ is based upon the results of Schwarz information criterion.

⁵ The starred coefficient estimates are significant at the 1 % (*), 5 % (**) or 10% (***) level. Standard errors are in parentheses.

⁶ Panel regression with fixed effects enables to show differences between analyzed countries. Possible causes of differences were described at the end of chapter 3.2.

Comparison of convergence across countries and market segments could be useful. Results of Equation 1 estimated for mortgage loans separately for each country can be found in Table 3. In all cases, beta coefficient is negative, indicating convergence. The speed of convergence is the highest for Poland (statistically significant), intermediate for Hungary and very low for the Czech Republic and Slovakia which is again consistent with the respective size of interest differentials.

	α constant	β R(-1)	γ $\Delta R(-1)$	F-test
Czech Republic	0,9165** (0,4010)	-0,1316** (0,0561)	-0,0875 (0,1257)	F = 3,287 Prob = 0,044
Slovakia	3,7772* (1,0207)	-0,4338* (0,1155)	0,1541 (0,1296)	F = 7,118 Prob = 0,002
Poland	0,7118*** (0,4147)	-0,0926 (0,0603)	-0,0386 (0,1277)	F = 1,471 Prob = 0,238
Hungary	0,7447 (0,6838)	-0,0451 (0,0425)	0,1245 (0,1276)	F = 0,841 Prob = 0,436

Table 4 Beta convergence for consumer loans⁵

As shown in Table 4, results of beta convergence for consumer loans differ significantly from those for mortgages. Beta coefficient is again in all cases negative which signals that convergence is taking place in consumer loan markets. However, the values of beta coefficients are significantly higher, especially for Slovakia and the Czech Republic (both statistically significant). Hungarian consumer loan market converges with euro zone very slowly. These results are rather surprising because there can be found no direct relation between interest differentials and the speed of convergence.

4.3 Sigma convergence

Sigma convergence measures the degree of financial convergence with cross-sectional standard deviation of interest rates. The results for both analyzed types of loans provided to households are in Figure 2.

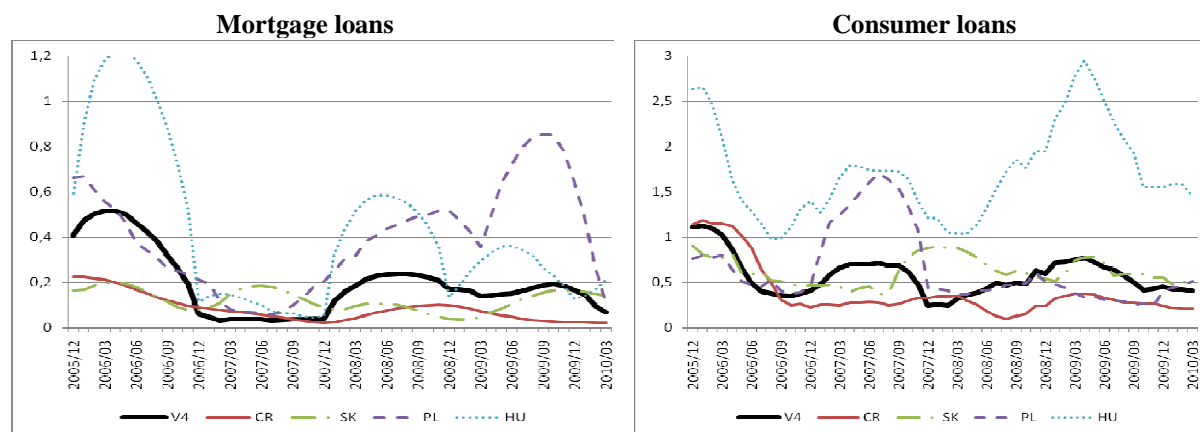


Figure 2 Sigma convergence for loans provided to households⁷

Low value of cross-sectional standard deviation for mortgage loans signals that, comparing with consumer loan market, there has been achieved much higher degree of convergence on mortgage loan markets. According to sigma convergence, the Czech mortgage and consumer loan markets are the most integrated markets. This conclusion corresponds with the fact that Czech interest rates on both types of loans had the lowest interest differentials.

⁷ V4 – cross-sectional standard deviation of average interest rates in Visegrad countries, CR, SK, PL, HU – cross-sectional standard deviation of interest rates in the Czech Republic, Slovakia, Poland and Hungary.

5 Conclusion

The aim of this paper was to assess with price indicators the extent to which markets of loans provided to households in Visegrad countries are integrated with euro zone countries.

Results of analysis of alignment and beta and sigma convergence concept suggest following conclusions. Comparing with consumer loans, mortgage loans have significantly lower interest differentials. The size of interest differential directly implies neither correlation with euro zone, nor the speed of convergence. Czech and Slovak consumer loans market and Polish and Hungarian mortgage loans market have statistically significant relatively higher speed of convergence. Comparing with consumer loan market, there has been achieved much higher degree of convergence on mortgage loan markets. Czech markets of loans provided to households belong to most integrated markets. However, panel data regression showed that barriers of integration are still very important.

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