Lending Booms in Europe's Periphery: South-Western Lessons for Central-Eastern Members

Michał Brzoza-Brzezina*

Abstract

In this paper we analyse the potential for lending booms in three biggest new EU member states (Czech Republic, Hungary and Poland) during the process of Euro adoption. Experience of old members (Greece, Ireland and Portugal) as well as econometric evidence speak in favour of strong increases in credit in Hungary and Poland and against such an event in the Czech Republic. However, the expected lending booms are smaller than those Ireland and Portugal witnessed recently. We state that, given the current data set, no substantial risk to the banking sectors of the new member states should be expected. We also find that the monetary consequences of these booms for the Euro-area as a whole will be almost negligible.

Keywords: lending booms, Euro area, banking sector stability, new member states

JEL: E51, E58, G21

*) National Bank of Poland and Warsaw School of Economics. The paper was written while the author was visiting the European Central Bank. Insightful comments from Frederic Boissay, Tomasz Chmielewski, Phillip Hartmann, Marcin Kolasa, Ryszard Kokoszczyński and the participants of the seminar at the ECB are gratefully acknowledged.
Authors e-mail: Michal.Brzoza-Brzezina@mail.nbp.pl

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 rates exceeding 20% p.a. for several quarters. Mostly affected were the lower-income, catching-up countries, Greece, Portugal and Ireland. This fact suggests that a similar process may be underway in new EU member states. These countries have relatively low GDP per capita levels and underdeveloped loan markets. This creates a huge growth potential, which, triggered by interest rate convergence to the Euro area level could end up in a lending boom. Lending booms, on their part, can be considered as potential danger for the banking sectors. International evidence shows that periods of rapid credit growth have often been associated with banking crisis. However, obviously not every period of strong loan creation has to be harmful for the banking sector.

In this paper we try to answer the following questions:

- Should credit booms be expected in new member states during Euro area accession?
- How big is the risk to their banking sectors?
- What are the policy implications?

As a 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. Although annual credit growth rates exceeded 20 - 30% in real terms, banking sectors have not been adversely affected. Banks remained profitable and well capitalised, non-performing loan ratios decreased. Accordingly, we state that the strong increases in lending that these countries faced during EMU accession seem to be harmless by their character. This may result from two issues. 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, so that servicing costs increased, an additional explanation must be found. This can be the low initial loan servicing to GDP ratio in these economies, related to the low loan satiation. 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 EMU countries.

As a second step we used econometric evidence to foresee the loan developments in three biggest Central-European countries during Euro area accession – Czech Republic, Hungary and Poland. On the basis of estimated Vector Error Correction Models we constructed simulated patterns for loan developments in new member states. We found that significant increases in lending can be expected in Hungary and Poland while almost no effects should be expected in the Czech Republic. However, even in the former countries the magnitude of the booms should be substantially smaller than experienced previously by Ireland and Portugal. The main reasons are the substantial level of interest rate convergence between new member states and the Euro area and the already very low level of interest rates in the EMU. Accordingly there is not much room for downward interest rate adjustment during the years of Central-European countries' EMU accession.

As a next step, we used the above evidence to assess, how much risk for the banking sectors in new member states is associated with the EMU accession process. Although it is clearly very difficult to identify *ex ante* a banking crisis, the experience of the analysed EMU 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 lending booms, brought us to the conclusion that no substantial threat for their banking sectors is related to EMU entry. However, since Euro area accession of the analysed countries is at least four years ahead, the situation can still change. Thus, supervisory agencies should remain vigilant. They have at their disposal several measures that could be applied in case of danger, e.g. changes in regulatory minima, provisioning rules or loan-to-value ratios and - in most serious cases – imposition of credit ceilings.

Finally, we tried to assess the potential impact of increased loan creation in new member states for common monetary policy. Not surprisingly, even under the most expansionary assumptions loan creation in the three analysed countries should add not more than 0.4 percentage point to the annual growth rate of Euro area credit aggregates.

1 Introduction

During the process of Euro adoption some participating member states were faced with unprecedented lending booms. Loans to the private sector expanded at rates exceeding 20% p.a. for several quarters. Not surprisingly mostly affected were the lower-income, catching-up countries, Greece, Portugal and Ireland (further referred to as EMU-3). Several reasons for this behaviour can be mentioned.

First and foremost it is the sharp reduction in interest rates at all maturities. Nominal rates started converging to the Euro area level already several years before Euro adoption, with the convergence process terminating at the point of accession. Real rates were falling even after joining the common currency because of inflationary pressures ascribed to expanding domestic demand and the Balassa-Samuelson effect. As a result, in 2003 real short-term rates found themselves 6-10 percentage points below their mid-1990's level. Lower real interest rates shifted out the intertemporal budget constraint of agents allowing them saving less and consuming more.

Second, according to various studies, joining a common currency increases growth prospects[1]. This argument is probably a more long-run one and requires agents to realise today future gains from joining the common currency area to change their behaviour already before accession. However, if they do so, their intertemporal budget constraint shifts out allowing for higher today's consumption against future income.

The third reason for lending booms in selected EMU countries is related to the structure of financial markets. The process of financial liberalisation that found place in several countries in the 1990's, including removing interest rate controls and credit ceilings (e.g. Honohan 1999) as well as privatisation of the banking sector and increased international competition reduced credit constraints that agents faced previously. As a result households and corporates which previously had no access to credit markets could start borrowing from the banking sector.

[1] Provided that optimum currency area conditions are fulfilled. See Mundell (1961) or NBP (2004b) for details on optimum currency areas.

Enumeration of the reasons for lending booms makes it clear, why poorer and catching up countries are more prone to credit expansions while joining the Euro area. First, poor countries often have a relatively high natural rate of interest. This is related, among others, to low capital equipment (and hence a higher marginal product of capital (e.g. Lipschitz et al. (2002)) and high risk premia. Second, the aforementioned countries made in the 1990's a big effort to decrease their inflation rate to comply with the Maastricht criteria. As a consequence, real interest rates in EMU-3 countries were lying much above the EU average in the mid 1990's, providing space for substantial reductions during the accession process. Moreover, the inflationary pressures, stemming from the Balassa-Samuelson effect, taking place after Euro area accession and decreasing real rates further, are more pronounced in relatively poor, catching-up economies. Also the issue of financial liberalisation added probably more to credit expansion in the analysed countries (especially in Greece and Portugal) than on average in the Euro area (Honohan (1999)).

The stylised facts about lending booms in Greece, Portugal and Ireland make it obvious that a similar story may be underway in the new EU accession countries. These countries aim at joining EMU in a few years, 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 heavy banking sector crises (e.g. Gourinchas et al. (2001), Terrones, Mendoza (2004)) it seems to be of utmost importance to policymakers in accession countries to know in advance what they can expect in the near future, allowing them taking preventive measures. The aim of this paper is to use the experience of the current EMU members to forecast the lending developments in accession countries.

The analysis is concentrated on the three biggest new EU member states: Poland, the Czech Republic and Hungary (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 the biggest attention. Being probably equally destructive for the home economy, a banking crisis in any of them would have by far more severe consequences for the stability and reputation of the Euro area than one happening in any of the smaller new member states[2].

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

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 1990's and are currently not diverging from EU standards. 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 of course proceed in course of integration, deserves however a separate study.

There exists a relatively large body of literature on loan demand and supply[3] (although interestingly it is much smaller than the literature on money (see Borio, Lowe (2004) for an interesting discussion)). However, the specific topic of potential lending booms and related macroeconomic imbalances (eg. current account deficits) resulting from EMU accession of new EU member states, has been taken up probably only by the IMF (2004). Simulations presented in that paper 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 new member states will start converging to the equilibrium level, given by the error correction model of loan demand for the whole Euro area. In our view, however, there is no reason to expect that the Euro adoption will immediately trigger a process of financial deepening consistent with the experience of old EMU 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 econometric approach based on error correction models estimated for the countries of concern.

[3] Bernanke, Blinder (1988) and Bernanke, Gertler (1995) are important examples of the literature on credit supply. For estimation of loan demand functions for European economies see Calza et al. (2001, 2003), Hofmann (2001). Applications for Central European countries include Hurlin, Kierzenkowski (2002), Chmielewski (2004), Cottarelli et al. (2003) and IMF (2004).

The rest of the paper is structured as follows. In section 2 the loan expansion and its consequences in Greece, Ireland and Portugal are described. In section 3 the situation of the banking sectors in accession countries is presented. Further, several characteristics of these countries are compared to the initial position of EMU-3 countries in order to assess, whether the latter constitute an appropriate benchmark for projecting lending booms. Finally, we use econometric evidence to simulate developments in the loan business of the new member states. Section 4 contains policy recommendations for national central banks and the ECB, section 5 concludes.

2 Stylised facts about loan expansion in selected Euro-area countries

2.1 Portugal

Portugal adopted the Euro in 1999 and can be regarded as the model example of an Euro area accession driven lending boom[4]. The expansion started around 1995-96 and reached its maximum in Q3 1999 at 28,6% (in real terms[5]), then returned within two years to the 0-5% band (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 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[6]. 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%. Since 1999 non-performing loans (NPL) have constituted only slightly above 2% of total loans. This indicator should however be regarded cautiously, since it tends to brighten the

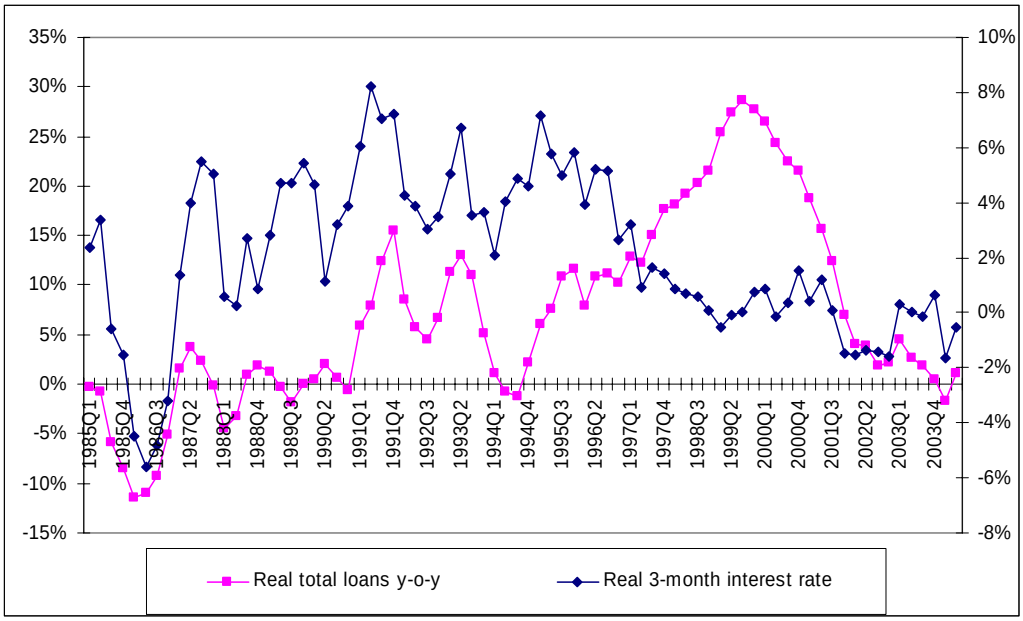
[4] We do not attempt to precisely define a lending boom, but rely on the fact that the described developments were of unprecedented magnitude in the analysed 20-year sample.

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

[6] 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%.

situation during loan expansions and to show the problem only with a substantial lag[7]. 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 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 the 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%

[7] 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 NPL ratio increases quickly, while the numerator shows a 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.

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.

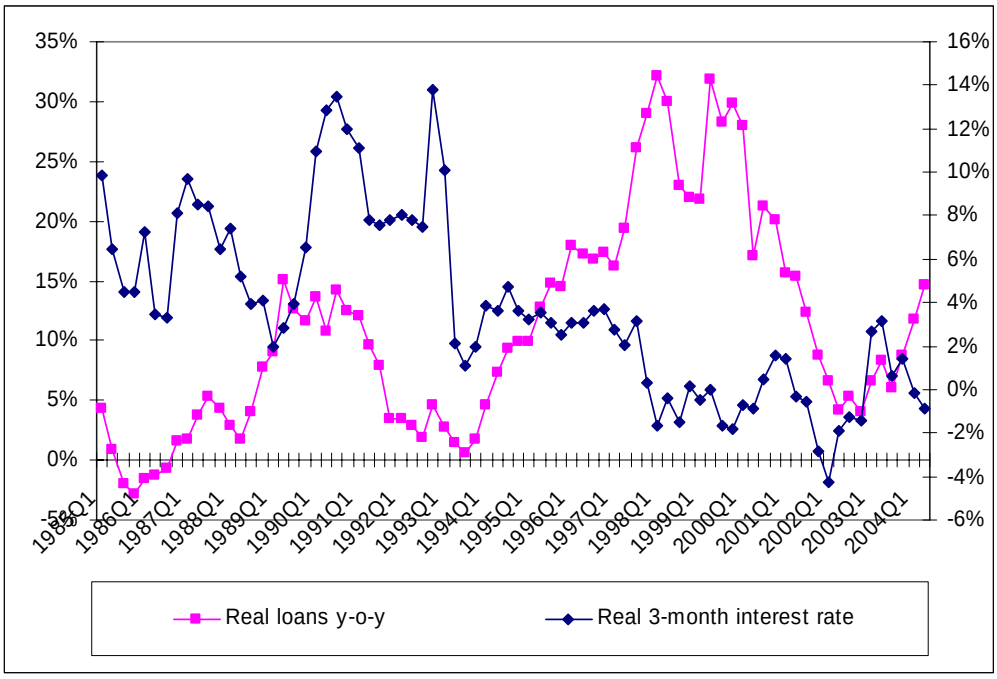
2.2 Ireland

The lending boom in the Irish banking sector started around 1995, i.e. four years before Euro area accession. Real total loans to the nonfinancial 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 Euro area countries. By 2002 the boom seemed to be over, however recently another period of strong credit expansion started. Regarding the sector decomposition, sources of credit creation were relatively balanced. In the first expansion phase corporate credit was the major source of expansion, whereas after 2002 this role was taken over by housing loans. Even from looking at the data (fig. 2) it is evident 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 unnaturally high levels could have influenced the magnitude and timing 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. As before it should however, be taken into account that this ratio is a lagged indicator of loan quality. Both, IMF missions (IMF (2001b, 2003b)) and the Irish supervisory authorities seem to be satisfied with the performance of the banking sector, pointing however at one source of concern. The surge of mortgage loans brought about a boom of house prices, which over the last 6 years were

growing at an annual rate of almost 20% (CBI (2001, 2002), CBFA (2004)). Although there is no clear evidence of overvaluation, there is some risk that Ireland faces a price bubble at 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%

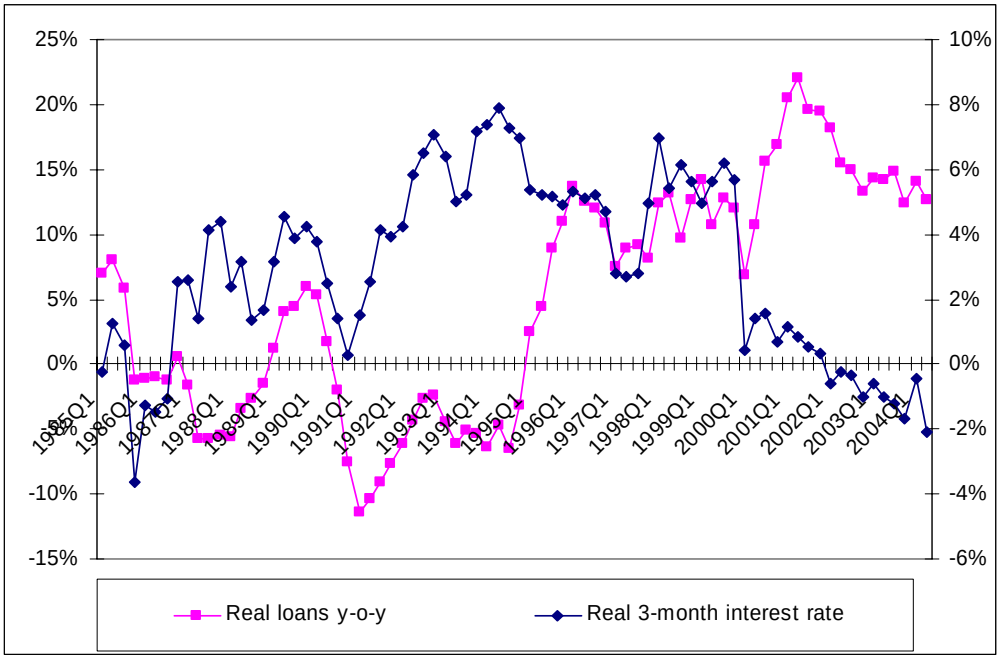
Source: IMF, Central Bank of Ireland and own calculations based on ECB and IMF data.

2.3 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 EMU. The expansion can be rather explained by 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 is not interesting from the point of view of possible occurrences in 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 followed an obvious drop in real rates from 5-6% in 1999 to about 1% in 2000 and further into negative regions in the subsequent 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 available sample. Disaggregating the data shows a clear winner of the Greek lending boom: loans for housing purposes showed highest growth rates over the whole period. In real terms they exceeded 30% in 2001-2002 (BoG (2003b)). On the other hand, corporate loans annual growth rate did not make it above the 20% mark. 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 it can be seen from the basic indicators presented in table 3, as in the previous cases, the prolonged loan expansion did not adversely affect the Greek banking sector. Solvency remained broadly stable at 10-13.6% as measured by the capital to risk adjusted asset ratio (capital adequacy ratio). The quality of the loan portfolio improved over time bringing the 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 mostly decreasing non-interest income due to weak equity markets performance (BoG (2000, 2001, 2002, 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 the 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, Central Bank of Greece and own calculations based on ECB and IMF data.

2.4 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 3-4 years before Euro area accession (difficult to asses for Greece) 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 terminated. 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 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 have been noted. The sectors remained profitable and well capitalised, non-performing loan ratios declined. One notable exception is 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 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 most Euro area countries, Greece's lending sector remained underdeveloped.

3 The potential for lending booms in new member states

3.1 Comparing 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 4 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 a little bit more developed as measured by GDP per capita (especially as compared with Poland), Ireland and Portugal had also a much higher level of credit satiation. 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. 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. Average real short term rate in CE-3 countries stood at 3.1% in 2004 as compared to 4.2% in EMU-3 countries in the mid 1990's. Spreads on

long term bonds are lower in CE-3 countries by 0.5 percentage point, the spread on short term rates is lower by 1.7 percentage points. Moreover, one has to remember that in EMU-3 countries the convergence of spreads was accompanied by a substantial decline of German/Euro area interest rates. This need not happen at the time CE-3 countries enter the Euro area, since interest rates are currently at historically low levels there, probably below their long-run equilibrium level. Nevertheless it should be noted that 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. Thus, at the first sight it seems that the lending boom potential in accession countries is smaller than in the old member states.

Table 4: 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%
Real10Y interest rate	4.1%	5.0%	5.3%	4.5%	3.2%	3.3%	1.7%	4.7%
Spread to Germany – 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%	8.2%	4.5%	3.0%[b)]	17.2%
Capital adequacy ratio	10.3%	13.0%	11.8%[c)]	11.7%	13.3%	13.6%	10.7%[b)]	15.6%

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

a) July – December 1997 data
b) 2003 data
c) 1995 data

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

The current stance of the banking sectors in CE-3 countries is good. Banks are well capitalised and their loan portfolios are not excessively troubled by non-performing assets. In the second case Poland, with its high NPL ratio may look as an outlier, however, the numbers reflect the very strict classification and provisioning rules[8] that have been eased 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

[8] For instance, until December 2003 Polish banks had no motivation to write-off lost loans. In case such loan had been repaid at a later date, it would have been treated as the bank's profit and become subject to taxation (NBP (2003)).

bad loans. The macroeconomic outlook for all three countries seems bright, GDP is expected to grow at 4-5% in the near future. Inflation remains low in Poland and the Czech Republic and only Hungary has to do some effort to decrease it in the coming years. Moreover, most of the region's commercial banks have now big foreign credit institutions as majority shareholders. Hence, there is a chance that in case of trouble parent institutions would be ready to bailout the troubled bank[9].

As already mentioned, the ratio of total loans to GDP is relatively low compared to other EMU members, even controlling for differences in economic development (IMF (2004), Cottarelli et al. (2003)). Looking at disaggregated data one more thing becomes apparent – the even deeper underdevelopment of the housing loan market. The ratio of housing to total loans amounted in June 2004 to 9.3% in Poland, 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.

Inferring from the statistical information, the following can be said about potential lending booms in accession countries. First, in general they should be considered prone to substantial credit expansions. They will join the Euro-area with a big catching-up potential and relatively high interest rates. This means that there is room for real interest rate reductions. If the pattern of EMU-3 countries were to be repeated, one could expect the process starting around 2006-2007 and peaking in the year of accession. The EMU-3 experience does not allow drawing firm conclusions about the end of the boom. Second, taking into account the relative underdevelopment of mortgage lending, this area of bank activity can be expected to grow fastest. Third, the condition of the CE-3 countries' banking sectors is good and, given the experience of EMU-3 countries, provided that

[9] Although the experience has been mix 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, when it faced bankruptcy in 2002.

protective measures of similar power are applied and the booms do not exceed those experienced in these countries one should not expect substantial trouble.

3.2 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 CE-3 economies, we build models for all six countries. This is done for two reasons. First, since the accession countries 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 results in a breakdown of the econometric relationship describing the loan behaviour. Therefore the relationships estimated for EMU-3 countries could be used as a supportive tool for forecasting loan expansions in CE-3 countries. Moreover these models can be used to check whether the relationships are stable subject to EMU entry.

For several reasons we try to keep the specification as simple as possible. First, the availability of time series for accession countries is limited. A number of time series starts only very recently. Since we would like to have the same data set for all 3 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 saving the model's degrees of freedom. Third, the model will be used for building a conditional forecast of loan developments. Every variable, which would enter into the model, but would not be sufficiently explained within it, would require exogenous assumptions for the forecast horizon. This would obviously increase the level of discretion.

Having this in mind, we follow the approach taken recently by Hofmann (2001) and Calza et al (2001, 2003) and build a vector error correction model in real loans to the private sector, real GDP and real interest rate[10]. Hence, the long run relationship is of the following form:

[10] Two other specifications were also verified. First, since in CE-3 countries a significant part of lending is done in foreign exchange, we tested a model including the real effective exchange rate for these countries. Second, in order to account for the catch-up effect in the loan market, we added

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

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

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 residual.

We use quarterly data starting Q1 1981 for Greece and Portugal, Q1 1983 for Ireland, Q1 1995 for the Czech Republic and Poland and Q4 1995 for Hungary, whereby the starting point is given 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[11], 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 nonstationary variables (e.g. Lanne (2002)). However, since we are trying to model consequences of permanent shifts in real rates it seems more appropriate to include them into the cointegrating vector.

---

to the model the gap between current and theoretical loan/GDP ratio. The latter was the theoretical value from an international panel study presented in Cottarelli et al. (2003). However both specifications resulted in wrongly signed and unstable coefficients in the cointegrating vector.

[11] This is justified by the fact that interest rate declines (and resulting increases in lending) will affect only domestic rates. Unfortunately for EMU-3 countries long series on local currency denominated loans were not available.

The unit root tests (tab. 6) tend to suggest that all the analysed variables are indeed integrated of order 1.

3.3 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 3 information criteria (Akaike, Schwarz and Hannan-Quinn) and the LR sequential test (tab. 7). If these are conclusive (at least 3 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. 9, 10). 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. 8). 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 in both 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 GDP and real loans with elasticities between 1.45 for Ireland and 3.39 in Hungary (tab. 11, 12). These numbers (especially those for Poland and Hungary) seem relatively high as compared to other studies[12]. However, since the credit satiation of these economies is very low, they 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[13].

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. 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

[12] 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.

[13] 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.

coefficients (fig. 4-7) show substantial parameter stability for Ireland. On the other hand some shifts can be observed in Portugal during the process of Euro adoption. Since, however these are quantitatively modest and the parameter values stabilise after EMU accession we decided to proceed with the Portuguese model as well.

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 2015 subject to the following assumptions:

- 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[14].
- 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[15] until end of 2006, then starts declining linearly to the Euro area level in Q4 2008. This is assumed to be 2%, higher than the current 0%. The reasoning behind it is that real rates in the Euro area cannot remain forever much below their equilibrium level estimated at approximately 2-2.5% (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, CE-3 countries will have to fulfil the inflation criterion, will be, however unwilling to depress inflation unnecessarily. According to simple calculations (NBP (2004b)), 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 CE-3 countries declines further due to increasing inflation in these countries. We assume that this stems only from

[14] 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%.

[15] The consensus estimate for the equilibrium level in Poland, based on Brzoza-Brzezina (2004) 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 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.

The simulations are done 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 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 CE-3 countries with short data samples. They give 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. 8-10). Not surprisingly the patterns differ substantially between the models. In the cases of Hungary and Poland clear lending booms 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%. The Czech Republic on the other hand shows only a very decent hump, which by no means can be considered a lending boom. This is an obvious consequence of the already now very low natural rate of interest. Thus, according to the simulation results, only Poland and Hungary could expect lending booms during Euro area accession, their magnitude can be however expected to remain below those Ireland and Portugal witnessed in recent years. Of course, given the model uncertainty and the number of exogenous assumptions one should treat the results only as a very rough approximation. It should nevertheless be noted that they are consistent with the previously stated fact that the potential for interest rate decreases seems much smaller in CE-3 than in EMU-3 countries. It should also be noted that despite the relatively decent humps, the forecasted average growth rates (at least from the "national" models for Hungary and Poland) imply substantial financial deepening over the coming years.

4 Policy recommendations for NCB's and the ECB

It is very difficult to assess *ex ante* how dangerous a lending boom can be for the banking sector. In general, sharp increases in bank lending have been often followed by banking and currency crises[16]. 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 1980's 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).

Obviously not every lending boom needs to imply troubles for the banking sector. If for example agents react to lower interest rates and increase their indebtedness in such way that it does not affect their repayment burden, there is no reason to expect solvency problems. However, even in some cases where lending booms were associated with higher debt service ratios, the stance of the banking sector did not necessarily deteriorate (like in the cases of EMU-3 countries). It is worth seeing, to what extent this was caused by the character of the boom itself and to what by protective measures taken by the authorities.

Below we present an overview of protective measures taken by EMU-3 supervising institutions. As it can be seen from table 5, the actions were not drastic. Taking this into account one could risk the thesis that the observed lending booms had a rather harmless character, being probably related to the fact that EMU-3 countries had relatively underdeveloped loan markets and simply caught-up with more mature EMU economies. In other words the loan satiation and the respective repayment burden increased towards levels that have been tested as safe by other economies.

[16] For instance Terrones and Mendoza (2004) estimate that 75% of credit booms in emerging market economies between 1970 and 2002 were associated with banking crises while 85% were associated with currency crises.

Table 5: Protective measures taken by the supervising authorities of EMU-3 countries

Country	Measure applied
Greece	• Tightening of provisioning rules for non performing loans and loans with limited collateral introduced
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 • Inspections of mortgage and commercial property lenders to examine the quality of underwriting increased • Single financial markets regulatory and supervising institution established
Portugal	• Capital requirements for housing loans with loan-to-value ratio exceeding 75% increased • Provisions based on average loan performance over the economic cycle introduced • National council of supervisors, involving all financial markets supervisory agencies established

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

Given a similar (or even less developed) starting point, a smaller expected magnitude of the boom, and the relatively good condition of the banking sectors, the loan expansions should not affect drastically CE-3 countries. If, however the situation threatened to go out of control, the authorities of 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).

Finally, one could think about the consequences of the forecasted loan expansions for the Euro area as a whole. Higher credit creation is likely to influence domestic demand and the inflationary pressure. This could, theoretically force the ECB to increase interest rates. However, a simple comparison of the net amount of loans created in CE-3 countries, even

in the year of strongest expansion, with total loans to the private sector outstanding in the EMU shows that the effect will be negligible. In accordance with the previous simulations, the total creation of loans in CE-3 countries[17] in 2010 would be at most about EUR 40 bn compared to some EUR 10.000 bn outstanding loans which can be roughly estimated for the Euro area by then[18]. This gives a rather modest 0.4 percentage point to the total loan expansion of the Euro area and should not pose any significant problem for the area wide monetary policy.

5 Conclusions

In the paper we analysed the potential for lending booms related to the process of monetary integration in three biggest new EU member states, the Czech Republic, Hungary and Poland. As a first step we described the lending patterns in three old EMU member states – Greece, Ireland and Portugal. In all 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 1990's. 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 credit satiation in these countries. As a result, even the strong 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 estimated for Hungary, Ireland, Poland and Portugal we constructed simulated patterns for loan developments in new member states. We found that significant increases in lending can be expected in Hungary and Poland while almost no effects should be expected in the Czech Republic. However, even in the former countries the magnitude of the booms

[17] Transformed into EUR at the September 2004 exchange rate.

[18] This is calculated by applying the historical (1998-2004) growth rate of 6.6% per annum to EUR 6.75 bn of outstanding loans to households and non-financial corporations in Q2 2004.

should be substantially smaller than experienced previously by Ireland and Portugal. The main reasons are the high level of interest rate convergence between new member states and the Euro area and the already very low level of interest rates in the EMU. Accordingly there is not much room for downward interest rate adjustment during the years of CE-3 countries' EMU accession.

Finally, we analysed the potential consequences of the encountered lending booms for banking sector stability and Euro area monetary policy. Although it is clearly very difficult to identify *ex ante* a banking crisis, the experience of the analysed EMU 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 lending booms, drives us to the conclusion that no substantial threat for their banking sectors is related to EMU entry. Nevertheless supervisory agencies should remain vigilant and we enumerate a number of possible protective measures that could be applied in case of danger. As regards the impact of lending booms in CE-3 countries for Euro area monetary policy, according to the simulations the loan expansion in the peak year should ad no more than 0.4 percentage point to area-wide loan creation. This shall not influence ECB monetary policy.

Due to the long time-span of the analysis, the presented results are relatively general and should be treated with appropriate caution. Given the current data set, especially the uncertainty about the changes in the banking sectors (who heard about internet banking ten years ago?) as well as the exact EMU accession date it would probably not be of much value to go today into more detail, analysing the specific weaknesses and exposures of banking sectors or major individual banks. However, as time goes by and the accession strategy becomes clear such exercises should be undertaken. Another interesting and unexplored field, are 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.

References

Bernanke B.S., Blinder A. 1988. "Credit, Money, and Aggregate Demand", *American Economic Review Papers and Proceedings*, Vol. 78, May, pp. 435-439.

Bernanke, B.S. Gertler, M. 1995. "Inside the Black Box: The Credit Channel and Monetary Policy Transmission", *Journal of Economic Perspectives*, Vol. 9, pp. 27-48.

BoG 2000, 2001, 2002, 2003b. "Annual Report", Bank of Greece, Athens.

BoG 2003 a. "Monetary Policy 2002-2003", Bank of Greece, Athens.

Borio, C., Lowe, P. 2004. "Securing Sustainable Price Stability: Should Credit Come Back from the Wilderness?", BIS Working Paper 157, Bank for International Settlements, Basle.

BdP 2003. "Annual Report", Banco de Portugal, Lisbon.

BRE 2004. "Naturalna stopa procentowa, jako indykator przyszłej inflacji", Miesięczny Przegląd Makroekonomiczny, Bank Rozwoju Eksportu, Warszawa

Brzoza-Brzezina, M. 2004. "The Information Content of the Natural Rate of Interest for Central Bankers: The Case of Poland", mimeo, NBP.

Calza, A., Gartner, C., Sousa, J. 2001. "Modeling the Demand for Loans to the Private Sector in the Euro Area", Working Paper 55, ECB, Frankfurt.

Calza, A., Manrique, M., Sousa, J. 2003. "Aggregate Loans to the Euro Area Private Sector", Working Paper 202, ECB, Frankfurt.

CBI 2001, 2002. "Financial Stability Report", Central Bank of Ireland, Dublin.

CBFA 2004. "Financial Stability Report", Central Bank and Financial Services Authority of Ireland, Dublin.

Chmielewski, T. 2003. "Is the Balassa-Samuelson Effect a Serious Obstacle for an Accession Country?", in: D.Alpen and H.Luchtmeier (eds): *The Euro in Eastern Europe: Options for the monetary and currency regime*, INFER Studies vol. 8, Berlin, March 2003

Chmielewski, T. 2004. "Developments in the Banking Sector and the Monetary Policy Transmission Mechanism – an Accession Country Perspective. The Case of Poland", mimeo, European Central Bank.

Cottarelli, C., Dell'Ariccia, G., Vladkova-Hollar, I., 2003. "Early Birds, Late Risers and Sleeping Beauties: Bank Credit Growth to the Private Sector in Central and Eastern Europe and the Balkans", Working Paper 03/213, International Monetary Fund, Washington.

CNB 2003. "The Czech National Bank's Forecasting and Policy Analysis System", Czech National Bank, Prague.

Crespo-Cuaresma, J., Gnan, E., Ritzberger-Gruenwald, D. 2003. "Searching for the Natural Rate of Interest: A Euro-Area Perspective", Working Paper 84, Oesterreichische Nationalbank.

Crum, L.L. 2002. "Banks and Banking" in *The Handbook of Texas Online*, http://www.tsha.utexas.edu/handbook/online/articles/view/BB/czb1.html

Gourinchas, P.O., Valdes, R., Landerretche, O. 2001. "Lending Booms: Latin America and the World", NBER Working Paper 8249.

Hartmann, P., Straetmans, S., Vries, C.G. 2004. "Banking System Stability: A Cross-Atlantic Perspective", mimeo, European Central Bank.

Hoffman, B. 2001, "The Determinants of Private Sector Credit in Industrialised Countries: do Property Prices Matter?", BIS Working Paper 108, Bank for International Settlements, Basle.

Honohan, P. 1999. "Consequences for Greece and Portugal of the Opening-up of the European Banking Market", mimeo, World Bank.

IMF 2000. "Portugal. Staff Report for the 2000 Article IV Consultation", International Monetary Fund, Washington D.C.

IMF 2001a. "Greece. Staff Report for the 2001 Article IV Consultation", International Monetary Fund, Washington D.C.

IMF 2001b. "Ireland. Staff Report for the 2001 Article IV Consultation", International Monetary Fund, Washington D.C.

IMF 2003a. "Greece. Staff Report for the 2003 Article IV Consultation", International Monetary Fund, Washington D.C.

IMF 2003b. "Ireland. Staff Report for the 2003 Article IV Consultation", International Monetary Fund, Washington D.C.

IMF 2003c. "Portugal. Staff Report for the 2003 Article IV Consultation", International Monetary Fund, Washington D.C.

IMF 2004. "Adopting the Euro in Central Europe – Challenges of the Next Step in European Integration", mimeo, International Monetary Fund, Washington.

Johansen, S. 1991. „Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models", *Econometrica* 59, pp.1551-1580.

Kovacs, M.A. 2002. "On the Estimated Size of the Balassa-Samuelson Effect in Five Central and Eastern European Countries", NBH Working Paper 2002/5, National Bank of Hungary.

Lanne, M. (2002). "Nonlinear Dynamics of Interest Rates and Inflation", Bank of Finland Discussion Papers No. 21/2002.

Lipschitz, L.J., Lane, T.D., Mourmouras, A.T. 2002. "Capital Flows to Transition Economies: Master or Servant?", WP 02/11, International Monetary Fund.

MacKinnon, J.G. 1996. "Numerical Distribution Functions for Unit Root and Cointegration Tests," *Journal of Applied Econometrics*, 11, 601-618.

MacKinnon, J.G., Haug, A.A., Michelis, L. 1999, "Numerical Distribution Functions of Likelihood Ratio Tests For Cointegration," *Journal of Applied Econometrics*, 14, pp. 563-577.

MNB 2004. "Report on Financial Stability", Magyar Nemzeti Bank, Budapest, June.

Mundell, R. 1961. "A Theory of Optimum Currency Areas", *American Economic Review* Vol. 51, No. 4, pp. 657-665.

NBP 2003, 2004a. "Financial Stability Review", National Bank of Poland, Warsaw, August.

NBP 2004b. "A Report on Costs and Benefits of Poland's Adoption of the Euro", ed. J.Borowski, National Bank of Poland.

Terrones, M, Mendoza, E. 2004. "Are Credit Booms in Emerging Markets a Concern?", in World Economic Outlook, IMF, Washington.

Appendix 1: Data sources

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

1. Total nominal loans to the private sector:

Greece, Ireland, Portugal – ECB

Czech Republic – Czech National Bank – www.cnb.cz

Hungary – National Bank of Hungary – www.mnb.hu

Poland – National Bank of Poland – www.nbp.pl

2. Nominal interest rate

Czech Republic – Czech National Bank (PRIBOR3M)

Greece, Portugal – OECD (short-term interest rate)

Hungary – ECB (BUIBOR3M)

Ireland – BIS (DIBOR3M, EURIBOR3M)

Poland - National Bank of Poland (WIBOR3M)

3. GDP at constant prices

All countries – OECD

4. GDP deflator

Czech Republic, Greece, Hungary, Ireland, Portugal – OECD

Poland – 1997-2004 GDP deflator (OECD); 1994-1996 GDP deflator substituted by domestic CPI (Central Statistical Office) due to questionable quality of data;

Appendix 2: Tables

Table 6: 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 are from McKinnon (1996).

Tab 7: 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 8: 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).

Tab 9: 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.

Tab 10: 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 11: 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_FI	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(-1))	-0.150221	0.100513	-0.031833
	(0.69216)	(0.15776)	(0.63965)
	[-0.21703]	[0.63713]	[-0.04977]
D(RINT(-1))	0.28267]	-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

Tab 12: 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	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(-1))	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

Tab 13: 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_FI	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(-1))	-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 14: 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	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(-1))	-0.157865	0.311065	0.163283
	(0.32447)	(0.11555)	(0.24275)
	[-0.48654]	[2.69212]	[0.67263]
D(GDP_FIXED_SA(-2))	0.366404	0.449150	-0.259900
	(0.33389)	(0.11890)	(0.24980)
	[1.09738]	[3.77748]	[-1.04042]
D(GDP_FIXED_SA(-3))	0.378838	0.080749	0.018446
	(0.34215)	(0.12184)	(0.25598)
	[1.10723]	[0.66273]	[0.07206]
D(GDP_FIXED_SA(-4))	-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 4: Recursive estimates of the GDP parameter (β_1) in the Irish model (initialisation at 60 obs.)

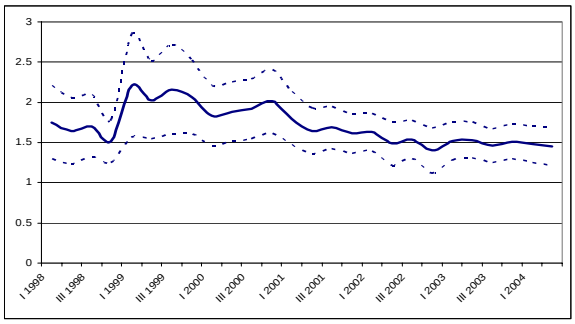


Figure 6: Recursive estimates of interest rate parameter (β_2) in the Irish model

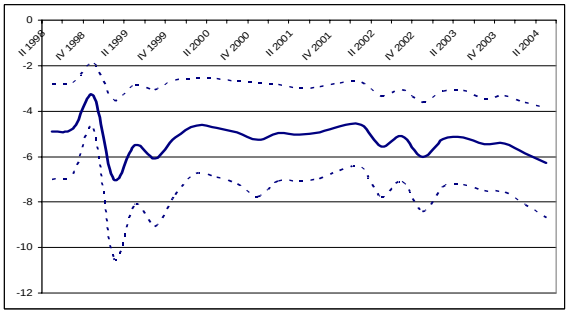


Figure 5: Recursive estimates of the GDP parameter (β_1) in the Portuguese model

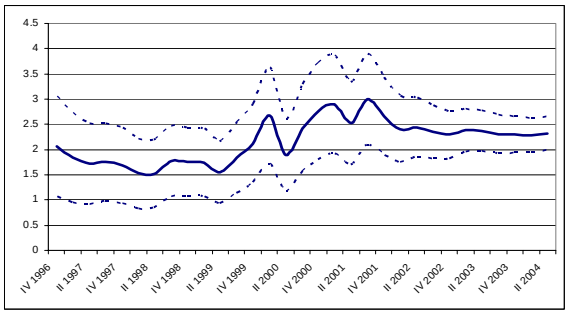


Figure 7: Recursive estimates of interest rate parameter (β_2) in the Portuguese model

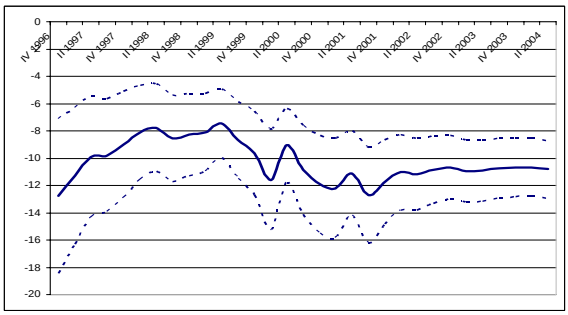


Figure 8: Simulation of loan expansion in the Czech Republic based on the Irish and Portuguese models

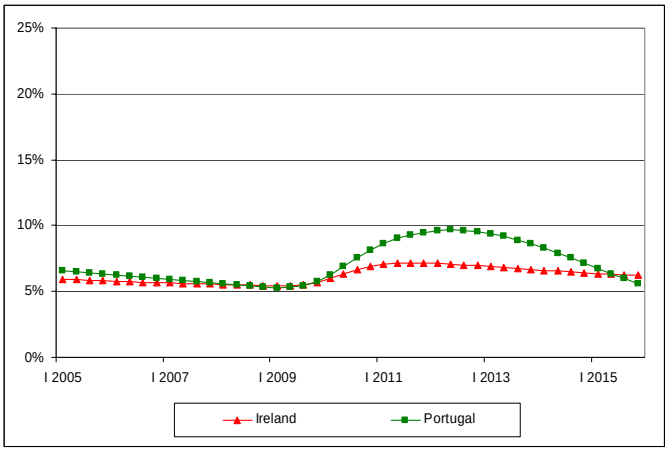


Figure 9: Simulation of loan expansion in Hungary based on the Hungarian, Irish and Portuguese models

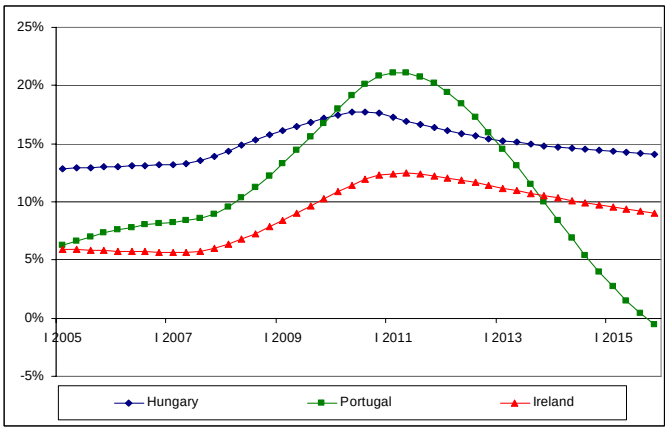


Figure 10: Simulation of loan expansion in Poland based on the Polish, Irish and Portuguese models