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LENDING BOOMS IN THE NEW EU MEMBER STATES

WILL EURO ADOPTION MATTER?

by Michał Brzoza-Brzezina

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2 National Bank of Poland and Warsaw School of Economics; e-mail: Michal.Brzoza-Brzezina@mail.nbp.pl

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Address
Kaiserstrasse 29
60311 Frankfurt am Main, Germany

Postal address
Postfach 16 03 19
60066 Frankfurt am Main, Germany

Telephone
+49 69 1344 0

Internet
http://www.ecb.int

Fax
+49 69 1344 6000

Telex
411 144 ecb d

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Abstract

The paper analyses the potential for lending booms in the three biggest new EU Member States (the Czech Republic, Hungary and Poland) during the process of euro adoption. Experiences of some old members (Greece, Ireland and Portugal) and the econometric evidence speak in favour of strong loan increases in Hungary and Poland even though their magnitude may be smaller than in the case of those recently recorded in Ireland and Portugal. Due to estimation problems, the situation in the Czech Republic was more difficult to foresee, but given almost complete interest rate convergence with the euro area only modest increases in lending should be expected there. In conclusion, it may be stated that, given the currently available information, no substantial risk to the banking sectors of the new Member States should be expected.

Key words: lending booms, euro area, banking sector stability, new Member States

JEL classification: E51, E58, G21

Non-technical summary

During the process of euro adoption some participating Member States were faced with unprecedented lending booms. Loans to the private sector expanded at annual rates exceeding 20-30% in real terms. Mostly affected were the lower-income, catching-up countries such as Greece, Portugal and Ireland. This suggests that a similar process may be underway in the new EU Member States. These countries have relatively low GDP per capita levels and underdeveloped loan markets. This creates a huge growth potential, which, if triggered by interest rate convergence to the euro area level, could end up in a lending boom. Lending booms can be considered as a potential danger for the banking sectors. International evidence shows that periods of rapid credit growth have often been associated with banking crises. However, not every period of strong loan creation has to be harmful for the banking sector.

In this paper we will try to answer the following questions:

- What size of lending booms can be expected in the new Member States?
- How big is the risk to their banking sectors?
- What are the policy implications?

Hence, we restrict our attention to the loan developments and the banking sector condition and do not attempt to analyse the vast implications of interest rate declines and increased lending for macroeconomic stability (current account deficits, demand and inflation pressure, loss of competitiveness).

In the first step we analysed the situation in Greece, Ireland and Portugal. We found that the booms started generally 3-4 years before euro adoption and peaked in the accession year. Despite the strong increase of loans, no adverse consequences were noted in the banking sectors. Banks remained profitable and well capitalised, non-performing loan ratios decreased. Accordingly, we can see that the strong increases in lending that these countries faced during euro area accession have been harmless to their banking systems. This may have two reasons. First, with the process of interest rate declines, loan servicing costs decline as well. This allows agents borrow more without increasing the repayment burden. However, since the loan expansion outpaced interest rate declines, which led to an increase in servicing costs, an additional explanation must be found. This can be the low initial loan servicing to GDP ratio, related to the low lending intermediation in these economies. As a result, even the strong lending booms increased the repayment burden

only to a level (relative to income) that has been previously serviced without major problems in more advanced euro area countries.

As a second step we used econometric evidence to foresee the loan developments in the three biggest Central-European countries during euro area accession – the Czech Republic, Hungary and Poland. On the basis of estimated vector error correction models we constructed simulated patterns for loan developments in the new Member States. We found that significant increases in lending can be expected in Hungary and Poland. However, their magnitude should be substantially smaller than experienced previously by Ireland and Portugal. The main reasons are the substantial level of interest rate convergence between Hungary, Poland and the euro area and the already very low level of interest rates in the euro area. Accordingly, there is not much room for downward interest rate adjustment during the years of these countries' euro area accession. Due to estimation problems the situation in the Czech Republic was more difficult to assess. However, given almost complete interest rate convergence between the Czech Republic and the euro area, we expect increases in lending related to euro area accession to be even smaller than in Hungary and Poland.

Finally, we used the above evidence to assess, how much risk for the banking sectors in the new Member States is associated with the euro area accession process. The experience of the analysed euro area countries, combined with the fact that Central-European countries show an even bigger initial underdevelopment of lending activities, have healthy banking sectors and can expect smaller loan increases, brought us to the conclusion that, with the currently available information, no substantial threat for their banking sectors can be seen.

However, taking into account the relatively short data series, the long-time span covered, the fact that we concentrated on domestic currency loans only and the well-known difficulty in forecasting banking sector crises one should treat these results with appropriate caution. Thus, supervisory agencies should remain vigilant, and have at their disposal measures that could be applied in the case of danger. These include, for instance, changes in regulatory minima, provisioning rules or loan-to-value ratios and - in the most serious cases – imposition of credit ceilings.

1 Introduction

During the process of euro adoption some participating Member States were faced with unprecedented lending booms[1]. Loans to the private sector expanded at rates exceeding 20-30% in real terms. Mostly affected were the lower-income, catching-up countries, Greece, Portugal and Ireland (further referred to as EMU-3). The sharp decline in interest rates, improving growth prospects and liberalisation of financial markets can be enumerated as main reasons for these developments.

The stylised facts about lending booms in Greece, Portugal and Ireland suggest that a similar scenario may be underway in the new EU Member States. These countries aim at joining the euro area in a few years, they are poor relative to the rest of the euro area and face currently higher nominal and real interest rates. Since lending booms have often preceded banking sector crises it seems to be of utmost importance to policymakers in Member States to know in advance what they can expect in the near future, allowing them to take pre-emptive measures.

In this paper we attempt to foresee developments on the loan markets of the new Member States during the process of euro area accession. The analysis is focused on the three biggest new EU Member States: the Czech Republic, Hungary and Poland (further referred to as CE-3). They add up to about 80% of the eight Central-European acceding countries' GDP and hence, should be paid particular attention. Being probably equally destructive for the home economy, a banking crisis in any of them would have more severe consequences for the stability and reputation of the euro area than one occurring in any of the smaller new Member States[2]. In the analysis we concentrate only on the consequences of monetary integration, leaving out the problem of financial liberalisation and financial development (i.e. better access to credit markets, increased domestic and foreign competition etc.). The first is because banking sector regulations have been adjusted gradually since the early 1990s and currently do not diverge from EU standards.

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[1] Several definitions of lending booms can be found in the literature (e.g. Terrones, Mendoza (2004), Gourinchas et al. (2001)). We do not attempt to define this term precisely, but use it to describe growth rates (in real terms) of loans to the private sector of unprecedented magnitude (in the analysed sample).

[2] However, given the level of financial integration between Central European countries and the older Member States, even a collapse of a major bank would be very unlikely to seriously affect financial institutions from current euro area Member States. For an analysis of links between current core and peripheral euro area countries' banks see Hartmann et al (2004).

Hence, in this respect there is not much to be expected as a consequence of the process of euro area accession. Financial development, on the other hand, will obviously proceed in the course of integration. This, however, deserves a separate study.

This paper draws from the literature on lending booms and their possible consequences for banking sector stability and from the literature dealing explicitly with possible loan developments in the new EU Member States.

The first topic has been covered broadly, although without leading to a generally accepted conclusion. On the one hand, several empirical studies have pointed at the strong relationship between credit growth and banking sector/ balance of payments crises[3]. For instance, Honohan (1997) reviews cases of financial crises in 24 developed and emerging markets and considers policy regime changes as an important source of banking crises. He also includes credit growth into his set of early warning indicators. Demirgüç-Kunt and Detragiache (1998) after analysing banking sector crises in 29 countries conclude that credit growth (lagged two years) is highly significant for explaining a crisis. Kaminsky, Lizondo and Reinhart (1998) review 27 empirical studies and note that most of them mention credit growth as one of the indicators of an upcoming banking sector/ balance of payments crisis. Similarly, Ball and Pain (2000), who review the literature on banking crises, conclude that domestic credit growth is consistently found as a significant indicator of an upcoming crisis. Terrones and Mendoza (2004) analyse credit booms in emerging market economies during the period from 1970 to 2002 and come to the conclusion that 75% of the credit booms were associated with a banking crisis, while 85% were associated with a currency crisis.

Other authors have argued that the relationship between loan expansions and crises is not as strong as suggested by the previous studies. Gourinchas, Valdes and Landerrechte (2001) analyse a broad sample of lending boom episodes over a 40-year sample. They find that the link between lending booms and banking crises is significant only in the Latin

[3] In most cases the literature deals with banking and currency crises simultaneously. While a currency crisis in a Member State of the monetary union is obviously unlikely, there is no reason why there should not emerge a local banking crisis. Texas in the 1980s can serve as an example. Imprudent lending to the soaring oil industry and to the real estate field, followed by a strong decline of oil prices, resulted in a dramatic increase in non-performing assets of the banking sector. Between 1987 and 1990 seven out of ten largest Texan banks failed and had to be bailed out by the Federal Deposit Insurance Corporation (Crum (2002)).

American subsample. Once these countries are removed from the data set, the relationship disappears. Hernandez and Landerrechte (2002) after analysing 25 developed and 35 developing countries come to the conclusion that although lending booms are often followed by banking crises, this phenomenon is in most cases related to poor regulatory and supervising activities. Tornell and Westermann (2002) analyse banking crises in 39 middle-income countries and find that the probability of a banking crisis conditional on a lending boom is only between 5.7% and 8.9%.

On the other hand, the topic of potential lending booms and related macroeconomic imbalances (eg. current account deficits) resulting from euro area accession of the new EU Member States, has not received much attention yet.

Cottarelli et al. (2003) present a broad analysis of the Central European and Balkan countries' banking sectors. They also attempt to model the possible developments in loans to the private sectors of these countries in the near future. For this purpose, the authors use an international panel of non-transition developing and industrialised countries, relating the ratio of credit to the private sector to GDP to a set of variables including the public debt-to-GDP ratio, GDP per capita, inflation and indices of financial liberalisation. Having compared the actual and theoretical values of credit to GDP in Central European countries the authors conclude that their loan markets are still substantially undersized. The deviation of the credit-to-GDP ratio from equilibrium has been estimated at 27 percentage points in the Czech Republic, 41 p.p. in Hungary and 42 p.p. in Poland. The authors conclude that fast credit growth should be expected in Central European countries in the near future, without, however, pointing explicitly at euro area accession as the main reason.

A more explicit approach to the consequences of euro area accession has been adopted by Schadler at al. (2005). This paper analyses various aspects of the prospective euro adoption in Central Europe. The presented simulations suggest a very strong loan expansion during the process of euro adoption, with annual growth rates peaking at 30-45% in real terms. However, these results are based on the assumption that just after euro adoption the new Member States will start converging to the equilibrium level of an error correction model of loan demand for the whole euro area.

In our view, however, there is no reason to expect that euro adoption will immediately trigger a process of financial deepening consistent with the experience of old euro area members. Central European countries showed for many years relative underdevelopment of their financial markets (probably being a legacy of the old system) and the process of catching up should be more related to financial liberalisation, EU entry and deeper market penetration by foreign banks, than to euro area accession as such. Hence, in this paper we adopt a different approach towards predicting the potential for lending booms and possible adverse banking sector developments in the new Member States[4].

First, we analyse thoroughly the recent loan market history of relatively similar euro area countries, which witnessed strong loan expansions while adopting the common currency (Greece, Portugal and Ireland) together with policy measures adopted by their monetary/supervisory authorities. We postulate that the relative similarity of these countries before euro area accession and CE-3 countries today increases the likelihood of similar loan market developments in Central Europe. Second, we estimate simple models of the loan markets in the CE-3 countries and, given exogenous assumptions about euro area accession, predict lending behaviour during the upcoming process of monetary integration.

It must be mentioned that both approaches have their drawbacks. Drawing conclusions from past experience is warranted if no substantial changes to policy are expected in the future. However, joining a monetary union is a substantial policy change, and thus extrapolating past relationships into the future should be treated with much caution. On the other hand, drawing conclusions from the experience of other countries, that joined the common currency area earlier, can be risky as well. It cannot be taken for granted that even given some similarities, loan market developments in the old and new Member States will be alike. Nevertheless, at this point of time we do not see any better way to predict lending patterns in new Member States during euro area accession.

The rest of the paper is structured as follows. In Section 2 stylised facts about the old and new Member States, their loan markets and banking sectors are given. In Section 3 we use econometric evidence to simulate developments in lending in the new Member States during euro area accession. Section 4 concludes.

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[4] In this paper we do not attempt to analyse the vast implications of interest rate declines and increased lending for macroeconomic stability (current account deficits, demand and inflation pressure, loss of competitiveness).

2 Stylised facts about selected euro area countries and new Member States

Without attempting to be exhaustive, we present below a brief description of the lending developments[5] in Portugal, Ireland and Greece during the process of euro adoption. Further, we present some stylised facts about banking sectors and lending to the private sector in the Czech Republic, Hungary and Poland. Finally, we compare the situation of EMU-3 and CE-3 countries before euro area accession.

2.1 Euro area countries

Portugal

Portugal adopted the euro in 1999 and can be regarded as the model example of a euro area accession driven lending boom. The expansion started around 1995-96 and reached its maximum in Q3 1999 at 28.6% (in real terms[6]), then returned within two years time to the 0-5% range (Fig. 1). It was accompanied by a relatively gradual reduction in real interest rates. The real short-term rate fell from 7.2% in Q1 1995 to zero in Q1 1999 and remained around this value for the next few years. The expansion started in housing loans and was strongest in this area (the real growth rate peaked at 33.9%). Moreover, it should be taken into account that the expansion of mortgages is underestimated due to a large volume of securitisation transactions[7]. Most new loans were, however, created for the corporate sector (EUR 59 bn) with housing loans closely behind (EUR 56 bn).

No substantial deterioration of the banking sector could be noted (Tab. 1). Banks remained sufficiently capitalised as reflected by a relatively stable solvency ratio of 9.2-12.4%. From 1999 on, non-performing loans accounted for slightly more than 2% of total loans. This indicator should, however, be treated with caution, since it tends to brighten the situation during loan expansions and show the problem only with a substantial lag[8].

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[5] Unless stated otherwise the terms loans or lending will mean loans to the private sector (households + non-financial corporations + non-profit institutions serving households) throughout the paper.

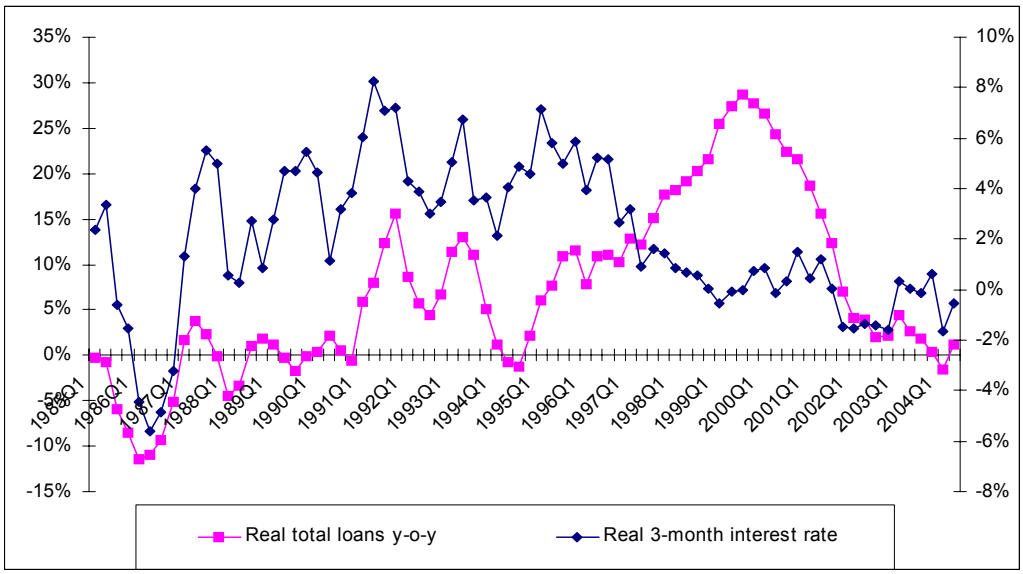
[6] Interest rates and loans have been deflated using the current GDP deflator.

[7] According to the estimates of the Banco de Portugal (BdP (2003)), the growth rate of housing loans adjusted for securitisation was 11.7% in 2003 as compared to the balance sheet rate of 2.2%.

[8] The obvious reason is that new loans granted are "good loans" for some time. Thus, in periods of fast credit growth, the denominator of the non-performing loan ratio increases quickly, while the numerator shows a

Profitability of the sector, as measured by return on assets (ROA), was stable, although not particularly high, only slightly above the euro area average. The prolonged expansion led to a significant increase in the loan-to-GDP ratio, which amounted to 136% in 2003, one of the highest in the euro area. It is noteworthy that the lending boom did not lead to significant asset price increases. In particular, despite high growth rates of housing loans, the growth rate of real estate prices remained modest over the recent years (IMF 2003c).

Figure 1: Real loans to the private sector (y-o-y) and real 3-month interest rate in Portugal (1985-2004)



Source: Own calculations based on ECB and OECD data.

Table 1: Selected indicators of performance of the Portuguese banking sector (%), (1995-2003)

Year	Capital adequacy ratio	Non-performing loan ratio	ROA	Loan- to-GDP ratio
1995	11.8	5.9	0.6	63
1996	11.4	5.2	0.6	67
1997	11.5	4.0	0.7	76
1998	12.4	2.9	0.8	90
1999	10.8	2.2	0.9	109
2000	9.2	2.2	0.9	128
2001	9.5	2.1	0.9	132
2002	9.8	2.3	0.7	135
2003	10.0	2.4	0.8	136

Source: IMF, Banco de Portugal and own calculations based on ECB and IMF data.

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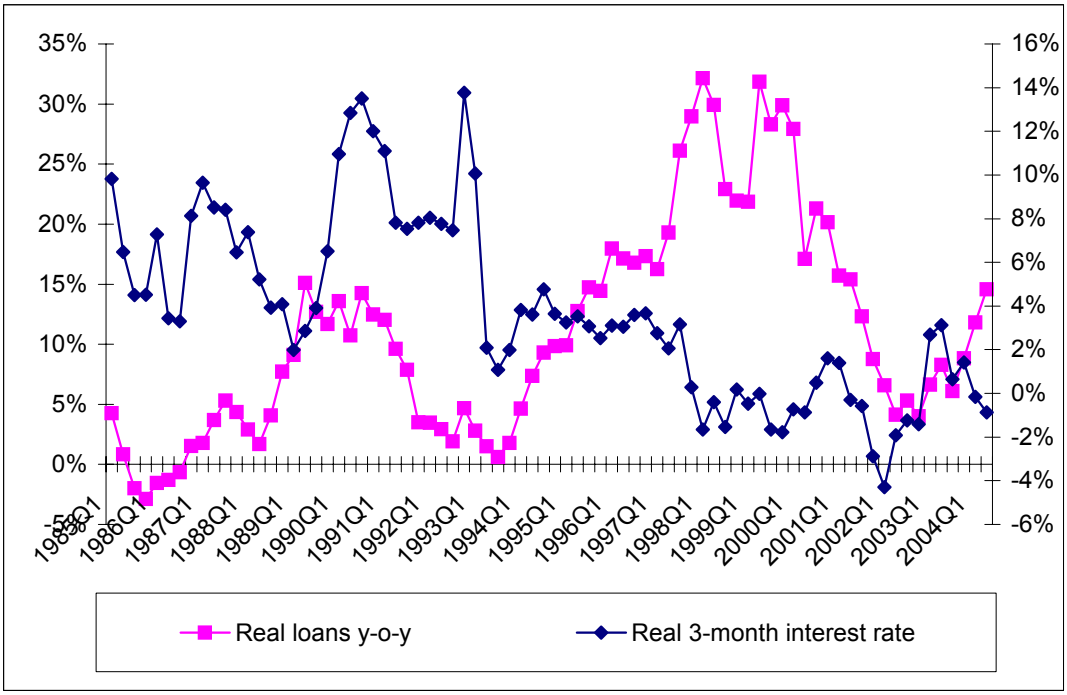
higher volume of bad loans only with a lag. Accordingly, during a boom the NPL ratio falls for some time and need not reflect the upcoming deterioration of the asset portfolio.

Ireland

The lending boom in the Irish banking sector started around 1995, i.e. four years before euro area accession. Real total loans to the non-financial sector increased by 32.1% y-o-y at the peak in 1998 and by 31.9% at a second peak one year later. In these terms, Ireland witnessed the most spectacular loan expansion among the euro area countries. By 2002, the boom seemed to be over, however, in 2004 another period of strong loan expansion started. Regarding the sector decomposition, sources of loan creation were relatively balanced. In the first expansion phase corporate loans were the major source of expansion, whereas after 2002 this role was taken over by housing loans. Even a cursory look at the data (Fig. 2) reveals that the drop of real interest rates, which started in 1993, could have been a major reason behind the expansion. The real 3-month interest rate dropped from above 10% in 1993 to negative regions in 1998 and remained there with minor exceptions until 2004. In this respect it should be noted that the ERM crisis and the subsequent drop in interest rates from very high levels could have influenced the magnitude and the time of occurrence of the lending boom in Ireland.

The loan expansion did not undermine the strength of the Irish banking sector. The capital adequacy ratio remained broadly stable over the analysed period and stayed securely above the minimum requirement of 8% (Tab. 2). Banking sector profitability, as measured by ROA, decreased slightly from 1.7% in 1995 to 1.3% in 2003. This process reflected falling interest margins, related to historically low interest rates and a shift away from deposits towards more expensive financing sources like loans from foreign banking institutions. Nevertheless, profitability remained much above the euro area average of 0.7% in 2003. Finally, loan quality improved, the ratio of non-performing loans to total loans decreased from 2.8% in 1997 to 1.1% in 2003. Like before, it should be taken into account that this ratio is a lagged indicator of loan quality. Both, IMF missions (IMF (2001b), IMF (2003b)) and the Irish supervisory authorities seem to be satisfied with the performance of the banking sector, however, pointing at one source of concern. The surge of mortgage loans brought about a boom of house prices, which over the last six years were growing at an annual rate of almost 20% (CBI (2001), CBI (2002), CBFA (2004)). Although there is no clear evidence of overvaluation, there is some risk that Ireland faces a price bubble in the property market.

Figure 2: Real loans to the private sector (y-o-y) and real 3-month interest rate in Ireland (1985-2004)



Source: Own calculations based on ECB, OECD and Reuters data.

Table 2: Selected indicators of the performance of the Irish banking sector (%), (1995-2003)

Year	Capital adequacy ratio	Non-performing loan ratio	ROA	Loan to GDP ratio
1995	13.0	NA	1.7	67
1996	11.6	NA	1.8	71
1997	11.1	2.8	1.4	89
1998	11.0	2.5	1.7	92
1999	10.4	1.8	1.6	111
2000	9.7	1.9	1.5	117
2001	11.2	1.9	1.5	123
2002	12.5	1.7	1.5	117
2003	11.0	1.1	1.3	127

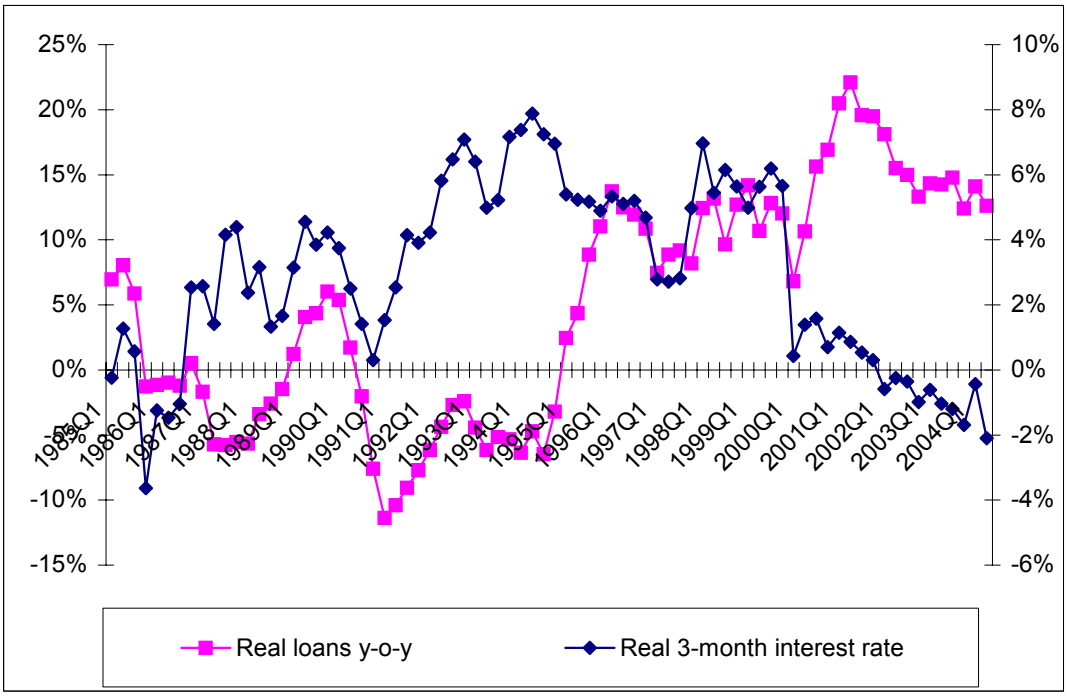
Source: IMF, Central Bank of Ireland and own calculations based on ECB and IMF data.

Greece

The case of Greece is not the most evident example of a euro-accession driven loan expansion. It is not obvious whether the lending boom, whose beginning can be observed around 1995, was related to monetary integration. No significant decrease in real rates could be observed before this event (Fig. 3); moreover, it seems that at that time nobody could be sure at what point in time Greece would enter the euro area. A more likely

explanation of the expansion is the removal of foreign exchange controls over 1993-94 which brought about a surge in foreign exchange lending (Honohan (1999), IMF (2001a)). Obviously, the capital account liberalisation can be regarded as a step towards monetary union, but it is not relevant for the examination of possible developments in the new Member States, since capital controls have already been liberalised there. Having this in mind, one should probably concentrate on the last phase of expansion, visible since 2000. This phase followed an obvious drop in real rates from 5-6% in 1999 to about 1% in 2000 and further into negative regions in the following years. Loan expansion of over 20% in real terms followed soon, peaking at 22% in Q2 2001 and remaining above 10% until the end of the sample. Data disaggregation shows a clear winner of the Greek lending boom: loans for housing purposes with highest growth rates over the whole period. In real terms they exceeded 30% in 2001-02 (BoG (2003b)). On the other hand, corporate loans' annual growth rate did not make it above 20%. Nevertheless, due to the higher initial level, corporate loans added most to the expansion (EUR 18 bn) followed by mortgages (EUR 16.9 bn).

Figure 3: Real loans to the private sector (y-o-y) and real 3-month interest rate in Greece (1985-2004)



Source: Own calculations based on ECB and OECD data.

As in the previous cases, the prolonged loan expansion did not adversely affect the Greek banking sector (Tab. 3). Solvency remained broadly stable at 10-13.6% as measured by

the capital adequacy ratio. The quality of the loan portfolio improved over time bringing the non-performing loan (NPL) ratio down to 8.1% in 2002 from over 19% in 1995. Only the profitability of the sector decreased substantially over the last four years, reflecting a general decrease in non-interest income due to weak equity markets performance (BoG (2000), BoG (2001), BoG (2002), BoG (2003a)). In general, no unwelcome developments were noticed, the only exception being a steady increase of property prices, of about 10% per annum for several years (IMF (2003a)), driven by mortgage lending.

Table 3: Selected indicators of performance of the Greek banking sector (%), (1995-2003)

Year	Capital adequacy ratio	Non-performing loan ratio	ROA	Loan to GDP ratio
1995	12.8	19.5	NA	34
1996	10.3	19.0	NA	36
1997	10.3	16.5	0.7	37
1998	10.2	13.6	0.7	40
1999	16.2	15.5	2.4	43
2000	13.6	12.3	1.4	49
2001	12.5	9.2	1.0	57
2002	10.5	8.1	0.5	61
2003	11.9	NA	0.9	66

Source: IMF, Bank of Greece and own calculations based on ECB and IMF data.

Protective measures

In order to assess to what extent the lack of adverse consequences of the lending booms in the old Member States was their intrinsic feature and to what extent a result of policy actions, a brief overview of protective measures taken by the EMU-3 supervising institutions is presented below. As it can be seen from Table 4, the actions were not drastic. Taking this into account one could risk the point that the observed lending booms had a rather harmless character, being probably related to the fact that the EMU-3 countries had relatively underdeveloped loan markets and simply caught up with more mature EMU economies. In other words, the lending intermediation and the respective repayment burden increased towards levels that have been tested as safe by other economies.

Table 4: Protective measures taken by the supervising authorities of the EMU-3 countries during euro area accession

Country	Measure applied
Greece	• Tightening of provisioning rules for non performing loans and loans with limited collateral • Holdings of non-remunerated deposits from excessive credit growth imposed on commercial banks
Ireland	• Letter of concern sent by the central bank to commercial banks • All credit institutions requested to arrange independent verification of their compliance with the best international standards of risk management and control • More intensified inspections of mortgage and commercial property lenders to examine the quality of underwriting • Establishment of single financial markets regulatory and supervising institution
Portugal	• Increased capital requirements for housing loans with loan-to-value ratio exceeding 75% • Introduction of provisions based on average loan performance over the economic cycle • Establishment of national council of supervisors, involving all financial markets supervisory agencies

Source: CBI (2002), BoG (2003), IMF (2000), IMF (2003a)

Common features

Several common features of loan expansions in the analysed countries can be found. These can be useful when drawing conclusions for the new Member States.

- **Timing:** Lending booms started 1-4 years before euro area accession and peaked in all countries in the accession year. Despite a significant slowdown in all the countries it is not sure whether the process has already fully died out. There is, however, no unique time pattern as regards the relative behaviour of corporate, household and housing loans.

- **Driving force:** Highest growth ratios were noted in lending for housing purposes. However, due to the initial low amount of outstanding mortgage loans, in all the countries most new loans were created for corporates. Nevertheless, the differences are only minor.

- **Side effects:** As a general rule no significant side effects for the banking sectors were noted. The sectors remained profitable and well capitalised, non-performing loan ratios declined. One notable exception are real estate prices, which increased substantially in Greece and Ireland. However, there is no clear evidence of a price bubble in any of these countries. Although serious problems in the banking sector seem now unlikely, some trouble cannot be ruled out, since in the two countries the booms are not over yet.

- **Financial deepening:** Loan-to-GDP ratios increased substantially in all three countries, approximately 2 times between 1995 and 2003. However, while Portugal and Ireland overtook, in this respect, most euro area countries, Greece's lending sector remained underdeveloped.

- **Protective measures:** Although all the EMU-3 countries' supervising bodies undertook actions to diminish the scale or potential negative consequences of the booms, these cannot be regarded as drastic. Hence, it seems that, by their character, the booms reflected rather harmless financial deepening than unsustainable developments on the lending market.

2.2 New Member States

The banking sectors of the CE-3 countries underwent dramatic changes during the transition period. Until the 1980s, these countries did not have a two-tier banking sector. Their banking systems were dominated by the so-called monobank, which combined the functions of central and commercial banks. In the late 1980s, the CE-3 countries decided to create a two-tier banking system, separating several commercial institutions from the central bank. This process, however, carried, from the very beginning, a sort of "original sin". The newly created banks were heavily burdened by bad loans inherited from the past. They also lacked the know-how of modern banking (including the inability to properly assess risk). Moreover, young and inexperienced supervisory institutions were not

prepared to enforce a restructuring process. As a result, in all CE-3 countries substantial aid from the public sector had to be given to rescue the banking systems[9].

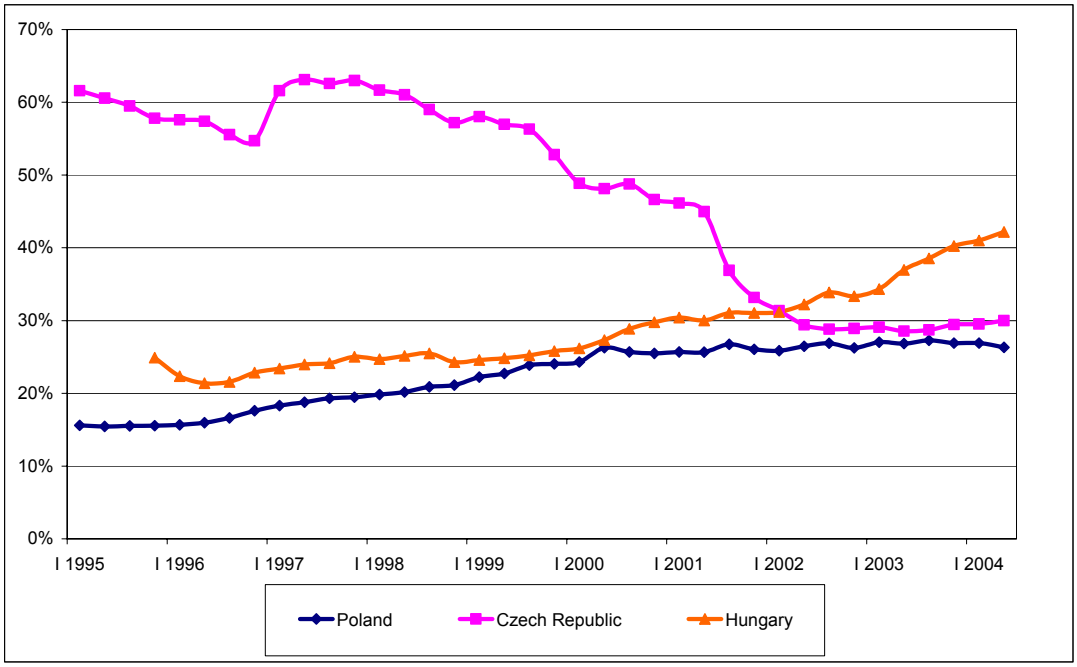
Poland and Hungary started the restructuring process relatively early. Around 1992-1994 banks in both countries were recapitalised (Polański (2002), Varhegyi (2002)), in Hungary bad loans were also partially transferred to a specialised institution. Full restructuring costs are estimated to have been around 6% of GDP in Poland and 13% in Hungary (Szapary (2001)). Simultaneously, the privatisation process was started. As a result, the bulk of commercial banks have been sold to foreign financial institutions. In 2003 foreign ownership amounted to 68% of the banking system assets in Poland and to 83% in Hungary (ECB (2005)).

The restructuring and privatisation processes in the Czech Republic were more troublesome than in Hungry and Poland. The restructuring process, which started in the early 1990s, was followed by the so-called voucher privatisation, which did not change the *status quo* in most big banks, where the state retained majority ownership. As a result, when the economy was hit by a currency crisis and a recession in 1997-98, many poorly managed banks faced severe problems. At the end of 1999 more than 40% of loans granted by the large banks were classified (Tuma (2002)). As a result, a huge restructuring program was introduced; its cost is estimated at 18% of GDP (Szapary (2001)). Subsequently, the big banks have been privatised, so that in 2003 foreign ownership in the Czech banking system's assets amounted to 96%. However, the bad loan problem coupled with economic recession contributed to a substantial decrease of loans granted to the private sector in 1998-2001. This episode differentiates the Czech Republic from the other two countries. While in Hungary and Poland, over the last decade a steady increase of the loan-to-GDP ratio could be observed, the Czech Republic faced a strong contraction (Fig. 4).

Being a legacy of the previous economic system, the ratio of total loans to GDP in CE-3 countries is relatively low compared to other euro area members, even controlling for differences in economic development (Schadler et al. (2005), Cottarelli et al (2003)).

[9] We present only a rough overview of the restructuring processes of CE-3 countries' banking sectors. For detailed information see Balassa (1995), Bonin et al. (1998), Polański (1995) and Wyczański (1993).

Figure 4: Total loans to the private sector as percent of GDP in the Czech Republic, Hungary and Poland 1995-2004



Source: Own calculations based on CNB, MNB, NBP and OECD data

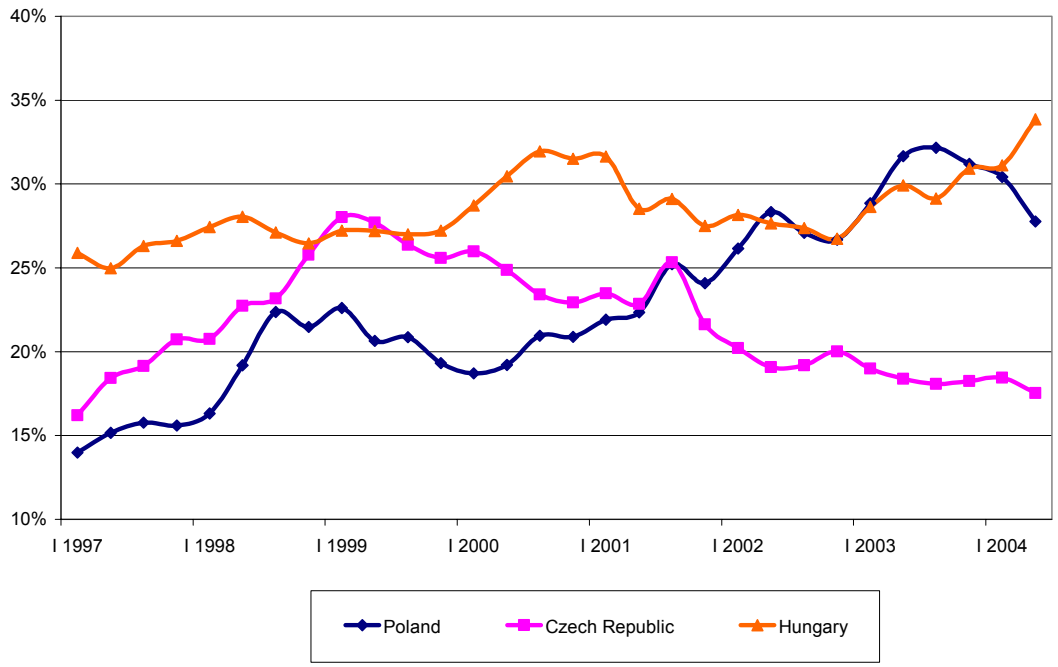
Looking at disaggregated data several observations can be made. First, foreign currency loans form a substantial, but not overwhelming, part of the banks' portfolios. Over the last years, the share of foreign currency loans in total loans to the private sector ranged between 15-28% in the Czech Republic, and increased from 25-35% in Hungary and from 14% to 25% in Poland (Fig. 5).

Second, regarding sector decomposition, a common tendency can be observed – a steady increase in the share of loans to households and a decline of the corporate loan share. By 2004, the share of households increased to almost 50% of total loans to the private sector in Poland, about 35% in the Czech Republic and more than 30% in Hungary.

Third, very deep underdevelopment of the housing loan market can be observed. The ratio of housing loans to total loans to the private sector amounted in June 2004 to 9.3% in Poland and 17.1% in the Czech Republic; only in Hungary it attained 31.1%. With exception of the latter, these numbers seem low as compared to 34% in Ireland, 38% in Portugal and 36% for the Union as a whole. Thus, whatever results for total loan expansions will emerge from the latter analysis, it should be remembered that the growth

potential of selected categories might be much bigger than the average and that these areas should be paid special attention. Mortgage lending is a prominent example.

Figure 5: Share of foreign currency loans in total loans to the private sector in the Czech Republic, Hungary and Poland 1997-2004



Source: Own calculations based on CNB, MNB and NBP data

The current condition of the banking sectors in the CE-3 countries is good. Banks are well capitalised and their loan portfolios are not excessively troubled by non-performing assets (Tab. 5). In the latter case, Poland, with its high NPL ratio may look as an outlier, however, the numbers reflect the very strict classification and provisioning rules[10] that have been eased only recently (NBP (2004a)), and hence the ratio is expected to decrease substantially in the near future. With the exception of the Hungarian mortgage market (MNB (2004)) there are no lending booms which could possibly threaten to result in substantial increases of bad loans. The macroeconomic outlook for all three countries seems positive, GDP is expected to grow at 3.5-5% in the near future (EC (2004)) and inflation remains low. Moreover, as already mentioned, most of the region's commercial

[10] For instance, until December 2003 Polish banks had no motivation to write-off lost loans. If such loan had been repaid at a later date, it would have been treated as exceptional profit and become subject to heavy taxation (NBP 2003).

banks have now big foreign credit institutions as majority shareholders. Hence, it is highly probable that in the case of problems, parent institutions would be ready to bail out the troubled bank[11].

Table 5: Non-performing loans and Capital adequacy ratios in CE-3 countries (June 2004)

	Czech Republic	Hungary	Poland
Non-performing loans/total loans	4.5%	3.4%	17.2%
Capital adequacy ratio	13.6%	11.5%	15.6%

Source: National Central Banks.

2.3 Comparing the old and new Member States

If predictions about lending patterns in new Member States are to be made from the above experience, one should check whether the initial conditions are similar between the groups of countries. Table 6 presents a brief comparison of the economic and banking sector characteristics. Since, according to official declarations, it can be expected that the new members will join the euro area around 2009-2010, we compare their current situation with that of the old members five years before accession, i.e. 1994 for Ireland and Portugal and 1996 for Greece.

The old members were slightly more developed as measured by GDP per capita (especially as compared with Poland), Ireland and Portugal had also a much higher level of lending intermediation. Nevertheless, on average, the differences here are not overwhelming. The divergence becomes more pronounced if one regards interest rates, which are expected to be the main driving factor behind lending booms. The new Member States are more advanced as regards nominal convergence with the euro area (inflation, interest rates). This is not only true for absolute levels, but also for spreads over German bonds and German/euro area short-term rates. The average real short-term rate in the CE-3 countries stood at 3.1% in 2004 as compared to 4.2% in the EMU-3 countries in the mid 1990's. Spreads on long-term bonds are lower in CE-3 countries by 0.5 percentage point, while the spread on short-term rates is lower by 1.7 percentage points. Moreover, one has to remember that in the EMU-3 countries the convergence of spreads was accompanied by

[11] However, experiences in this respect have been rather mixed so far. In 2003 the Belgian owner KBC recapitalised the Polish Kredyt Bank when there was a serious threat of falling below the 8% margin for capital adequacy. On the other hand, Bayerische Landesbank left the Croatian Rijecka Bank stranded in 2002, when it faced bankruptcy as a result of losses generated in the dealing room.

a substantial decline of German/ euro area interest rates. This need not happen at the time the CE-3 countries enter the euro area since interest rates are currently at historically low levels there, probably below their long-run equilibrium level. Thus, at the first sight it seems that the lending boom potential in the new Member States is smaller than in the old Member States. Nevertheless, it should be noted that the CE-3 countries are not homogenous as regards interest rate levels. For instance, real and nominal short rates are much higher in Poland and Hungary than in the Czech Republic.

Table 6: Selected indicators for comparison of EMU-3 and CE-3 countries

	Greece 1996	Ireland 1994	Portugal 1994	Average EMU-3	Average CE-3	Czech Rep. 2004	Hungary 2004	Poland 2004
GDP per capita at PPP $ (constant prices)	15131	19231	15093	17181	14345	16265	15342	11427
Loans to private sector/GDP	35.6%	63.7%	59.0%	49.7%	36.0%	32.7%	44.9%	30.5%
Nominal 3M interest rate	13.8%	5.9%	11.1%	9.8%	6.3%	2.1%	11.3%	5.5%
Nominal 10Y interest rate	9.7%[a)]	8.0%	10.5%	8.9%	6.3%	4.6%	7.8%	6.6%
Inflation rate (HICP)	7.9%	2.9%	5.0%	5.4%	3.1%	1.3%	6.1%	1.8%
Real 3M interest rate	5.5%	2.8%	5.8%	4.2%	3.1%	0.8%	4.9%	3.7%
Real 10Y interest rate	4.1%	5.0%	5.3%	4.5%	3.2%	3.3%	1.7%	4.7%
Spread to Germany/ euro area – short rate	10.5%	0.6%	5.8%	5.5%	4.2%	0.0%	9.2%	3.4%
Spread to Germany – long rate	4.2%	1.2%	3.6%	2.7%	2.2%	0.5%	3.7%	2.5%
Non-performing loans/total loans	19.0%	2.8%	7.0%	10.9%	8.4%	4.5%	3.0%	17.2%
Capital adequacy ratio	10.3%	13.0%	11.8%[b)]	11.7%	13.6%	13.6%	11.5%	15.6%

Note: data on inflation and interest rates are 12-month averages. For CE-3 countries June 2004 data is presented, except GDP, where IMF estimates for 2004 are given. The averages are unweighted.

a) July – December 1997 data

b) 1995 data

Source: ECB, Eurostat, IMF, National Central Banks and Reuters.

Inferring from the statistical information, the following can be said about potential lending booms in the new Member States.

First, in principle they should be considered prone to substantial loan expansions. They have a big catching-up potential and still face relatively high interest rates, which means that there is room for real interest rate reductions. However, the room is substantially smaller than it was in the case of the EMU-3 countries.

Second, if the pattern of EMU-3 countries were to be repeated, one could expect the process starting around 2006-2008 (provided that accession will find place in 2009-2010) and peaking in the year of accession. The EMU-3 experience does, however, not allow drawing firm conclusions about the end of the boom.

Third, taking into account the relative underdevelopment of mortgage lending, this area of bank activity can be expected to grow fastest.

Fourth, the very low level of lending intermediation in the CE-3 countries leaves much space for a relatively safe financial deepening.

Fifth, the condition of the CE-3 countries banking sectors is good. Given the experience of EMU-3 countries, provided that supervisory measures of similar power are applied and the booms do not exceed those experienced in these countries one is inclined to risk the hypothesis that substantial financial trouble should not be expected in the CE-3 economies.

3 The potential for lending booms in the new Member States

3.1 Model and data

In order to go beyond simple inference based on comparing statistics, we construct econometric models of loan developments. Although we want to forecast only the developments in the CE-3 economies, we build models for all six countries. This is done for two reasons. First, since the new Member States have undergone a deep transformation of their economic systems and their time series are not particularly long, models, especially based on quarterly data, are not always of top quality. Second, there is some risk that the accession to the euro area is by itself such a deep change in economic conditions that it could result in a breakdown of the econometric relationship describing the loan behaviour. Therefore, the relationships estimated for the EMU-3 countries could be used as a supportive tool for forecasting loan expansions in the CE-3 countries. Moreover, these models can be used to check whether the relationships remain stable upon euro area entry.

For several reasons we try to keep the specification as simple as possible. First, the availability of time series for the new Member States is limited. A number of time series starts only very recently. Since we would like to have the same data set for all three new Member States, this limits substantially our possibilities. Second, even the longest available series are relatively short (not longer than 10 years of quarterly observations). Limiting the data set helps save the model's degrees of freedom. Third, the model will be used for building a conditional forecast of loan developments. Every variable which were to enter into the model but were not sufficiently explained within it, would require

exogenous assumptions for the forecast horizon. This would unnecessarily increase the level of discretion.

Having this in mind, we follow the approach adopted recently by Hofmann (2001), Calza, Gartner and Sousa (2001) and Calza, Manrique and Sousa (2003) and build a vector error correction model in real loans to the private sector, real GDP and real interest rate[12]. This is certainly not a complete list of loan determinants. However, since we still lack a widely accepted theory of loan evolution, we have decided to concentrate on variables, which are considered as basic determinants of money and loan creation i.e. output and interest rates (Laidler (1991), Borio and Lowe (2004)). Although one could think of additional determinants of loan development (e.g. indices of financial liberalisation, crowding-out, capital available to banks) it seems impossible to obtain a consistent cross-country data set on quarterly basis for these variables. It should be also borne in mind, that since the quantity of loans is determined simultaneously by supply- and demand-side factors, the relationship we estimate should not be treated as a demand or supply equation. The time series used for estimation purposes have been plotted in Appendix 3 (Fig. 13-18).

The long-run relationship takes the following form:

$$(1) \qquad l_t - \beta_0 - \beta_1 y_t - \beta_2 r_t = 0$$

where l stands for the log of real loans, y for the log of real GDP and r for the real rate of interest. Accordingly, the vector error correction model takes the form:

$$(2) \qquad \Delta x_t = \Gamma_1 \Delta x_{t-1} + \ldots + \Gamma_n \Delta x_{t-n} + \alpha\beta' x_{t-1} + c_t + \varepsilon_t$$

where $x_t=[l_t, y_t, r_t]'$, Δ denotes the first difference, Γ are matrices of short-run coefficients, α is the load matrix of error correction coefficients, β is the matrix of long-run coefficients and ε denotes the vector of residuals.

[12] Since in the CE-3 countries a significant part of lending is done in foreign exchange, we also tested a specification including the real effective exchange rate for these countries. However, this resulted mainly in wrongly signed and unstable coefficients in the cointegrating vector.

We use quarterly data starting from Q1 1981 for Portugal, Q1 1983 for Greece and Ireland, Q1 1995 for the Czech Republic and Poland and Q4 1995 for Hungary, where the starting point is determined by data availability. All the series terminate in Q2 2004. Total domestic currency denominated loans to the private sector are taken for CE-3 countries[13], total loans to the private sector for the EMU-3 countries. Since no consistent data on loan interest rates was available, we used the 3-month money market rate. Interest rates and loans were deflated using the GDP deflator. Moreover, GDP at constant prices is used for all countries. A detailed description of data sources is presented in Appendix 1.

According to the model specification real loans, GDP at constant prices and real interest rates should be integrated of order one. From the theoretical point of view, this is certainly not controversial as regards loans and GDP. However, as to real interest rates, it is not completely clear whether they should be treated as stationary or non-stationary variables (Lanne (2002)). However, since we are trying to model consequences of permanent shifts in real rates it seems more appropriate to include them in the cointegrating vector. The unit root tests (Tab. 7) tend to suggest that all the analysed variables are indeed integrated of order 1.

3.2 Estimation and simulation

We estimate a separate VEC model for each country. As a first step, we determine the number of lags in each model. We use three information criteria (Akaike, Schwarz and Hannan-Quinn) and the LR sequential test (Tab. 8). If these are conclusive (at least three criteria indicating the same lag), we choose the indicated number of lags, if not (or if they indicate 0 lags as in the case of Hungary), we build a small model with well-behaved residuals (Tab. 10 and 11). Inferring from the maximum eigenvalue and trace tests (Johansen (1991)), we find one cointegrating vector at the 5% level in the cases of Hungary, Ireland, Poland and Portugal (Tab. 9). The null of zero vectors cannot be rejected in the case of Greece and the Czech Republic. A closer look at the data shows that

[13] This is justified by the fact that interest rate declines will affect only domestic rates and hence influence only domestic currency lending. Since after euro area accession an overwhelming part of lending will be done in domestic currency, the results obtained for domestic currency loans can be applied to total loans to the private sector. Unfortunately, for the EMU-3 countries long series on local currency denominated loans were not available. On the other hand, only relatively short series of foreign currency lending in CE-3 countries have been available, thus impeding complete comparability of the models.

in both latter cases the sample is dominated by flat or even falling amount of real loans, which explains why no long-run relationship to GDP can be found.

The four encountered cointegrating vectors show a positive relationship between real GDP and real loans with elasticities between 1.45 for Ireland and 3.39 in Hungary (Tab. 12-15). These numbers (especially those for Poland and Hungary) seem relatively high as compared to other studies[14]. However, since the financial intermediation in these economies is very low, they probably simply reflect the process of financial deepening that has been going on over the estimation period and can be expected to hold on over the foreseeable future. Real interest rates have in all models a negative impact on real lending, whereas the semi-elasticity varies between -4.42 in Hungary and -10.81 in Portugal. International comparisons are difficult in this respect, since substantial differences are found between studies[15].

The major diagnostic tests of the models are satisfactory. At the 5% level we cannot reject the hypothesis of normality and lack of autocorrelation in the residuals (Tab. 10, 11). Since the time series for the new Member States are already very short we do not perform stability tests on them (which require truncating the sample further). The recursive estimates of the coefficients (Fig. 6, 8) show substantial parameter stability for Ireland. On the other hand, some shifts can be observed in Portugal during the process of euro adoption (Fig. 7, 9). Yet, as these are quantitatively modest and the parameter values stabilise after euro area accession we have decided to proceed with the Portuguese model as well. These estimates, together with the findings in Calza, Manrique and Souza (2003) show, that parameters in loan equations changed in a modest way after euro area accession. This gives support for our concept of using models estimated for CE-3 countries to forecast loan developments after euro adoption.

The estimated models are now used to simulate possible loan developments in CE-3 countries during the process of euro adoption. This means that we solve the models forward for the period Q3 2004 – Q4 2020 subject to the following assumptions.

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[14] Calza et al. (2003) report an elasticity of 1.6 for the EMU as a whole, Hofmann (2001) finds elasticities between 1.04 and 2.49 for a group of 16 industrial countries.

[15] For instance Calza et al. (2001) find a semi-elasticity of –1.01 for the euro area, on the other hand Calza et al. (2003) find -5.05 and Hoffman (2001) reports numbers between -0.01 and -0.08.

- As a general rule we treat only the real interest rate as exogenous. Real lending to the private sector and GDP are determined within the model[16].
- Euro area accession is scheduled for all countries in 2009. This is in line with the objectives of the Hungarian and Polish Governments. The Czech Republic did not set any specific target for accession. However, the simulation results can be simply "pushed ahead", if one assumes another date for euro adoption.
- The real interest rate remains at its long-run equilibrium level[17] until the end of 2006, and then starts declining linearly to the euro area level until Q4 2008. This is assumed to be 2% at that time, approximately at the long-run equilibrium level (Crespo-Cuaresma et al. (2003)). Our assumption of equal real rates between acceding members and the euro area results from the following reasoning. First, at the day of accession nominal interest rates must be equal. Second, the CE-3 countries will have to fulfil the inflation criterion, they will, however, be unwilling to depress inflation unnecessarily. According to simple calculations (Borowski and Brzoza-Brzezina (2004)), inflation close to the euro area average should be sufficient to fulfil the criterion. Hence, with equal nominal rates and similar inflation, real rates will be similar as well.
- After euro area accession the real interest rates in the CE-3 countries decline further due to increasing inflation in these countries. We assume that this stems only from the Balassa-Samuelson effect and, hence, deduct its estimates from the real rate. This is assumed to happen linearly during the 4 quarters following accession. The estimates of the Balassa-Samuelson effect are taken from Chmielewski (2003) and Kovacs (2002). We assume 1.5% for Hungary and Poland and 1% for the Czech Republic. This means that the ultimate real interest rate since Q1 2010 is 0.5% for Hungary and Poland and 1% for the Czech Republic.
- The simulation process starts from the model's steady state, i.e. it ignores the initial disequilibrium. This implies that the simulation results should not be treated as a forecast for the near future but only as an approximation of the developments to be expected during euro area accession.

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[16] With Poland being the exception, where the implausibly high long-run growth rate of GDP (6.5% p.a.) is corrected exogenously to the sample average of 4.5%.

[17] The consensus estimate for the equilibrium level in Poland, based on Brzoza-Brzezina (2005) and BRE (2004) is 4%, in the Czech Republic 2% (CNB 2003). Since for Hungary no estimates are available, we take the average over Q3 2003 – Q2 2004, which is 4.5%.

The simulations are performed on the basis of the estimated national model (for Hungary and Poland) and on the basis of the models estimated for Ireland and Portugal (for all the CE-3 countries). As already mentioned, the latter results are performed due to the relatively high uncertainty about the quality of the models estimated for the CE-3 countries with short data samples. They provide an answer to the question "how would the Irish (Portuguese) economy behave if it faced a drop in real interest rates that we assume for Poland (Czech Republic, Hungary)".

The results are presented in Appendix 3 (Fig. 10-12). Not surprisingly, the patterns differ substantially between the models. In the cases of Hungary and Poland, high growth rates of loans to the private sector during the accession period can be seen. However, it should be noted that in none of the models the growth rate of loans exceeds 25%. For Poland, the peak estimates vary between 12% and 20%, in Hungary between 13% and 21%. Since for the Czech Republic we have only the Irish and Portuguese models, not much can be said about projected growth rates of loans to the private sector. However, the very decent humps that can be observed on Fig. 10 suggest that the loan expansion resulting from euro area accession will be very modest in the Czech Republic. This is an obvious consequence of the already very low natural rate of interest in this country. Thus, according to the simulation results, only Poland and Hungary could expect relatively high growth rates of loans to the private sector during euro area accession. Their magnitude can be, however, expected to remain below those witnessed in recent years in Ireland and Portugal.

These results are consistent with the main findings from Section 2. Indeed, the potential for interest rate decreases and loan increases seems smaller in the CE-3 than in the EMU-3 countries. Accordingly, it gives support to the thesis that at this point of time not much risk of adverse outcomes in the banking sectors during CE-3 countries' euro area accession can be seen. However, given the model uncertainty, the long-time span covered and the well-known difficulty in forecasting banking sector crises one should treat these results with much caution. Another factor of uncertainty is related to the fact that we concentrated only on domestic currency loans.

4 Conclusions

In the paper we analysed the potential for lending booms and related adverse banking sector developments resulting from the process of monetary integration of the three

biggest new EU Member States - the Czech Republic, Hungary and Poland. As a first step, we described the lending patterns in the three old EMU Member States – Greece, Ireland and Portugal. In all the countries substantial increases in lending took place in the years shortly before and after euro area accession. In Ireland and Portugal, annual growth rates of real loans exceeded 25%, the developments in Greece were slightly more modest. In all countries the loan to GDP ratio more than doubled since the mid 1990s. Surprisingly, the strong expansions did not affect the stance of these countries' banking sectors. In fact, as a general rule, the quality of the loan portfolio improved, while profitability and solvency remained unchanged. Looking for reasons, we found that the relatively harmless character of the booms was probably related to the initially low level of financial intermediation in these countries. As a result, the lending booms increased the repayment burden to a level (relative to income) that has been previously serviced without major problems in more advanced EMU countries.

As a second step, we used econometric evidence to foresee the loan developments in CE-3 countries during euro area accession. On the basis of vector error correction models we constructed simulated patterns for loan developments in the new Member States. We found that significant increases in lending can be expected in Hungary and Poland. However, the magnitude of the booms should be substantially smaller than experienced previously by Ireland and Portugal. The main reasons are the high level of interest rate convergence between the new Member States and the euro area and the already very low level of interest rates in the euro area. Accordingly, there is not much room for downward interest rate adjustment during the years of the CE-3 countries' euro area accession. Due to estimation problems the situation in the Czech Republic was more difficult to assess. However, given almost complete interest rate convergence between the Czech Republic and the euro area, we expect increases in lending related to euro area accession to be even smaller than in Hungary and Poland. Analysing the results one should, however, remember that we concentrated only on domestic currency loans. Taking into account foreign currency loans could change the picture (especially in Hungary and Poland), but it is difficult to assess at what side the risks are concentrated. On the one hand exchange rate stabilization should support foreign currency lending, on the other, for foreign currencies no interest rate convergence (being the main factor driving domestic currency loans), will take place.

Although it is clearly very difficult to identify *ex ante* a banking crisis, the experience of the analysed euro area countries, combined with the fact that CE-3 countries show an even bigger initial underdevelopment of lending activities, have healthy banking sectors and can expect smaller increases in lending, leads us to the conclusion that no substantial threat for their banking sectors seems to be related to their euro area entry. Nevertheless, it should be made clear that the positive experience of the old Member States does not rule out the possibility of problems in CE-3 countries. Still, in our view, the recent history of loan market developments in EMU-3 countries is probably the best guess about how the situation can evolve in the analysed new Member States.

If, however, the situation threatened to go out of control, the supervisory authorities of the CE-3 countries could think about using some of the following instruments to curb lending or diminish its adverse consequences:

- Expressing concern in letters to commercial banks,
- Moral suasion through domestic informal top management contacts,
- Moral suasion by courtesy of foreign supervisory institution (vs. foreign owner),
- Tightening of provisioning rules for non performing loans,
- Increasing capital adequacy requirements above the regulatory minimum of 8%,
- Imposing/decreasing the maximum loan-to-value ratio for housing loans,
- Imposing credit ceilings (possibly in implicit ways, e.g. by imposing maximum engagement in mortgage loans relative to other lending activities).

It should, however, be borne in mind that measures that worked elsewhere, need not be successful in the new Member States. One reason for this is the obvious risk of banks taking advantage of regulatory arbitrage. This would mean moving headquarters to another EU country where supervisory conditions are less tough, and operating in the Czech Republic, Hungary or Poland via subsidiaries or the internet. Concluding, if a troublesome scenario for the banking sectors in the CE-3 countries were to result from euro area accession, monetary authorities could find themselves in a difficult situation. Still, at this point of time such developments seem relatively unlikely.

Due to the long time-span of the analysis, the presented results are relatively general and should be treated with due caution. Given the uncertainty about the changes in the banking sectors (who heard about internet banking ten years ago?) as well as the exact euro area

accession date, it would not be very revealing here to go into more detail and analyse the specific weaknesses and exposures of banking sectors or major individual banks. However, as time goes by and the accession strategies become clearer, such exercises should be undertaken. Another interesting and unexplored field are the macroeconomic consequences of lending booms in the new Member States. Increased loan creation can result in demand and wage pressure, inflation, loss of competitiveness and higher current account deficits. All these are interesting topics for future research.

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Appendix 1: Data sources

The following sources of data for the econometric model were used:

1. Loans to the private sector:
   - Total loans (all currencies) to the private sector (households + non-financial corporations + non-profit institutions serving households) in Greece, Ireland, Portugal – source: ECB
   - Total loans (domestic currency) to the private sector (households + non-financial corporations + non-profit institutions serving households) in the Czech Republic – source: Czech National Bank
   - Total loans (domestic currency) to the private sector (households + non-financial corporations + non-profit institutions serving households) in Hungary – source: National Bank of Hungary
   - Total loans (domestic currency) to the private sector (individuals + non-financial corporations) in Poland – source: National Bank of Poland

2. Nominal interest rate
   - Czech Republic – source: Czech National Bank (PRIBOR3M)
   - Greece, Portugal – source: OECD (short-term interest rate)
   - Hungary – source: ECB (BUIBOR3M)
   - Ireland – source: BIS (DIBOR3M, EURIBOR3M)
   - Poland - source: National Bank of Poland (WIBOR3M)

3. GDP at constant prices
   - All countries – source: OECD

4. GDP deflator
   - Czech Republic, Greece, Hungary, Ireland, Portugal – source: OECD
   - Poland – 1997-2004 GDP deflator (source: OECD); 1994-1996 GDP deflator substituted by domestic CPI (source: Central Statistical Office) due to questionable quality of deflator data;

Appendix 2: Estimation results

Table 7: Augmented Dickey-Fuller tests with constant for presence of unit roots

	Greece	Ireland	Portugal	Czech Republic	Hungary	Poland
l	0.29	1.13	1.22	-0.61	1.78	-2.46
Δl	-2.07	-2.73*	-3.19**	-5.20***	-5.10***	-3.26***
y	1.79	0.11	-1.00	0.76	-0.13	-1.25
Δy	-13.45***	-2.37	-2.63*	-2.79*	-4.39***	-7.73***
r	-1.85	-2.20	-1.91	-0.19	-2.45	-2.20
Δr	-8.43***	-8.31***	-9.27***	-3.30**	-6.22***	-5.02***

*, **, *** denote rejection of H_0 at the 1%, 5% and 10% level respectively. Number of lags was chosen in accordance with the Schwarz info criterion. Critical values from McKinnon (1996).

Table 8: Lag selection criteria

	Lag	LR	AIC	SC	HQ
GR	0	NA	-7.22	-7.13	-7.19
	1	684.37	-16.00	**-15.64**	-15.86
	2	31.04	-16.20	-15.58	**-15.95**
	3	11.15	-16.14	-15.24	-15.78
	4	22.97	-16.26	-15.09	-15.79
	5	**17.70**	**-16.30**	-14.88	-15.73
	6	5.10	-16.17	-14.47	-15.48
IRL	0	NA	-5.99	-5.72	-5.88
	1	763.07	-16.07	-15.54	-15.86
	2	56.04	**-16.64**	**-15.33**	**-16.31**
	3	15.18	-16.63	-15.56	-16.21
	4	9.38	-16.55	-15.21	-16.02
	5	14.18	-16.56	-14.95	-15.91
	6	**17.36**	-16.64	-14.76	-15.88
PT	0	NA	-4.96	-4.87	-4.92
	1	1054.39	-17.30	-16.97	-17.17
	2	64.73	-17.90	**-17.31**	-17.66
	3	28.22	-18.06	-17.21	-17.72
	4	21.45	-18.14	-17.04	-17.69
	5	**29.11**	**-18.34**	-16.99	**-17.79**
	6	3.92	-18.19	-16.59	-17.54
CZ	0	NA	-9.76	-9.63	-9.71
	1	213.62	-16.35	-15.81	-16.17
	2	**26.91**	**-16.82**	**-15.88**	**-16.50**
	3	9.73	-16.69	-15.35	-16.24
	4	13.60	-16.81	-15.06	-16.22
HU	0	NA	-9.26	-9.12	-9.21
	1	**240.07**	-17.57	**-17.01**	**-17.35**
	2	15.86	-17.65	-16.68	-17.33
	3	15.28	-17.80	-16.41	-17.34
	4	12.32	**-17.90**	-16.10	-17.31
PL	0	NA	-8.76	-8.63	-8.72
	1	268.05	-16.17	-15.66	-15.99
	2	**28.92**	-16.63	**-15.73**	**-16.31**
	3	15.92	**-16.73**	-15.43	-16.27
	4	9.32	-16.63	-14.95	-16.03

LR denotes sequential modified LR test statistic, AIC denotes Akaike information criterion, SC denotes Schwarz information criterion, HQ denotes Hannan-Quinn information criterion. Numbers in bold indicate lag order selected by the criterion for the VAR model.

Table 9: Cointegration tests

Country	Hyp. no of CE	Trace statistic	5% critical value		Hyp. no of CE	Max eigenvalue	5% critical value
Greece	0	20.56	29.80		0	12.99	21.13
	<=1	7.57	15.49		<=1	6.75	14.26
	<=2	0.82	3.84		<=2	0.82	3.84
Ireland	**0**	**34.04**	**29.80**		**0**	**24.17**	**21.13**
	<=1	9.87	15.49		<=1	9.13	14.26
	<=2	0.74	3.84		<=2	0.74	3.84
Portugal	**0**	**31.75**	**29.80**		**0**	**25.23**	**21.13**
	<=1	6.52	15.49		<=1	5.48	14.26
	<=2	1.04	3.84		<=2	1.04	3.84
Czech Rep.	0	20.46	29.80		0	12.82	21.13
	<=1	7.64	15.49		<=1	7.60	14.26
	<=2	0.04	3.84		<=2	0.04	3.84
Hungary	**0**	**37.23**	**29.80**		**0**	**27.71**	**21.13**
	<=1	9.51	15.49		<=1	6.24	14.26
	<=2	3.27	3.84		<=2	3.27	3.84
Poland	**0**	**32.12**	**29.80**		0	18.55	21.13
	<=1	13.57	15.49		<=1	11.95	14.26
	<=2	1.63	3.84		<=2	1.63	3.84

Numbers in bold denote rejection of H_0 at the 5% level. Critical values are from MacKinnon, Haug, Michelis (1999).

Table 10: Tests for normality of residuals

		Chi square statistic	Probability				Chi square statistic	Probability
IRL	Skewness	0.72	0.86		HU	Skewness	3.77	0.28
	Kurtosis	1.55	0.66			Kurtosis	2.47	0.48
	Jarque-Berra	2.28	0.89			Jarque-Berra	6.25	0.39
PT	Skewness	3.46	0.32		PL	Skewness	1.62	0.65
	Kurtosis	5.70	0.12			Kurtosis	2.31	0.51
	Jarque-Berra	9.17	0.16			Jarque-Berra	3.93	0.68

H_o: residuals are multivariate normal.

Table 11: LM test for presence of residual autocorrelation

Country	Lag	LM statistic	Probability		Country	Lag	LM statistic	Probability
Ireland	1	14.41	0.11		Hungary	1	8.30	0.50
	2	10.45	0.32			2	12.85	0.17
	3	14.47	0.11			3	9.65	0.38
	4	15.89	0.07			4	8.54	0.48
Portugal	1	5.93	0.75		Poland	1	10.62	0.30
	2	6.02	0.74			2	11.37	0.25
	3	8.76	0.46			3	10.57	0.31
	4	6.92	0.65			4	2.94	0.97

H_0: no autocorrelation present at lag n.

Table 12: VEC model for Hungary

Cointegrating Eq:	CointEq1		
RKRED(-1)	1.000000		
GDP_FIXED_SA(-1)	-3.391334		
	(0.24341)		
	[-13.9328]		
RINT(-1)	4.429280		
	(1.05327)		
	[4.20526]		
C	42.87768		
Error Correction:	D(RKRED)	D(GDP_FIXED_SA)	D(RINT)
CointEq1	-0.113619	0.011550	-0.026918
	(0.03230)	(0.00736)	(0.02985)
	[-3.51808]	[1.56914]	[-0.90192]
D(RKRED(-1))	-0.080560	0.128065	0.053080
	(0.17116)	(0.03901)	(0.15818)
	[-0.47066]	[3.28273]	[0.33558]
D(GDP_FIXED_SA(-	-0.150221	0.100513	-0.031833
	(0.69216)	(0.15776)	(0.63965)
	[-0.21703]	[0.63713]	[-0.04977]
D(RINT(-1))	0.282671	-0.086372	-0.036286
	(0.24561)	(0.05598)	(0.22697)
	[1.15090]	[-1.54292]	[-0.15987]
C	0.027935	0.005662	-0.000505
	(0.00812)	(0.00185)	(0.00750)
	[3.44064]	[3.05946]	[-0.06731]
R-squared	0.364282	0.313121	0.068578
Adj. R-squared	0.273465	0.214995	-0.064482
Sum sq. resids	0.014020	0.000728	0.011973
S.E. equation	0.022376	0.005100	0.020678

Table 13: VEC model for Ireland

Cointegrating Eq:	CointEq1		
RKRED(-1)	1.000000		
GDP_FIXED_SA(-1)	-1.454953		
	(0.11953)		
	[-12.1728]		
RINT(-1)	6.266904		
	(1.20762)		
	[5.18946]		
C	18.47941		
Error Correction:	D(RKRED)	D(GDP_FIXED_SA)	D(RINT)
CointEq1	-0.025615	-0.022766	-0.042131
	(0.01218)	(0.00874)	(0.01050)
	[-2.10273]	[-2.60585]	[-4.01383]
D(RKRED(-1))	0.433655	0.259496	-0.201119
	(0.08296)	(0.05950)	(0.07148)
	[5.22746]	[4.36154]	[-2.81360]
D(GDP_FIXED_SA(-	0.649162	-0.192944	0.121974
	(0.14231)	(0.10206)	(0.12262)
	[4.56160]	[-1.89042]	[0.99470]
D(RINT(-1))	0.001629	0.131443	0.239240
	(0.11127)	(0.07981)	(0.09588)
	[0.01464]	[1.64705]	[2.49517]
C	0.005375	0.010293	0.002682
	(0.00317)	(0.00227)	(0.00273)
	[1.69480]	[4.52563]	[0.98150]
DUM_Q2_93	-0.004204	0.007898	-0.058824
	(0.01780)	(0.01277)	(0.01534)
	[-0.23613]	[0.61856]	[-3.83479]
DUM_Q4_92	0.002283	-0.002801	0.061499
	(0.01697)	(0.01217)	(0.01463)
	[0.13451]	[-0.23007]	[4.20480]
R-squared	0.537672	0.304835	0.461284
Adj. R-squared	0.501647	0.250666	0.419306
Sum sq. resids	0.021644	0.011133	0.016070
S.E. equation	0.016766	0.012024	0.014446

Table 14: VEC model for Poland

Cointegrating Eq:	CointEq1		
RKRED(-1)	1.000000		
GDP_FIXED_SA(-1)	-3.169606		
	(0.91354)		
	[-3.46960]		
RINT(-1)	7.569300		
	(2.38630)		
	[3.17198]		
C	26.19142		
Error Correction:	D(RKRED)	D(GDP_FIXED_SA)	D(RINT)
CointEq1	-0.034423	-0.020601	-0.018821
	(0.01112)	(0.00665)	(0.00728)
	[-3.09660]	[-3.09681]	[-2.58484]
D(RKRED(-1))	0.558097	-0.006939	0.199533
	(0.13933)	(0.08338)	(0.09126)
	[4.00566]	[-0.08322]	[2.18643]
D(GDP_FIXED_SA(-	-0.564859	-0.640016	-0.576013
	(0.26949)	(0.16127)	(0.17652)
	[-2.09603]	[-3.96853]	[-3.26322]
D(RINT(-1))	0.272015	0.586848	0.321283
	(0.28257)	(0.16910)	(0.18508)
	[0.96264]	[3.47039]	[1.73587]
C	0.016826	0.017073	0.003195
	(0.00528)	(0.00316)	(0.00346)
	[3.18633]	[5.40260]	[0.92381]
R-squared	0.515223	0.411410	0.398339
Adj. R-squared	0.456462	0.340066	0.325411
Sum sq. resids	0.013237	0.004741	0.005679
S.E. equation	0.020028	0.011986	0.013118

Table 15: VEC model for Portugal

Cointegrating Eq:	CointEq1		
RKRED(-1)	1.000000		
GDP_FIXED_SA(-1)	-2.320529		
	(0.16645)		
	[-13.9411]		
RINT(-1)	10.81069		
	(1.06162)		
	[10.1832]		
C	36.41126		
Error Correction:	D(RKRED)	D(GDP_FIXED_SA)	D(RINT)
CointEq1	-0.041439	-0.007780	-0.047317
	(0.01436)	(0.00511)	(0.01075)
	[-2.88512]	[-1.52108]	[-4.40326]
D(RKRED(-1))	0.418074	-0.029735	0.050574
	(0.10932)	(0.03893)	(0.08179)
	[3.82447]	[-0.76385]	[0.61837]
D(RKRED(-2))	0.117589	-0.034141	0.053350
	(0.11564)	(0.04118)	(0.08652)
	[1.01686]	[-0.82907]	[0.61664]
D(RKRED(-3))	0.042997	0.044715	0.120457
	(0.11657)	(0.04151)	(0.08722)
	[0.36884]	[1.07712]	[1.38114]
D(RKRED(-4))	0.279743	-0.001128	-0.275741
	(0.10761)	(0.03832)	(0.08051)
	[2.59969]	[-0.02943]	[-3.42509]
D(GDP_FIXED_SA(-	-0.157865	0.311065	0.163283
	(0.32447)	(0.11555)	(0.24275)
	[-0.48654]	[2.69212]	[0.67263]
D(GDP_FIXED_SA(-	0.366404	0.449150	-0.259900
	(0.33389)	(0.11890)	(0.24980)
	[1.09738]	[3.77748]	[-1.04042]
D(GDP_FIXED_SA(-	0.378838	0.080749	0.018446
	(0.34215)	(0.12184)	(0.25598)
	[1.10723]	[0.66273]	[0.07206]
D(GDP_FIXED_SA(-	-0.632562	-0.137648	-0.588911
	(0.32770)	(0.11670)	(0.24517)
	[-1.93031]	[-1.17953]	[-2.40205]
D(RINT(-1))	0.199419	0.053828	0.188078
	(0.13374)	(0.04763)	(0.10006)
	[1.49110]	[1.13022]	[1.87969]
D(RINT(-2))	0.153020	0.064525	0.289266
	(0.13334)	(0.04748)	(0.09976)
	[1.14763]	[1.35891]	[2.89973]
D(RINT(-3))	-0.086889	0.061844	0.177704
	(0.13232)	(0.04712)	(0.09900)
	[-0.65666]	[1.31246]	[1.79507]
D(RINT(-4))	-0.059665	0.028056	-0.104134
	(0.12100)	(0.04309)	(0.09053)
	[-0.49308]	[0.65109]	[-1.15027]
C	0.002422	0.002129	0.005425
	(0.00292)	(0.00104)	(0.00218)
	[0.83065]	[2.05021]	[2.48647]
R-squared	0.636319	0.533177	0.529121
Adj. R-squared	0.573281	0.452261	0.447503
Sum sq. resids	0.020334	0.002579	0.011381
S.E. equation	0.016466	0.005864	0.012319

Appendix 3: Figures

Figure 6: Recursive estimates of the GDP parameter (β_1) in the Irish model (initialisation at 60 obs.)

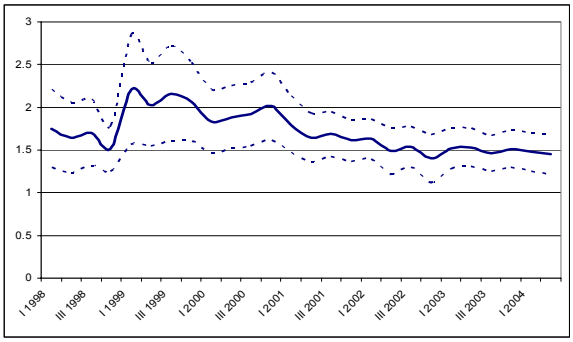


Figure 7: Recursive estimates of the GDP parameter (β_1) in the Portuguese model (initialisation at 60 obs.)

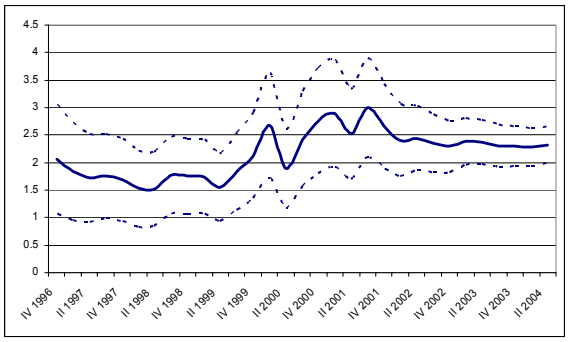


Figure 8: Recursive estimates of interest rate parameter (β_2) in the Irish model (initialisation at 60 obs.)

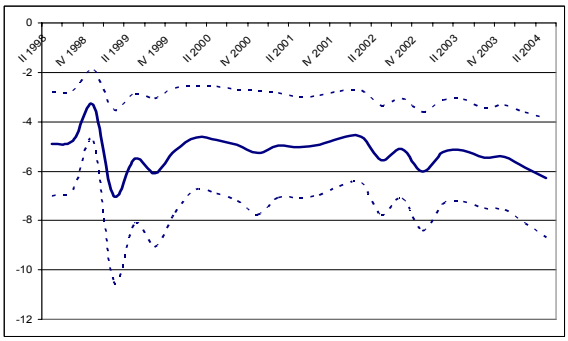


Figure 9: Recursive estimates of interest rate parameter (β_2) in the Portuguese model (initialisation at 60 obs.)

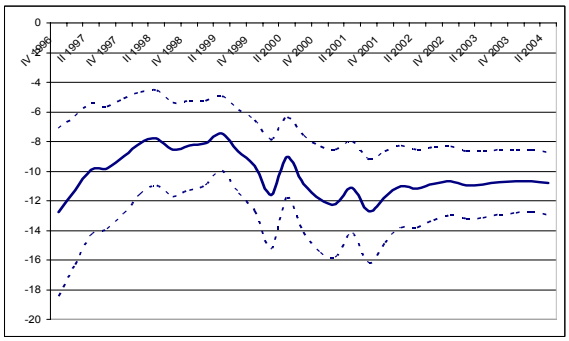


Figure 10: Simulation of loan expansion in the Czech Republic based on the Irish and Portuguese models

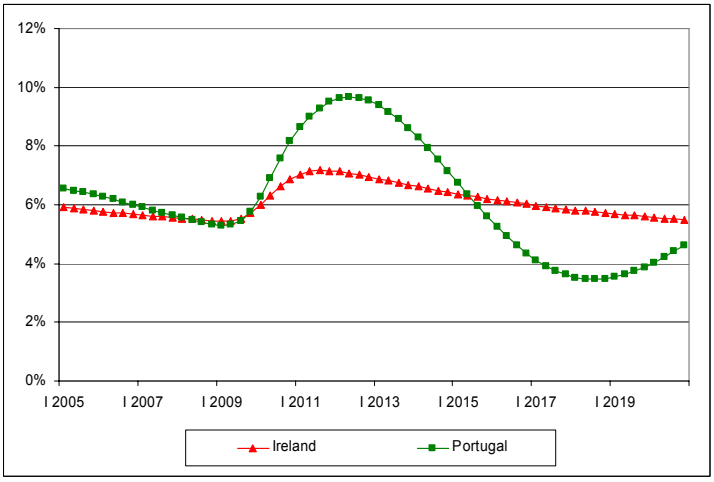


Figure 11: Simulation of loan expansion in Hungary based on the Hungarian, Irish and Portuguese models

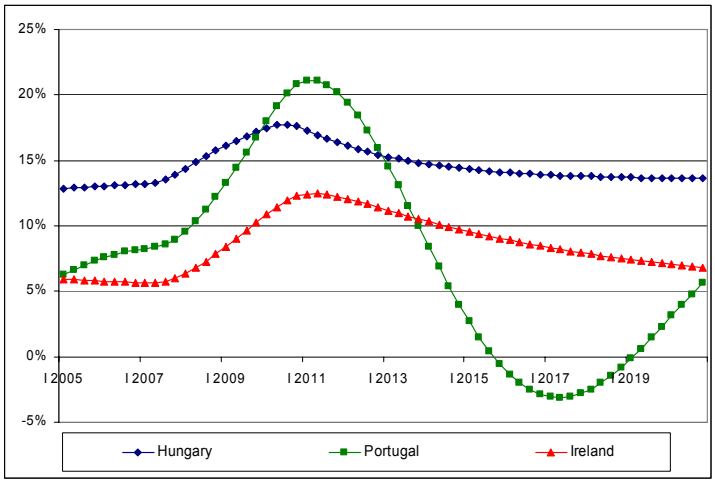


Figure 12: Simulation of loan expansion in Poland based on the Polish, Irish and Portuguese models

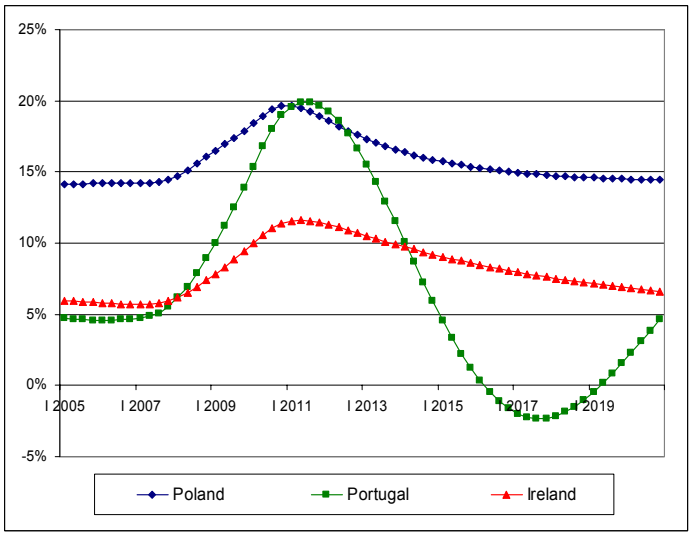


Figure 13: Log GDP, log real domestic currency loans and real interest rate in Greece

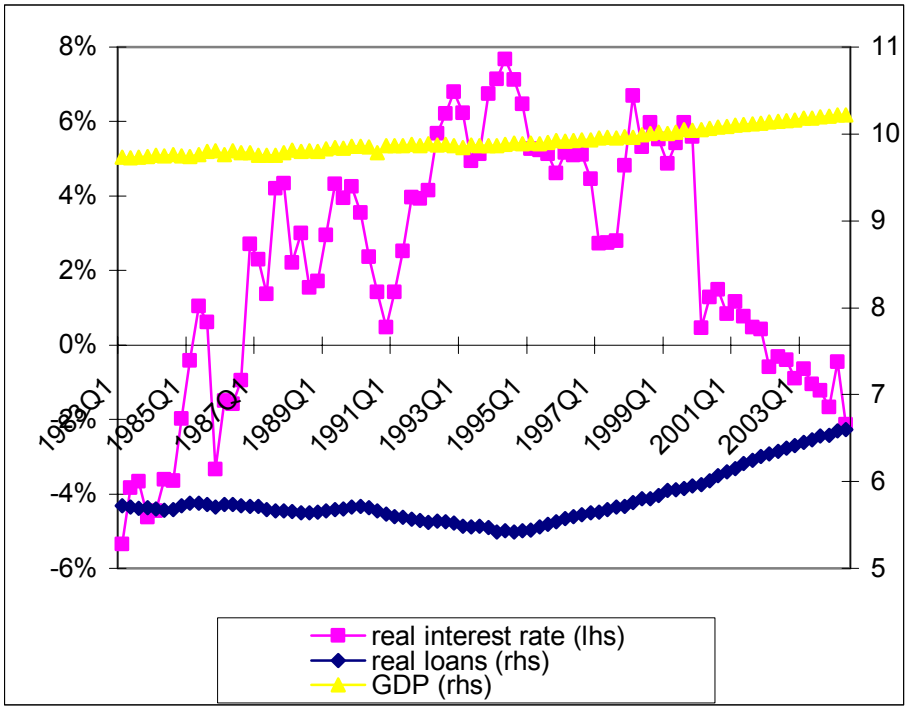


Figure 14: Log GDP, log real domestic currency loans and real interest rate in Ireland

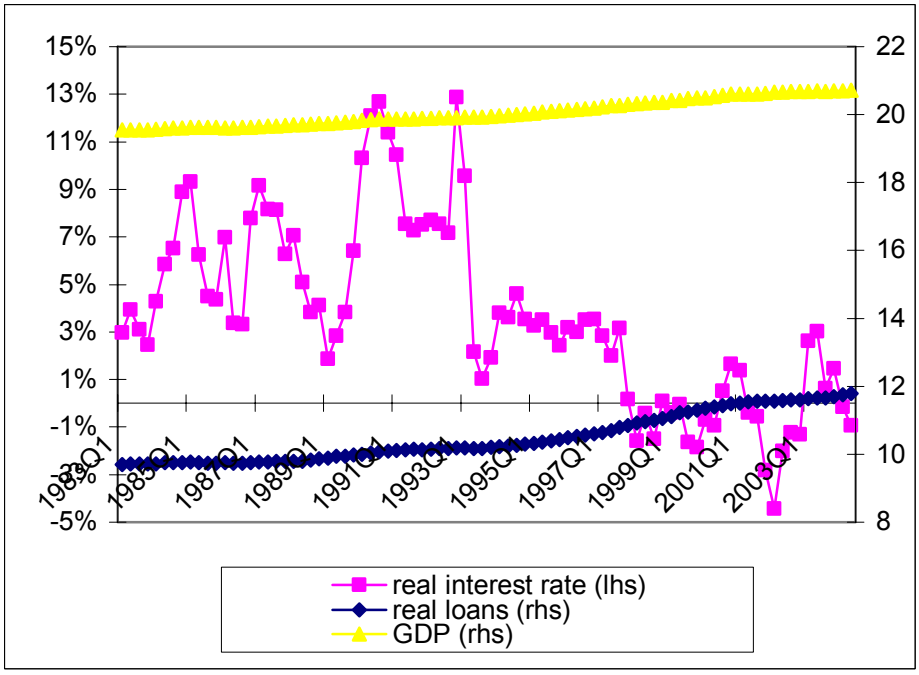


Figure 15: Log GDP, log real domestic currency loans and real interest rate in Portugal

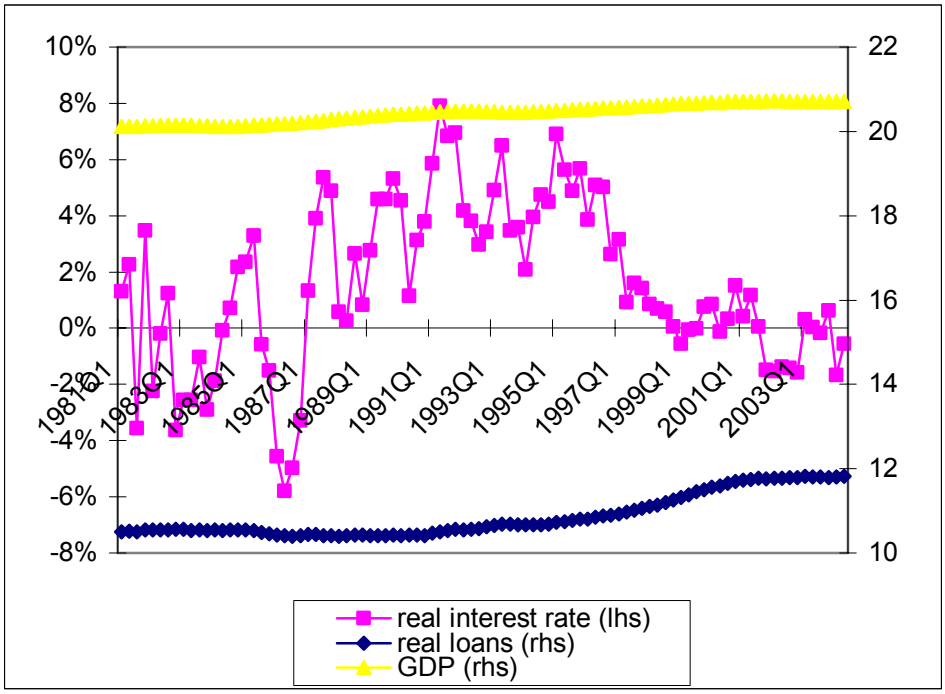


Figure 16: Log GDP, log real domestic currency loans and real interest rate in the Czech Republic

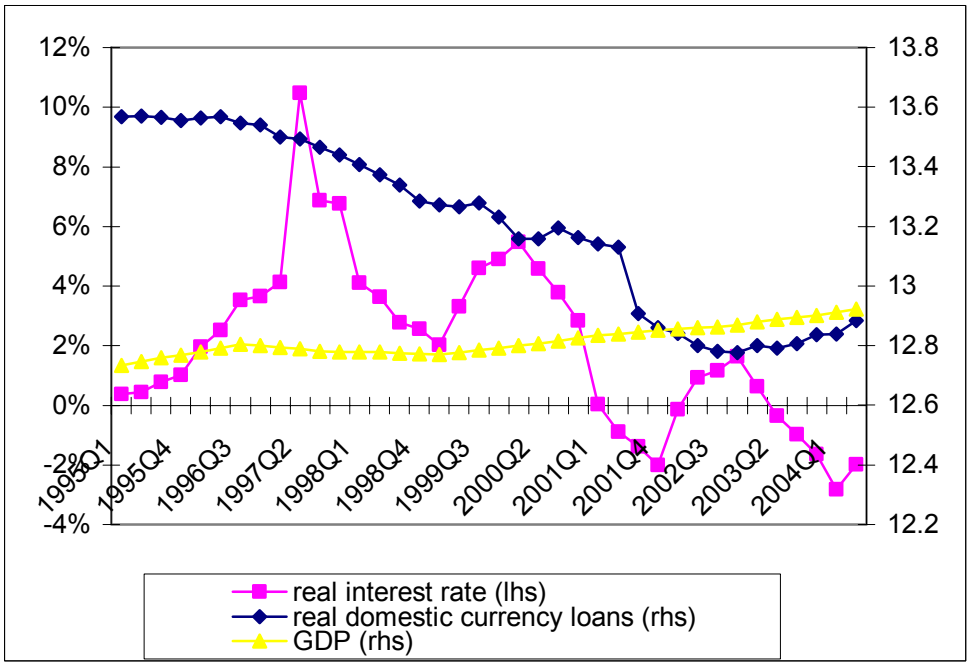


Figure 17: Log GDP, log real domestic currency loans and real interest rate in Hungary

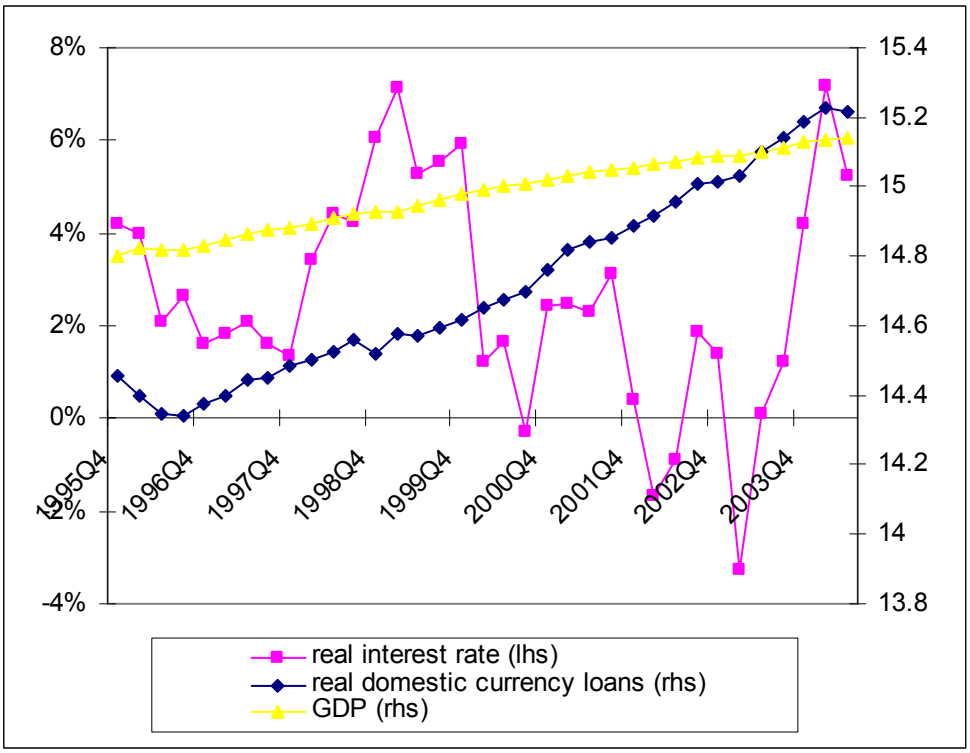
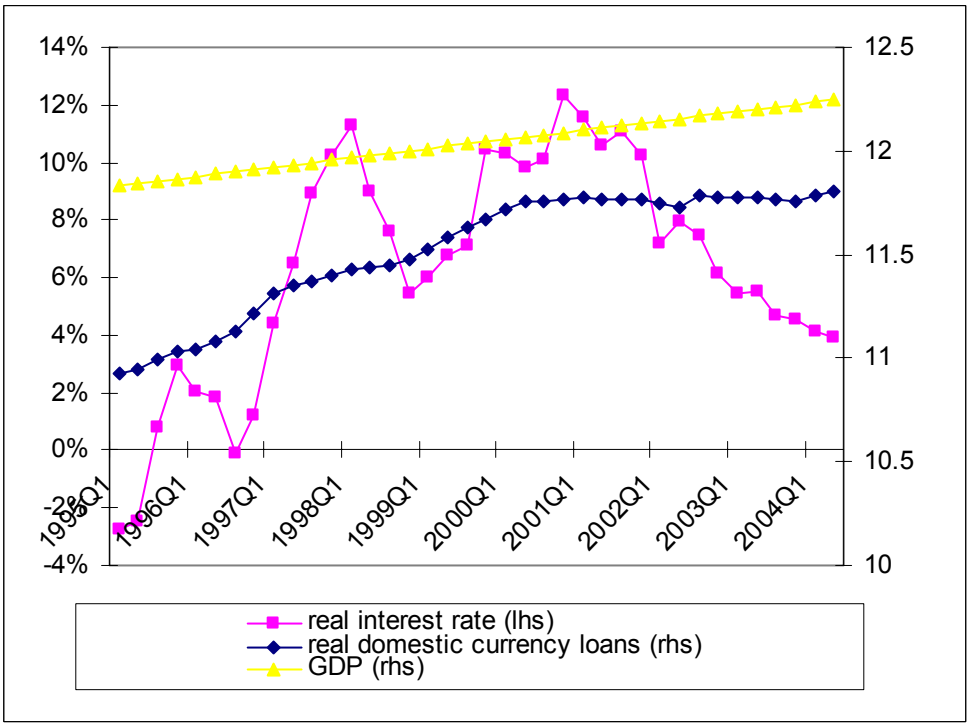


Figure 18: Log GDP, log real domestic currency loans and real interest rate in Poland



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