

# **CMBS Subordination, Ratings Inflation, and the Crisis of 2007-2009**

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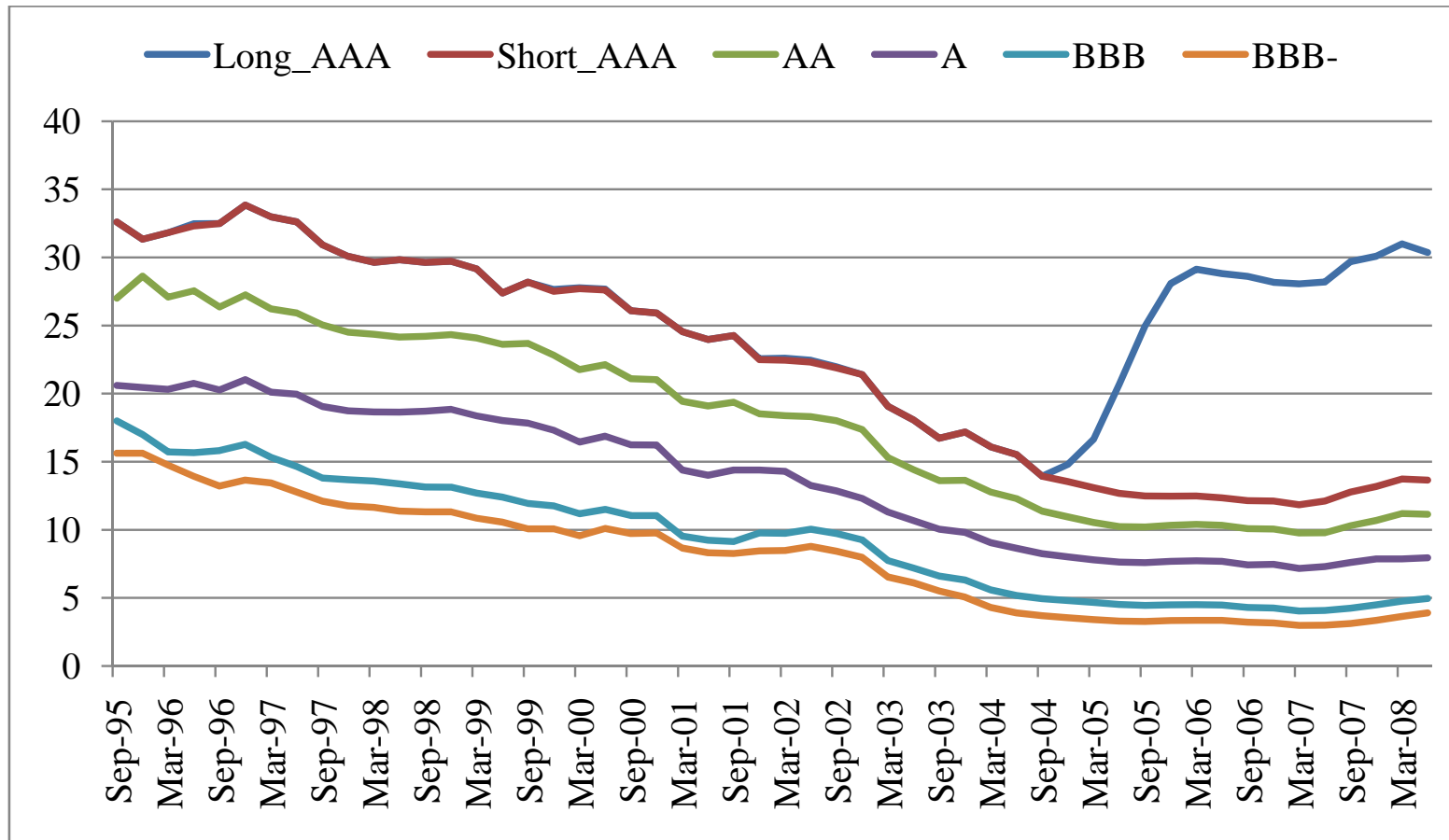
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Stability and Risk Control in Banking,  
Insurance and Financial Markets

## Overview

- ▶ An empirical analysis of the role of the rating agencies in the financial crisis.
- ▶ Focus on the Commercial Mortgage Backed Securities (CMBS) market.
  - We use detailed origination and performance data on the loans, the CMBS bonds, and similarly rated RMBS bonds;
  - We apply reduced-form and structural modeling strategies to test for regulatory capital arbitrage and ratings inflation in CMBS;
  - We quantify the CMBS related risk-based capital savings and expected losses due to these policies.
- ▶ We conclude that the performance of the CMBS market and the actions of its investors are consistent with distortions associated with regulatory arbitrage facilitated by the rating agencies and bank regulators.

# CMBS Conduit Subordination (587 Deals): 1995 - 2008



# Advantages of the CMBS Market for Evaluating Rating Agency Performance

- ▶ There are fewer confounding factors than in other securitized bond markets.
  - There is detailed origination and performance data on the CMBS tranches and the loans underlying them.
  - Unlike the residential RMBS market, all agents in the CMBS market can reasonably be viewed as sophisticated, informed investors (90% held by Insurance Co., mutual funds, 12 commercial banks, and GSEs).
  - Unlike the RMBS market, there were no major changes in the underlying market for commercial loans over this period.
  - Regulatory changes in the CMBS market in the years prior to the crisis significantly increased incentives for institutions to hold highly rated CMBS.

## Empirical Literature

### ▶ Coval, Jurek, and Stafford (2008)

- Credit ratings were systematically downwardly biased due to naive extrapolation of the default experience from the recent past.
- Yields to AAA too low and yields to BBB- too high.

### ▶ Griffin and Tang (2009)

- Applied a “rating-agency-like” CDO credit model – found that the actual size of the AAA tranche in each deal was, on average, over 12% larger than the allocation allowed by the model.

### ▶ Ashcraft, Goldsmith-Pinkham, and Vickery (2009)

- Observably riskier deals significantly under-performed relative to their initial subordination levels.
- Ratings inflation was associated with increased opacity (number of no-doc loans).

# Theoretical Literature 1

- ▶ Issuer-pays structure leads to conflicts of interest.
  - Bolton, Freixas, and Shapiro (2009) – naive investors take ratings at face value.
  - Skreta and Veldkamp (2009) – investors are fooled by the issuers practice of revealing only the highest rating as the result of “ratings shopping.”
  - Sangiorgi, Sokobin, and Spatt (2009) – “ratings shopping” provides an equilibrium interpretation for notching (selection leads to winners curse).

## Theoretical Literature 2

- ▶ Rational expectations framework with regulatory distortions – Opp, Opp, and Harris (2010)
  - Rating agencies alter their information acquisition and disclosure policy when ratings are used for regulatory purposes (e.g. bank capital requirements).
  - Issuer pays model without regulatory arbitrage leads to fully informative rating agency information gathering and disclosure.
  - Large regulatory distortions may lead to a complete breakdown of delegated information acquisition by rating agencies.
  - Regulatory arbitrage more likely to occur with complex securities, where information costs are high and regulatory benefits are valuable.

## Risk-Based Capital (RBC) Requirements for Commercial Banks (1/2002) and Insurance Companies (2001)

► Regulatory policy changes:

	Commercial Banks				Life Insurance Companies		
	Rating	Risk Weight <sup>1</sup>	Capital Requirement	Risk Based Capital Requirement per \$1 of Book Value	Asset Class	Factor <sup>2</sup>	Risk Based Capital Requirement per \$1 of Book Value
	2002–2008				2001–2008		
CMBS Bonds							
a) Investment Grade							
	AAA	20% <sup>3</sup>	8%	\$0.016	1	0.4%	\$0.004
	AA	20%	8%	\$0.016	1	0.4%	\$0.004
	A	50%	8%	\$0.040	1	0.4%	\$0.004
	BBB	100%	8%	\$0.080	2	1.3%	\$0.013
b) Non-Investment Grade	BB	200%	8%	\$0.160	3	4.6%	\$0.046
Commercial Real Estate Mortgages	BBB	100%	8%	\$0.080		2.60%	\$0.0260
	1997–2001				1997–2000		
CMBS Bonds							
a) Investment Grade							
	AAA	100%	8%	\$0.080	1	0.3%	\$0.003
	AA	100%	8%	\$0.080	1	0.3%	\$0.003
	A	100%	8%	\$0.080	1	0.3%	\$0.003
	BBB	100%	8%	\$0.080	2	1.0%	\$0.010
b) Non-Investment Grade	BB	200%	8%	\$0.160	3	4.0%	\$0.040
Commercial Real Estate Mortgages	BBB	100%	8%	\$0.080		2.25%	\$0.0225



## Risk-Based Capital Savings from Holding AAA CMBS

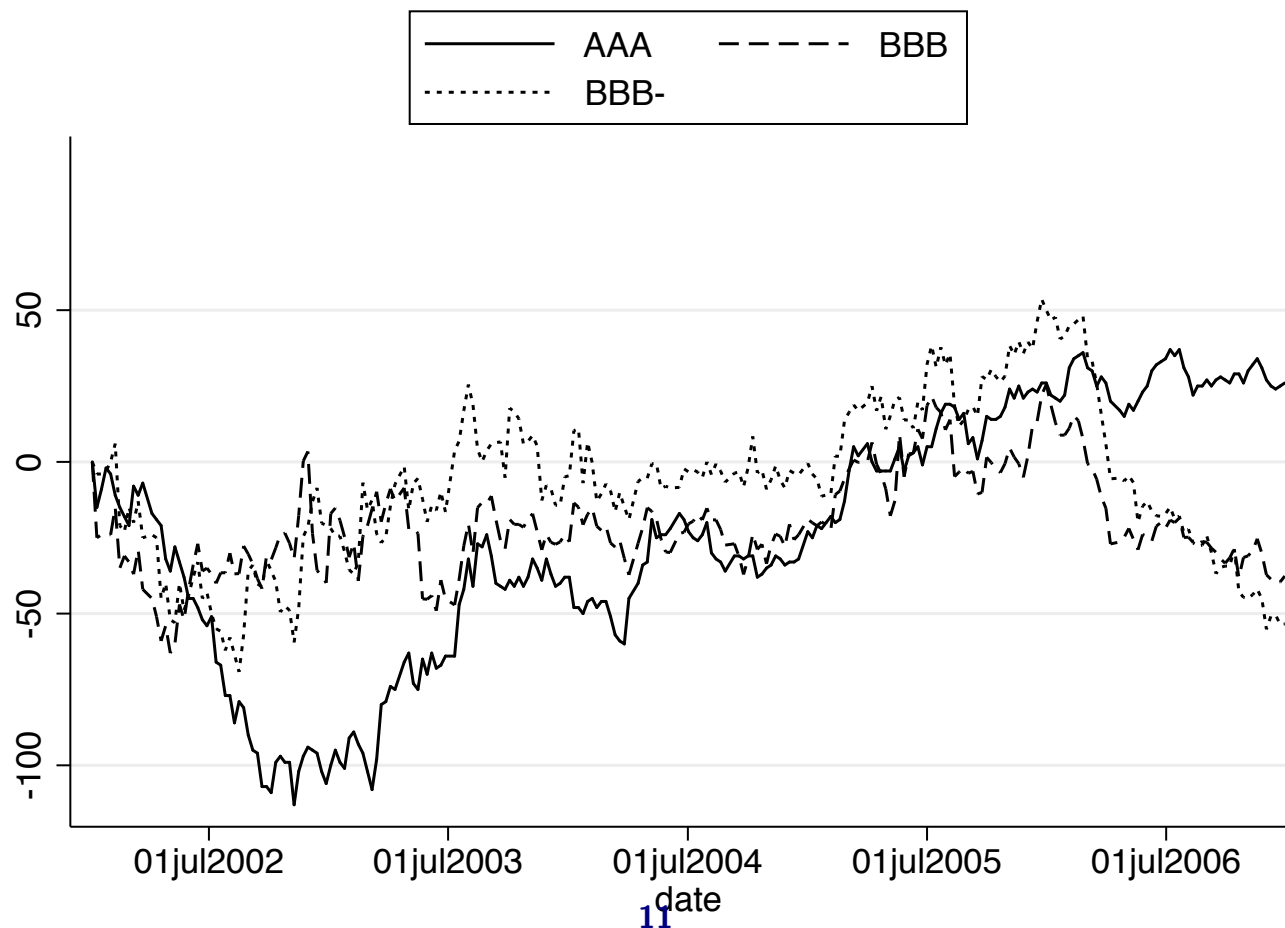
	Bank RBC (\$ billions)	Insurance RBC (\$ billions)
AAA-CMBS Held in 2007	35.81	188.50
2007 Risk-Based Capital required for AAA-CMBS	0.570	0.750
2007 Risk-Based Capital required for Holding Equivalent as Commercial Real Estate Mortgages	2.86	4.90
Capital Savings	2.29	4.15

## Reduced-form Tests for Regulatory Arbitrage

- ▶ Exploit the natural experiment induced by the RBC rule change.
- ▶ Questions we seek to address:
  1. Is there a spread differential between AAA CMBS yields and AAA corporate bond yields following the loosening of CMBS capital requirements?
  2. Were there shifts in overall risk perceptions for AAA-rated paper, or does the CMBS market exhibit unique performance dynamics?
  3. Were the decreases in subordination levels (with corresponding increase in the proportion of AAA-rated CMBS), accompanied by any change in the quality of the underlying loans?

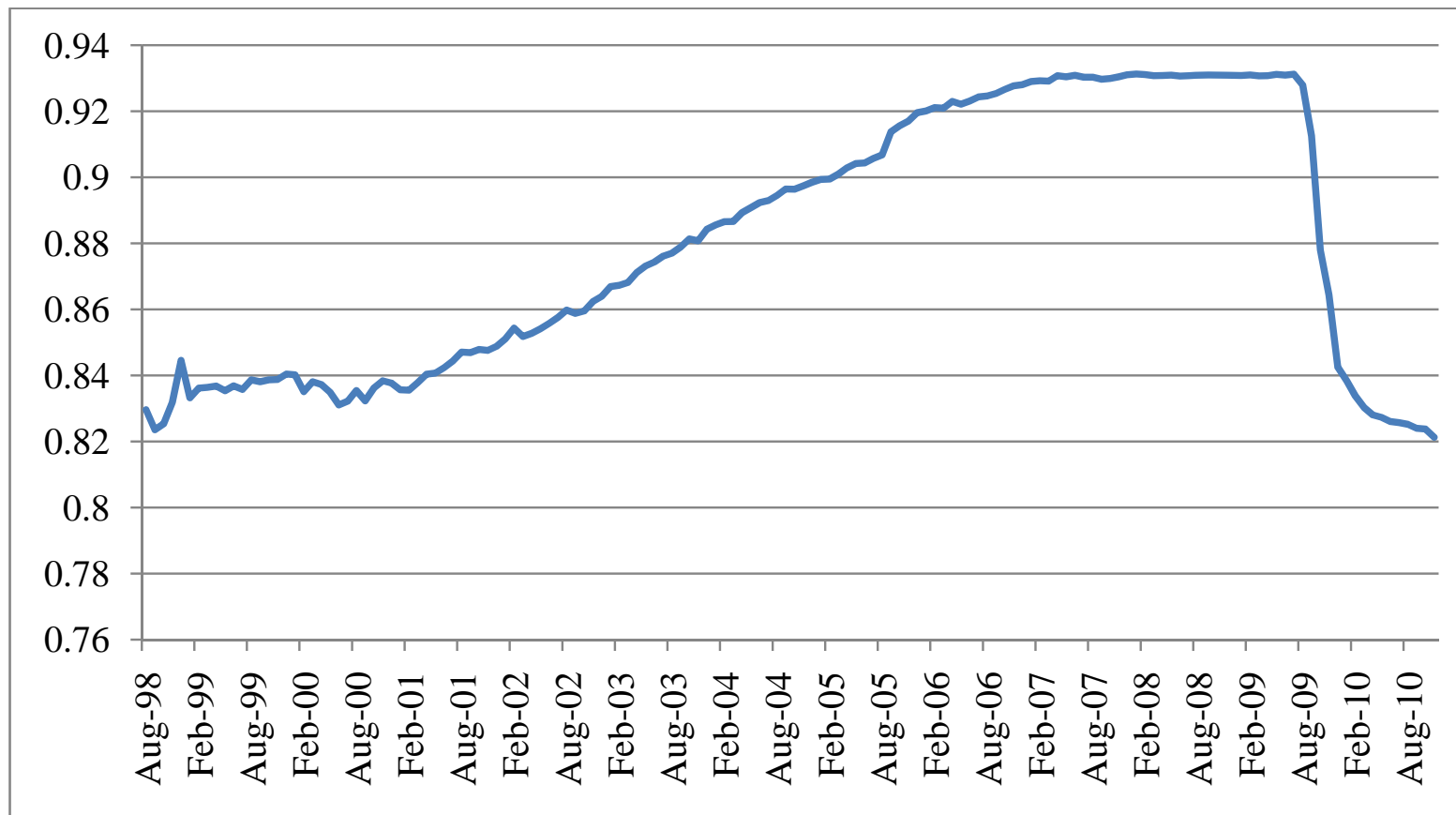
## CMBS to Corporate Bond Yields – AAA Effect is Consistent with Demand Shock from Policy Change

- ▶ The figure plots the difference (in basis points) between CMBS and corporate-bond yields for ratings AAA, BBB and BBB- Prices.



## Growth in AAA-Rated CMBS: Effects of Subordination and Upgrading

- ▶ AAA share of the stock of CMBS grew to 93.5% by 2/2007.



## Logit Analysis of RMBS and CMBS Comparative Rates of AA to AAA Upgrades: 1998 through 2009

Parameter	Coefficient Estimate	Standard Error	Coefficient Estimate	Standard Error
Intercept	-3.738***	0.023	-3.470***	0.023
Observation years 1998-2000	-2.273***	0.184	-2.490***	0.184
Observation year = 2001	-1.002***	0.161	-1.046***	0.161
Observation year = 2002	-0.619***	0.093	-0.753***	0.094
Observation year = 2003	-0.668***	0.080	-0.779***	0.080
Observation year = 2004	-1.382***	0.080	-1.457***	0.080
Observation year = 2005	-1.930***	0.084	-1.949***	0.084
Observation year = 2006	-2.261***	0.090	-2.213***	0.090
Observation year = 2007	-2.366***	0.107	-2.250***	0.107
Observation year = 2008	-4.876***	0.317	-5.144***	0.317
Observation year = 2009	-6.692***	0.707	-6.960***	0.707
CMBS × Observation Years 1998-2000	0.384	0.366	0.723**	0.369
CMBS × Observation Year = 2001	1.060***	0.219	1.125***	0.220
CMBS × Observation Year = 2002	1.418***	0.132	1.549***	0.132
CMBS × Observation Year = 2003	1.92***	0.104	1.978***	0.104
CMBS × Observation Year = 2004	3.341***	0.089	3.468***	0.089
CMBS × Observation Year = 2005	4.125***	0.088	4.118***	0.088
CMBS × Observation Year = 2006	4.904***	0.091	4.820***	0.091
CMBS × Observation Year = 2007	5.180***	0.107	4.987***	0.107
CMBS × Observation Year = 2008	7.883***	0.317	7.883***	0.317
CMBS × Observation Year = 2009	9.607***	0.707	9.607***	0.707
Observation Year × Vintage Fixed Effects	No		Yes	
Likelihood	49307.647***	20 df	52768.342***	28 df
Number of Observations	468,788		468,788	

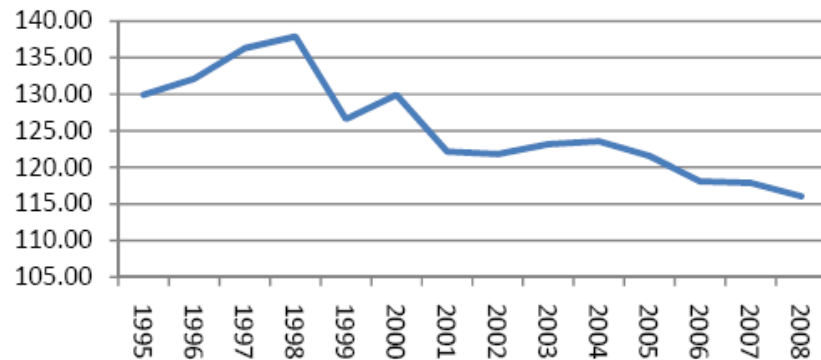
$\chi^2$  tests of statistical significance: \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Structural Modeling Evidence – A Robustness Check on Reduced-Form Evidence

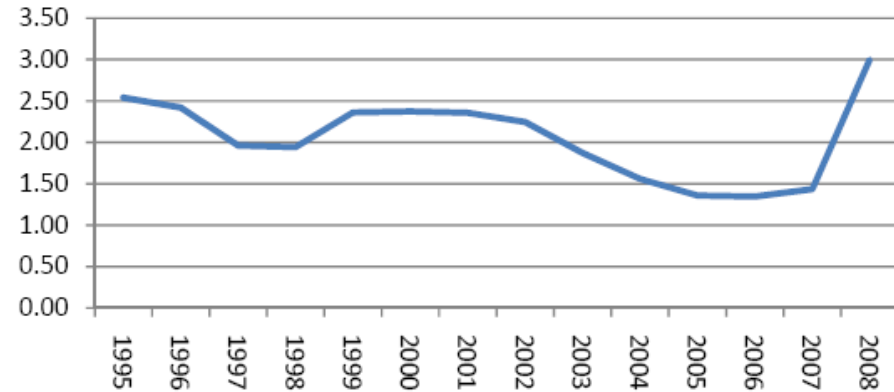
- ▶ Recap of reduced-form evidence (CMBS bond performance):
  1. Consistent with a regulatory-arbitrage explanation, spreads for AAA CMBS were significantly lower than AAA corporate bonds starting in 2002.
  2. Likelihood of an upgrade from AA to AAA was significantly higher in the CMBS market than in the RMBS market.
- ▶ Exploit a structural modeling framework testing for structural shifts in loan contracting (CMBS loan characteristics):
  1. Were there changes in loan quality?
  2. Were there changes in the pool compositions?
  3. Were there changes in loan pricing at origination?

# Changes in Loan Underwriting Quality

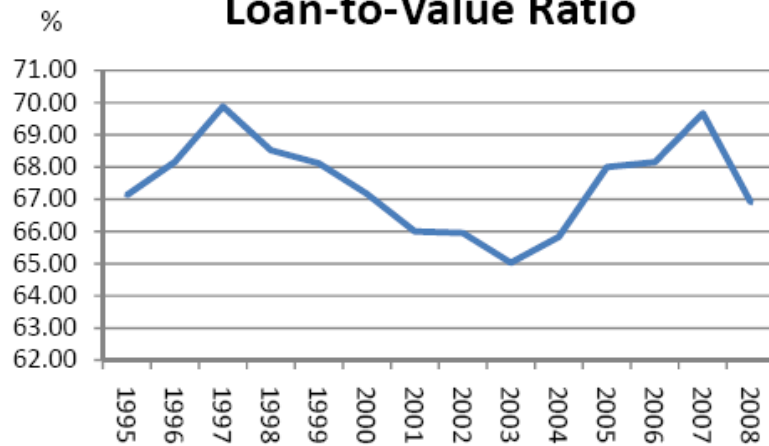
### Payout Term



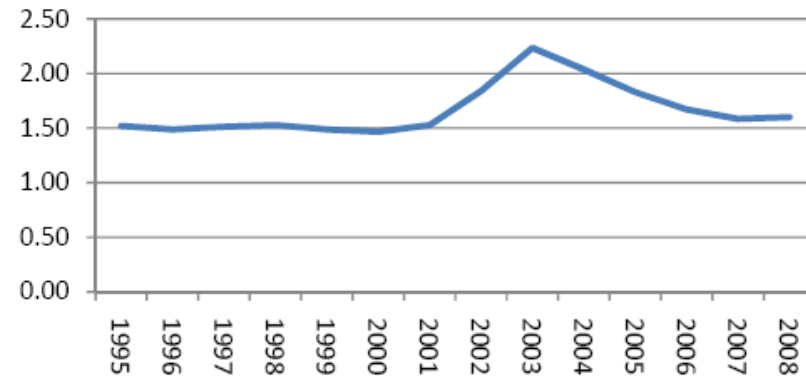
### Spread to 10-Year Treasury



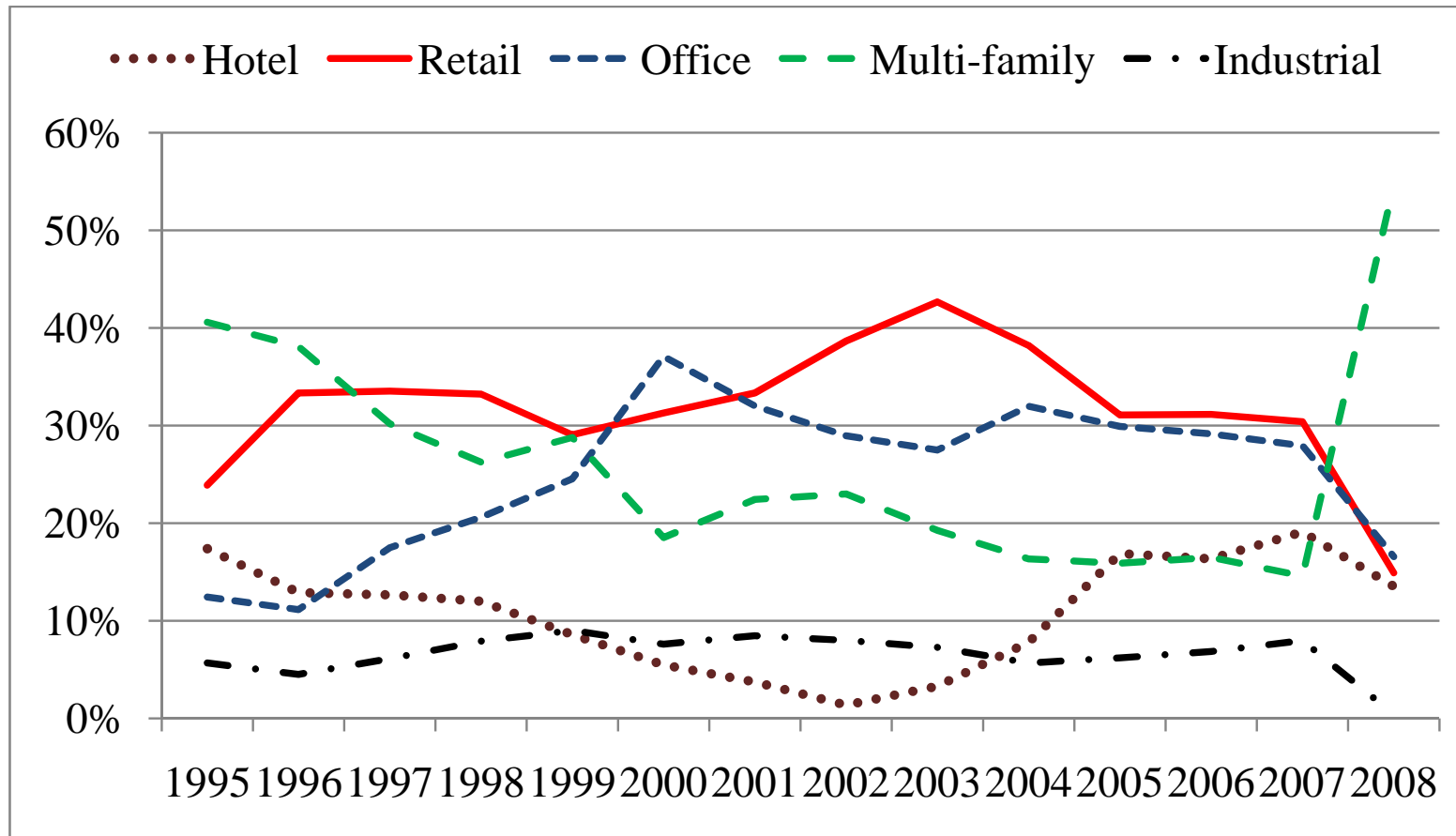
### Loan-to-Value Ratio



### Debt Service Coverage Ratio



## Change in Loan Composition by Property Types





# Mortgage Valuation: Bets on Commercial Real Estate Volatility

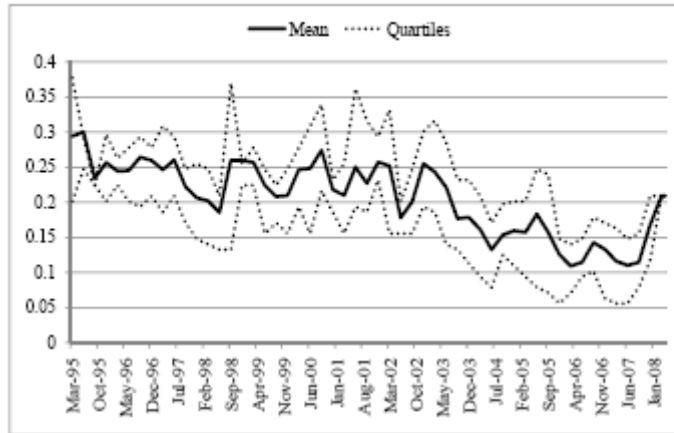
- ▶ Market expectations for real estate volatility are embedded in mortgage contract terms:
  - *Volatility*  $\longrightarrow$  *Default probability*  $\longrightarrow$  *Mortgage value*
- ▶ Given a two-factor valuation model, we can back out a property specific implied volatility from the mortgage default option.
  - Assume competitive lenders issue mortgages at par.
  - Assume mortgage coupon spread reflects default risk.

## Solving for Implied Volatility

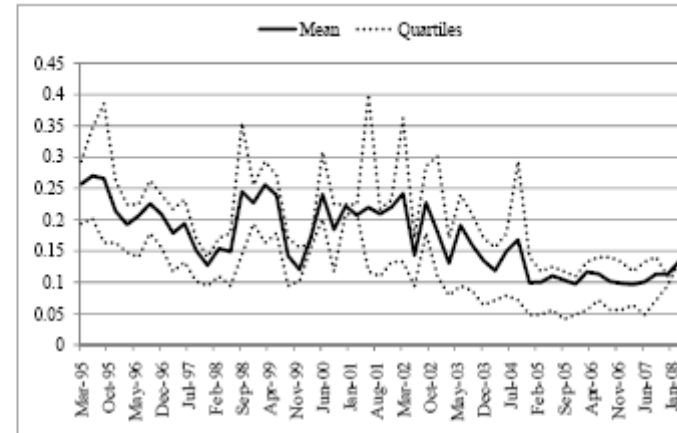
- ▶ Origination data on mortgage contract terms:
  - Loan-level CMBS data, 516 CMBS deals, 51,677 loans all from Trepp LLC.
  - Originated between 1995 and 2008
  - Coupon, term, amortization period, prepayment lockout period, LTV.
  
- ▶ Solve for the volatility that sets the mortgage price to par.

	Number of Observations	Mean (%)	Standard Deviation (%)
Retail	18,399	18.842	5.526
Multifamily	15,129	17.051	5.392
Office	9,778	21.478	5.973
Industrial	4,675	20.619	5.250

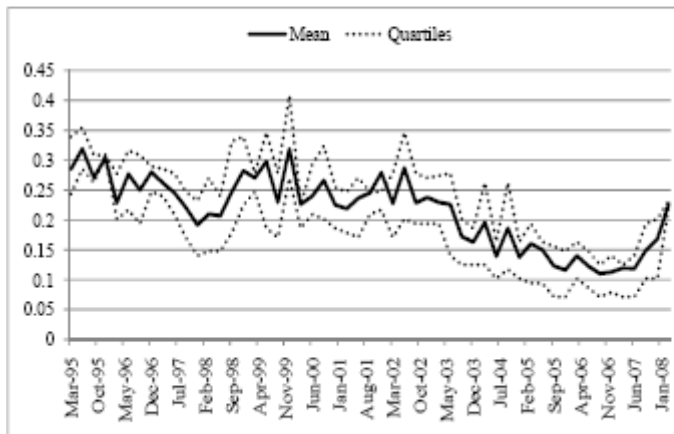
# Implied Volatility by Property Type



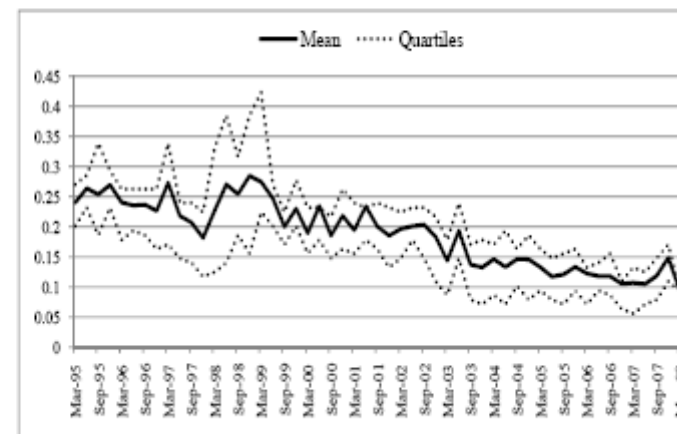
(a) Industrial



(b) Multifamily

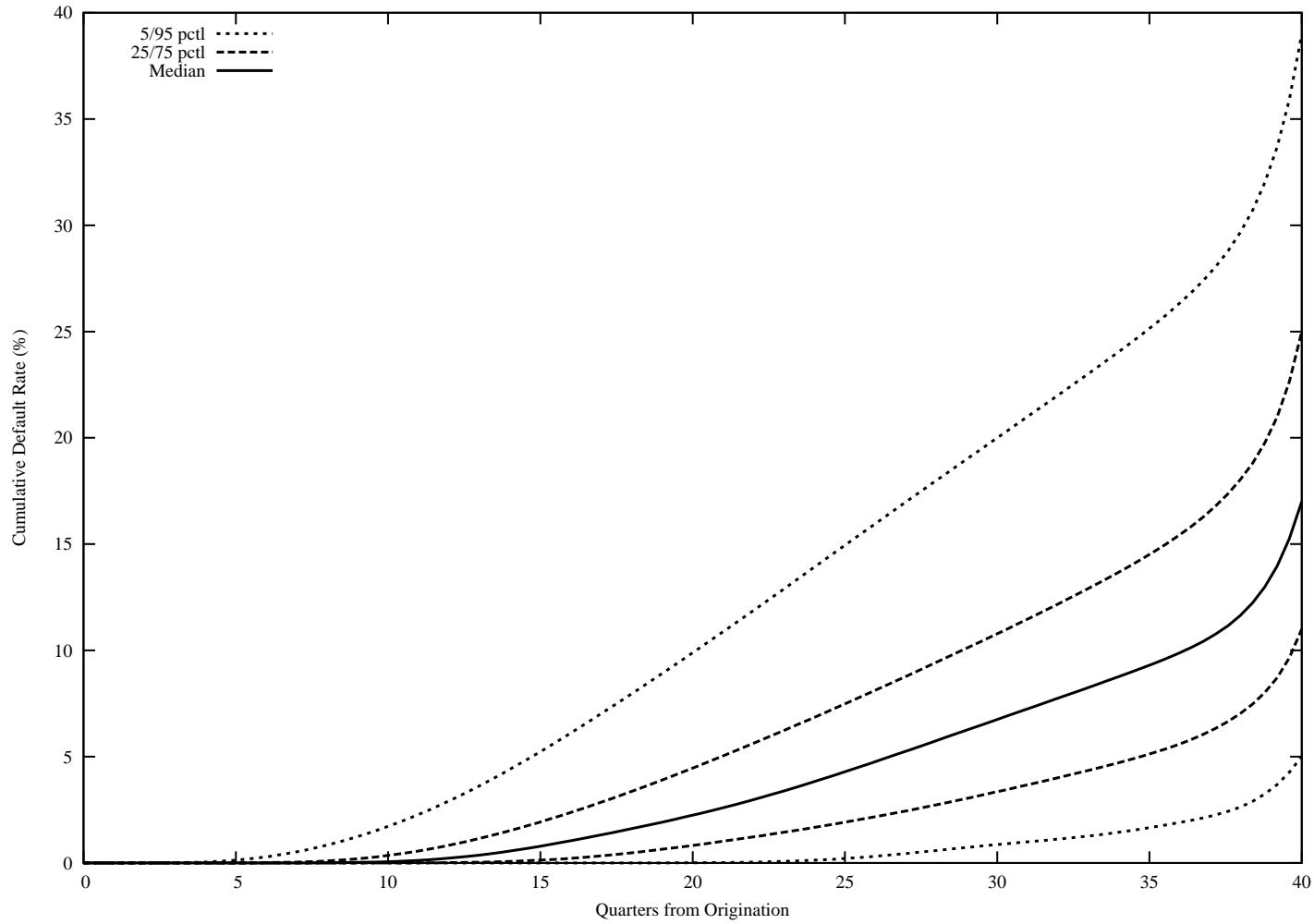


(c) Office

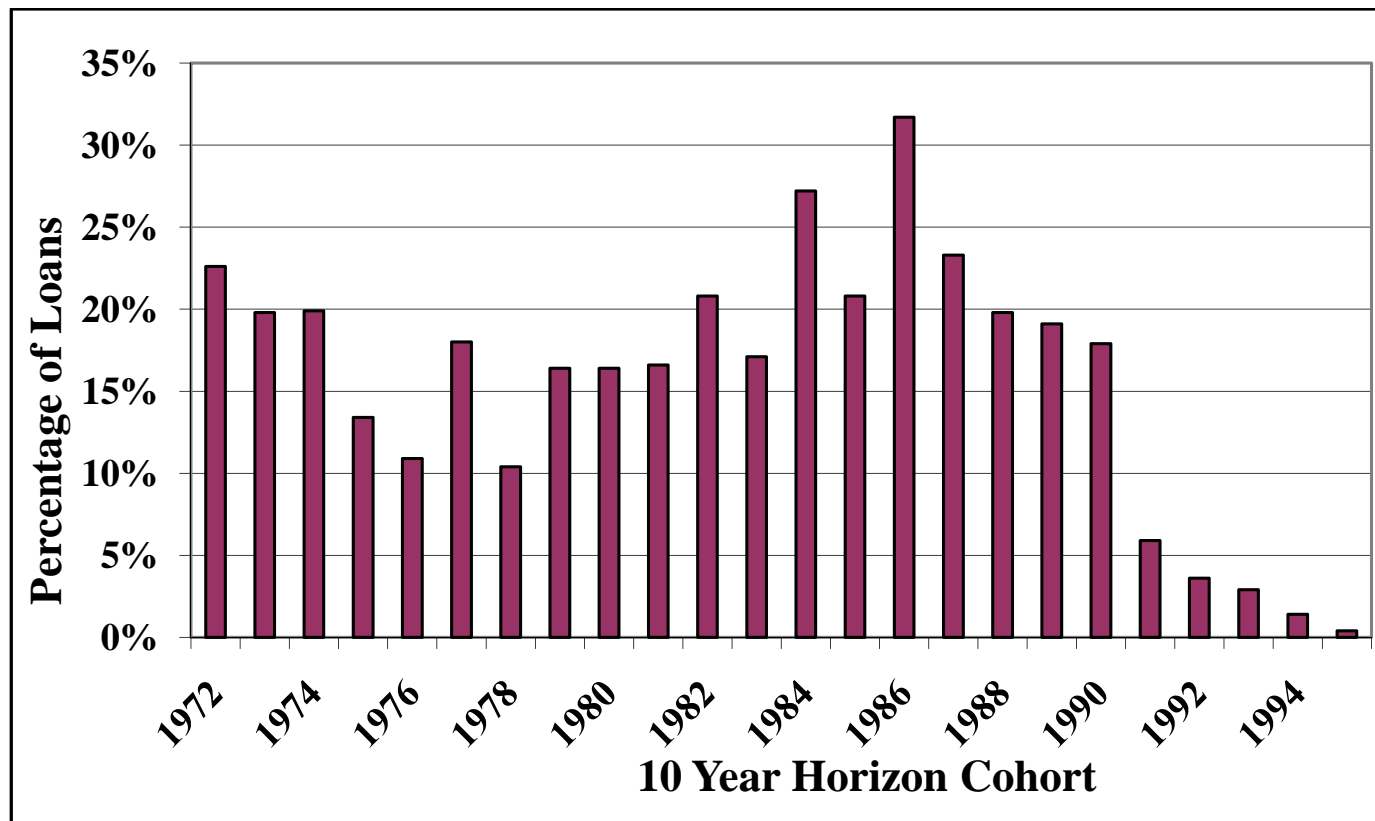


(d) Retail

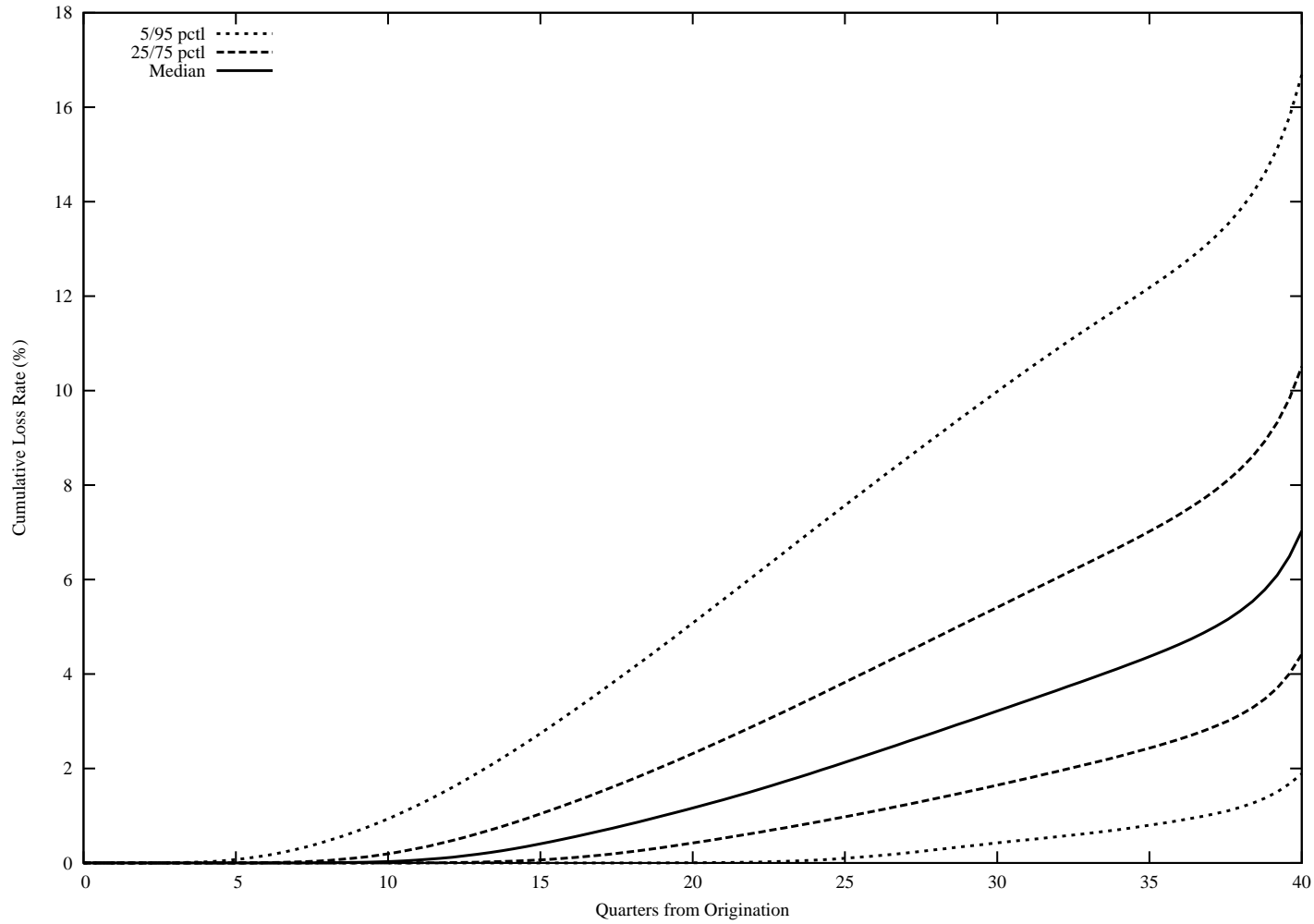
# Distribution of Simulated Cumulative Default Rates



## Realized Commercial Real Estate Default Rates in Insurance Company Portfolios (Esaki, 2003)



# Distribution of Simulated Cumulative Loss Rates



## CMBS Default Rates Required for Loss

- At these loss levels would expect BBB losses for the 2006 and 2007 vintages:

2006 CMBS Conduit Pools - Number of Pools = 70	
Short-Senior AAA	28.4
Long-Junior AAA	12.4
AA	10.4
A	7.8
BBB	4.6
BBB-	3.3
2007 CMBS Conduit Pools - Number of Pools = 65	
Short-Senior AAA	28.5
Long-Junior AAA	13.6
AA	10.5
A	8.0
BBB	4.7
BBB-	3.2

## Summary and Conclusions

- ▶ Ratings inflation has been hard to pin down due to the presence of many other confounding factors in bond markets other than CMBS.
  - CMBS investors are sophisticated.
  - There were no significant changes in commercial loan characteristics or pricing from 1995 through 2007.
  - Expected defaults are in line with levels observed over almost the whole of the 40-year period before the crisis.
- ▶ Trends in the CMBS market are consistent with regulatory arbitrage following the loosening of risk-based capital requirements in 2002:
  - Significant decreases in the subordination levels for senior bonds.
  - Sophisticated investors were willingly to pay high prices for the AAA CMBS bonds.
  - Elevated rates of upgrading CMBS bonds relative to similarly rated RMBS bonds (inconsistent with overall shifts in risk perceptions for AAA labels).
- ▶ **Conclusion:** Regulatory-capital arbitrage appears to have driven CMBS investment strategies prior to the financial crisis – these strategies increased the leverage of these firms and their susceptibility to even minor shocks to fundamentals.