



THE OVERHEATING OF FIVE EU NEW MEMBER STATES AND CYCLICALITY OF SYSTEMIC RISK IN THE BANKING SECTOR

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Abstract. Rapid credit growth has been one of the most pervasive developments in recent years in Central and Eastern Europe. We tested for the significance of macroeconomic and banking sector variables that condition non-performing loan ratios and the hypothesis of procyclicality between economic activity and improving banking-sector results in the Baltic States, Bulgaria and Romania. The theory of procyclicality between economic activity and the non-performing loan ratio was proven. The increased economic activity improved the loan portfolio quality of the banking sector, as indicated by a lower NPL ratio. Due to a high share of loans denominated in a foreign currency and the fact of productivity gains in the tradable sector, the appreciation of the real exchange rate contributed to an improvement in loan portfolio quality. The procyclicality of banking sector performance and high economic activities growth could be a signal of an economy overheating and therefore a slowdown in economic activity is likely to accelerate the growth of the non-performing loan ratio in the Baltic States, Bulgaria and Romania.

Keywords: cyclical, non-performing loans, systemic risk, asset quality, economic growth.

JEL CLASSIFICATION: F47, G15, G21.

1. Introduction

In response to a global financial crisis in the 1980s and 1990s, national and international institutions began monitoring the soundness of the financial system carefully. As a result, the bulk of financial stability indicators have been greatly extended (Mörttinen *et al.* 2005): regulatory capital vs risk-weighted assets, interest margins and non-interest expenses vs gross income, a return on assets and a return on equity, spread between the highest and lowest inter-bank rates, liquid assets to short-term liability ratios, liquid assets to total assets as well as the cost-income ratio. As well, credit relative to GDP, the net open position in foreign currency to capital, the geographical distribution of loans to total loans, the share of non-performing loans to total loans as well as foreign-currency-denominated loans to total loans are usually used as indicators of financial stability and balance-sheet quality. When observing the study of Schinasi (2005) and Kool (2006), common exposure to macroeconomic risk factors across banks is a source of systemic risk that influences the quality of a loan portfolio, which can be expressed as the non-performing loan to total gross loan (NPL) ratio.

An increasing ratio may be a signal of deterioration in banking sector results. According to theory, we would expect that the non-performing loans to total loans ratio is assumed to be procyclical within the economic cycle.

In Bulgaria and Romania the banks recorded a decline in their non-performing loans ratio, while in the Baltic States they recorded the lowest share of non-performing loans among New EU Member States. The outlook for the banking sector results possibly reflects a favourable assessment of their economic growth. The increasing indebtedness of the private sector could become a cause for concern if the macroeconomic environment develops less favourably.

We analyzed the relationships between the non-performing loan ratio and macroeconomic/banking sector variables as a source of systemic risk in order to assess the banking sector's vulnerability to bad loan performance on a macroeconomic level. In the second chapter the literature overview and the theoretical background of empirical analysis are presented. In the third chapter, we have summarized the characteristics of the macroeconomic environment and the banking sector in the

Baltic States, Bulgaria and Romania. In the fourth chapter, the methodology, the empirical analysis and the results are explained. The implications of the empirical analysis are revisited in the conclusion.

2. The literature overview

The empirical findings presented in the literature (in the text below) are an important source of the hypothesis when it comes to the responsiveness of the NPL ratio on macro/banking factors.

Quagliariello (2003) presented a regression between the evolution of NPL ratio as the dependent variable and a set of explanatory variables: real GDP growth rate, the growth of real gross fixed investment and consumption, changes in the unemployment rate, the consumer price index (CPI), the real exchange rate and the M2 growth rate. Babouček and Jančar (2005) investigated economic developments by unemployment, GDP growth, export, import, appreciation, CPI and credit growth as the indicators of the NPL ratio performance. Hoggarth *et al.* (2005) investigated the link between loan write-offs and output gap, retail prices, real estate prices, the nominal short-term interest rate and the real exchange rate. Fofack (2005) investigated the NPL ratio performance via macro economic variables and banking variables like return on asset, return on equity, equity as a share of total asset, deposit to asset ratio, deposit to liability ratio, net interest margin and net income. De Nicolo *et al.* (2003) employed credit to asset ratio, deposit to loan ratio, credit to liability ratio and net foreign asset to net asset ratio as the set of explanatory variables for the evolution of NPL ratio.

Čihák *et al.* (2007) compared system-focused stress testing methods and discussed issues relating to the design of stress tests for the Czech banking system. Jakubík (2007b) employed the regression method for NPL inflow estimation using real GDP, real effective exchange rates, the CPI, the loan to GDP ratio, unemployment, and real interest rates as explanatory variables. Festić and Bekő (2008) employed a regression method for the NPL ratio dynamics in the five CEE economies by using the macroeconomic variables as the explanatory variables. Männasoo (2005) presented a panel logit model between the evolution of NPL and a set of explanatory variables: liquidity ratio, inverse liquidity ratio, loan to asset ratio, equity to asset ratio, cost-income ratio and macro economic variables. Babihuga (2007) presented a regression between the evolution of NPL as the dependent variable and a set of explanatory variables: the quality of banking sector supervision measured by an index of compliance with

the Basel core principles, terms of trade, unemployment, real lending rates, real effective exchange rate and business cycle component of GDP.

Theoretical background. The economic literature often differentiates between demand factors (such as economic convergence, wealth accumulation, interest rates, inflation, gross domestic product, purchasing power parity, etc.) and supply factors (liberalization of the banking sector, financial deepening, etc.) determining sustainable credit growth and sustainable loan asset ratio (Sirtaine and Skamnelos 2007). First, the majority of studies have confirmed that GDP/export/gross fixed capital formation is a major challenge to loan portfolio quality and the dynamics of the NPL have been proven to be pro-cyclical with respect to economic growth. Periods of economic growth and strong demand for the country's exports have a positive effect on the domestic corporate and household sectors (Borio *et al.* 2001). Second, the empirical record associated with an explicit analysis of the (net) foreign currency assets and exchange rate to NPL relationship is mixed, partly as a result of economies' different degrees of foreign trade openness, as well as with dissimilar (foreign currency) debt exposure in individual sectors. The worsening of banking sector mismatches and NPL ratio could occur – when borrowers borrow in foreign currency (or their loans are nominated in foreign currency) and pay back the credit in domestic currency – due to the shortage of foreign currency assets and domestic currency depreciation that threatens the NPL performance and increases the debt burdens (Edwards 2001). On the other hand, appreciation of the real exchange rate (as the result of the higher net foreign currency assets of the banking sector or export growth or Balassa-Samuelson effect) could contribute to the build-up of a crisis through shifts in international competitiveness coupled with terms of trade deterioration and with direct implications for loan performance as can be seen in the fact that bank lending surveys show that loans granted to enterprises are partly hedged by their export proceeds (Kaminsky and Reinhart 1999).

Third, low bank capitalization (and low deposit to loan ratio) often lead to the adoption of imprudent lending strategies with direct implications for banks' loan portfolios, which tend to be heavily skewed toward high risk projects (Jappelli and Pagano 1994; Lardy 1999). Applying soft budget constraints, prevalent in many transition countries for credits to enterprises or households, may lead to considerable losses in the economy when investments turn out to be counterproductive (Berglöf and Roland 1995) or when the household's liabilities/income ratio is extremely high (Kiss *et al.*

2006). Higher the debt burdens and counterproductive investment could increase the NPL ratio (Sirtaine and Skamnelos 2007).

Fourth, the share of banks' loans to the private sector in total banking assets is considered as a proxy of risk taken by the banks (D'Avack and Levasseur 2007). Loan-assets ratio is positively correlated with banking problems and (in)solvency is a result of bank long-term mismanagement (Männassoo 2005). Fifth, the deposits of the private sector as a share of loans to private sector is used as a rough measure of the profitability of the deposit money or as a proxy for national savings with banks as a rough measure of banking sector reserves (Cândida 2009).

3. The banking sector in the macroenvironment of the New Member States

Due to the fact that catching-up economies required investment levels that exceeded domestic savings, the NMS financed a part of their investment through foreign direct investment (FDI) and the huge current account deficits have been financed by a steady increase in the net-inflow of FDI, net portfolio investment and foreign currency loans (KBC AM 2007). The positive impact of FDI and the import of capital goods on *economic growth* is visible in the diversification of the foreign trade structure, the increase of labour productivity and the improvement of competitiveness in the *export* industries (Brandmeier 2006), an improvement in the market structure and high growth rates¹. *Economic growth* has been high and widespread: *domestic demand*, boosted by a foreign-financed boom in bank lending, plummeting unemployment, real wage growth on the back of productivity gains; and *export growth* have all contributed to GDP growth after the EU accession.

The catching-up process in the New Member States (NMSs) – combined with the general banking sectors' pro-cyclicality – has reinforced credit growth around the EU accession area. Nominal convergence and the

lowering of interest rates have also increased demand for leveraging amongst companies and boosted private consumption (Brzoza-Brzezina 2005). Bank credits have remained an important source of financing, for both investment and consumption. Credit growth in the NMSs has been largely foreign-funded and loans to the private sector have been growing at a rapid pace in the period from 2002–2007.

3.1. Macroenvironment

The Baltic States have the great volume of trade with western Europe, central and eastern Europe and the impact of *Russian crisis* in 1998 on these economies brought the differing pace of structural adjustment back into focus but did not reverse the trend. After the Russian crisis, favourable economic development and approaching EU membership increased investments and the amount of credit started to grow (Ådahl 2006).

After the EU accession, the Baltics faced the recovery of EU economies and the positive externalities of accession to the EU have contributed to export growth between 2002 and 2007. Low interest rates, an ongoing credit boom, gains in productivity, the growth of private consumption, fixed capital formation as the major driving force of GDP growth in *the Baltics*, a higher capacity to absorb EU investment grants and strong external demand have caused relatively high GDP growth rates. The credit-fuelled domestic demand boom has moreover translated into upward price pressures in goods and labour markets, leading to higher inflation (KBC AM 2008)².

In the Baltics, signals of economic *overheating* with a medium-term risk of a hard landing could be evident in 2007. The deceleration of economic growth in the second half of 2008 was mostly due to a supply side shock and the unwinding of the boom in the EU economies in 2008. Looking at the structure of output growth, increasing domestic demand has also played a prominent role, since net exports were negatively affected by sluggish economic activity in Europe (KBC AM 2008).

Significant amounts of FDI have been related to the banking sector and non-tradable sector (like real estate business) that are closely tied to the availability of bank finance, which differentiates the Baltics from the central Europe, where most of capital inflows have taken the form of FDI into the tradable sector. Romania

¹ The productivity increases in the tradable sector in the 1990s induced significant effects with regard to the overall *inflationary differences* between the NMSs and their main Western trading partners, owing to the Balassa-Samuelson effect, which caused the NMSs' currencies to be appreciated in real terms (Chmielewski 2003; Breuss 2003). Breuss (2003) saw the appreciation of the real exchange rates as the result of productivity gains in the tradable sector and as a "natural phenomena in catching-up countries," which did not erode export competitiveness because higher gross fixed capital formation led to a rise in external competitiveness and higher exports (Brandmeier 2006).

² Substantial progress has been made in reducing inflation after 1999 but later, inflation reaccelerated again due to indirect taxes and administered prices, higher food prices and the impact of increasing fuel prices as well.

and Bulgaria have become one of the main beneficiaries of FDI in tradable sector in the Central and Eastern European Region due to their EU accession, the relatively low wages of the highly educated labour force and the rapidly growing domestic market.

After the EU accession, Romania and Bulgaria faced the recovery of the EU economies and the positive externalities of accession to the EU have contributed to economic growth. In *Bulgaria*, a higher-than-expected revenue performance and economic growth as a strong stimulus for channelling budget resources, declining tax evasion and improved tax collection have resulted in a general government budget surplus (Table 1). The Established Property Fund of December 2005 com-

pensated citizens for the non-return of property confiscated during the communist period, and the fiscal deficit expanded in *Romania*. Huge capital inflows led to an unsustainable level of exchange rate appreciation in *Romania* and, supported by the strong appreciation of currency, the stock of public debt declined (Barisitz 2005, 66–68).

Progress in the implementation of reforms has been an important driver for *Bulgaria* in achieving macroeconomic stability and productivity improvements. EU membership has been expected to allow further economic expansion due to the fact that consumption and investment achieved the forefront of economic expansion after 2003. The much greater increase in domestic

Table 1. Macroeconomic and banking sector indicators for the Baltic States, Bulgaria and Romania

Macroeconomic environment (2006/2007/2008^f)							
	GDP % growth	Credits/GDP (95/00/06)	Inflation (yoy, ann. in %)	Budget balance (% of GDP)	Public debt (% of GDP)	Current account (% of GDP)	FDI inflow (% of GDP)
Estonia	11.2/7.0/4.0	18/39/82	4.4/6.6/9.0	3.7/3.6/0.6	4.0/2.8/2.3	-15.5/-15.9/-13.1	3.4/3.9/2.7
Latvia	11.9/10.7/5.8	73/22/82	6.5/10.1/10.5	-0.3/0.7/1.0	10.6/10.2/7.8	-22.3/-23.9/-18.2	7.4/8.0/5.1
Lithuania	7.7/8.8/7.2	18/16/50	3.8/5.7/7.8	-0.2/-0.5/-0.6	18.2/17.7/17.2	-10.7/-13.2/-12.0	5.2/4.3/3.1
Bulgaria	6.3/6.2/5.6	41/18/52	7.3/8.4/11.0	3.6/3.5/3.5	22.8/19.3/16.0	-17.8/-21.5/-20.2	23.6/21.1/14.5
Romania	7.9/6.0/5.5	16/14/28	6.6/4.8/7.4	-1.6/-2.3/-3.0	12.4/12.5/12.8	-10.4/-13.9/-14.2	8.9/5.8/4.5
Banking sector indicators (commercial banks, 2006/07)							
	Asset share of foreign banks/states' share (in %)	Total capital ratio (2006)	NPL (2001/2003/2006/2007) *	ROE/ROA	FCLo/TLo (2005) in %	Rating Moody's / S&P (2005)	EBRD index of banking sector reform^{c*}
Estonia	97.3/0.0	14.5	1.3/0.7/0.2/0.2	12.6/1.50	78	A1/A	3.3–3.7
Latvia	47.2/4.1	11.7	2.8/1.4/0.7/0.5	16.3/1.47	72	A2/A–	3.0–3.7
Lithuania	95.6/0.0	13.2	8.3/2.4/2.5/1.1	13.4/1.26	50	A3/A–	3.0–3.0
Bulgaria	79/12	14.5	3.4/2.8/2.2/2.2	21.5/2.1**	40	Baa3/BBB+	3.7–3.7
Romania	59/34	17.8	8.3/8.2/8.4/8.0	18.8/2.0**	48	Baa3/BBB–	3.0–3.0

* Exchange rate regime: ERM II since June 2004 in Estonia and Lithuania; and since May 2005 in Latvia; **currency board (EUR) in Bulgaria; and managed float (EUR) in Romania since November 2004.**

* Portfolio quality and loan classification categories: Estonia – standard, watch, doubtful, uncertain, loss; Latvia and Lithuania – standard, watch, substandard, doubtful, loss. Substandard loans are 91 to 180 days past due (and require provisioning between 15 and 40), doubtful loans are 181 to 365 days past due (and require provisioning between 40 and 99) and losses are not repayed (requiring 100% provisioning). In Estonia, loans overdue for 150 plus days have to be written off in Estonia. In Latvia, although the substandard classification covers loans 31–90 days overdue and provisioning levels are 10/30/60/100 percent, respectively. In Bulgaria and Romania: NPL – substandard, watch, doubtful, uncertain, loss. Substandard loans are 91 to 180 days past due (and require provisioning between 15 and 40), doubtful loans are 181 to 365 days past due (and require provisioning between 40 and 99) and losses are not repayed (requiring 100% provisioning).

* The EBRD indicators of banking sector reform are measured on a scale of 1 to 4+ (for 1997 and 2003): score 2: established internal currency convertibility, significant liberalised interest rates and credit allocation; score 3: achieved substantial progress in establishing prudential regulation and supervision framework; score 4: level of reform approximates the BIS institutional standards.

* RoA, RoE: average of the period, return on assets, return on equity.

* FCLo/TLo: foreign currency loans in total loans to private sector; and PSL/PSD: private sector loans in private sector deposits.

** For Romania and Bulgaria data for 2004 and 2006.

Source: IMF (2008), KBC AM (2008).

demand than overall growth implies the mounting negative growth contribution from net exports mirrored in a ballooning current account deficit (KBC AM 2008). Due to the fact that Bulgaria has channelled a significant part of FDI into the non-tradable sector (real estate and services) and because of its high current account deficit, there is a risk that FDI will not contribute to export capacities and risk the sustainability of the currency board regime.

Romania's economy grew strongly on the back of strong household spending, accelerating investment growth and FDI. The credit-led domestic demand growth was accompanied by macroeconomic imbalances like overleveraged households and external imbalances. Sizeable productivity increases and moderate wage growth until 2003, as well as cuts in social security contributions also contributed to the external competitiveness of Romania. Buoyant growth in *Romania* rode on the back of robust consumption spending (stimulated by easier access to credit, lower taxes and lowering unemployment) together with accelerating investments (as a result of reconstruction activities and a large number of programmes co-financed by the EU). FDI has been persistently strong, GDP growth has been quite favourable, but the contribution of net exports has remained mostly negative due to strong domestic demand that has pushed up the external deficit (KBC AM 2008).

3.2. The banking sector

While the Estonian and Lithuanian banking sector became truly consolidated, *Latvia* remained the exception, with a number of smaller niche banks oriented towards the Russian market, attracting particular non-resident deposits (Eesti Pank 2006). Estonia had privatized their last remaining large state-owned banks into foreign hands. In *Latvia*, the large amount of banks is partly explained by the fact that ten of the banks deal primarily with nonresident transactions, meaning investing Russian money in Western Europe. In 1998, *Latvian* banks suffered relatively large losses due to the Russian crisis (Koivu 2002). For many *Latvian* banks, receiving deposits from the CIS and reinvesting them in Western Europe is an important business activity. The *Lithuanian* banking sector is considerably smaller and its effectiveness has been lower than in Estonia or *Latvia* due to the state ownership, which lasted longer in *Lithuania*, and due to the fact that the banks are too risk-averse and small- and medium-sized enterprises have been suffering from insufficient financing.

Despite the fact that lending has been growing rapidly in the period from 2002 to 2007, recently banks in

the *Baltics* have maintained adequate *solvency* buffers and they identified consolidation, the adaptation of organizational structures and regulatory incentives as significant drivers of change (Ådahl 2006). An analysis of financial health EBRD indicators confirms that generally the capital adequacy in the banking sector has been sufficient (Table 1), banks enjoy adequate profitability (profits were also supported by continued cost-containment) and banks have benefited from the enhancement of asset quality (which allowed for reduced provisioning).

In *Bulgaria*, state-owned banks had provided credits to loss-generating state owned enterprises, relying on the refinancing programme of the *Bulgarian National Bank* (significantly after 1995) acting as the first instance creditor (Mishev 2006). This led to a devastating bank crisis in the second half of the 90s. Following an economic and financial crisis in 1996/97 the New Law on Banks was introduced in 1997. In compliance with EU directives and regulations, banks have been forced to introduce a number of regulations to ensure adequate risk diversification. *Romania* commenced fairly late with the reforming of its banking system. After weathering the financial and banking sector crisis in the late 90s, the banking sector began to consolidate and the number of banks fell significantly. The success of privatization contributed to a positive performance in the *Romanian* banking sector. Despite this, it has the characteristics of an oligopoly: a large number of banks and rapid assets have grown over the period from 2002-2005 (Duenwald *et al.* 2005).

Foreign banks have significantly contributed to the transformation of the banking sector in *Romania* and *Bulgaria* (Barisitz 2005). Sustained economic recovery and foreign ownership of the banking sector have increased competition and boosted confidence (Walko *et al.* 2006). The EBRD indicators (Table 1) show that the capacities for effective *prudential regulation and supervision* have been developed. Some of the most pertinent risk problems for banking sector have appeared to be: the persisting lag in restructuring the real sector (particularly state-owned enterprises and loss-prone firms), lack of financial discipline, partly non-transparent insolvency procedures, where further improvements have been needed (Barisitz 2005).

3.3. Lending of banking sector

Already in the aftermath of the *Russian crisis* in the end of the 90s, Estonia and *Latvia* experienced very rapid loan growth between 2000–2002, while *Lithuania* lagged somewhat behind. Credit growth has picked-up in Estonia and *Latvia* in the second half of the 90s,

while in Lithuania, the credit to GDP ratio has been increasing slightly since 2001. *Estonia* and *Latvia* recorded a marked credit ratio growth until 2004, while Lithuania boosted its ratio in 2002. By the end of 2006, Estonia and Latvia were leading with a roughly 85% private credit to GDP ratio, followed by Lithuania with a ratio well over 50%. From 1999-2002, more than half of all loans were granted in foreign currencies and the majority in euros (Table 1). The major share of foreign loans to the private sector consists of housing loans, which have increased remarkably between 1999 and 2002 (KBC AM 2008).

The acceleration in domestic lending – in particular to households – was fuelled by strongly increasing foreign liabilities (Sopanha 2006), while the corporate sector gained better access to alternative financing sources in the Baltics. Credit growth to the corporate sector lagged behind loans to households, which can be partly explained by the fact that an important share of investment by the non-financial corporate sector was financed by retained earnings, inter-company loans and foreign capital, including credits from banks in other countries and FDI in the period from 2002 to 2006.

In *Romania*, the cautious approach of banks to lending after the banking crisis in the late 90s and their preference for doing low-risk business led to a low share of private sector loans to GDP (Table 1). The growth in private consumption – triggered by strong real wage growth – led to a pick-up in lending in 2003. Domestic credits have primarily been financed by domestic deposits and external sources. The banks' ability to fund loan expansion was boosted by strong capital inflows through the banking system, amid high global liquidity and low interest rates. With the opening of a capital account in 2004, household preferences started to switch from domestic to foreign currency denominated loans. With foreign borrowing becoming important, the net foreign asset position of the banking system deteriorated in Romania as well. The share of total credit institutions assets in GDP has risen from 36.6% in 2004 to 62.5% in 2007 (which is much lower than in the Euro-area) (Naraidoo et al. 2008). The National Bank of Romania started to implement measures to curb domestic credit growth after 2004.

In *Bulgaria*, banks are predominantly deposit financed and banking sector's assets have been increasingly dominated by claims on the domestic sector, while securities and repurchasing agreements continue to play a subordinate role. The banking sector's net external position has deteriorated in recent years, as domestic savings have not kept up with the expansion of lending activity in the late 90s and beginning of 2000. The

banks did not meet the growing demand for loans and started decreasing their net foreign asset balances, providing them as credit lines and credits (Mishev 2006). The period after 2001 saw a great credit expansion after the crisis. In the light of the recent credit boom and the failed attempts of the Bulgarian National Bank to curtail loan growth, the banking sector's risk profile has deteriorated somewhat. Bulgarian National Banks introduced measures in order to decrease credit growth rate in the period from 2004-2006 (Ess et al. 2006).

3.4. The non-performing loans

The transition economies shared a common problem: their banking sectors in the early 1990s were characterized by a relatively small number of large, state-owned institutions that had become burdened by large volumes of non-performing loans. We can point to two reasons for this: first, these countries had to deal with the issue of a large amount of inherited NPL from the past, and second, new NPL's mounted up in the balance sheets of commercial banks due to a lack of experience, government intervention, inappropriate incentives for bank management and poorly designed privatization methods.

In the Baltic states, non-performing loans, dating back to government intervention in state-owned banks and companies in the early 90s (Tang et al. 2000), have been fully written off in recent years. Estonia and Latvia relied on a decentralized model, injecting capital into banks they considered viable and suitable for further privatization, while leaving it to the banks themselves to deal with their bad loans. Lithuania chose a centralized approach and set up a central agency to clean up the bad loans of selected banks and provide banks with government assets for recapitalization. To this effect, the government issued special bonds and transferred cash from the budget (Krzak 1997). Since the Russian crisis, *non-performing loans* have been reduced by half. Supervisory and regulatory authorities have proven their mettle in forcing the pace of *mergers* during the crisis and thereafter rapidly improving supervision (Table 1).

In *Bulgaria and Romania*, the structure of NPLs has also improved due to the fact that the worst categories (doubtful loans and loss assets), that previously had a share of around 73% in Romania and Bulgaria in 2000, decreased to 57% in Bulgaria and to 35% in Romania by the end of 2004. The removal of non-performing loans from balance sheets (predominantly affecting loans to the corporate sector) during the bank restructuring process and improved management skills have improved banks' loan portfolios (Table 1, Fig. 1).

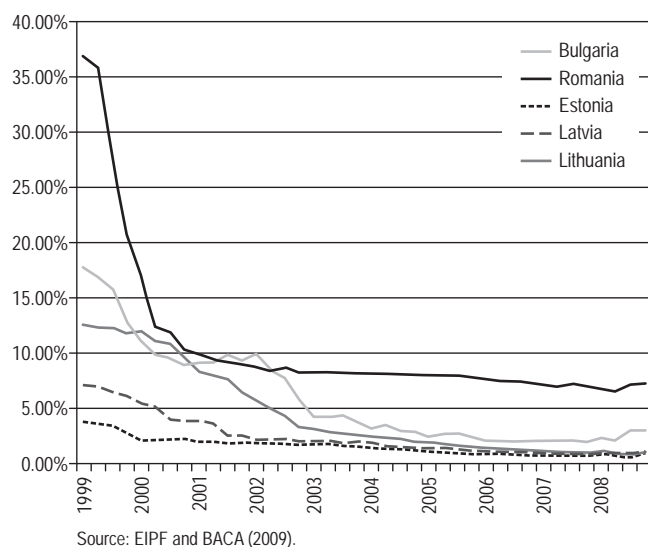


Fig. 1. The NPL ratio dynamics in the Baltic States, Romania and Bulgaria

These changes in the asset structure display a similarity to the developments in the New Member States-8 over the last decade (Walko *et al.* 2006).

3.5. Trends and overheating

Structural dependence on external financing – which is in part a by-product of the effect of low levels of internal saving – have led to large current account deficits and financial instability.

In *Estonia*, GDP growth after 2005 was favourable especially due to favourable developments in the service sector and export growth. Export growth improved economic conditions in *Estonia* from 1998 to 2007, most likely due to strong productivity growth and increasingly diversified export and import structures that have reduced vulnerability in terms of trade deterioration (export growth mainly exceeded import growth in *Estonia* in the period from 1999 to 2006). After 2004, domestic savings with banks (= deposits) started to augment, which is explainable by the substantially increased income of households and enterprises. But increasing available deposits (and liquidity) with banks did not contribute to NPL ratio deterioration.

Since 2000, *Latvia* has experienced rapid growth in investments, which encouraged the modernization of production and introduction of new technologies. In *Latvia*, the investment to GDP ratio might have risen to maintain strong economic growth and a healthy banking sector has helped to allocate savings to the most productive investment. Rapid credit growth appears to have been contained by high domestic savings (and deposit accumulation) in *Latvia* after 2000. On the

other hand, the inflow of foreign capital contributed to significant growth in liquidity, and surplus liquidity created an additional supply of loans. The current account deficits, strong domestic demand (only partially financed by FDI and net portfolio investment) and productivity adjusted wage growth relative to trading partners have highlighted the need for demand restraint to improve the saving-investment balance and slow down the debt accumulation of the private sector after 2006.

In *Lithuania*, economic growth has been stimulated by the expanding internal market after the accession to the EU and favourable export conditions, as well as household incomes rising since 2001, bringing economic growth to the general population. After 2004, the decrease of personal income taxes affected private savings positively. In the beginning of 2008, the current account deficit was higher (despite the strong pace of exports) than in the same period in 2007, because FDI and cross-border financing started showing signs of weakness. Flagging economic growth would likely be expected to trigger an adjustment in the current account deficit in *Lithuania*.

In *Bulgaria*, the most immediate effect of the credit boom was an increase in *Bulgaria*'s current account deficit. If the economy runs a persistent current account deficit, its default risk increases as the debt mounts, and external liquidity weakens. In the long run, the deficit can be seen as the increase of foreign ownership in domestic capital resources, decreasing reinvestment and economic activity within the domestic economy and taking interest rates abroad. The threat could be the high share of new real estate property and mortgage loans. The price bubble itself could consequently appear after increasing real estate demand. Another threat could be the depreciation of domestic currency and the net foreign asset balances of commercial banks, due to the fact that banks became net external debtors.

In *Romania*, a sudden reversal of capital flow or other external shock, a slowdown in growth and a drop in asset prices could engender a hard landing for the economy. A large part of household loans are denominated in a foreign currency and credit risk through exchange rate exposure is a concern given the large share of often unhedged foreign currency loans (liabilities as a percentage of household income are higher in *Romania* than in the CEE-8 – except in the Baltics), which confirms a bubble in the housing sector. Despite good FDI coverage and the recovery of export growth, the sustainability of the external imbalance is in the medium term an issue of concern.

4. Empirical analysis: data specification, methodology, empirical results and discussion

4.1. Data specification and theoretical background

Based on the studies of the determinants of the NPL ratio, we constructed a data set of explanatory variables that are usually employed in models³. The usual definition is that NPL's are defined as loans that are more than 90 days past due, as was used in our case.

Some authors (see, for example, Jakubík 2007a), however, emphasize the better performance of NPL inflow variables in empirical estimates. The NPL ratio could be problematic to use, where outflow is given by one-off NPL write-offs. This ratio can be driven by purely administrative measures. So, for example, in the New EU Member States, a significant portion of defaulted loans were removed from banks and substituted with government bonds. Since we could not provide the NPL inflow time series, we had to rely on the use of an NPL series as nominal loans that are at least 90 days past due. The NPL (in bn of domestic currency and deflated by consumer price index) as the share in total loans to private sector (in bn of domestic currency and deflated by consumer price index) was utilised for the dependent variable in our analysis.

Originally, the following time series for economic activity were utilised: the export of goods and services (in bn of domestic currency deflated by retail price index), gross fixed capital formation in the non-financial sector (in bn of domestic currency deflated by retail price index) and the interest rate variable was covered by real long-term (lending) 5-year interest rates. Furthermore, we used the real effective exchange rate in an individual country, expressed as the weighted average of a country's currency relative to a basket of other major currencies (measured as a foreign price for domestic currency) and adjusted for the effects of inflation as an explanatory variable. The banks' loans to the private sector (i.e. loans to households and corporations, as obtained from banks in the country, in bn of domestic currency deflated by consumer price index) as the share in total banking assets (in bn of domestic currency deflated by consumer price index), considering this variable as a proxy of risk taken by the banks;

and the deposits of the private sector (in bn of domestic currency deflated by consumer price index) as a share of loans (expressed in bn domestic currency deflated by consumer price index), as a rough measure of the profitability of the deposit money, were employed. All the nominal variables expressed in national currencies were corrected by an individual country's retail price index or consumer price index (the last quarter of 2008 as a base) and transformed into EUR by using the exchange rate of the last quarter of 2008.

We relied on the internal database of the BACA (2009), EIPF (2009) and the databases of central banks in individual countries. The quarterly time series (year on year growth rate, annual basis) were used for the period from the first quarter of 1999 to the last quarter of 2008, in order to explain the NPL dynamics in the Baltic States, Bulgaria and Romania.

4.2. Methodology

The methods used in different estimations that look for the empirical evidence of a relationship between financial stability, asset quality indicators and macroeconomic variables are mainly: co-integration analysis, correlations, cross-country regressions and panel regressions (Beck and Katz 1995). According to the relatively short time series and similarities between the analyzed economies, we decided to use panel regression (»cross section weights«) (Hsiao 2003), and obtain more information on the analyzed parameters (Wooldridge 2002). According to Temple (1999), the method allows one to control for omitted variables that are persistent over time and, by including lags of regressors, may alleviate measurement errors and endogeneity bias (see also Maddala and Wanhong 1996). The advantage of the applied method is that it lowers co-linearity between explanatory variables (Davidson and MacKinnon 1993) as well as dismisses heterogeneous effects (Western 1998). We analyzed the model with permanent effects, which controls the impact of neglected and changing variables among observed units that are constant within a time period (Stock and Watson 2003).

Moffatt and Salies (2003) have demonstrated that logarithmic approximation is only accurate if the rates of change in variables are reasonably small. Since the dynamics of the NPL ratio is sometimes large – this approximation would produce a significant downward bias in the simulation – all the time series were transformed into the differences of the growth rates in the original time series (measured in percentage points). After deriving the transformed time series, the station-

³ It is important to note, however, that cross-country variation in asset quality indicators can also be explained by differences in loan classification rules (see notes, Table 1). National practices differ on whether ex-post (evidence from past behavior, such as 90-day non-payment of interest/principal) or ex-ante information (assess future losses by considering forward-looking information) should be used to assess loan classification (IMF 2008).

arity of all the selected time series was obtained at a 1% significance level (Dickey and Fuller 1979) and then proven by the ADF-Fischer Test (Esaka 2003, Appendix, Table A)⁴. The lag length selection in the specified model was based on Schwarz information criterion. Variables' seasonal adjustment was reached by using year on year growth rate on annual basis.

Using quarterly data, we contributed to the existing empirical evidence of the impact of the macroeconomic environment on NPL ratio dynamics in the following way: we used panel estimates to explain NPL ratio growth by introducing macroeconomic and banking sector variables⁵. Using fixed effects within the estimation, we assumed a slope common to each of the countries (b_i), while intercepts varied across each of the countries (c_i) (Beck and Katz 2004). The fixed effects were included to account for possible unobserved heterogeneity across nations⁶. All the calculations were performed by Eviews 6.0. We estimated the following equation:

$$D(NPL)_t = c + b_1 \cdot D(\text{credit/asset})_{t-n} + b_2 D(\text{deposit/loan})_{t-n} + b_3 \cdot D(\text{export})_{t-n} + b_4 \cdot D(\text{reeffexch_r})_{t-n} + b_5 \cdot D(\text{invest})_{t-n} + b_6 \cdot D(\text{yields}_n)_{t-n} + \varepsilon_t$$

Symbols:

- D(): the difference in growth rate, as measured in percentage points,
- NPL: the share of non-performing loans to total bank loans,
- CREDIT/ASSET: the ratio between bank credits to the private sector and total banking assets,
- DEPOSIT/LOAN: deposits of the private sector as a share of loans,
- EXPORT: export of goods and services,
- REFFEXCH_R: the (real) effective exchange rate,
- INVEST: gross fixed capital formation,
- YIELDS: the long run (real) lending interest rate,
- ε_t : error term.

⁴ Variables are cointegrated of different levels and there is no long run equilibrium relationship between the variables.

⁵ The Q-Statistics (Appendix, Table B) were employed to check autocorrelation in the residuals. We accepted the hypothesis of no autocorrelation of residuals – with high probabilities and low Q-statistics (Iwaisako 2004).

⁶ Our results (see Table 2) reject the H0 hypothesis (H0 = the fixed effects are all equal to each other) and we accepted the fixed effects in our panel regression model. According to results of Cross-section F-test the system responds well within the fixed effects estimations in our model.

4.3. Results and discussion

The obtained results confirmed the influence of the chosen explanatory variables on the dynamics of the NPL ratio. As expected, we found evidence of a positive influence of the credit/asset ratio (with a coefficient of 0.029) and evidence of the negative effects of the deposit/loan ratio (with a coefficient of -0.042). The theory of procyclicality between export and the NPL ratio, as well as the procyclicality between gross fixed capital formation and the NPL ratio was proven with regression coefficients of -0.017 and -0.058 . The increased economic activity improved the loan portfolio quality of the banking sector and decelerated the NPL ratio dynamics. Appreciation of the real exchange rate decreased NPL ratio growth by -0.024 percentage points for 1 percentage point of real effective exchange rate appreciation, while yields increased the NPL ratio growth by 0.11 percentage points.

Simultaneously, using the values obtained with the Cross-section F-tests (Table 2), we can confirm that the common slopes (within the Baltic States, Bulgaria and Romania) are clear signs of integration, since NPL growth rates have similar reactions to the behaviour of the chosen explanatory variables. Under the conditions of increasing competition, the macroeconomic conditions and banking sector performance have contributed in a similar way to NPL ratio growth. Nevertheless, each country has a different intercept, that is, it had a specific initial condition (Estonia -0.029 , Latvia -0.020 and Lithuania -0.008 , Bulgaria -0.034 and Romania 0.041), which is consistent with the fact that the banking sector of these countries have faced different consequences, while adapting to new conditions during the EU integration process.

High credit growth rates were confirmed for the NMSs by Stavrakeva (2006) due to financial liberalization, followed by boom-bust cycles in bank lending, economic activity and asset prices (especially real estate). The inflow of foreign capital contributed to significant growth in liquidity and created an additional supply of loans. Excess credit growth to households, which finances increasing consumption and causes a deterioration in external accounts, can threaten the stability of the banking sector due to the fact that credit boom driven deficits are often financed through short-term external debt creation. Large deficits are typical for emerging markets and do not pose a problem as long as they are caused by the importing of capital goods and if future export growth is strong enough to reimburse foreign debt.

The inflow of foreign capital contributed to a significant growth in liquidity and the surplus liquidity created an additional supply of loans (for CEE see: Festic and Bekö 2008). The real exchange rate appreciation

Table 2. The panel regression results for the Baltic States, Bulgaria and Romania

Dependent Variable: D(NPL), Cross-section weights, Cross-sections included: 5 (the first quarter of 1999 – the last quarter of 2008), n = 200				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.028416	0.003092	-9.190717	0.0000
D(deposit/loan ₍₋₇₎)	-0.042660	0.012414	-3.436568	0.0008
D(credit/asset ₍₋₁₂₎)	0.029100	0.014429	2.016790	0.0045
D(export ₍₋₁₁₎)	-0.017185	0.011739	-1.463920	0.0145
D(reffexch_r ₍₋₆₎)	-0.023275	0.010125	-2.298811	0.0231
D(yields ₍₋₅₎)	0.114890	0.019370	5.931245	0.0000
D(invest ₍₋₈₎)	-0.058254	0.009454	-6.161944	0.0000
Fixed Effects (Cross)				
_RO-C	0.040951			
_BU-C	-0.034175			
_EE-C	-0.029235			
_LAT-C	0.019744			
_LIT-C	0.008236			
Cross-section fixed (dummy variables)				
Weighted Statistics				
R-squared	0.441575	Mean dependent var		-0.062294
Adjusted R-squared	0.399271	S.D. dependent var		0.109540
S.E. of regression	0.083636	Sum squared resid		0.923327
F-statistic	10.43793	Durbin-Watson stat		1.727967
Prob(F-statistic)	0.000000			
Redundant Fixed Effects Test				
Effects Test	Statistic	d.f.		Prob.
Cross-section F	6.239963	(4,132)		0.0001

Symbols: D(): denotes difference of growth rate of the variables. NPL: the share of non-performing loans to total bank loans, CREDIT/ASSET ratio: the ratio between bank credits to private sector to banking sector assets, DEPOSIT/LOAN ratio: deposits of the private sector as a share of total loans to the private sector, INVEST: gross (real) fixed capital formation (in non-financial sector), EXPORT: real export, REFFEXCH_R: real effective exchange rate in an individual country (measured as foreign price for domestic currency), YIELDS: the long run (real) lending interest rate.

* The time lag of an individual coefficient is given in subscripts.

has not proven to deteriorate NPL ratio growth. Breuss (2003: 25) saw the appreciations of the real exchange rates as the result of productivity gains in the tradable sector and as a “natural phenomena in catching-up countries,” which did not erode export competitiveness because higher investments led to a rise in external competitiveness and higher exports (Brandmeier 2006), expanding the capability of a country to service foreign debt (Wu 2004). Despite good foreign direct investment coverage and the recovery of export growth, the sustainability of the external imbalance is, in the medium term, an issue of concern for the banking sectors. A slowdown in economic activity and a higher balance of payment deficit is also likely to

deteriorate NPL ratio growth in the Baltic States, Bulgaria and Romania, with a negative repercussion on debt repayment. The slowdown in economic activity is likely expected to accelerate the NPL ratio growth in the NMSs (Égert *et al.* 2006; Kiss *et al.* 2006).

5. Conclusions

In this study, we demonstrated that the credit/asset ratio contributed to an increase in the dynamics of the NPL ratio within the observed economies. Our estimates for the Baltic States, Bulgaria and Romania therefore support the hypothesis that the growth of credit might harm banking performance (most probably due to soft-

loan constraints, ample liquidity of the banking sector – as the result of capital inflows; and overheating of economies). Our results do support the hypothesis that the appreciation of a real effective exchange rate could contribute to an improvement in the loan portfolio quality due to a high share of loans nominated in foreign currency and productivity increases. The results also imply that gross fixed capital formation in the selected economies contributed to an increase in economic activity and lower NPL ratios. Since we confirmed that the boost in the export of these economies improved the NPL ratio, the eventual weakening of growth in export-oriented industries could lead to economic contraction with a direct impact on the sustainability of banking-sector results in these countries.

We can also state that strong economic growth and a decelerating non-performing-loan ratio, within the context of the procyclicality theory, can be interpreted as a signal for economic overheating and therefore as a potential threat to banking sector performance.

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APPENDIX

Table A. Results of the ADF – Fisher Test*

	Statistic	Prob.
D(NPL)	92.9498	0.0000
D(CREDIT/ASSET)	104.001	0.0000
D(DEPOSIT/LOAN)	47.5778	0.0000
D(EXPORT)	51.8533	0.0000
D(INVEST)	41.6745	0.0000
D(REFFEXCH_R)	66.9199	0.0000
D(YIELDS)	58.6903	0.0000

* Probabilities for ADF – Fisher Test are computed using the asymptotic Chi-square distribution.

* D(): the difference in growth rate of the variable as measured in percentage points.

Table B. Autocorrelation of the residuals (Sample: 1999:1 2008:4)

































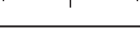
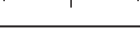






Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	0.013	0.013	0.0041	0.949
		2	-0.227	-0.227	1.4173	0.492
		3	0.135	0.149	1.9391	0.585
		4	0.063	0.002	2.0575	0.725
		5	0.079	0.151	2.2555	0.813
		6	0.007	-0.010	2.2571	0.895
		7	-0.104	-0.066	2.6438	0.916
		8	-0.146	-0.192	3.4646	0.902
		9	-0.047	-0.095	3.5542	0.938
		10	0.040	-0.020	3.6237	0.963
		11	-0.251	-0.257	6.6535	0.826
		12	-0.132	-0.073	7.5706	0.818
		13	0.075	-0.011	7.8938	0.850
		14	0.141	0.222	9.1626	0.820
		15	-0.149	-0.146	10.756	0.770
		16	-0.067	0.050	11.121	0.802
		17	0.142	0.024	13.063	0.732
		18	-0.148	-0.238	15.594	0.621
		19	0.033	-0.041	15.748	0.674
		20	0.161	-0.000	20.745	0.412

Table C. The time series statistics

	D(NPL)	D(CREDIT/ ASSET)	D(INVEST)	D(EXPORT)	D(REFFEXCH_R)	D(DEPOSIT /LOAN)	D(YIELDS)
Mean	-0.032539	0.063833	-0.060450	0.064302	0.013246	0.054063	0.143539
Median	-0.017972	0.066412	-0.063023	0.015517	-0.036309	0.058362	0.024751
Maximum	0.110828	0.647842	0.093368	0.761523	0.397820	0.419148	2.029587
Minimum	-0.133792	-0.639667	-0.259095	-0.848657	-0.276841	-0.318340	-1.403771
Std. Dev.	0.046310	0.223020	0.086545	0.342937	0.174413	0.173332	0.965723
Skewness	-0.117614	-0.162981	-0.075679	0.037334	0.541816	0.069010	0.204784
Kurtosis	4.412084	3.553010	2.434883	3.424968	2.455671	2.972210	2.081993
Jarque–Bera	3.330134	2.747136	0.556184	0.302531	2.083283	0.032210	1.347312
Probability	0.189178	0.253202	0.757227	0.859620	0.352875	0.984024	0.509841
Sum	-1.269027	10.21331	-2.357532	2.507774	0.450378	2.108472	4.593251
Sum Sq. Dev.	0.081494	7.908299	0.284624	4.469017	1.003861	1.141676	28.91125
Observations	200	200	200	200	200	200	200
Cross sections	5	5	5	5	5	5	5

* D(): the difference in growth rate of the variable as measured in percentage points.