

Risk taking by Banks: What did we know and when did we know it?

Sugato Bhattacharyya
Amiyatosh Purnanandam

Ross School of Business
University of Michigan

A *Common* Story of the Crisis

- ▶ Advent of cost-effective securitization led to transfer of risk from originators to investors.
- ▶ Led to *excessive* risk-taking by banks during the pre-crisis period.
- ▶ And ultimately large defaults.

Key Question

- ▶ Did banks take excessive risks?
 - ▶ Magnitude of collapse proves excessive risk taking.
 - ▶ Everybody underestimated risk in the boom years.
- ▶ How do we disentangle these competing views?
- ▶ Our approach: Focus on contemporaneous market beliefs.
 - ▶ Markets' assessment of risk.
 - ▶ Markets' assessment of earnings quality.
- ▶ Our findings:
 - ▶ Banks' market beta more than doubled from 2000 to 2006.
 - ▶ Banks' idiosyncratic volatility came down considerably.
 - ▶ Earnings quality of high mortgage banks became suspect.

Effects of Risk-taking

- ▶ Did the risk-taking benefit anyone?
- ▶ Risk changes are driven by mortgage lending and securitization activities.
- ▶ High mortgage exposure did result in higher short term earnings.
- ▶ CEO compensation - especially short term bonus - increased significantly.
- ▶ Share prices suggest evidence of *excessive* risk-taking.

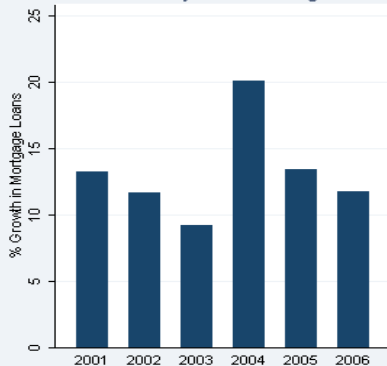
Data & Sample

- ▶ Comprehensive sample of publicly traded U.S. commercial banks.
 - ▶ Sample ranges from 233 to 278 banks from 2000 to 2006.
- ▶ Bank-level data from December call reports.
- ▶ Stock data at holding company level (source: CRSP).
- ▶ Other data sources: IBES, Executive Compensation Database.

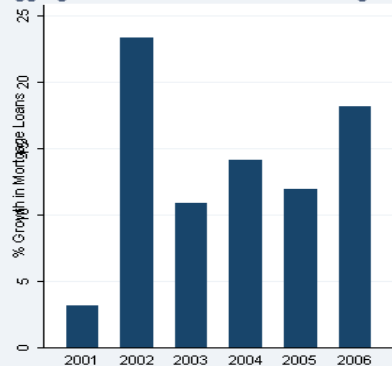
Growth in Mortgage Lending

% Growth in Mortgages, by year

Bank-by-Bank Average

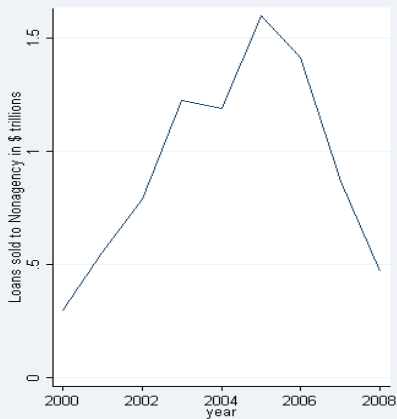


Aggregate Growth Rate for the Banking Sector

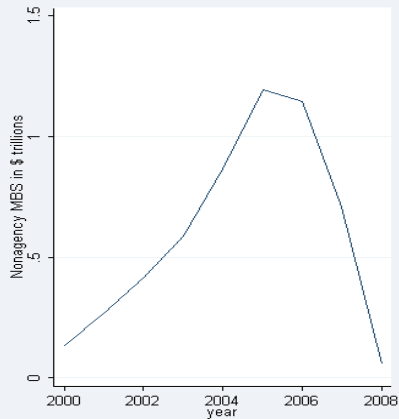


1-4 family residential loans

Securitization Activity



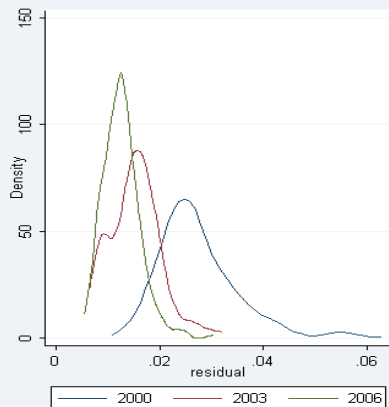
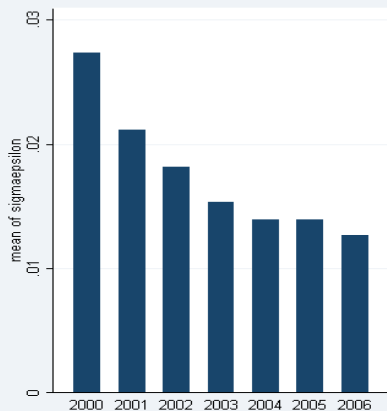
Based on annual HMDA data.



Based on Inside Mortgage Finance.

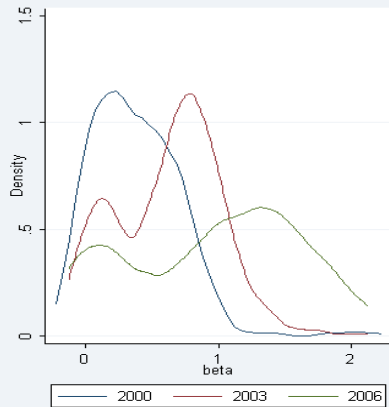
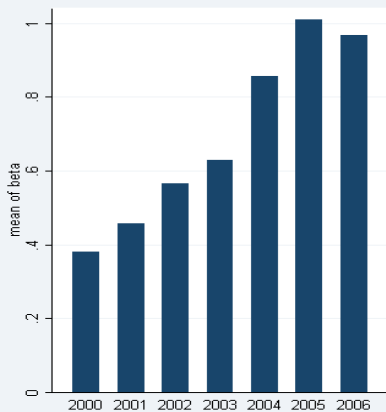
Idiosyncratic Risk

Std Dev of CAPM Residual, by year



Systematic Risk

CAPM Beta, by year



Interpretations

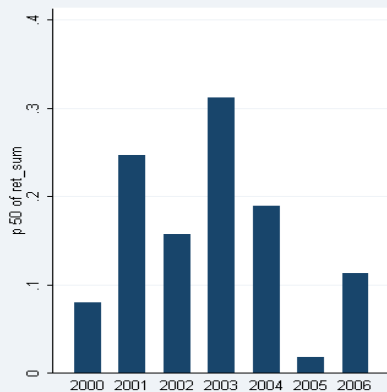
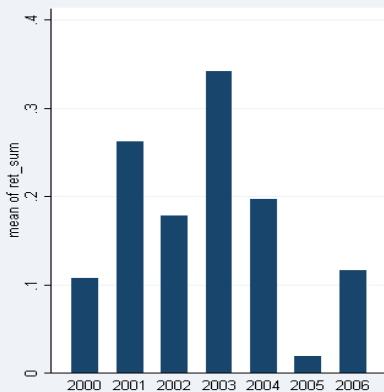
- ▶ Idiosyncratic risk reduction consistent with securitization activity.
- ▶ Increase in systematic risk can come from:
 - ▶ Lending to riskier borrowers (no doc, low FICO).
 - ▶ Accepting riskier terms (high LTV, teaser rates).
 - ▶ Increased correlation across geographical regions.
- ▶ Question: did markets associate mortgage activity with these changes?

Mortgages and Risk

	CAPM Beta				Idiosyncratic Risk			
	Model 1		Model 2		Model 3		Model 4	
	Estimate	<i>t</i> -stat	Estimate	<i>t</i> -stat	Estimate	<i>t</i> -stat	Estimate	<i>t</i> -stat
<i>mort/ta</i>	-1.3372	(-2.54)	-0.6600	(-1.56)	0.0283	(3.80)	0.0187	(3.09)
<i>peak</i>	0.0841	(2.36)			-0.0021	(-3.68)		
<i>mort/ta * peak</i>	0.5577	(3.02)			-0.0066	(-2.36)		
<i>logta</i>	1.4470	(2.04)	1.5500	(2.44)	0.0026	(0.32)	0.0007	(0.10)
<i>logta</i> ²	-0.0311	(-1.36)	-0.0423	(-2.07)	-0.0003	(-1.22)	-0.0001	(-0.64)
<i>cil/ta</i>	0.0726	(0.12)	0.6391	(1.20)	0.0337	(3.06)	0.0252	(2.52)
<i>td/ta</i>	0.6451	(1.68)	0.2041	(0.61)	-0.0069	(-1.31)	0.0006	(0.14)
<i>ddfrac</i>	-0.0015	(-0.00)	0.0788	(0.14)	0.0148	(1.76)	0.0130	(1.73)
<i>after</i>			0.2927	(5.16)			-0.0049	(-5.52)
<i>mort/ta * after</i>			0.4527	(1.73)			-0.0083	(-2.16)
<i>R</i> ²	0.319		0.390		0.397		0.481	
<i>N</i>	1835		1835		1835		1835	

Annual Stock Returns

Mean and Median Annual Returns



Monthly returns cumulated over the year

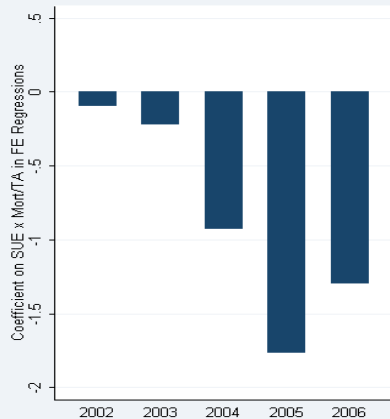
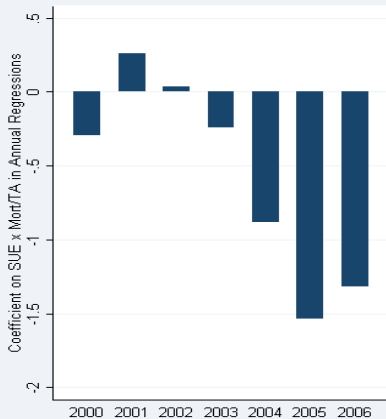
Mortgage and Stock Returns

	Model 1		Model 2		Model 3		Model 4	
	Estimate	<i>t</i> -stat	Estimate	<i>t</i> -stat	Estimate	<i>t</i> -stat	Estimate	<i>t</i> -stat
<i>mort/ta</i>	-0.0180	(-0.22)	-0.0271	(-0.42)	0.3777	(1.45)	0.3052	(1.24)
<i>after</i>	0.0233	(1.18)			0.0913	(3.45)		
<i>mort/ta * after</i>	-0.2262	(-2.20)			-0.2638	(-2.10)		
<i>logta</i>	-0.0549	(-1.81)	-0.0561	(-1.85)	0.0039	(0.02)	0.0198	(0.11)
<i>logta</i> ²	0.0009	(0.99)	0.0010	(1.03)	-0.0056	(-0.88)	-0.0054	(-0.87)
<i>eps</i>	0.0324	(4.80)	0.0319	(4.68)	0.0599	(4.28)	0.0598	(4.32)
<i>cil/ta</i>	-0.0618	(-0.91)	-0.0336	(-0.49)	0.1086	(0.35)	0.1132	(0.38)
<i>td/ta</i>	-0.0196	(-0.30)	-0.0258	(-0.40)	-0.3518	(-1.67)	-0.2900	(-1.39)
<i>dd/ta</i>	-0.0484	(-0.47)	-0.0488	(-0.47)	-0.4115	(-1.23)	-0.4489	(-1.36)
<i>peak</i>			0.0599	(3.40)			0.0849	(4.48)
<i>mort * peak</i>			-0.2502	(-2.72)			-0.2645	(-2.69)
<i>R</i> ²	0.033		0.034		0.045		0.047	
<i>N</i>	1836		1836		1836		1836	

Mortgage and Accounting Performance (EPS)

	Model 1		Model 2		Model 3		Model 4	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
<i>peak</i>	-0.0837	(-1.58)	-0.0829	(-1.62)				
<i>mort/ta * peak</i>	0.7007	(2.61)	0.6924	(2.59)				
<i>mort/ta</i>	-0.1106	(-0.30)	0.3978	(0.70)	-0.1450	(-0.36)	0.4040	(0.69)
<i>logta</i>	0.4458	(1.50)	-0.1297	(-0.17)	0.4732	(1.59)	-0.0880	(-0.12)
<i>logta²</i>	-0.0051	(-0.53)	0.0122	(0.49)	-0.0060	(-0.62)	0.0108	(0.43)
<i>cil/ta</i>	-0.7275	(-1.43)	-1.3745	(-1.86)	-0.7813	(-1.50)	-1.4444	(-1.93)
<i>td/ta</i>	0.7179	(1.86)	0.2304	(0.49)	0.6666	(1.73)	0.1506	(0.32)
<i>dd/ta</i>	0.1926	(0.33)	-1.0049	(-1.43)	0.2163	(0.37)	-0.9860	(-1.40)
<i>after</i>					-0.0855	(-1.12)	-0.0741	(-0.95)
<i>mort * after</i>					0.5877	(1.58)	0.5597	(1.47)
<i>R²</i>	0.1969		0.1527		0.1959		0.1504	
<i>N</i>	1836		1836		1836		1836	
Fixed Effects	No		Yes		No		Yes	

Earnings Response Coefficient



Coefficient estimates from regression of CAR on SUE x mort/TA

Story So Far

- ▶ Bank stocks in general did well during this period.
- ▶ Relatively speaking, high mortgage banks did not do as well.
- ▶ Their earnings performance, however, was significantly better.
- ▶ But the market did not consider their earnings to be credible/sustainable.
- ▶ Was the market right?

ERC and Ex Post Defaults

	Model 1		Model 2	
	Estimate	<i>t</i> -stat	Estimate	<i>t</i> -stat
<i>ERC</i>	-0.0037	(-2.40)		
<i>meanlogta</i>	0.0039	(4.30)	0.0038	(4.22)
<i>meanmortta</i>	-0.0083	(-0.64)	-0.0071	(-0.56)
<i>ERC * mortta</i>			-0.0032	(-2.01)
R^2	0.092		0.086	
<i>N</i>	241		241	

EPS and CEO Compensation: Before and After 2000

	Total Comp		Total Comp		Bonus		Bonus	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
<i>logassets</i>	0.6928	(11.72)	0.6677	(8.46)	-0.0484	(-0.21)	-0.4785	(-1.39)
<i>return</i>	-0.0040	(-0.24)	-0.0052	(-0.29)	0.6308	(4.44)	0.6164	(4.57)
<i>eps</i>	0.0875	(2.71)	0.0736	(2.02)	0.9931	(3.67)	0.7870	(2.98)
<i>after</i>			0.0369	(0.52)			0.6492	(1.60)
<i>eps * after</i>			0.0620	(0.76)			0.9143	(1.73)
R^2	0.309		0.310		0.074		0.083	
N	1059		1059		1059		1059	

CEO Compensation and Mortgage Related Earnings

	Model 1 EPS		Model 2 Total Comp		Model 3 Bonus		Model 4 Bonus/Total	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
<i>return</i>	0.1625	(3.76)	-0.0335	(-1.05)	0.4114	(1.44)	0.0226	(2.35)
<i>logta</i>	0.2110	(1.96)	0.1142	(1.02)	-3.2073	(-2.73)	-0.0613	(-2.21)
<i>sigmaepsilon</i>	-32.7149	(-3.54)						
<i>epshat</i>			0.2806	(2.08)	3.4281	(2.38)	0.0833	(2.35)
R^2	0.172		0.053		0.091		0.080	
N	452		452		452		452	

Conclusions

- ▶ Big changes in risk profiles of U.S. commercial banks from 2000 to 2006.
- ▶ These changes can be attributed to residential mortgage exposure/securitization.
- ▶ Market performance reflected excessive risk taking.
 - ▶ Relatively lower returns.
 - ▶ Poor earnings response coefficients.
- ▶ Ease of securitization enhanced banks' earnings generation technology.
- ▶ Compensation contracts did not adequately adjust to this change.
- ▶ Evidence consistent with a picture of governance failure.