

Discretionary Credit Rating and Bank Stability During a Financial Crisis

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Motivation

- Existing accounting standards and banking regulation induce procyclicality in the loan-loss provisions.
- In economic downturns the incidence of loan default increases and the value of banks' assets decreases.
- Resulting higher loan-loss provisions negatively reflect in the P&L account and bank capital, which creates incentives to relax standards of credit risk assessment and valuation of assets in times of economic downturn.
- Persistent underestimation of credit risk results in significantly weaker banks.

Motivation

Slovenian case in the current crisis

- Slovenia experienced a major banking crisis.
- By 2012 the NPL ratio exceeded 20%.
- In 2013 10 banks, accounting for about 70% of assets, went through a comprehensive review.
- Huge capital shortfalls:
 - 214% of existing capital overall
 - Big differences across banks:
 - 78% foreign-owned banks - 244% domestic banks.
 - Within domestic group: large (2 banks) 228% - small 278%.
 - 2 largest banks majority state owned and held 36% market share \Rightarrow "too-big-to-fail" + explicit state guarantee.

Motivation

Topic of the paper

- This paper focuses on discretion in credit risk assessment.
- Incentives for discretion differ across banks: size, ownership, access to funding/capital.
- Hypotheses:
 - Banks that are bigger and have easier access to funding have less incentives to underestimate risk.
 - Foreign owned bank should have the least incentives, followed by large domestic banks.
 - The most pronounced incentives to underestimate risk in a crisis are in small domestic banks.

Motivation

Topic of the paper

- We analyze how incentives to underestimate credit risk reflect in credit ratings assigned by banks to their clients by ...
- ... testing for the capacity of credit ratings to predict financial default across different groups of banks: foreign, large domestic, small domestic.
- Link the results on changes in predictive capacity of credit ratings to incentives to underestimate credit risk.

Relation to the literature

- Huizinga and Laeven (2012) study discretion in valuation of bank assets.
- They report significant discrepancies between market value and banks' valuation of real-estate related securities for the case of the US mortgage crisis.
- These differences attributed to the use of discretion over classification of mortgage-backed securities with the aim of inflating banks' books.
- Our paper focuses on assessment of credit risk.
- First paper analysing the information content of credit ratings.

Plan of the talk

- Incentives for discretionary risk assessment
- Econometric methodology
- Main findings
- Robustness checks
- Conclusions

Incentives for discretionary risk assessment

Loan-loss Provisions Across Credit Ratings

Credit rating	Loan-loss provisions in % of outstanding loans
A	0.6
B	3.2
C	13.6
D	41.4
E	80.6

Incentives for discretionary risk assessment

Non-performing loans and coverage ratios across groups of banks

	2007	2008	2009	2010	2011	2012
	Share of NPLs					
Large Domestic Banks	2.8	3.3	6.6	16.5	26.7	33.2
Small Domestic Banks	2.3	3.5	7.1	11.7	19.2	26.4
Foreign Banks	2.1	3.9	6.6	8.7	9.0	11.9

Incentives for discretionary risk assessment

Summary

- Foreign banks had the weakest incentives to underestimate risk (access to funding through internal capital market, smaller burden of NPLs, better collateral).
- Small domestic banks at the opposite end of the specter (cut of from wholesale funding, weak owners, NPL burden).
- Large domestic banks in between (high NPL burden, but explicit state guarantee).

Test for discretion in credit risk assessment

Basic idea

- When assigning credit ratings banks dispose with publicly available (balance sheet and income statement data) and private information (relations with clients).
- An econometrician disposes only with publicly available data.
- Banks thus have an information advantage over an econometrician: credit ratings should be informative about the probability of default.
- We estimate two bankruptcy prediction models: one using credit ratings, the other using information from balance sheets and income statements.
- Compare classification accuracy of defaulted non-financial corporations in (1) time and (2) across groups of banks.

Test for discretion in credit risk assessment

Basic idea

- Prior expectations:
 - Time domain: As the crisis unfolds incentives to underestimate credit risk increase in general. We should observe a deterioration of classification accuracy of credit ratings relative to a pure financial info.
 - Cross-section domain: The deterioration of classification accuracy of credit ratings should be larger for those banks that have bigger incentives to underestimate risk.

Test for discretion in credit risk assessment

Data

- Over 18000 bank-firm observations per year in 2006 - 2012
- Non-financial corporations (over 80% of NPLs)
- Credit registry of the Bank of Slovenia: credit ratings, info on blocked transaction accounts
- Financial statements published by the Agency for public and legal records

Test for discretion in credit risk assessment

The Balance-Sheet Model

$$Y_{it} = \begin{cases} 1 & \text{if firm } i \text{ is } > 90 \text{ days overdue to at least one bank in } t \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

$$P(Y_{it} = 1 | X_{it-1}) = \Lambda(\alpha + \beta X_{it-1}) = \frac{e^{\alpha + \beta X_{it-1}}}{1 + e^{\alpha + \beta X_{it-1}}} \quad (2)$$

X_{it-1} contains financial ratios and sectoral dummies.

Test for discretion in credit risk assessment

The Credit-Ratings Model

$$Y_{ijt} = \begin{cases} 1 & \text{if firm } i \text{ is } > 90 \text{ days overdue to bank } j \text{ in time } t \\ 0 & \text{otherwise} \end{cases} \quad (3)$$

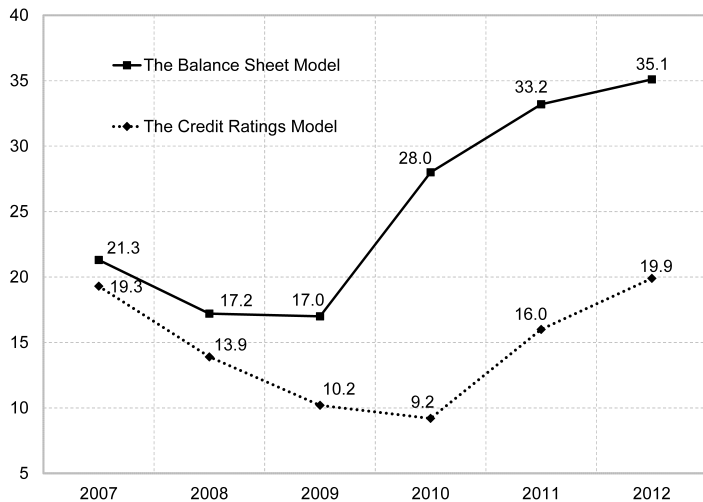
$$P(Y_{ijt} = 1 | R_{ij,t-1}) = \Lambda(\delta + \gamma R_{ij,t-1}) = \frac{e^{\delta + \gamma R_{ij,t-1}}}{1 + e^{\delta + \gamma R_{ij,t-1}}} \quad (4)$$

$R_{ij,t-1}$ is a set of five dummy variables for each of the credit ratings from A to D.

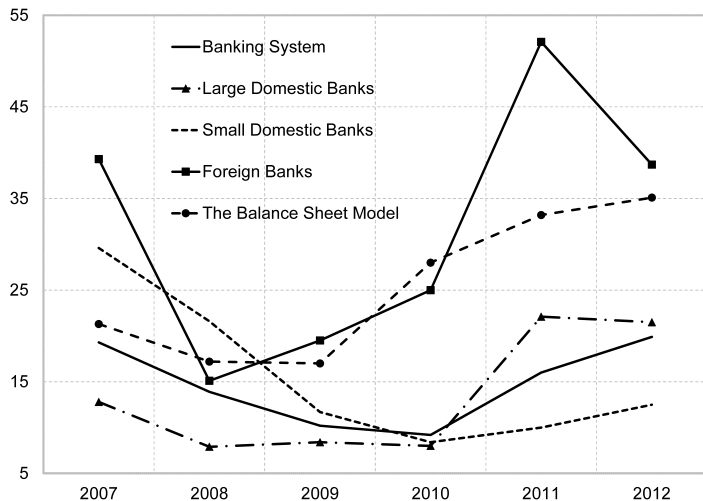
Comparison of classification accuracy

	The Balance Sheet Model		The Credit Ratings Model		Difference	
	Overall	Defaulters	Overall	Defaulters	Overall	Defaulters
2007	96.2	21.3	96.9	19.3	-0.7	2.0
2008	95.2	17.3	96.0	13.9	-0.8	3.4
2009	93.8	17.1	94.5	10.2	-0.7	6.9
2010	93.8	28.2	93.8	9.1	0.0	19.1
2011	93.8	33.0	93.4	15.8	0.4	17.2
2012	93.3	34.7	92.9	19.9	0.4	14.8

Comparison of classification accuracy of firms in default



Comparison of classification accuracy across groups of banks



Main findings

- Precision of ratings in predicting default deteriorated in crisis and only gradually picked up:
 - In absolute terms
 - Relative to a benchmark logit model using standard publicly available financial ratios
- Credit ratings of foreign banks the most reliable in predicting default.
- Followed by large domestic banks.
- Small domestic banks the least reliable.
- Differences widened with the amplification of the crisis.
- In line with our hypotheses, smaller banks and banks without access to market funding, have the strongest incentives to underestimate risk in times of financial distress.
- Can explain findings of the comprehensive review about shortages of capital.

Robustness checks

- Controlling for updating of banks' information set:
 - Rating changes
 - Public release of balance sheet and income statement data
- Forecast horizon
- Our basic conclusions remain valid.

Conclusions

- The paper tests for discretionary risk assessment in the Great recession in Slovenia.
- The comprehensive review subjected banks to external examination using common methodology.
- Results revealed significant shortages of bank capital that differed significantly across banks.
- Our empirical analysis show that differences can be linked to differences in the incentives banks had to underestimate credit risk.
- EA-wide comprehensive review in 2014: capital shortfalls significantly larger for smaller banks.

Policy implications

1. Regulation should pay attention to incentives to underestimate risk in times of financial turmoil.
 - Incentives to underestimate risk present also in case of advanced IRB systems.
 - Risks eventually materialize \Rightarrow prolonged financial crises, higher social cost (direct fiscal cost of bank bailout in Slovenia exceed 10% of GDP, 2 banks being closed down).
 - External control/provision of credit risk assessment.

Policy implications

2. Increasing capital requirements in times of financial distress may be counterproductive.
 - Example: European Banking Authority required banks to hold at least 9% Core Tier 1 capital adequacy ratio by mid 2011.
 - Our analysis shows that such a measure could have amplified the incentives to underestimate risk.

The Balance Sheet Model - Estimates for Each Year Separately

	2007	2008	2009	2010	2011	2012
$\log(\text{Total sales})_{it-1}$	-0.275***	-0.157***	-0.136***	-0.096***	-0.111***	-0.095***
Age_{it-1}	-0.022***	-0.038***	-0.050***	-0.046***	-0.040***	-0.043***
$\text{Quick ratio}_{it-1}$	-0.142***	-0.093***	-0.159***	-0.218***	-0.226***	-0.159***
$\text{Debt-to-assets}_{it-1}$	0.016**	0.006	0.072*	0.382***	-0.017	0.040
$\text{Cash flow ratio}_{it-1}$	-0.319***	-0.232***	-0.136***	-0.276***	-0.441***	-0.326***
$\text{Asset turnover ratio}_{it-1}$	-0.471***	-0.650***	-0.458***	-0.733***	-0.608***	-0.478***
$\text{No. of days with bl. ac.}_{it-1}$	0.011***	0.011***	0.012***	0.012***	0.014***	0.014***
$\text{No. of bank-bor. rel.}_{it-1}$	0.401***	0.376***	0.386***	0.381***	0.430***	0.497***
Constant	-1.459***	-4.091***	-2.234***	-1.356**	-3.235***	-2.186***
No. of observations	15751	16018	17572	18010	18193	18249

Source: Bank of Slovenia, AJPES, own calculations.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The Credit Ratings Model - Estimates for Each Year Separately

	2007	2008	2009	2010	2011	2012
Credit rating A_{ijt-1}	-6.189***	-5.554***	-5.171***	-5.790***	-6.096***	-5.832***
Credit rating B_{ijt-1}	-4.779***	-4.220***	-4.206***	-4.666***	-4.940***	-4.677***
Credit rating C_{ijt-1}	-3.425***	-2.954***	-3.044***	-3.333***	-3.214***	-3.065***
Credit rating D_{ijt-1}	-1.900***	-1.901***	-1.920***	-2.242***	-2.413***	-2.112***
Constant	1.290***	1.177***	1.480***	1.946***	2.168***	1.948***
No. of observations	21275	21551	23974	24981	25258	25656

Source: Bank of Slovenia, own calculations.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

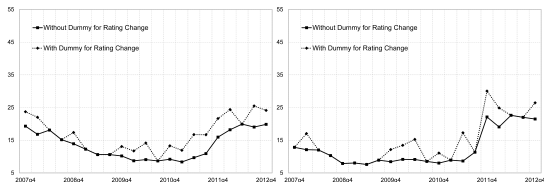
Controlling for updating of banks' information set

Effect of rating changes

- Data on credit ratings is on quarterly and even monthly frequency (after 2009).
- We can trace the timing of rating changes, which occur after banks update their information set.
- Imperfect \Leftarrow cannot identify cases where information set updated but no corresponding rating change.
- Nevertheless, controlling for rating changes could improve the performance of the credit rating model.

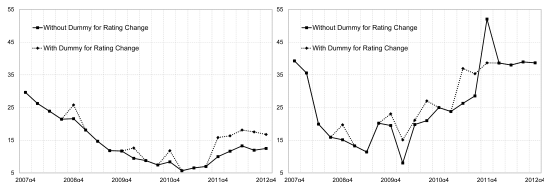
Robustness checks

Controlling for updating in the banks' information set - Correctly Classified Defaulters
Four Quarters Ahead Across Groups of Banks (in %)



(a) Banking System

(b) Large Domestic
Banks



(c) Small Domestic
Banks

(d) Foreign Banks

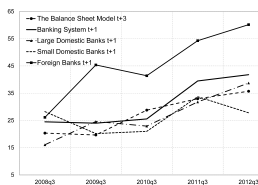
Controlling for updating of banks' information set

Effect of public release of balance sheet data

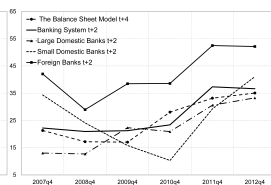
- Balance sheet and income statement data released in March for past year
- Potential information advantage for the balance sheet model
- Compare models with forecast horizon displaced by 2 quarters

Controlling for updating of banks' information set

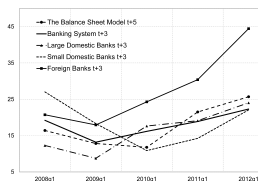
Effect of public release of balance sheet data



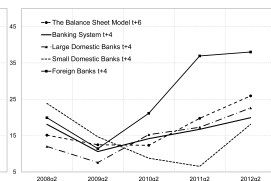
(e) BS model $t+3$, CR model $t+1$



(f) BS model $t+4$, CR model $t+2$



(g) BS model $t+5$, CR model $t+3$



(h) BS model $t+6$, CR model $t+4$

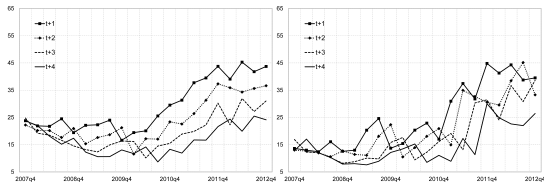
Robustness checks

Controlling for forecast horizon

- Thus far we considered predicting default 1 year ahead
- Managing risk in a financial crisis requires prompt reaction
- We can check robustness also at shorter horizons

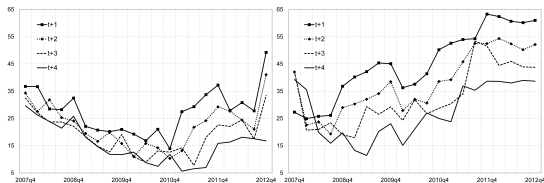
Robustness checks

Controlling for forecast horizon - correctly classified defaulters at horizons 1 to 4



(i) Banking System

(j) Large Domestic Banks



(k) Small Domestic
Banks

(l) Foreign Banks