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Драгиша Оташевић

Macroeconomic determinants of the quality of banks' loan portfolio in Serbia

Dragiša Otašević

Директорат за економска истраживања и статистику

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Апстракт: Циљ овог рада је да се испита утицај макроекономских фактора на реализацију кредитног ризика у портфељу банака у Србији. Примењено је више метода панела над подацима за 33 банке у периоду од Т3 2008. до Т2 2012. године. Одвојено су анализирани банкарски кредити становништву, односно предузећима. Резултати економетријске анализе указују на то да су погоршање пословног циклуса и депрецијација динара доминантно допринели погоршању квалитета кредитног портфеља банака у Србији у посматраном периоду. Осим тога, резултати упућују на утицај инфлације на квалитет кредита привреди и становништву, док је квалитет кредита становништву додатно осетљив на кретање краткорочних каматних стопа.

Кључне речи: Банкарски кредити, квалитет кредита, економска активност, девизни курс, валутно индукован кредитни ризик, Србија
[JEL Code]: C33, E51, E58, G21, G32

Macroeconomic determinants of the quality of banks' loan portfolio in Serbia

Dragiša Otašević

Abstract: This paper investigates macroeconomic determinants of the realisation of credit risk in the banking book (measured by the ratio of loan loss provisions to the value of total gross loans) using a panel data set of 33 Serbian banks spanning from 2008Q3 to 2012Q2. Three different panel methods were applied. Two types of loan portfolios were investigated separately – loans to households and loans to enterprises. The results indicate that a deteriorating business cycle and exchange rate depreciation led to the worsening of the quality of banks' loan portfolio in Serbia in the period under review. In addition, statistical evidence indicates that the CPI inflation additionally affected the quality of loans to enterprises and households. Furthermore, we find that household loan portfolios are also sensitive to changes in the short-run interest rates.

Key words: Loan portfolio, Credit quality, Economic activity, Exchange rate, Foreign currency induced Credit risk, Serbia
JEL Code: C33, E51, E58, G21, G32

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Non-tehnical Summary

The deterioration in the quality of banks' loan portfolio in Serbia following the spillover of the global financial crisis to our economy has been an important issue for national macro-prudential surveillance. A better understanding of the main drivers of ex post credit risk facilitates the identification of vulnerabilities in the banking sector.

Empirical literature indicates a negative relationship between real GDP growth and the deterioration in the quality of banks' loan portfolio. Real GDP growth usually leads to more income which improves the capacity of borrowers to service their debt. Thus credit quality should be higher. Contrarily, in the case of a slowdown in or even negative real GDP growth, credit quality could deteriorate. Changes in short-run interest rates can affect credit quality through their pass-through to lending interest rates on RSD-nonindexed loans and changes in the borrowers' debt burden thereafter.

In Serbia, as in many CEE countries, the banking sector is dominantly foreign-owned and characterised by a high degree of euroisation, measured by the share of foreign currency loans in total loans. While banks operating in Serbia apply market risk management and match the currency composition of their assets and liabilities, this is not always the case with the private sector which borrows from banks. When a debtor is unhedged against exchange rate risk or other market risks, the debtor's ability to settle his obligations to the bank might be negatively affected in the case of a realisation of the respective risks.

This paper contributes to the assessment of the impact of realised macroeconomic and market risks, especially exchange rate risk, on the credit risk in the loan portfolio of banks in Serbia. It focuses on ex post credit risk, measured by the ratio of loan loss provisions to the value of total gross loans in the Serbian banking sector. It utilizes a panel data set comprising 33 commercial banks and spans the period 2008Q3 to 2012Q2. This time period includes the financial crisis period, as well as the period of the sovereign debt crises and banking sector crisis in the eurozone. Banks' size, capitalisation and liquidity are also considered in the empirical analysis. These variables do not represent the focus of the analysis but are important to take into account the effect that bank-specific characteristics might have had on lending behaviour and the relationship between key macroeconomic variables and credit quality. To the author's best knowledge, this is the first panel analysis of the determinants of credit quality in Serbia after the financial crisis.

The obtained results suggest that a deteriorating business cycle and exchange rate depreciation led to the worsening of the quality of banks' loan portfolio in Serbia in the period under review. In addition, statistical evidence indicates that the CPI inflation had additional effect on the quality of loans to enterprises and households. Furthermore, we find that household loan portfolios are sensitive to changes in short-run interest rates (proxied by the interbank money market rate, BELIBOR).

Contents:

1. Introduction

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In Serbia, as in many CEE countries, the banking sector is dominantly foreign-owned and characterised by a high degree of euroisation, measured by the share of foreign currency loans in total loans. While banks operating in Serbia apply market risk management and, for example, match the currency composition of their assets and liabilities, this might not always be the case with the private sector which borrows from banks. When a debtor is unhedged against exchange rate risk or other market risks, the debtor's ability to settle his obligations to the bank might be negatively affected in the case of a realisation of the respective risks.

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The findings indicate that a deteriorating business cycle and the exchange rate depreciation led to the worsening of the quality of banks' loan portfolio in Serbia in the period under review. In addition, statistical evidence indicates that the CPI inflation affected the quality of loans to enterprises and households. Furthermore, we find that household loan portfolios are sensitive to changes in the short-run interest rates (proxied by interbank money market rate, BELIBOR).

The structure of the rest of this paper is organised as follows: section 2 gives a review of the relevant existing literature, section 3 presents a short overview of the banking sector in Serbia and section 4 shows the empirical approach and discusses the results. Finally, conclusions are given in section 5.

2. A brief review of literature

The literature on credit quality and its relationship to macroeconomic conditions is vast and based on both theoretical and empirical analysis. The financial accelerator theory discussed in Bernanke and Gertler (1989), Bernanke and Gilchrist (1999) and Kiyotaki and Moore (1997) is a theoretical basis for approaching linkages between the macroeconomy and financial markets. Wilson (1997a, 1997b) developed a multifactor credit risk model that explicitly links macroeconomic factors and corporate sector default rates in order to account for systemic or nondiversifiable credit risk. Such an approach is generally applied in empirical macro stress testing. Models based on the estimation of the sensitivity of the balance sheets items to adverse changes in relevant macroeconomic variables are known as balance-sheet models. They are often estimated in reduced-form, i.e. not in the context of complex structural macroeconomic models, but in the form of time-series or panel data regressions.

The set of macroeconomic variables used to explain variation in credit quality varies across empirical studies, but generally includes broad measures of macroeconomic performance, such as GDP growth and unemployment rate, interest rates, inflation and exchange rates. Measures of credit quality differ across empirical studies. As a measure of credit quality, most studies use loan loss provisions (LLP), non-performing loans (NPL), loss given default (LGD) or expected default frequencies (EDF).

Although there are empirical studies employing panel data analysis on both country and cross country levels, the focus in this paper is on the empirical literature which considers the determinants of credit quality across banks within specific countries. Keeton and Morris (1987) present one of the earliest studies to examine the drivers of loan losses. The authors examine the loan losses (non-performing loans net of charge-offs) of 2,470 insured commercial banks in the United States over the period 1979-85 and show that local economic conditions along with the poor performance of certain sectors explain the variation in loan losses recorded by the banks. They also report that commercial banks with greater risk appetite tend to record higher losses. Subsequent studies offered similar as well as different explanations for the occurrence of loan losses in commercial banks' balance sheets in the United States. Sinkey and Greenwalt (1991) argue that both internal and external factors explain the movements of the loan loss rate. They find a significant positive relationship between the loan loss rate and internal factors such as high interest rates, excessive lending, and volatile funds. Similar to Keeton and Morris (1987), they find that depressed regional economic conditions also explain the loan loss rate of commercial banks. Salas and Saurina (2002) analyse the drivers of credit risk in the loan portfolio of Spanish banks. Their findings indicate that, besides bank-specific variables (bank size, net interest margin, capital ratio and market share), real GDP growth is a driver of bad loans in the Spanish banking sector. Rhajan and Dal (2003) find that favourable macroeconomic conditions (measured by GDP growth) and financial factors such as maturity, cost and terms of credit, bank size, and credit orientation impact significantly the NPLs of commercial

banks in India. Fofack (2005) finds evidence that economic growth, real exchange rate appreciation, the real interest rate, net interest margins, and inter-bank loans are significant determinants of NPLs in Sub-Saharan African countries. The author explains the strong association between the macroeconomic factors and non-performing loans by the undiversified nature of some African economies (in terms of their exposure to external shocks). Quagliariello (2007) analyses banks' behaviour over the business cycle in Italy. The paper concludes that the business cycle affects bank's riskiness (measured by loan loss provisions and NPLs) and profitability (measured by return on assets). Louzis, Vouldis and Metaxas (2010) examine the determinants of NPLs in the Greek banking sector. Their analysis covers the nine largest banks during 2003–09 and NPLs broken down by type of loan—business, consumer, and mortgage. Their findings indicate that, beside management quality, macroeconomic fundamentals explain NPLs (GDP, unemployment and interest rates). They find a positive relationship between NPL and real lending rates. Shijaku and Ceca (2011) concentrated on detecting a model of the response of credit quality to macroeconomic shocks in Albania, using banks' panel data. Though acknowledging the shortcomings related to lack of robustness in the results, they indicate evidence of a stronger response of credit quality to GDP shocks. They also found the exchange rates and EURIBOR to be important determinants of credit quality in foreign currency lending. Floro (2010) examines how the bank capital position influences the management of loan-loss provisioning of Phillippine banks. The results show evidence of capital management through loan-loss provisioning, but also evidence for a procyclical behaviour of banks in loan loss provisioning. Such a link between the business cycle and banks' loan loss provisioning is influenced in a non-linear way by bank capitalisation: both low-capitalised and well capitalised banks provision less (more) during an economic expansion (downturn). Craigwell and Elliot (2011) investigate the process of loan loss provisioning within the commercial banking system of Barbados. They found that both macroeconomic factors and bank-specific factors influence the level of provisions. In particular, loan loss provisions are heavily dependent upon the performance of the real economy and competition in international markets. Moreover, their study asserts that larger banks in Barbados are better able to screen loans and avoid defaults.

Macro stress tests were introduced in the FSAP 1999 joint program of the IMF and the World Bank. Consecutively, national regulators and supervisors started to incorporate stress tests into their financial stability assessment frameworks. A better understanding of the relationship of credit risk and the business cycle is one of the main focuses of several studies that deal with macro stress testing. Two analyses published by the IMF in the Global Financial Stability Report examine the deterioration of banks' loan portfolio after the financial crisis in emerging markets and in Central, Eastern and Southeastern Europe – Hartelius (2010) and De Bock and Demyanets (2012). De Bock and Demyanets (2012) assess the vulnerability of emerging markets and their banks to aggregate shocks. The authors find significant links between banks' asset quality, credit and macroeconomic aggregates. According to their results lower economic growth, an exchange rate depreciation, weaker terms of trade and a fall in debt-creating capital inflows reduce credit growth while loan quality deteriorates. Nkusu (2011) analyses the link between NPLs and the business cycle using two complementary approaches. First, she investigates the

macroeconomic determinants of NPLs in panel regressions and confirms that adverse macroeconomic developments lead to rising NPLs. She also finds statistically significant evidence for a feedback effect of rising NPLs to its macroeconomic determinants in a panel vector autoregressive (PVAR) model.

According to economic theory, market risk and credit risk are interrelated and not separable. By applying a reduced form approach, Jarrow and Turnbull (2000) offer a way for modeling the interaction of market risk and credit risk. More specifically, they argue that default risk and recovery rate uncertainty may not be the sole determinants of the credit spread and show how to incorporate the spillover of market risk into the credit spread. Jankowitsch and Pichler (2003) propose a model for estimating the credit spread curve for a single issuer with bonds in different currencies and reject the hypothesis of zero correlation of credit risk and exchange rate risk. They present empirical evidence for currency dependence of corporate credit spreads and claim that dollar-related credit spread curves cannot be used without special care for pricing defaultable claims denominated in other currencies. Chan-Lau and Santos (2006) approach the problem of currency mismatches in corporate balance sheets and their implications for measuring default risk for firms with currency mismatches in their asset/liability structure. They propose models for credit risk that can be adapted to different exchange rate regimes and are analytically tractable, and estimated using available equity price and balance sheet data. Božović, Urošević and Živković (2009) analyse how exchange-rate risk of foreign currency loans spills into default risk. Within the framework of a financial market in a partial equilibrium setup with rational expectations they show that in an economy where foreign currency loans are a dominant source of financing economic activity, depreciation of the local currency establishes a negative feedback mechanism that leads to higher default probabilities, reduced credit supply and reduced growth.

This paper contributes to the existing literature on the empirical determinants of credit quality by employing a panel data analysis for the case of 33 commercial banks in Serbia. The measure of credit quality analysed is the ratio of loan loss provisions to total gross loans. Exploiting cross-section variation within the panel approach allows for heterogeneity and is likely to yield more robust results than an ordinary time series approach since the time series for measures of credit risk such as NPLs and loan loss provisions in the case of Serbia are short, covering 16 quarters of quarterly data in the dataset used. The results may help identify vulnerabilities in the Serbian banking sector.

3. Some relevant facts for the case of Serbia

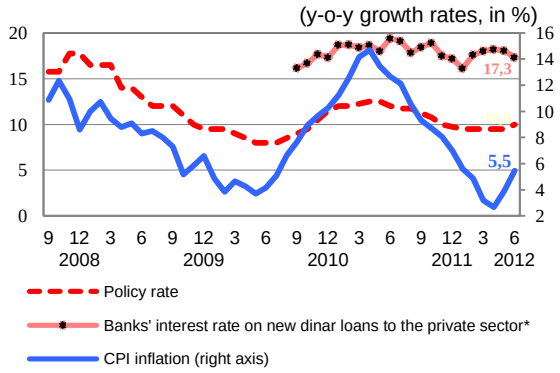
3.1. Macroeconomic environment in Serbia

Serbia's economic outlook is clouded by weak economic conditions and sizeable domestic and external imbalances in the period of analysis. Slowing global and regional growth negatively affected Serbia's output and prospects for a turnaround in the labour market remain dim. Slower growth in Serbia's main trading partners, especially in the euro zone, resulted in a flat or even negative GDP growth during the period after 2008. Bad agricultural seasons affected output and price stability rather significantly. One of the main risks for the Serbian economy were lower capital inflows due to rising euro zone tensions that constrain external financing prospects. Regarding the sustainability of public debt repayment ability, the main risks stem from the impact of currency depreciation given the high share of public debt denominated in foreign currency.

In the period after the global economic crisis hit in 2008, Serbia is faced with high and volatile inflation, strong depreciation of the local currency and a real GDP growth which is either negative or below pre-crisis levels (See Figures 1 to 3).

Empirical literature indicates a negative relationship between real GDP growth and the deterioration in the quality of banks' loan portfolio. This may be related to the fact that real GDP growth usually leads to more income which improves the capacity of borrowers to service their debt. As a result, credit quality should be higher. Contrarily, in the case of a slowdown in or even negative real GDP growth, credit quality could deteriorate. Changes in the exchange rate affect balance sheets of banks and enterprises and households. Thus, a depreciation of the domestic currency could, instead of encouraging economic acitivty, contribute to defaults in the private sector.

Figure 1. CPI developments and interest rates
(in %)

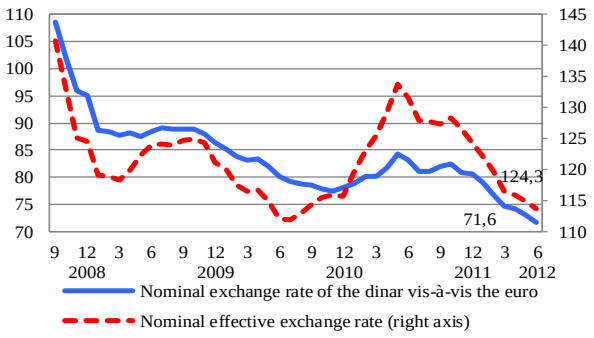


* Official data avaiable before September 2010 is not comparable due to change of methodology and is therefore not presented.
Source: National Bank of Serbia and Statistical Office of the Republic of Serbia

Figure 2. GDP developments
(seasonally adjusted q-o-q growth rates in %)

Source: National Bank of Serbia

Figure 3. Exchange rate developments*
(2005 = 100)



*An increase represents the appreciation of the dinar.
Source: National Bank of Serbia and own calculations

3.2. Banking sector stability and performance

The major part of the Serbian banking sector is foreign-owned. According to the NBS Bank Supervision Report for Q2 2012, 21 banks operating in Serbia were in foreign and 12 in domestic ownership at the end of June 2012. Among domestically owned banks, nine banks were state-owned and three banks were privately-owned. Foreign-owned banks accounted for around 74% of total assets (see Figure 6). State- and privately-owned domestic banks accounted for 26% of total banking sector assets.

The level of regulatory capital of Serbia's banking sector was adequate throughout the 2008-2011 period. It remained so after the harmonisation with Basel II requirements (end-2011). The capital adequacy ratio (CAR) was 17.2% in Q2 2012, which is significantly above both the minimum defined by Basel II standard (8.0%) and the regulatory minimum in Serbia (12%) (See Figure 4). The ratio of regulatory capital to risk-weighted assets of the Serbian banking sector is one of the highest among CEE countries.

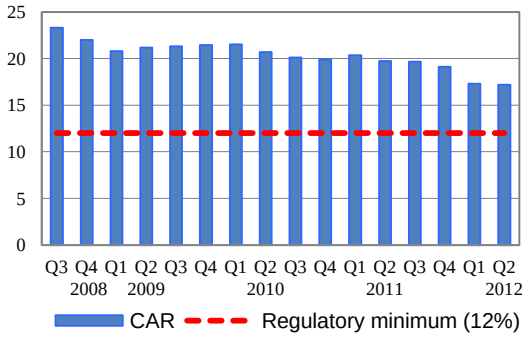
The Serbian banking sector is very liquid, hence the liquidity risk is not a serious threath. Banks in Serbia invest in government securities and NBS bills, which could be a form of liquidity hoarding due to heightened risk awareness. Having more liquid assets, banks are less sensitive to negative shocks and therefore might be motivated to engage in riskier behaviour. Thus a good liquidity outlook encourages banks to take more credit risks and not to screen their borrowers, which can lead to a worsening of credit quality.

Profitability of the Serbian banking sector is sound (see Figure 5). According to the Global Financial Stability Report April 2012 (IMF), Serbia's banking sector is one of the most profitable in the region at end-2011 primarily due to the comfortable situation for banks with regard to a high spread between interest rates in Serbia and those in the European Union. Both deposit and lending rates on both – RSD and foreign currency deposits and

loans are much higher in Serbia than in the European Union where most of the shareholders of foreign-owned banks in Serbia come from. In terms of their share in total banking sector assets, the most significant foreign-owned banks operating in Serbia were Italian banks (around 22%), followed by Austrian (around 16%), Greek (around 15%) and French (around 10%) banks.

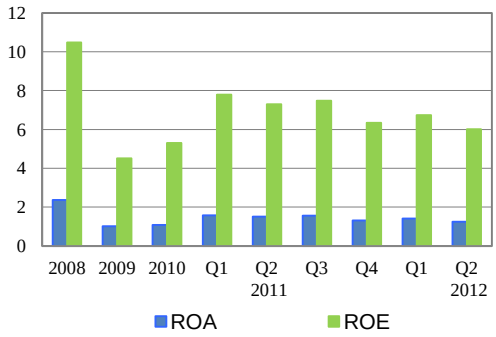
Deposits and capital are the two most important sources of financing of banks in Serbia. Their share in total liabilities of banks in Serbia is stable so that they represent a stable and sound base for lending activity. The share of long-term sources of funding increased during the 2008-2012 period which contributed to their quality.

Figure 4. Capitalisation of the Serbian banking sector
(CAR in %)



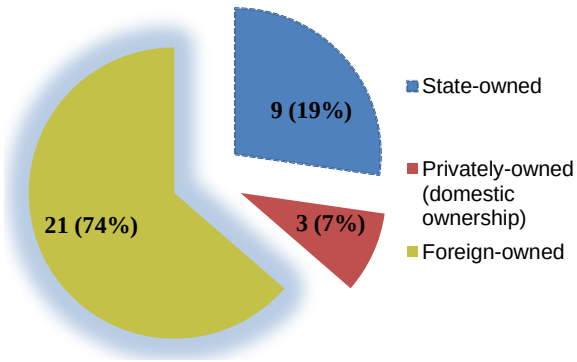
Source: National Bank of Serbia

Figure 5. Profitability of the Serbian banking sector*
(in %)



* For the purpose of getting a clearer picture, three state-owned banks wih bad performance were excluded from calculations of profitability indicators.
Source: National Bank of Serbia

Figure 6. Ownership sturcture of the Serbian banking sector
(Number of banks and share in total assets in %)



Source: National Bank of Serbia

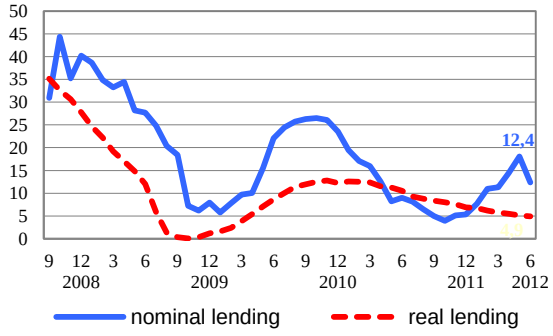
3.3. Bank lending to households and enterprises

After the crisis hit in 2008, real growth in lending activity started slowing down. The heightened risk awareness of banks in Serbia certainly had an impact on diminishing the real growth in lending activity. Government subsidy programmes led to temporary accelerations, but the trend of decelerating real growth rates contunued until H1 2012 (See Figures 7 and 8). Loans to enterprises, followed by loans to households, dominate in lending to nonmonetary sectors.

Foreign currency loans are dominant in the currency structure of total loans (See Figures 9 and 10). Majority of foreign currency loans are dinar loans indexed to the euro. Such currency structure of the loan portfolio could indicate an indirect foreign-currency exposure of the banks through foreign currency induced credit risk of unhedged borrowers.

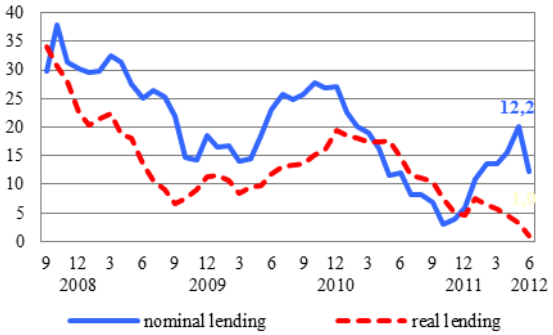
Additionally, financial and real euroisation make inflation targeting more difficult. Aleksić et al. (2008) show that the pass-through from the NBS key policy rate to lending rates is limited due to high dollarisation. Hence the dinarisation strategy of the NBS opts to reduce financial stability risks over the medium term, mainly by encouraging firms to avoid or hedge against foreign exchange risks. The development of a primary and secondary T-bills market helps promote dinarisation and thus strengthen monetary policy effectiveness and maintain financial stability by reducing un-hedged FX risks.

Figure 7. Bank lending to households
(y-o-y growth rates in %)



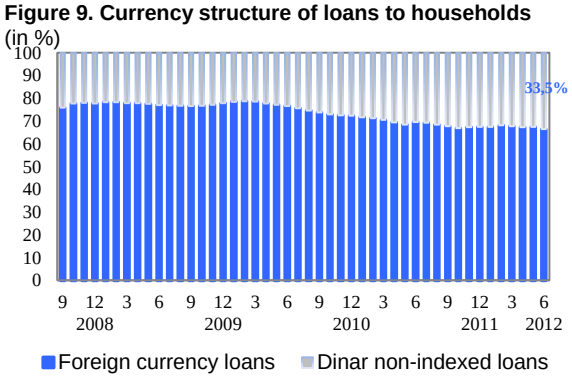
Source: National Bank of Serbia and own calculations

Figure 8. Bank lending to enterprises
(y-o-y growth rates in %)



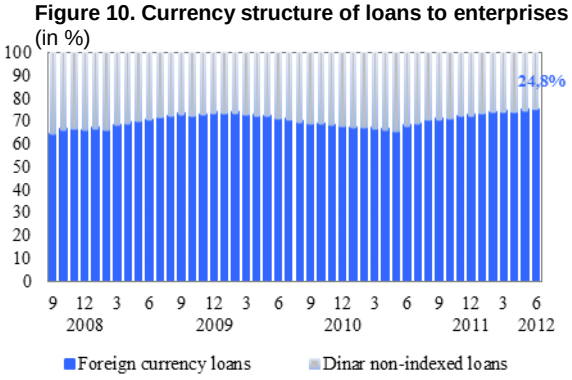
Source: National Bank of Serbia and own calculations

Figure 9. Currency structure of loans to households



Source: National Bank of Serbia

Figure 10. Currency structure of loans to enterprises



Source: National Bank of Serbia

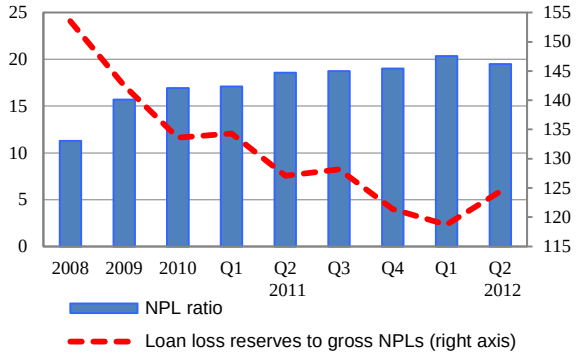
3.4. Quality of banks' loan portfolio

The quality of Serbian banks' loan portfolio deteriorated in the 2008-2012 period. The share of nonperforming loans in total gross loans increased to 20% in H1 2012 from 11% in 2008 (See Figure 11). Non-performing loans to enterprises account for the largest share of non-performing loans, followed by non-performing loans to households. The coverage of non-performing loans by allowances for impairment or regulatory reserves attests to the banking sector's capacity to absorb losses resulting from NPLs. As regulatory loan loss reserves covered 124.4% of gross non-performing loans at the end of H1 2012 (See Figure 11), nonperforming loans should not pose a direct threat to financial stability.

The ratio of loan loss provisions to total gross loans increased in the 2008-2012 period for both loan portfolios – loans to enterprises and loans to households (See Figure 12). The ratio of loan loss provisions to non-performing loans was relatively stable during the period under consideration and equaled around 0.5 at the end of H1 2012.

The Financial Sector Support Program (2009) played an important role in maintaining the stability of the banking sector during the period of the crisis. The scheduled implementation of Basel II framework at the end of 2011 was aimed to further strengthen the banking sector's standards in corporate governance, risk management, capital management, and transparency. In the context of Basel II adoption, the NBS also reviewed the banks' asset classification and provisioning regime, aiming to relax somewhat the conservative provisioning rules adopted during the pre-crisis period with the aim of putting a brake on rapid credit growth.

Figure 11. Gross non-performing loans to total gross loans and their coverage
(in %)

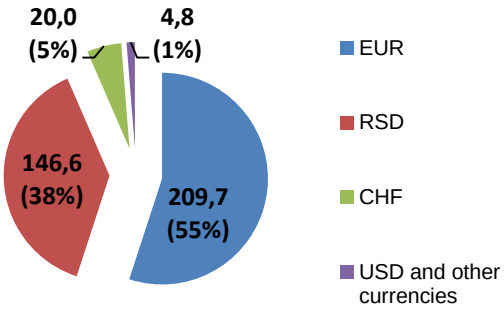


Source: National Bank of Serbia

Figure 12. Loan loss provisions in total gross loans
(in %)

Source: National Bank of Serbia and own calculations

Figure 13. NPLs by currency of approval
(in RSD bln and in % of total NPLs in June 2012)



Source: National Bank of Serbia and own calculations

4. Empirical approach and results

4.1. Empirical model and econometric specification

This analysis assesses the sensitivity of balance sheet items to the adverse change in relevant macroeconomic variables. The main advantage of balance-sheet models is that they are intuitive and easy to implement. The estimated coefficients can be used to assess the potential impact on the banking sector under hypothetical scenarios. One disadvantage of

these models is that they are usually expressed in a linear form though the relationship between the credit quality variables from the balance sheet and the macroeconomic variables is often non-linear. Wilson (1997a,b) explicitly linked the default rate with the macroeconomic variables and based his model on the relatively simple logistic function that is used in the regression analysis. Thus he allowed for non-linearity. He showed empirically that the non-linear logistic transformation is more suitable for analysing the relationships in the model than the linear functions.The dependent variable (Credit Risk) is the logit transformation of the ratio of loan loss provisions (impairments) according to IFRS to total gross loans. This transformation is applied in order to allow for non-linearity. That measure should depend on the values of the macroeconomic variables, bank-specific characteristics and their interaction terms:

$$Credit\ Risk_{i,t} = \frac{e^{x_{it}}}{1+e^{x_{it}}} \tag{4.1}$$

or equivalently:

$$\ln\left(\frac{Credit\ Risk_{i,t}}{1-Credit\ Risk_{i,t}}\right) = x_{it} \tag{4.2}$$

More precisely, the full specification is given by the following expression:

$$\begin{aligned}\Delta logit(Credit\ Risk)_{it} = \alpha_0 + \textstyle\sum_{j=1}^{l}\beta_{1,j}\Delta logit(Credit\ Risk)_{i,t-j} + \\ \textstyle\sum_{j=0}^{l}\beta_{2,j}\,\Delta\ln GDP_{t-1} + \sum_{j=0}^{l}\beta_{3,j}\,\Delta\ln NEER_{t-j} + \sum_{j=0}^{l}\beta_{4,j}\,\Delta\ln REPO_{t-j} + \\ \textstyle\sum_{j=0}^{l}\beta_{5,j}\,\Delta\ln CPI_{t-j} + \beta_{6,j}Size_{i,t-1} + \beta_{7,j}Capitalisation_{i,t-1} + \\ \beta_{8,j}Liquidity_{i,t-1} + \eta_i + \varepsilon_{i,t}\end{aligned} \tag{4.3}$$

where i=1,2,…,N and t=1,2,…,T denote the cross section and time dimension of the panel, respectively. The constant term is not specified in the dynamic panel regression and the lagged dependent variable is omitted in the panel regression with fixed effects. The explanatory variables are explained in the section – Data description. The residual term consists of two parts: the first part η_i are unobserved and time invariant bank-specific effects and the second part $\varepsilon_{(i,t)}$ - i.i.d is the residual of bank i on a quarterly basis.

In order to also account for the time-constant unobserved heterogeneity between banks, the fixed effects model is applied. It is reasonable to apply this estimator since the regression is applied on banks from one banking sector and all variables are time varying. Then the assumption of independent and identically distributed disturbances is relaxed and a panel-corrected standard error (PCSE) model with unobserved bank-specific effects is estimated. This estimator accounts for heteroscedasticity and contemporaneously correlated disturbance terms across panels. Panel-corrected standard errors are estimated for linear panel models where the parameters are estimated by OLS or Prais-Winsten regression. The two-step generalized method of moments (GMM) developed by Arellano and Bond (1991) is also

applied. In all models, the signs of the explanatory variables are in line with economic theory.

In the case of the dynamic panel, a two step Arellano-Bond estimator (Arellano and Bond, 1991) is applied (estimation of first-order dynamic fixed-effects models for short panels that specify the dependent variable for an individual bank to depend on its values in previous periods). The group-specific effect, which is time invariant, is potentially correlated with the current and all lagged values of dependent variable which can lead to inconsistent parameter estimates. In order to overcome this problem, the model is transformed into differences and the Generalized Method of Moments (Hansen, 1982) is applied. In order to avoid the problem of too many instruments in comparison to the number of groups (Roodman, 2009), the number of instruments are kept lower than the number of banks. Additionaly, the lag ranges used as instruments are binded and instrument set is collapsed. In the standard (un-collapsed) form, each instrumenting variable creates one instrument for each time period and the lag available to that period, whereas in the collapsed form not a whole matrix of instruments but a single column vector of instruments is created. While collapsing can reduce statistical efficiency in large samples, it can be very helpful as a tool to avoid the bias in finite samples which are usually characterised by instrument proliferation.

The applied GMM estimator assumes that the idiosyncratic disturbances are uncorrelated across individuals, which is not realistic. A possible solution to this problem is to include the GDP growth rate and inflation rate that may capture the relevant time effect. In this way the effects of period-specific and group invariant shocks are removed from the idiosyncratic error term into the systematic part of the model.

In Tables A2 to A7 in the Appendix, a standard suite of diagnostic tests is reported (overall F test, R-squared, Arellano-Bond test for the second-order serial correlation in the error term of the first-differenced equation, Sargan/Hansen test for the validity of overidentifying restrictions and the Difference-in-Hansen test for the validity of subsets of instruments). Since standard errors for the two-step GMM estimator are downward biased. Windmeijer (2005) small sample corrected standard errors are reported.

At lag 1, the specification tests for first-order autocorrelation in the differenced error terms (AR(1)) rejects the null hypothesis of first-order autocorrelation in the differenced error terms. The Arellano-Bond test for autocorrelation at lag 2 (AR(2)) accepts the null hypothesis of no second-order autocorrelation in the differenced terms. The Hansen test returns p-values higher than 0.10 confirming the joint validity of instruments. The number of instruments in all dynamic panel regressions is smaller than the number of banks. Short-run elasticities of the models are also reported. Explanatory variables (except BELIBOR and bank-specific variables) are considered exogenous and are used as instruments in themselves.

4.2. Data description

The time period considered starts with Q3 2008 and covers the period untill Q2 2012. This time-constraint is due to the availability of data for loan loss provisions and outstanding amounts of loans at the bank level.

The dependent variable (Credit Risk) is the logit transformation of the ratio of loan loss provisions (impairments) according to IFRS to total gross loans. It should indicate how much of the loans banks impair due to uncollectability. One must state that loan loss provisions (same as non-performing loans) may not reflect the real credit risk/quality of the loan porfolio as some banks may restructure or roll-over bad loans while others may write them off relatively quickly. Nevertheless, it is a reasonable proxy for the realisation of credit risk.

The independent variables are macroeconomic and financial indicators which tend to affect the quality of bank loans. The data for q-o-q real GDP growth (GDP) and q-o-q CPI inflation (CPI) are obtained from the website of the Statistical Office of the Republic of Serbia. The data for the Belgrade interbank offer rate (BELIBOR) and nominal effective exchange rate (NEER), as well as bank-specific data for credit, loan loss provisions, assets (A_{it}), capital (C_{it}) and Liquidity (L_{it}) are obtained from the National Bank of Serbia, Directorate for Economic Research and Statistics. The nominal effective exchange rate (NEER) is included in the specifications in order to capture the effect that the depreciation of the local currency had on credit quality. The nominal effective exchange rate is calculated as the geometric weighted average of bilateral exchange rates of the dinar vis-à-vis the euro and the US dollar (weights are 80% and 20% respectively).

The quality of banks' loan portfolio might respond differently to a change in the macroeconomic fundamentals depending on bank-specific characteristics. In order to control for the existence of such distributional effects of changes in macroeconomic fundamentals across banks, bank-specific financial characteristics are introduced. These financial characteristics are size, capitalisation and liquidity. Large banks (in terms of their assets) can have easier access to non-deposit funds and are usually better positioned in the credit market which enables them make a better client selection. Therefore, large banks might differ in terms of their credit quality from smaller banks. Having more liquid assets, banks are less sensitive to negative shocks and therefore might be motivated to take more risks. Thus a good liquidity outlook might encourage banks to take more credit risks and not to mitigate them by screening their borrowers which can lead to a worsening of credit quality. Banks with high levels of capital relative to assets might be encouraged to embark on riskier activities leading to riskier credit portfolios (lending to fx risk unhedged borrowers, for example). Measures for size, capitalisation and liquidity are given by equations (4.4) to (4.6).

$$Size_{i,t} = logA_{it} - \frac{\sum_{i=1}^{N} logA_{it}}{N_t} \quad (4.4)$$

$$Capitalisation_{i,t} = \frac{C_{i,t}}{A_{i,t}} - \frac{\sum_{i=1}^{T}\left(\sum_{i=1}^{N}\frac{\left({}^{C_{i,t}}/_{A_{i,t}}\right)}{N_t}\right)}{T} \quad (4.5)$$

$$Liquidity_{i,t} = \frac{L_{i,t}}{A_{i,t}} - \frac{\sum_{i=1}^{T}\left(\sum_{i=1}^{N}\frac{\left({}^{L_{i,t}}/_{A_{i,t}}\right)}{N_t}\right)}{T} \quad (4.6)$$

In order to adjust for distributional effects across banks and over time the measures for capitalisation and liquidity are normalised with respect to their mean across all banks in the sample and get indicators that sum to zero over all observations in the sample. By de-meaning the assets the upward trend that can be observed in banks' assets is removed.

4.3. Empirical results

In Tables 1 and 2, the signs of the significant estimated coefficients are reported for the model for households and for enterprises, respectively. Short comments are given. In tables A2 to A7 in the Appendix, the estimated coefficients and standard errors of the fixed effects, panel-corrected standard errors and two-step Arellano-Bond estimations are reported for the ratio of loan loss provisions to total gross loans to households and loans to enterprises, respectively.

With a small sample size (small number of both cross sections and time periods), caution should be applied in interpretation of the results. Also, it is important to bear in mind the possible bias in responses of credit quality to the chosen independent variables due to the fact that the time dimension corresponds to the period of global economic and financial crises. Credit quality deteriorated through the sample period and less than four years of data are not sufficient to capture the full credit cycle. Therefore only short run relationships are analysed. However, having in mind these limitations, the estimated models are able to explain the development of credit risk in the Serbian banking sector reasonably well.

The coefficients of the lagged dependent variable are positive and statistically significant for loans to households and loans to enterprises. This might point to the persistence in credit risk but can also be observed from the viewpoint of inefficient bad debt write-off policies of banks.

As expected, a drop in real GDP growth led to a deterioration in the quality of bank loans to enterprises and households. Coefficients of lagged GDP growth are negative and significant. This finding is robust across all considered specifications for loans to enterprises and for most specifications for loans to households. Recession or low GDP growth on average seems to precede the deterioration in credit quality.

The coefficients of the contemporaneous NEER are insignificant (except in one specification in the Panel-corrected standard error model for loans to enterprises), but the coefficients of the lagged NEER are negative and significant in all specifications for loans to both households and enterprises. This leads to the conclusion that the depreciation of the dinar did not affect borrowers' payment ability within the same quarter but contributed to the deterioration in the quality of banks' loan portfolio after one quarter. Foreign exchange risk, which banks shifted to unhedged borrowers through foreign currency-indexation of loans, might have returned to the banking sector in the form a of foreign-exchange induced credit risk.

The coefficients of contemporaneous and lagged prices and the interbank money market rate differ for loans to households and loans to enterpirses. Positive and significant coefficients of the lagged BELIBOR indicate that interbank money market interest rates affected the cost of borrowing of households through its pass-through to interest rates, thereby affecting households' credit burden. This is correlated with the fact that around one half of all non-performing household loans are loans in dinars. Also a significant portion of newly approved household dinar loans are loans with variable interest rates or initial period of interest rate fixation shorter than one year. In the case of loans to enterprises, all coefficients of the BELIBOR are insignificant so that there is no statistical evidence of the impact of changes in the money market interbank rate on credit risk in banks' loans to enterprises. There is statistical evidence that inflation affected credit quality in banks' loan portfolio. This evidence is stronger in the case of loans to enterprises. Negative coefficients of the contemporaneous inflation in all three models and all specifications suggest that inflation led to the lowering of credit risk in banks' loans to enterprises in the short-run. In the case of loans to households, the coefficients for contemporaneous inflation are negative and significant in all specifications of the Panel corrected standard error model and in two specifications of the fixed effects model. This lack of robustness may be correlated with the fact that growth in real net wages was rather low and sometimes even negative in the sample period. Overall, the results on CPI inflation suggest that higher inflation can make debt servicing easier by reducing the real value of outstanding loans, and thus lead to a decrease of the credit risk ratio in the short-run.

The inclusion of the bank-specific variables does not appreciably change the statistical or economic significance of the macroeconomic variables. The coefficients of bank-specific characteristics themselves considered in this analysis are statistically insignificant in the case of loans to households. There is statistical evidence for a relationship between banks' size and capitalisation and the quality of loans to enterprises. However, this evidence is not robust to alternative methods and more research needs to be undertaken before the relationship between the revealed bank-specific characteristics and credit quality is more clearly understood.

Table 1: Results of panel estimation – Statistically significant coefficients for loans to households

Explanatory variable	Sign	Comment
Credit risk (LD)	**+**	high inertia
GDP (LD)	**-**	strong bussines cycle effect
NEER (LD)	**-**	exchange rate risk spillover
BELIBOR (LD)	**+**	interest rate channel
CPI (D)	**-**	reducing the real value of outstanding loans

Table 2: Results of panel estimation – Statistically significant coefficients for loans to enterprises

Explanatory variable	Sign	Comment
Credit risk (LD)	**+**	high inertia
GDP (LD)	**-**	bussines cycle effect
NEER (LD)	**-**	exchange rate risk spillover
CPI (D)	**-**	reducing the real value of outstanding loans

Conclusion and future research

This paper investigates macroeconomic determinants of the realisation of credit risk in the banking book (measured by the ratio of loan loss provisions to the value of total gross loans) based on a panel data set of 33 Serbian banks spanning from 2008Q3 to 2012Q2. Three different panel methods were applied: fixed effects, panel-corrected standard errors and two-step 'difference' GMM estimators. Two types of loan portfolios were investigated separately – loans to households and loans to enterprises.

The main finding is that a worsening business cycle and exchange rate depreciation led to a deterioration in the quality of banks' loan portfolio in Serbia during the period of analysis. The statistical results are in line with economic theory. In the case of real GDP growth as explanatory variable, the results point to the dependence of the business and household sector's capacity to repay their debt on the state of the business cycle. After a negative GDP shock, the quality of both loans to enterprises and households deteriorates with a lag of one quarter. In the case of the results for the nominal effective exchange rate, the high share of foreign currency loans in total loans in the Serbian banking sector is relevant. In that context it is reasonable to assume that foreign exchange risk, which banks shifted to unhedged borrowers through foreign currency-indexation of loans, returned to the banking sector in the form of foreign-exchange induced credit risk.

Changes in the interbank money market rate (BELIBOR) seem to have affected only the quality of loans to households through its pass-through to interest rates. With prevailing short-term loans to households, a significant portion of newly approved household dinar loans with variable interest rates or initial period of interest rate fixation shorter than one year, and approximately half of all non-performing loans to households being initially approved in dinars, such a conclusion seems to be reasonable. There is statistical evidence that CPI inflation affected the quality of loans to enterprises and households, which is stronger in the case of loans to enterprises. Such results suggest that higher inflation can make debt servicing easier by reducing the real value of outstanding loans, and thus lead to a decrease of the credit risk ratio in the short-run.

The results for macroeconomic variables are robust to the inclusion of the bank-specific control variables. As for the bank-specific characteristics themselves, there is no robust statistical evidence for a relationship between them and the quality of loans. However, more research on this topic needs to be undertaken before the relationship between the revealed bank-specific characteristics and credit quality is more clearly understood.

As Serbia is a country with less developed financial markets and a private sector which is highly exposed to changes in exchange rates, especially in terms of the balance sheet channel, the interrelationship between the exchange rate and credit risk should be a major focus of both domestic macro- and micro-prudential policy. Prudential regulations should motivate banks to pay more attention to possible negative spillovers when assessing the creditworthiness of individuals and corporations.

The analysis in this paper is confronted with several limitations, which at the same time offer perspectives for future research. Firstly, in order to analyse in more detail the effect of exchange rate movements on credit quality, it is necessary to know the structure of non-

performing loans by currency of approval. Since such data are available only from March 2012, they are not used in this paper. Secondly, the existence of heterogeneity within banks in terms of credit quality suggests hetergeneous lending schedules. In this context, it might be useful to analyse separately the state-owned or foreign-owned banks. Thirdly, balance sheet data of enterprises would be helpful in forming a more complete picture of balance sheet effects of business cycles and currency depreciations. Also, industry-specific drivers of problematic loans are not taken into consideration in this paper. Finally, a worsening of the credit quality can have negative feedback effects on lending, the real economy and financial stability. Therefore such negative feedback effects should be assessed.

Appendix: Variable definitions and regression results

Table A1: Variable definitions

Variable*	**Definition**
Credit Risk (households)	The logistic transformation of the ratio of loan loss provisions to total gross loans to households
Credit Risk (enterprises)	The logistic transformation of the ratio of loan loss provisions to total gross loans to enterprises
GDP	Real GDP growth rate (q-on-q) calculated as the log differenced real GDP
NEER**	Nominal effective exchange rate of the dinar against the euro and the US dollar
BELIBOR**	Three-month Belgrade Interbank Offer Rate
CPI	CPI inflation (q-o-q)
A_{it}^{**}	Total assets of a bank I in quarter t
$\frac{C_{it}}{A_{it}}^{**}$	The ratio of capital to total assets of bank i in quarter t
$\frac{L_{it}}{A_{it}}^{**}$	The ratio of liquid assets to total assets of bank i in quarter t Liquid assets comprise investment in government and other securities, NBS bills, current acount, valut cash and deposit facilities with the NBS.

* Except the dependent variable, all variables are taken in logs. ** Three-month averages were calculated.

Table A2. Results of panel regressions – loan loss provisions to total gross loans to households

Explanatory variables		**Fixed effects**			
		Model 1	**Model 2**	**Model 3**	**Model 4**
GDP					
	LD.	**-1.735***	**-1.689***	**-2.129****	-1.448
		(0.935)	(0.935)	(0.811)	(1.196)
NEER					
	D1.	0.095	0.206	0.083	0.046
		(0.371)	(0.297)	(0.376)	(0.411)
	LD.	**-1.252*****	**-1.306*****	**-1.348****	**-1.223*****
		(0.429)	(0.433)	(0.525)	(0.399)
BELIBOR					
	D1.	0.109	0.145	0.161	0.109
		(0.101)	(0.121)	(0.129)	(0.101)
	LD.	**0.339*****	**0.329****	**0.386****	**0.307****
		(0.122)	(0.124)	(0.156)	(0.119)
CPI					
	D1.	-2.415	-2.158	-2.782	-2.306
		(1.470)	(1.146)	(1.850)	(1.357)
	LD.	0.130	0.086	0.013	0.111
		(0.303)	(0.280)	(0.253)	(0.299)
Bank-specific control variables					
Size (L.)			0.366		
			(1.328)		
Capitalisation (L.)				0.941	
				(1.314)	
Liquidity (L.)					0.317
					(0.333)
Constant		**0.048*****	**0.093***	**0.052****	**0.046*****
		(0.017)	(0.053)	(0.022)	(0.016)
Number of observations		398	398	398	398
Number of banks		32	32	32	32
F-test for the significance of the whole regression (p-value)		10.33	10.78	8.46	7.01
		(0.000)	(0.000)	(0.000)	(0.000)
R squared		0.094	0.098	0.069	0.049

Notes: D1. refers to the first difference of the variables in logarithms. LD. refers to the lagged differenced variables in logarithms.

Standard errors are given in parenthesis. Vce robust standard errors are reported.

***/**/* denote significance at 1%, 5% and 10% level of significance, respectively. Computations have been done in STATA 11.

Table A3. Results of panel regressions – loan loss provisions to total gross loans to enterprises

Explanatory variables		Fixed effects			
		Model 1	Model 2	Model 3	Model 4
GDP					
	LD.	**-2.855*** **	**-2.734** **	**-3.081*** **	**-2.708** **
		(1.014)	(1.036)	(1.045)	(1.109)
NEER					
	D1.	-0.272	-0.205	0.265	-0.293
		(0.440)	(0.427)	(0.444)	(0.430)
	LD.	**-0.876** **	**-0.910*** **	**-0.949*** **	**-0.860*** **
		(0.260)	(0.258)	(0.267)	(0.260)
BELIBOR					
	D1.	0.050	0.046	0.037	0.048
		(0.132)	(0.128)	(0.126)	(0.131)
	LD.	0.158	0.150	0.173	0.142
		(0.217)	(0.216)	(0.210)	(0.215)
CPI					
	D1.	**-3.311*** **	**-3.247*** **	**-3.597*** **	**-3.247*** **
		(0.761)	(0.738)	(0.761)	(0.767)
	LD.	1.102	-1.052	-1.138	-1.111
		(0.783)	(0.820)	(0.764)	(0.792)
Bank-specific control variables					
Size (L.)			**-0.276** **		
			(0.130)		
Capitalisation (L.)				-0.589	
				(0.524)	
Liquidity (L.)					0.163
					(0.289)
Constant		**0.104*** **	**0.103*** **	**0.106*** **	**0.102*** **
		(0.025)	(0.025)	(0.023)	(0.024)
Number of observations		399	399	399	399
Number of banks		32	32	32	32
F-test for the significance of the whole regression (p-value)		6.03	5.12	6.37	6.02
		(0.000)	(0.000)	(0.000)	(0.000)
R squared		0.072	0.080	0.091	0.078

Notes: D1. refers to the first difference of the variables in logarithms. LD. refers to the lagged differenced variables in logarithms.

Standard errors are given in parenthesis. Vce robust standard errors are reported.

Table A4. Results of panel regressions – loan loss provisions to total gross loans to households

Explanatory variables		**Xtpcse**			
		Model 1	**Model 2**	**Model 3**	**Model 4**
Credit Risk (L.)		**0.388*** **	**0.355*** **	**0.397*** **	**0.386*** **
		(0.120)	(0.114)	(0.116)	(0.120)
GDP					
	LD.	-0.977	**-1.065***	**-1.266***	-0.769
		(0.699)	(0.625)	(0.751)	(0.716)
NEER					
	D1.	**-0.331***	0.309	-0.291	**-0.372***
		(0.193)	(0.190)	(0.206)	(0.191)
	LD.	**-0.686*** **	**-0.716*** **	**-0.781*** **	**-0.660*** **
		(0.160)	(0.160)	(0.184)	(0.157)
BELIBOR					
	D1.	0.009	0.000	0.008	0.006
		(0.070)	(0.072)	(0.079)	(0.067)
	LD.	**0.276*** **	**0.273** **	**0.288*** **	**0.248*** **
		(0.063)	(0.066)	(0.071)	(0.068)
CPI					
	D1.	-1.464	**-1.470*** **	**-1.715*** **	**-1.358*** **
		(0.472)	(0.472)	(0.551)	(0.458)
	LD.	0.221	0.215	0.159	0.229
		(0.399)	(0.400)	(0.429)	(0.380)
Bank-specific control variables					
Size (L.)			-0.114		
			(0.139)		
Capitalisation (L.)				-0.591	
				(0.451)	
Liquidity (L.)					0.230
					(0.336)
Constant		**0.069*** **	**0.132***	**0.069** **	**0.071*** **
		(0.027)	(0.075)	(0.027)	(0.027)
Number of observations		448	448	448	448
Number of banks		32	32	32	32
Wald statistic for the significance of the whole regression	(p-value)	2.40e+07	1.87e+07	2.32e+06	68010101.44
		(0.000)	(0.000)	(0.000)	(0.000)
R squared		0.305	0.305	0.330	0.305

Notes: D1. refers to the first difference of the variables in logarithms. LD. refers to the lagged differenced variables in logarithms.

Standard errors are given in parenthesis. ***/**/* denote significance at 1%, 5% and 10% level of significance, respectively.

Table A5. Results of panel regressions – loan loss provisions to total gross loans to enterprises

Explanatory variables		Xtpcse			
		Model 1	Model 2	Model 3	Model 4
Credit Risk (L.)		**0.307*** **	**0.297*** **	**0.311*** **	**0.307** **
		(0.083)	(0.087)	(0.082)	(0.083)
GDP					
	LD.	**-1.768***	**-1.770***	**-1.931** **	**-1.633***
		(0.931)	(0.923)	(0.986)	(0.935)
NEER					
	D1.	-0.362	-0.365	-0.338	-0.388
		(0.289)	(0.287)	(0.300)	(0.294)
	LD.	**-0.566** **	**-0.568** **	**-0.702*** **	**-0.546** **
		(0.241)	(0.239)	(0.258)	(0.243)
BELIBOR					
	D1.	0.070	0.069	0.043	0.069
		(0.115)	(0.114)	(0.122)	(0.115)
	LD.	0.128	0.128	0.151	0.110
		(0.109)	(0.109)	(0.115)	(0.114)
CPI					
	D1.	**-3.065*** **	**-3.070*** **	**-3.469*** **	**-2.995*** **
		(0.759)	(0.755)	(0.809)	(0.758)
	LD.	0.541	-0.566	-0.581	-0.540
		(0.658)	(0.654)	(0.684)	(0.662)
Bank-specific control variables					
Size (L.)			**-0.062** **		
			(0.091)		
Capitalisation (L.)				**-0.645***	
				(0.341)	
Liquidity (L.)					0.164
					(0.319)
Constant		**0.158*** **	**0.191*** **	**0.158*** **	**0.159*** **
		(0.043)	(0.065)	(0.043)	(0.044)
Number of observations		448	448	448	448
Number of banks		32	32	32	32
Wald statistic for the significance of the whole regression	(p-value)	260850.16	126229.87	430080.03	73160.41
		(0.000)	(0.000)	(0.000)	(0.000)
R squared		0.260	0.263	0.286	0.261

Notes: D1. refers to the first difference of the variables in logarithms. LD. refers to the lagged differenced variables in logarithms.

Standard errors are given in parenthesis. ***/**/* denote significance at 1%, 5% and 10% level of significance, respectively.

Table A6. Results of panel regressions – loan loss provisions to total gross loans to households

Explanatory variables		Two-stage (Arellano Bond) difference - GMM			
		Model 1	Model 2	Model 3	Model 4
Credit Risk (L.)		**0.270****	0.120	**0.177****	**0.252****
		(0.136)	(0.110)	(0.097)	(0.132)
GDP					
	LD.	**-1.441***	**-2.231***	**-1.443***	**-2.043***
		(0.847)	(1.113)	(0.784)	(1.082)
NEER					
	D1.	0.220	0.281	0.115	0.292
		(0.260)	(0.279)	(0.211)	(0.242)
	LD.	**-0.402*****	**-0.500****	**-0.402****	**-0.464****
		(0.147)	(0.187)	(0.170)	(0.192)
BELIBOR					
	D1.	-0.025	-0.051	-0.094	0.001
		(0.088)	(0.119)	(0.104)	(0.101)
	LD.	**0.196***	**0.291****	**0.257****	**0.298***
		(0.103)	(0.131)	(0.106)	(0.162)
CPI					
	D1.	-0.307	-0.498	-0.150	-0.378
		(0.521)	(0.522)	(0.509)	(0.579)
	LD.	-0.183	0.181	-0.049	-0.487
		(0.367)	(0.374)	(0.309)	(0.401)
Bank-specific control variables					
Size (L.)			0.607		
			(0.490)		
Capitalisation (L.)				0.280	
				(0.731)	
Liquidity (L.)					0.309
					(0.705)
Number of observations		384	384	384	384
Number of banks		32	32	32	32
Number of instruments		15	16	16	17
F-test for the significance of the whole regression (p-value)		5.33	4.47	4.31	6.10
		(0.000)	(0.000)	(0.001)	(0.000)
AR(1)/(p-value)		0.088	0.079	0.084	0.095
AR(2)/(p-value)		0.149	0.182	0.127	0.148
Hansen (p-value)		0.278	0.370	0.423	0.514
Diff- in Hansen cross sectional corr (p-value)		0.140	0.581	0.430	0.351

Notes: D1. refers to the first difference of the variables in logarithms. LD. refers to the lagged differenced variables in logarithms.

Windmeijer (2005) corrected standard errors are given in parenthesis. ***/**/* denote significance at 1%, 5% and 10% level of significance, respectively.

Table A7. Results of panel regressions – loan loss provisions to total gross loans to enterprises

Explanatory variables		Two-stage (Arellano Bond) difference - GMM			
		Model 1	Model 2	Model 3	Model 4
Credit Risk (L.)		**0.312****	**0.232*****	**0.355*****	**0.433*****
		(0.128)	(0.052)	(0.087)	(0.095)
GDP					
	LD.	**-2.819***	**-1.863***	**-2.867***	**-3.593***
		(1.505)	(1.035)	(1.524)	(2.080)
NEER					
	D1.	0.679	0.135	0.591	0.286
		(1.004)	(0.579)	(0.399)	(0.431)
	LD.	**-0.654****	**-0.667****	**-0.542****	**-0.705****
		(0.260)	(0.290)	(0.293)	(0.327)
BELIBOR					
	D1.	0.224	0.186	0.167	0.251
		(0.364)	(0.118)	(0.210)	(0.170)
	LD.	0.099	0.081	0.181	0.304
		(0.189)	(0.334)	(0.215)	(0.209)
CPI					
	D1.	**-3.306*****	**-3.278*****	**-3.880*****	**-3.666*****
		(0.970)	(0.906)	(0.885)	(0.916)
	LD.	0.532	-1.094	0.793	0.526
		(0.982)	(0.711)	(0.686)	(0.878)
Bank-specific control variables					
Size (L.)			-0.113		
			(0.914)		
Capitalisation (L.)				**-2.964***	
				(1.719)	
Liquidity (L.)					2.273
					(1.384)
Number of observations		384	334	384	334
Number of banks		31	31	31	31
Number of instruments		16	20	16	16
F-test for the significance of the whole regression (p-value)		4.90	13.91	10.72	4.13
		(0.000)	(0.000)	(0.000)	(0.000)
AR(1)/(p-value)		0.027	0.035	0.091	0.025
AR(2)/(p-value)		0.128	0.172	0.749	0.326
Hansen (p-value)		0.465	0.185	0.289	0.227
Diff- in Hansen cross sectional corr (p-value)		0.236	0.145	0.451	0.304

Notes: D1. refers to the first difference of the variables in logarithms. LD. refers to the lagged differenced variables in logarithms.

Windmeijer (2005) corrected standard errors are given in parenthesis. ***/**/* denote significance at 1%, 5% and 10% level of significance, respectively.

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