

What was the key determinant of loan quality deterioration of Russian banks during the last crisis: macroeconomic conditions or risky business strategies?

Research Proposal

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Research Task

The objective of research is to separate the influence of macro- and microeconomic factors that led to an increase in bad loans of Russian banks.

Background of research

- During the latest crisis Russian banking system was faced with a significant deterioration in the loan quality.
- Under these conditions Russian government was forced to carry out massive recapitalization of the major banks to maintain their stability.
- The question inevitably arises, how justified was the decision of Russian government to provide financial support to credit institutions?

Practical contribution: remote stress testing of banks, improve efficiency of government decisions on providing financial support to credit institutions

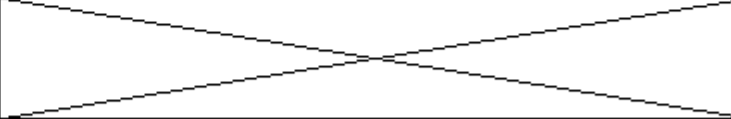
Research methodology

- Econometric analysis of panel data (individual bank level)
- Estimation of bad loans equation will allow us to judge about proportion of bad loans growth caused by micro- and macroeconomic determinants for any bank (factor decomposition of dependent variable)
- Emphasis on recapitalized banks

Plan

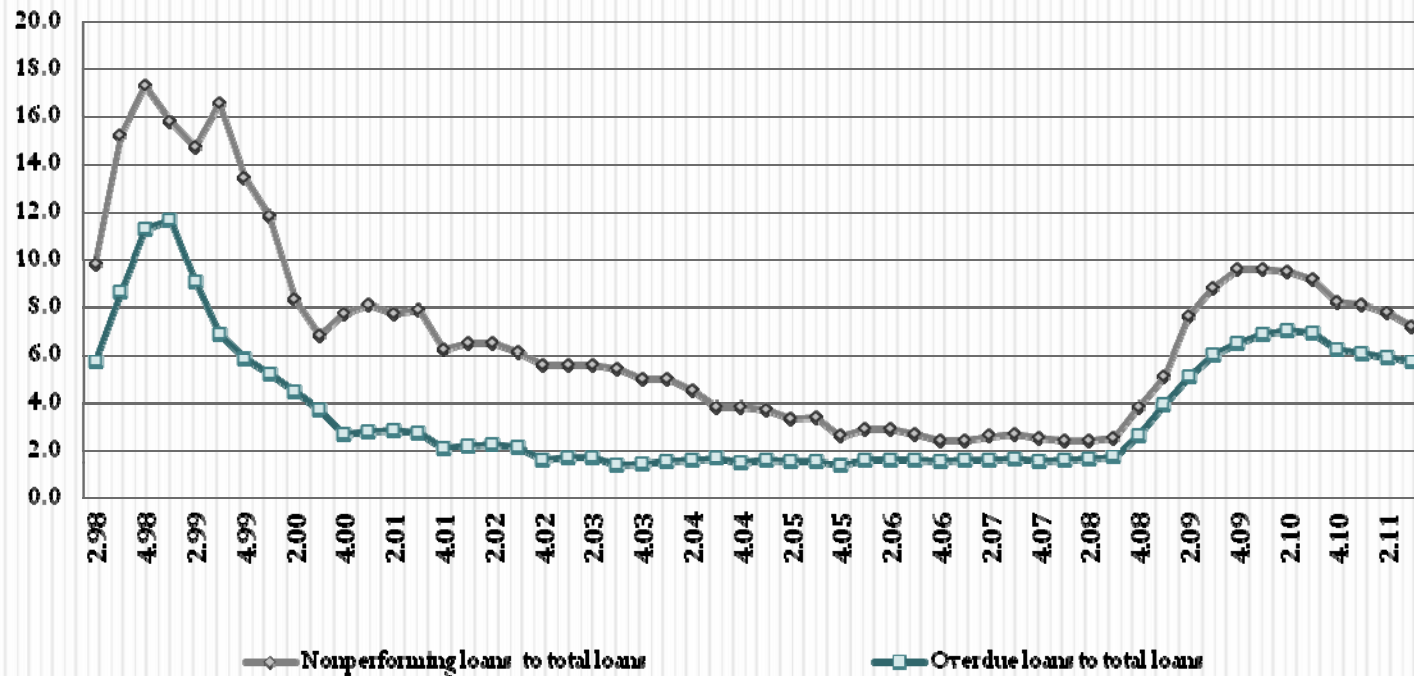
- Literature review
 - Main approaches to credit risks modeling
 - Dependent variable choice
 - Main hypotheses tested
- Methodology
 - Data description
 - Model specification
 - Explanatory variables
- Preliminary results
- Further development directions

Review of main approaches to modeling credit risks (dependent variable in brackets)

Approach, level of aggregation		Econometric methods	
		Time series analysis	Panel data analysis
Piecewise approach	banking system level	Hoggarth, Sorensen, Zicchino (2005) (write-offs to total loans)	Pesola (2005) (loan losses to total loans) Babihuga (2007) (nonperforming loans to total loans)
	individual bank level	for internal stress testing of individual banks	Jimenez, Saurina (2005) (nonperforming loans to total loans) Espinoza, Prasad (2010) (nonperforming loans to total loans) Quagliariello (2007) (loan loss provisions to total loans, new bad debts to performing loans)
Integrated approach	banking system level	Boss (2002) (aggregate default probability)	
	individual bank level	for internal stress testing of individual banks	Virolainen (2004) (average default rate for industry i) Jimenez, Saurina (2005) (probability of default of loan i) Carling, Jacobsen, Linde, Roszbach (2003) (probability of default of firm i)

Dependent variable choice – the ratio of overdue loans to total loans as an available substitute for nonperforming loans

The latter is published only for banking system as a whole while the former is available for individual banks



- Ratio of overdue loans to total loans reflects only the outstanding "tranches" of credit
- The entire loan becomes nonperforming when payment is past due by 90 days or more

Main hypotheses tested - I

In a seminal paper Berger and DeYoung (1997) proposed three hypotheses related to determinants of loan quality

- **«bad management»** - low cost efficiency indicates low quality of bank management, thus leading to problem loans increase
- **«skimping»** - high cost efficiency reflects reduction of resources allocated to risk management, which leads to loan quality deterioration
- **«moral hazard»** - low capital adequacy produces moral hazard incentives for bank owners to involve in more risky projects. This leads to increase in nonperforming loans

Cost efficiency measurement

- **Balance-sheet ratios:**

cost-to-income ratio (CIR),

Operating cost net of loan loss provision operations
and revaluation of foreign currency & private securities

$$CIR = \frac{\text{Operating Cost}}{\text{Total Income}}$$

- **Econometric approach:**

Efficiency scores based on *DFA* (Distribution Free Approach) and *SFA* (Stochastic Frontier Approach). These scores are computed on the basis of translog cost frontier function

$$\ln COST = f(OUTPUTS, FACTOR INPUT PRICES) + \varepsilon, \quad \text{where } \varepsilon = u + v$$

u is an inefficiency term, v is a random error

in DFA u is a fixed effect of each bank in a sample;

in SFA u is a random effect with (positive) half-normal distribution

Main hypotheses tested - II

Louzis, Angelos and Metaxas (2011) formulated additional three hypotheses:

- **«diversification»**
 - involvement in operations not associated with credit risk taking (payment transactions, broking, etc.) allows to earn less risky income thus, reducing incentives to finance speculative projects
 - opportunity to lend money to a diversified range of borrowers leads to reduce in problem loans (minimizes the risk of individual borrower)
- **«too big to fail»** - large banks take excessive risk and therefore have more nonperforming loans
- **«procyclical credit policy»** - current performance reflects credit policy of banks. More liberal loan issuance can lead to future problems

Diversification measurement

- Non interest income to total income as a measure of reliance on income not accompanied by the adoption of credit risk
- Bank size (bank's share in assets) as a measure of borrowers diversification

Procyclical credit policy measurement

- Rapid loans growth reflects decreasing lending standards as rapid growth of loan portfolio leads to reduction in time for consideration of loan applications, decline in monitoring quality, etc. and after a time (often during a crisis) it leads to problem loans increase
- (Salas, Saurina, 2002) note that current loans growth lead to a reduction in nonperforming loans (increase in denominator) while for future credit risk the effect is opposite

Empirical testing of hypotheses

- «**Bad management**» - Berger and DeYoung (1997), Louzis, Angelos and Metaxas (2011), Quagliariello (2007), Podriera, Weill (2008)
- «**Moral hazard**» – Salas, Saurina (2002), Berger and DeYoung (1997),
- «**Procyclical credit policy**» - Jimenez, Saurina (2006), Espinoza, Prasad (2010), Quagliariello (2007),
- «**Diversification**» - Salas, Saurina (2002)

Data description

Data sources:

- macroeconomic factors - from Federal State Statistics Service website (www.gks.ru), Bank of Russia website, FINAM Investment Holding website (<http://www.finam.ru>)
- bank specific factors - from Bank of Russia website (www.cbr.ru)
 - We use public data from so called «101 and 102 forms» of the consolidated financial statements of Russian commercial banks within the period Q1 2004 – Q2 2011. Earlier bank-level data are not available.

Sample:

- We fixed the sample of 525 banks, who constantly publish their statements within the period from 2004 to 2011. This sample of banks is representative, as it covers most (about 85%) of the total assets of Russian banking system

Model specification - I

Following the existing literature, we specify the static version

of bad loans model as following:

$$OL_{it} = \alpha + \sum_{j=1}^{K1} \beta_j \cdot BSV_{j,it} + \sum_{l=1}^{K2} \gamma_l \cdot MV_{l,it} + \varepsilon_{it},$$

where OL_{it} – overdue loans ratio,

BSV_{it} – set of $K1$ bank specific variables;

MV_{it} – set of $K2$ macroeconomic variables;

$\varepsilon_{it} \sim i.i.d.(0, \sigma^2)$, the error term, $\varepsilon_{it} = \mu_i + v_{it}$

(sum of individual effect & idiosyncratic shock);

$i = 1, \dots, 525$ (fixed sample of Russian banks)

$t = 1q2004 - 2q2011$

Model specification - II

- As noted in Salas, Saurina (2002), the share of bad loans have a tendency to persist over time. This necessitates the use of the dynamic specification of equation.

$$OL_{it} = \alpha + \delta \cdot OL_{it-1} + \sum_{j=1}^{K_1} \beta_j \cdot BSV_{j,it} + \sum_{l=1}^{K_2} \gamma_l \cdot MV_{l,it} + \varepsilon_{it},$$

- OLS, FE, RE estimators are inconsistent
- Generalized Method of Moments (GMM) is appropriate (Arellano-Bond and extensions)
- GMM also helps to overcome the endogeneity problem of bank-specific variables

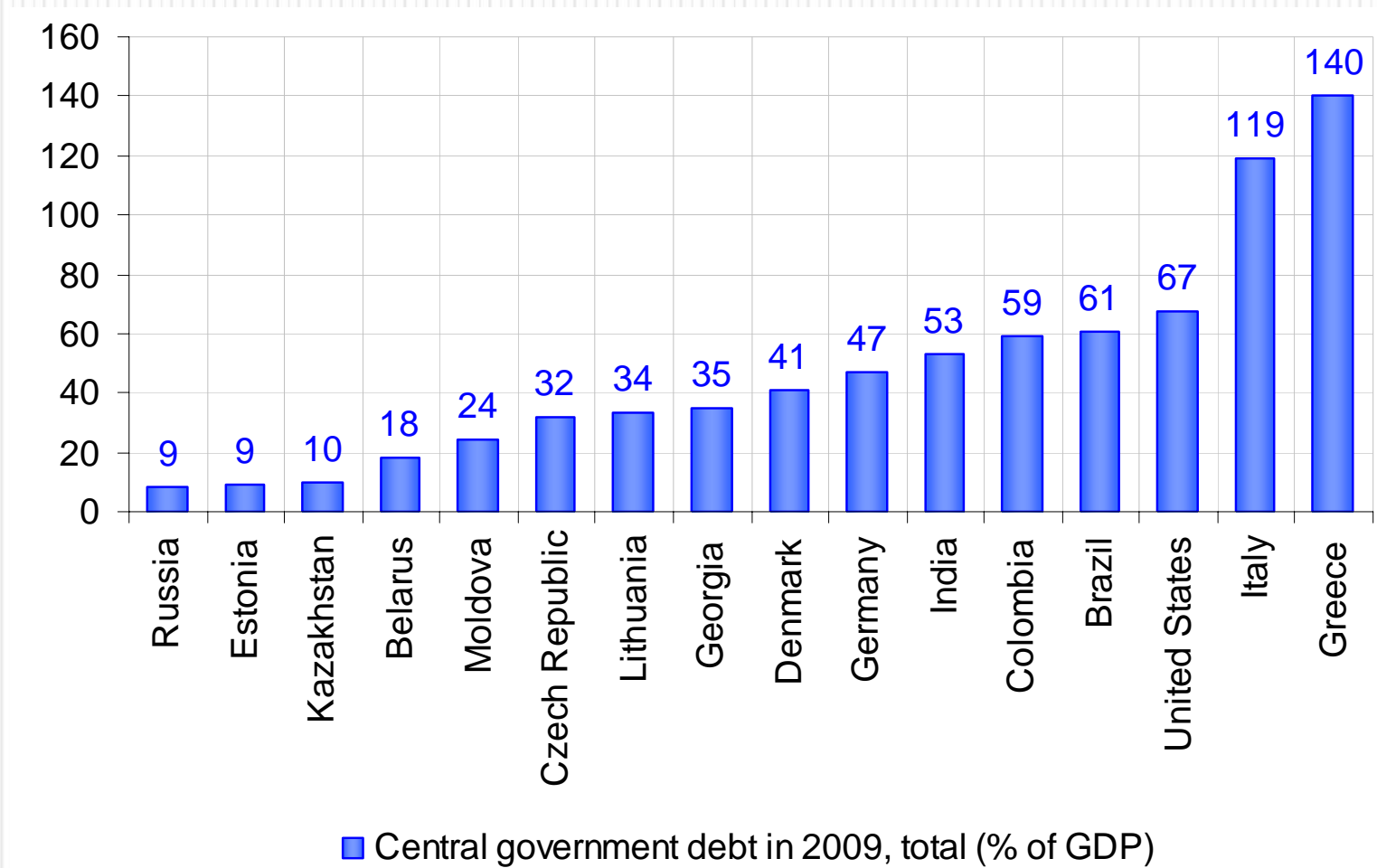
Explanatory variables: macroeconomic factors - I

- National economy characteristics
 - Total debt to GDP
 - Consumption and investment expenditure to disposable income
 - GDP growth
 - Inflation
- Households indicators
 - Unemployment growth
 - Households expenditure and income mismatch
 - Households indebtedness to income ratio

Explanatory variables: macroeconomic factors - II

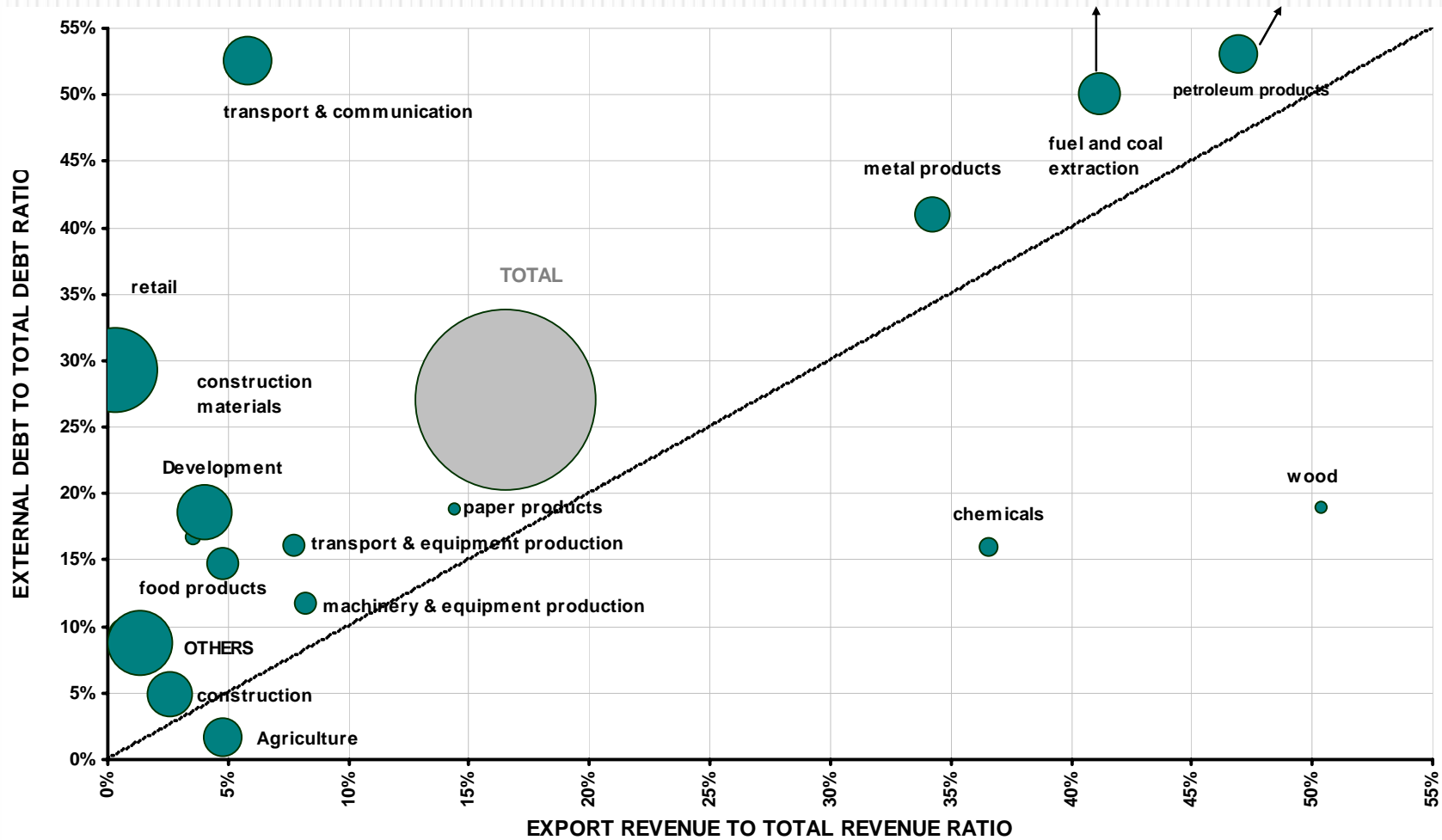
- Corporate sector indicators
 - Gross profit to debt
 - Enterprise debt to current capital
- Collateral indicators
 - MICEX index
 - House price index
- External conditions
 - Real effective exchange rate index, nominal exchange rate
 - Terms of trade
 - Oil price
 - Current account balance to GDP ratio

Why government debt indicators are not included into equation?



Why external conditions are taken into consideration?

Mismatch between currency composition of debt and currency structure of income for the range of internally-oriented industries



Area of a circle - the total amount of domestic and external debt

Source: CMASF

Explanatory variables: additional bank-specific factors

- Individual banks' loan market concentration level
- Overall banking sector concentration level
- Individual lending rates

$$R = \frac{\textit{InterestIncome}}{\textit{Loans}}$$

- bank profile dummy variables (retail, corporate, universal) and ownership structure dummy variables (foreign, government, private Moscow, private regional)

Preliminary results

- We have estimated only static form of overdue loans equation
 - From macroeconomic set of indicators GDP and unemployment growth, stock market overheating showed significant effects
 - From bank-specific variables – lagged share of non-interest income (diversification), lagged credit growth (procyclical credit policy), lagged RoA (skimping), lagged individual lending rate (adverse selection), bank's competition environment and overall competition level (measured via concentration)

Further model development

- Multiply households and corporate indebtedness and external fragility indicators by individual bank risk exposure to this type of loans
- Measure efficiency by alternative methods.
Check robustness
- Estimate a dynamic specification of overdue loans equation

Thank you for your attention!

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