The Risk Sensitivity of Capital Requirements: Evidence from an International Sample of Large Banks

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Motivation

- Banks are often seen to be undercapitalized despite holding capital well above the minimum regulatory requirements.
- From the onset of the recent crisis, fears that banks hold insufficient capital raised doubts over bank solvency.
- The IMF (2009) shows that banks in Europe and the U.S. which received capital assistance from governments during 2008-09 displayed higher regulatory capital ratios over the preceding decade than banks which were not in need of government assistance.
- One reason why banks hold insufficient capital could be that the regulatory capital requirements are not sufficiently attuned to the riskiness of bank assets (Acharya and Richardon, 2009; Basel Committee, 2009).

Motivation

- In this paper, we ask a simple question: Are the Basel capital *requirements* sensitive to the portfolio risk of banks?
- They should be. Otherwise, banks will game the system by investing in risky assets which maximize returns while reducing capital requirements (Rochet, 1992; Acharya et al., 2010; Hellwig, 2010).
- Basel III proposals are motivated by the perceived failings of capital regulations with respect to their risk sensitivity (Basel Committee, 2009; 2010). Are these criticisms justified? Are the Basel III changes likely to be sufficient?

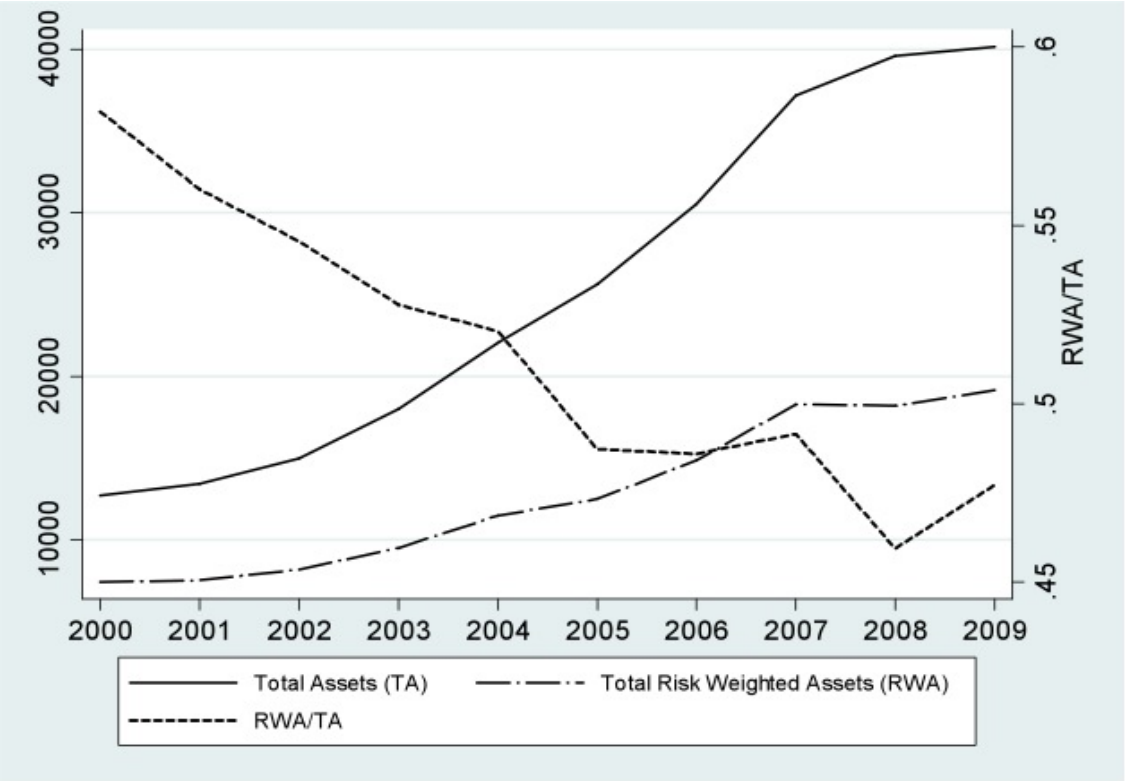
Institutional Background

Risk-based Capital Requirements

- The Basel Accord of 1988 introduced min. capital standards as a fixed proportion of the risk exposure of a bank, as measured by risk-weighted assets (RWA). In most countries, min. capital requirements = 8% of RWA.
- RWA = the weighted sum of various on- and off-balance sheet exposures. RWA has become more comprehensive over time (to include market risk and operational risk).
- Basel II introduced in various countries (EU, Japan, etc.). Changes to the algorithm used to determine RWA to make 'the Framework more risk sensitive than the 1988 Accord' (Basel Committee, 2006).
- Critical for our paper: total RWA reflect a regulatory assessment of the total economic risk of a bank's asset portfolio.

Institutional Background

Risk-based Capital Requirements



RWA & TA (bn US$) for 124 sample banks, 2000-09

Summary of Research Design

- We estimate the extent to which changes in RWA are linked to changes in a bank's portfolio risk.
  - RWA is the regulatory measure of bank portfolio risk which determines minimum capital requirements.
  - We capture portfolio risk using a measure of asset volatility derived from option pricing theory.
- Effectively, we contrast regulatory and market measures of bank portfolio risk.
- Implementation of Basel varies across countries. We inspect annual reports to identify which banks have adopted Basel II and which approach they use (standardized or IRB).

Summary of Findings

- RWA/TA is ill-calibrated to bank asset volatility.
- A low risk sensitivity of capital requirements has permitted banks to build up capital buffers by underreporting their portfolio risk.
- A low risk sensitivity of capital requirements undermines the ability of banks to withstand adverse shocks. In the run-up to the financial crisis, capital requirements were not risk sensitive at banks which were in need of government-financed recapitalizations.
- While the risk sensitivity of capital requirements is higher for banks that have adopted Basel II and banks located in countries with smaller shadow banking sectors, it remains low across banks and countries.

Previous Literature and Contributions

- If capital regulation is to prevent banks from holding excessively risky asset portfolios, regulatory capital requirements ought to be highly calibrated to the riskiness of bank assets (Kim and Santomero, 1988; Rochet, 1992).
- From its inception, the risk-weighting methodology underlying Basel has been criticized as insufficiently fine-tuned to distinguish between the riskiness of different portfolio choices of banks (Avery and Berger, 1991; Jones 2000; Jacques and Nigro, 1997; Hellwig, 2010).
- Previous work on capital and risk has focused on whether capital holdings (not requirements) are in line with bank risk (Shrieves and Dahl, 1992; Jacques and Nigro, 1997; Calem and Rob, 1999; Flannery and Rangan, 2008).

Previous Literature and Contributions

- Our results help explain why regulatory capital ratios perform so poorly in predicting bankruptcy and distress in the banking industry (e.g., Estrella, Park and Peristiani, 2000; IMF, 2009).
- Our study contributes to work on the impact of Basel II on banks (Repullo and Suarez, 2004; Hakenes and Schnabel, 2011). An assumption underlying this work is that the different approaches for determining capital adequacy (Standardized or IRB) differ in terms of their risk sensitivity. We show that this is not the case.
- Our results can be used as a benchmark for impending Basel III capital adequacy rules and, therefore, contribute to work which examines the effects of Basel III on banks (Feess and Hege, 2011; Kashyap et al., 2010; Admati et al., 2010).

Sample & Market Risk Measure

- Sample: the 650 largest banks (USD assets) on Datastream, 2000-09.
  - Excl. cooperative, government-owned, Islamic, regional Japanese, and majority-controlled banks.
  - Match with $\geq$ 5 years of accounting data from Bankscope.
- End sample: 246 unique banks chartered in 41 countries; 2,092 obs.
- Market risk measure: Asset volatility, $\sigma_{A,t}$, which reflects asset and liability returns as well as changes in off-balance items and operating efficiencies (Flannery and Sorescu, 1996; Flannery and Rangan, 2008).

$$V_{E,t} = V_{A,t} N(d_{1,t}) - L_t e^{-r_f T} N(d_{2,t})$$

$$\sigma_{E,t} = \left(\frac{V_{A,t}}{V_{E,t}} \right) N(d_{1,t}) \sigma_{A,t}$$

RWA/TA by RISK ($\sigma_{A,t}$)

Univariate Analysis

	LOW RISK	HIGH RISK	(2) minus (1)	Δ min capital (3)
	(1)	(2)	(3)	(4)
Mean RISK	2.10%	6.40%		
Mean RWA/TA	60.40	70.00	9.59***	0.77%
Median RWA/TA	60.40	70.90	10.50***	0.84%

Regressions: Impact of Portfolio Risk on RWA/TA

$$\frac{\text{RWA}_{i,t}}{\text{TA}_{i,t}} = \alpha_0 + \beta_1 \times \frac{\text{RWA}_{i,t-1}}{\text{TA}_{i,t-1}} + \beta_2 \times \text{RISK}_{i,t} + \gamma' \textbf{CONTROL} + \varepsilon_{i,t}$$

- Dynamic panel based on GMM estimator. Instrumental variable estimator proposed by Blundell and Bond (1998). The estimator uses both the lags of the explanatory variables and the data from the original level specification as instrumental variables.
- GMM used to account for the persistence in bank-level values of RWA as well as endogeneity issues when modelling the relationship between RISK and RWA.
- Controls: LOANS, NINTEREST, SIZE, ROA, DEPOSITS, BUFFER, BASELII (IRB, STANDARDIZED), SHADOWBANKING, CAPITALSTRING, REGSTRENGTH, GDPG.

GMM Regressions on RWA/TA

	(1)	(2)	(3)	(4)
Lag RWA/TA	0.777***	0.758***	0.813***	0.777***
	(20.3)	(17.46)	(22.47)	(19.48)
RISK	0.381***	0.392***	0.447***	0.390***
	(3.33)	(3.22)	(4.04)	(3.28)
LOANS	0.097**	0.100**	0.087**	0.102**
	(2.55)	(2.43)	(2.31)	(2.51)
NINTEREST	0.047	0.039	0.04	0.032
	(1.50)	(1.15)	(1.41)	(1.04)
SIZE	-0.002	0.001	-0.005	0.01
	(0.60)	(0.20)	(1.34)	(0.01)
ROA	1.004**	0.898**	0.977***	1.011***
	(2.47)	(2.31)	(2.74)	(2.64)
DEPOSITS	0.078***	0.097***	0.068***	0.093***
	(3.38)	(3.75)	(2.94)	(4.24)
BUFFER	-0.673***	-0.628***	-0.565***	-0.564***
	(4.30)	(3.62)	(3.91)	(3.65)
BASELII	-0.008			
	(1.28)			
IRB		-0.013*		-0.014*
		(1.76)		(1.65)
STANDARDIZED			0.002	-0.004
			(0.34)	(0.50)
SHADOWBANKING	0.015**	0.011	0.012*	0.013*
	(2.36)	(1.32)	(1.95)	(1.94)
CAPITALSTRING	0.004***	0.008***		0.004***
	(2.82)	(2.70)		(3.02)
Observations	1,819	1,835	1,835	1,835
Number of Banks	244	246	246	246
Bank fixed effects	YES	YES	YES	YES
Time fixed effects	YES	YES	YES	YES
m2 Statistic	-1.2	-1.3	-1.34	-1.3
Hansen J Statistic	220.22	225.99	234.88	219.17

economic impact: a 5%-increase in RISK means 0.15 of additional capital per unit of assets (capital ratio of 8%).

Basel II and the Relationship between RISK and RWA/TA

Marginal Effects using Previous Table: Changes in RWA/TA under Basel II, by RISK

	RWA/TA%		**Cap/TA%**	
	Low-risk	High-risk	Low-risk	High-risk
Basel II:	-2.36***	-0.04	-0.19***	0.00
RWA/TA= ($\beta_9 + \beta_{10}$ * RISK)	(-2.72)	(-0.60)	(-2.72)	(-0.60)
IRB:	-2.81***	-0.42	-0.22***	0.00
RWA/TA= ($\beta_{11} + \beta_{12}$ * RISK)	(-2.85)	-0.41	(-2.85)	(-0.41)
Standardized:	-2.01**	-0.28	-0.17**	0.00
RWA/TA= ($\beta_{13} + \beta_{14}$ * RISK)	(-1.77)	(-0.38)	(-2.11)	(-0.38)
H0: IRB = Standardized	0.37		0.37	
	-0.545		-0.545	

Capital Buffers

- Banks hold capital above minimum regulatory requirements (Flannery and Rangan, 2008; Brewer et al., 2008; Gropp and Heider, 2011).
- In our sample, the average buffer above capital requirements is 4.56% between 2000 and 2007.
- We test if buffers are the product of capital arbitrage or, alternatively, if banks hold higher capital holdings against riskier bank portfolios. We examine whether the risk sensitivity of capital requirements differs by the size of capital buffers which banks maintain.

Coefficient on (RISK+BUFFER*RISK), by BUFFER	
Buffer = 0%	0.722***
Buffer = 3% [25th perc]	0.568***
Buffer = 6% [75th perc]	0.414***

Additional Findings

- For banks which received capital support during the financial crisis which was at least in part government funded, the coefficient on RISK is not different from zero.
- Banks which increased their regulatory capital ratios during the crisis without government support display a risk sensitivity which is not significantly different from the rest of the sample.
- Regulatory tolerance of shadow banking varies across countries. Securitzation lowers capital requirements with a commensurate decrease transfer in asset risk.
- We find that, in countries where the shadow banking sector (=outstanding securitized assets to GDP) is large, the risk sensitivity of capital requirements is lower.

Conclusions and Policy Implications

- First, our results raise doubts over whether Basel III will be sufficient to ensure that banks are required to hold capital in line with their portfolio risk.
  - The Basel Committee (2011) suggests a factor of 1.23 as an approximation of the average increase in RWA associated with Basel III (relative to Basel II).
  - Even under a min. capital ratio of 13%, banks in our sample will only be required to hold, on average, 1.95% of additional capital per unit of assets. Need for a more profound overhaul.
- Second, our results suggest that any tightening of capital regulations also needs to involve supervisory attempts to further regulate the shadow banking system.

Thank you.