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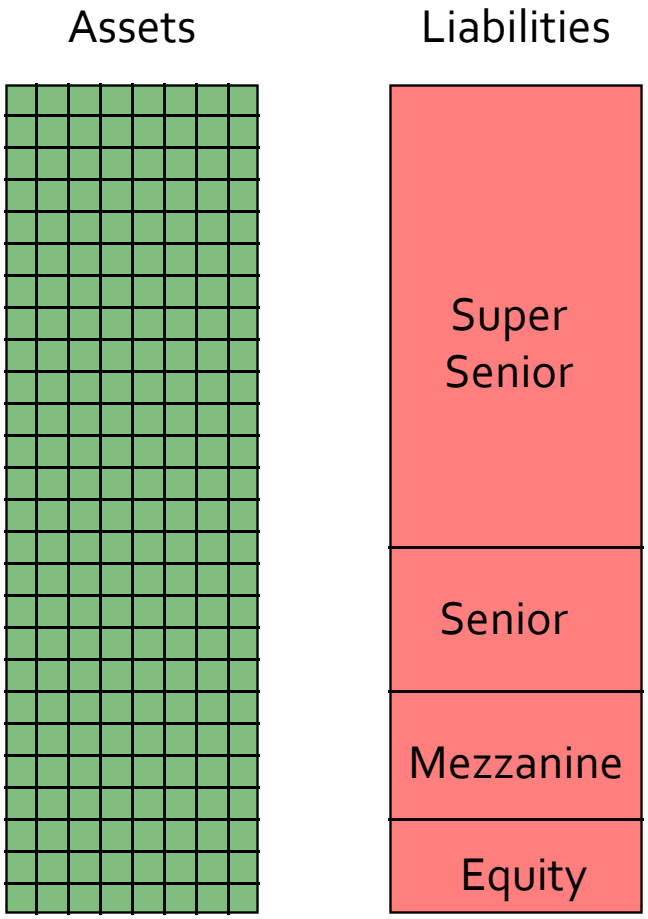
The Past as Prologue: Lessons from the Crisis in Mortgage Securitization

Today's Talk

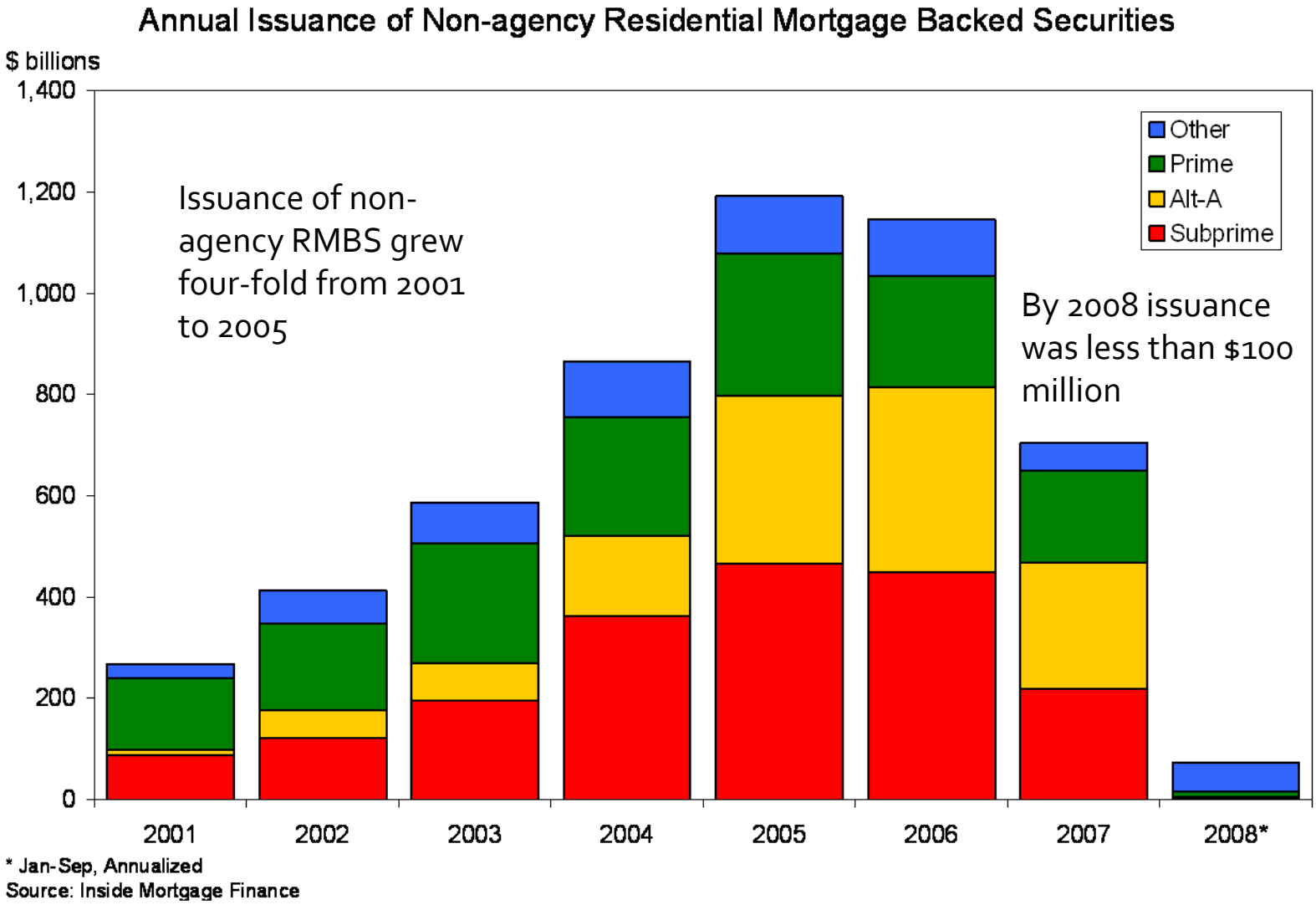
- A brief overview of the crisis in mortgage-backed structured securities
- **Lesson 1**: Ratings focused on the wrong risk metrics
  - Credit ratings are typically designed to reflect unconditional default probabilities or expected losses
  - Structured credit products leverage exposure to systematic risk
- **Lesson 2**: Structured finance ratings did not account for model risk
  - Senior structured securities are sensitive to the tails of collateral loss distributions
  - Structured securities are inherently more difficult to rate than comparable whole loans
- Implications for risk managers and financial regulators

Securitization pools assets and tranches liabilities

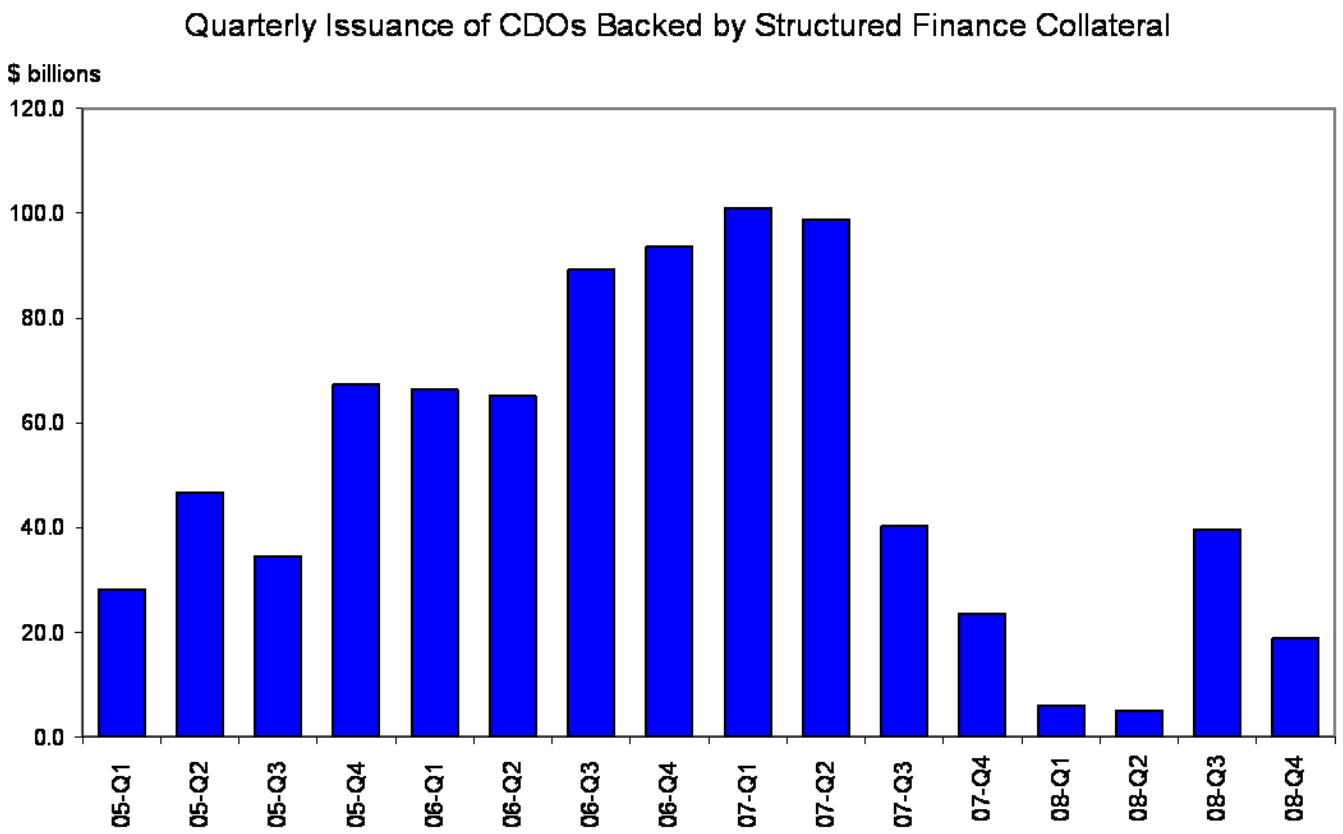


- Assets are a pool of loans or bonds with embedded credit risk such as
  - Corporate bonds
  - Mortgages
  - Credit card receivables
  - Other structured products
- Liabilities are structured in tranches ordered in terms of payment priority
  - Senior tranches bear least risk but carry lowest interest rate
  - Mezzanine tranches bear more risk in return for higher rate
  - Lowest tranche (equity) bears most risk and is often not traded

Rapid growth of new MBS



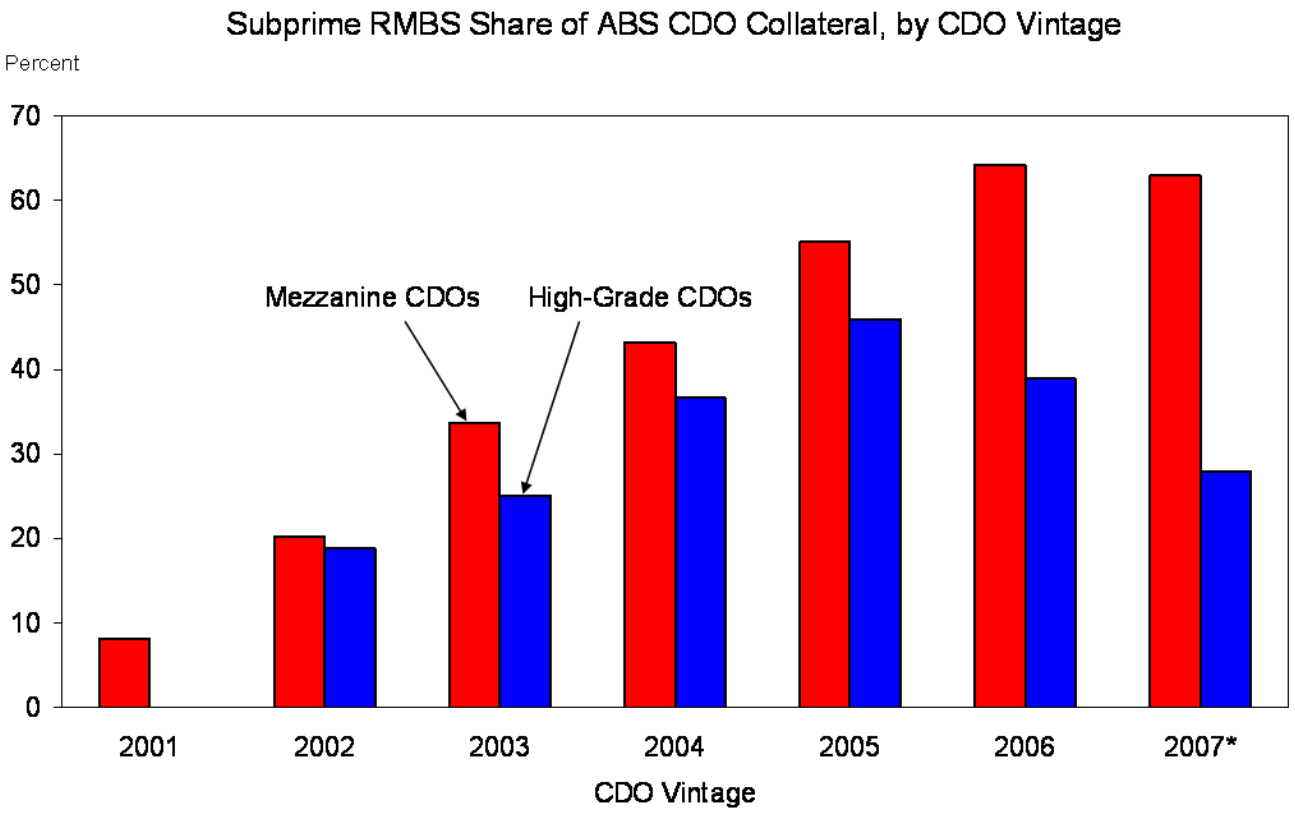
Advent of ABS CDOs…



Source: Securities Industry and Financial Markets Association

Collateralized debt obligations backed by other structured securities became a popular alternative to direct investment in asset-backed securities

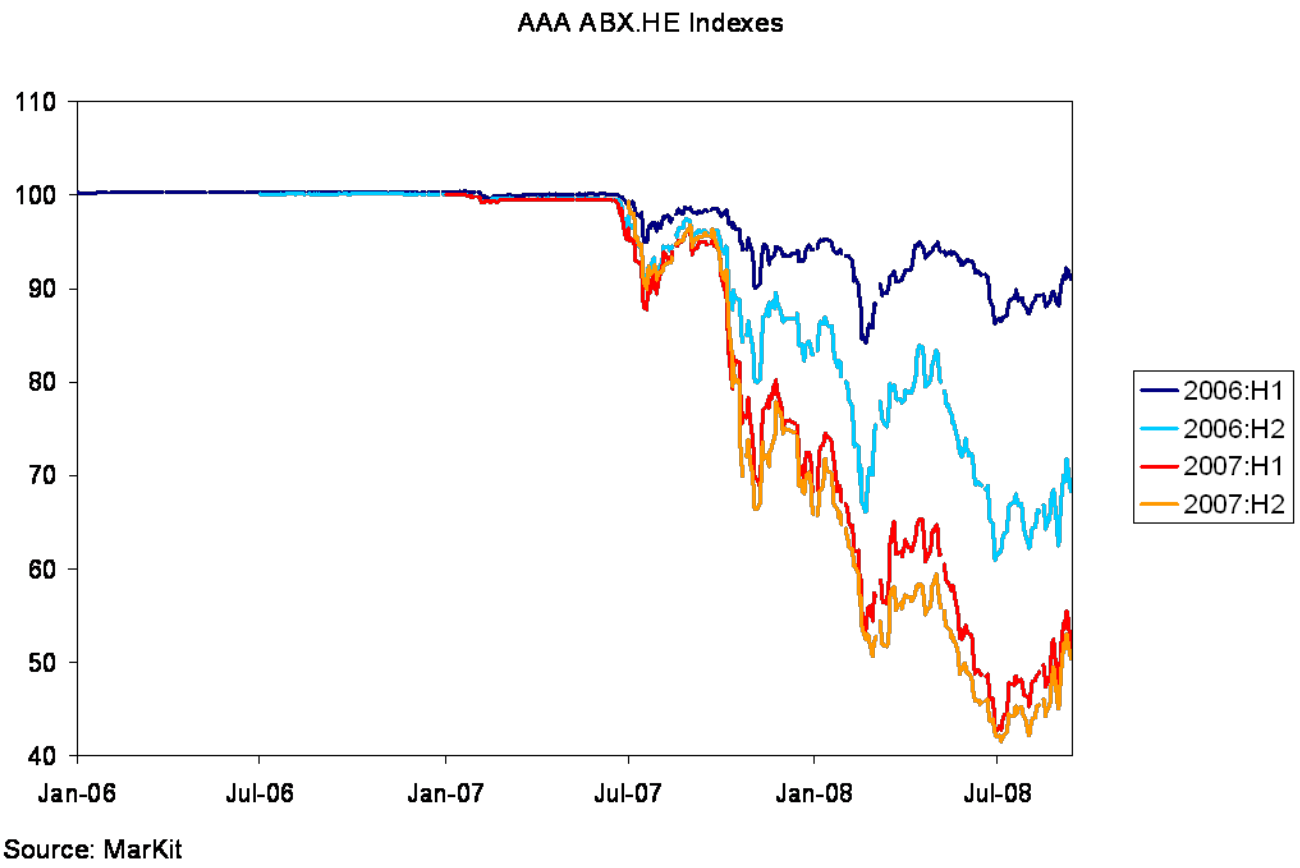
…heavily invested in MBS



* 2007 vintage includes deals completed through September
Source: Standard and Poor's

ABS CDOs were an indirect means of investing in non-agency RMBS

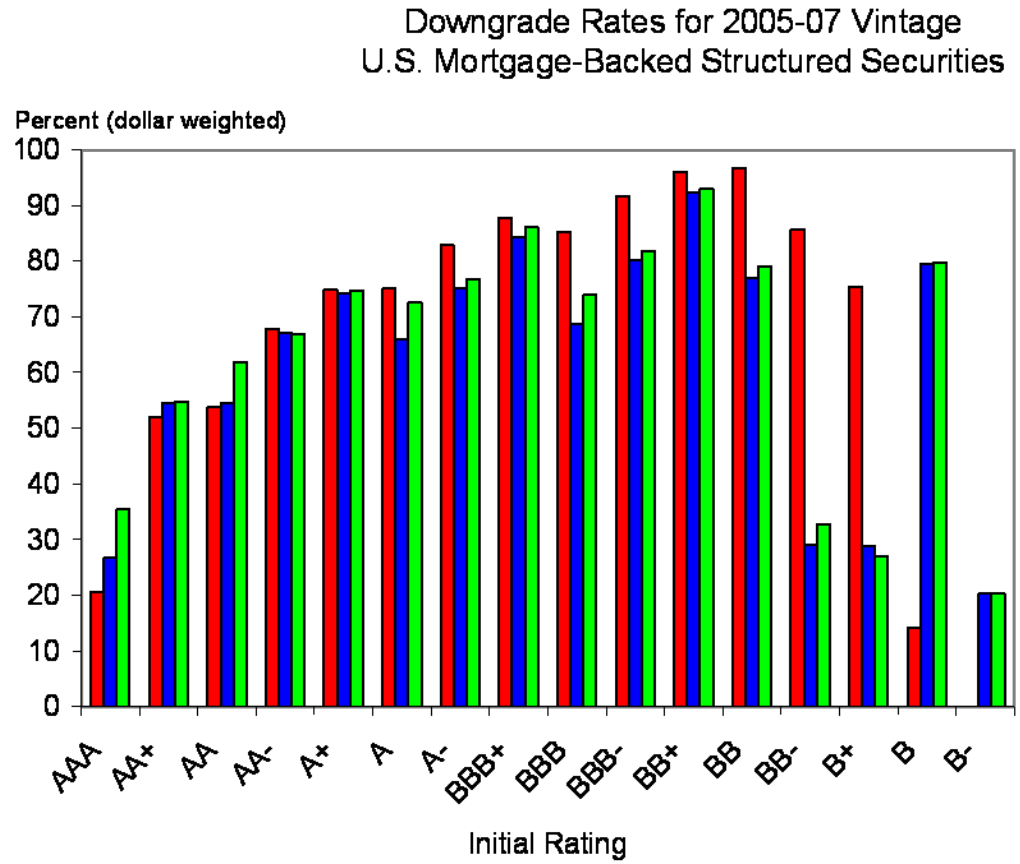
MBS valuations collapsed…



Source: MarKit

Less than a year after issuance, AAA-rated RMBS were trading at half their par value

…and credit ratings plunged



Source: Standard and Poor's

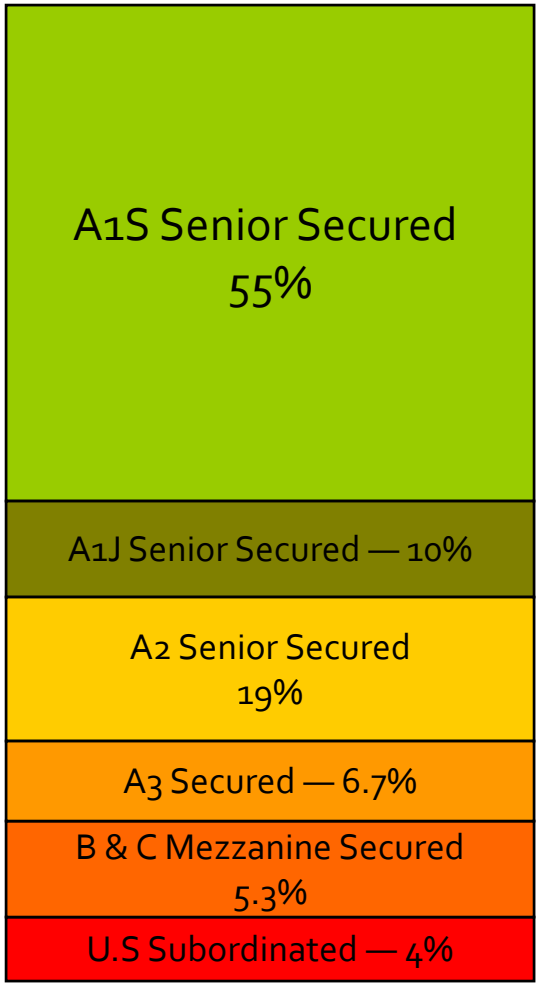
Over $1 trillion in AAA 2005-07 vintage mortgage backed structured securities have been downgraded

Tasman CDO

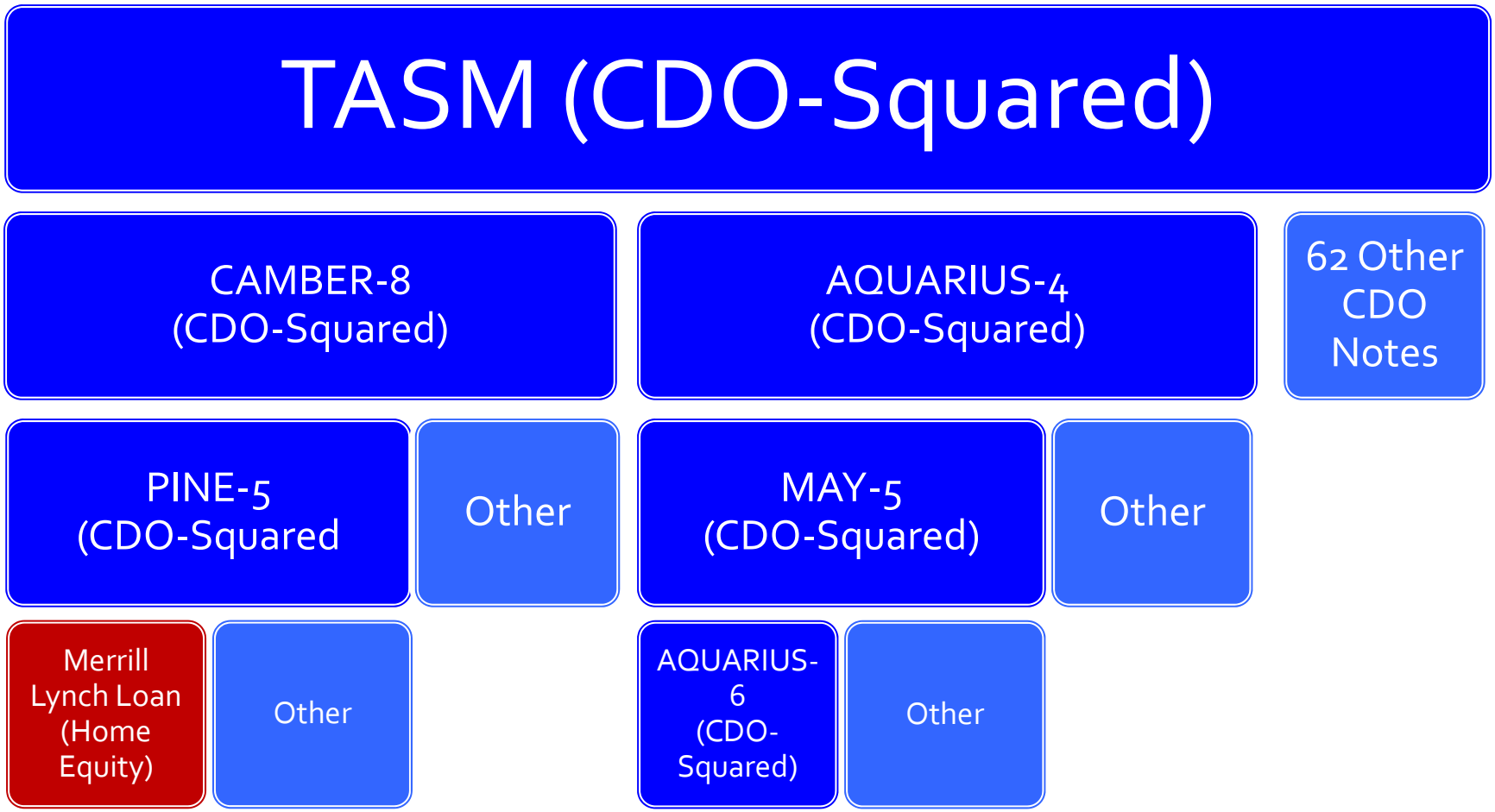
- $300 million mezzanine-hybrid CDO-squared
- Deal date: January 11, 2007
- Lead Underwriter: UBS
- Capital Structure: 7 debt classes maturing in March 2047
- Assets: 64 CDO notes of various types

Tasman CDO – Liabilities

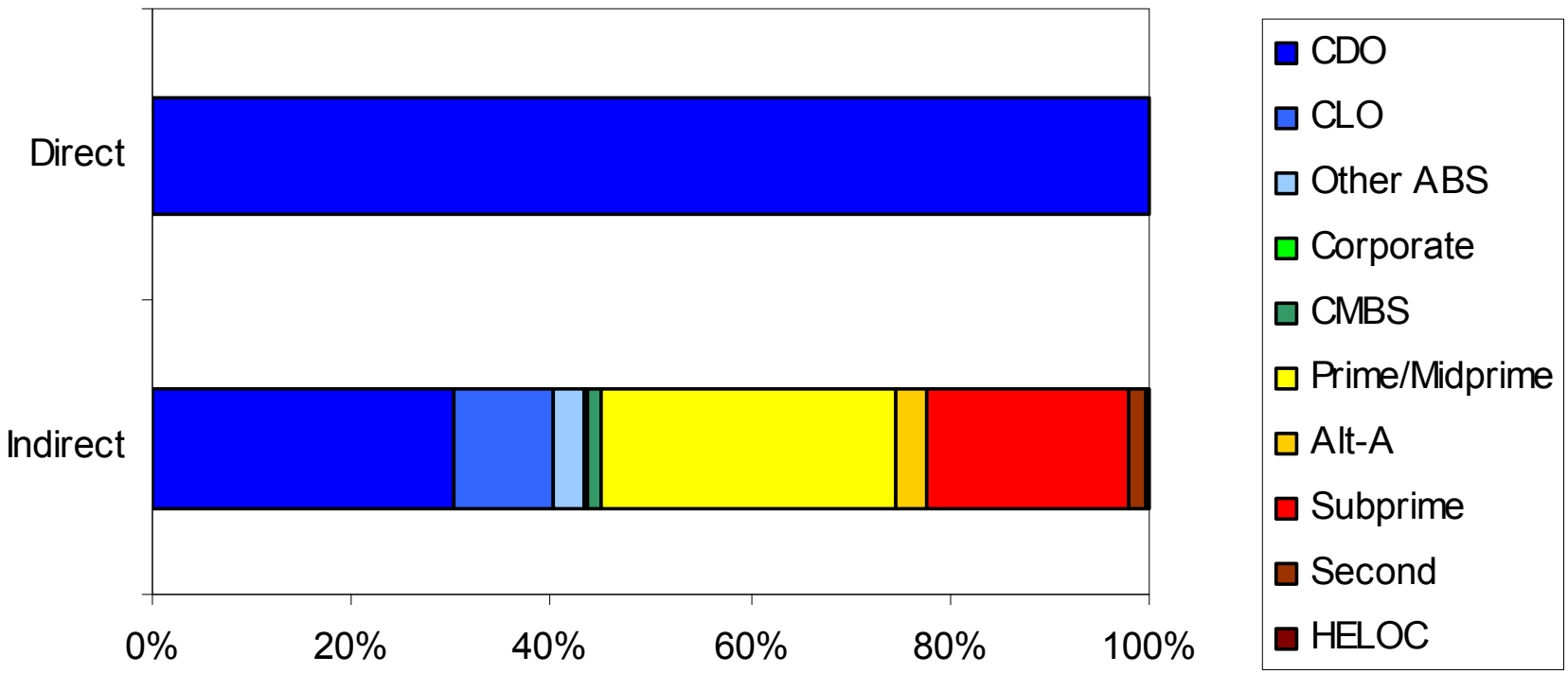
Class Name	Issue Amount ($MM)	Initial Rating
A1S Senior Secured	$164	Aaa
A1J Senior Secured	$30	Aaa
A2 Senior Secured	$58	Aa2
A3 Secured Deferrable	$20	A2
B Mezzanine Secured Deferrable	$12	Baa2
C Mezzanine Deferrable	$4	Ba1
U.S Subordinated	$12	NR



Tasman CDO – Assets

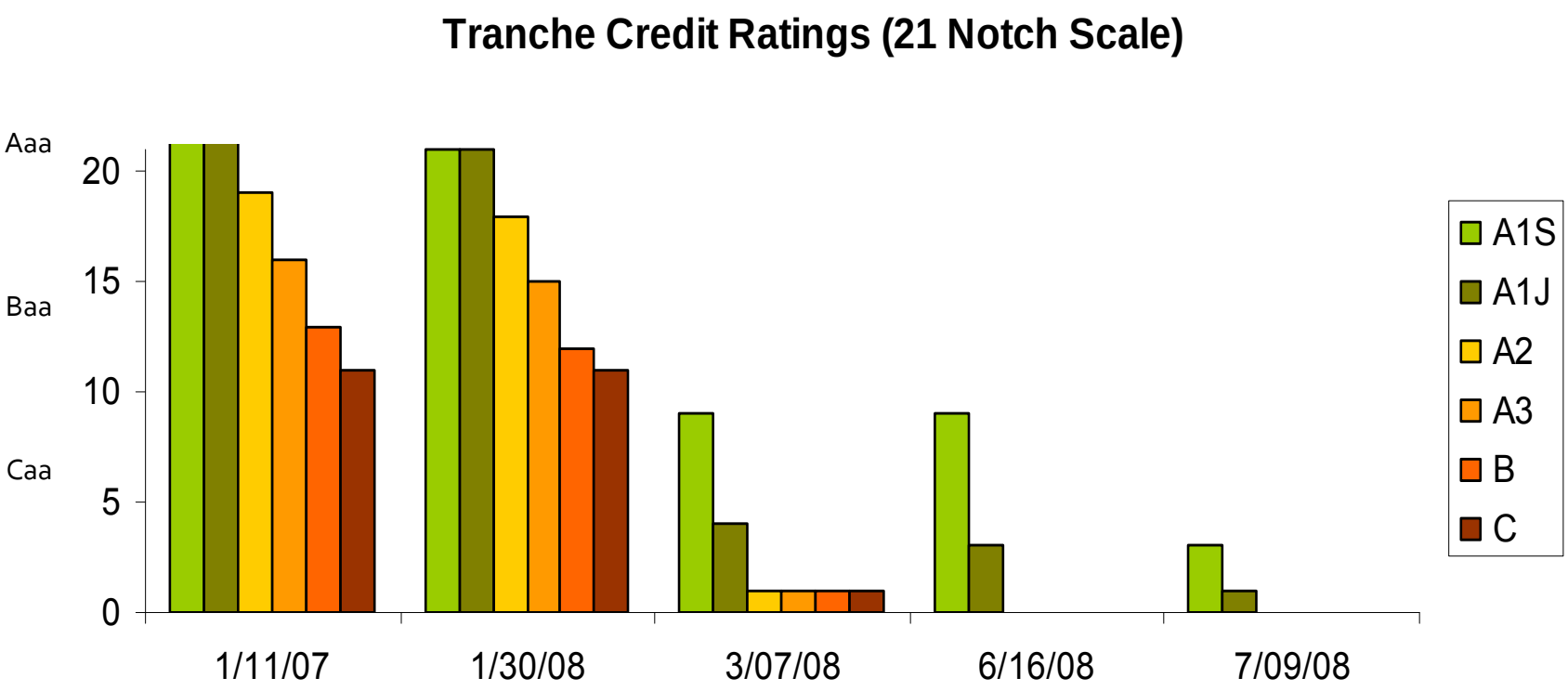


Tasman CDO – Assets



Note: "Indirect" exposure tabulated at three-level depth.

Tasman CDO – Credit performance



Entered accelerated repayment on March 17, 2008

Why were structured finance credit ratings so uninformative?

- Ratings designed to reflect unconditional default probabilities or expected losses did not capture structured securities' leveraged exposure to systematic risk
- Ratings for structured securities were particularly sensitive the model risk

Pooling assets does not reduce systematic risk

- Performance of collateral assets depends on two types of risk factors
  - Idiosyncratic factors unique to each asset (e.g., quality of a firm's management, homeowner's individual financial condition)
  - Systematic factors shared by all assets (e.g., macro environment, aggregate house price appreciation)
- Pooling assets limits importance of idiosyncratic risk
  - Law of Large Numbers implies that loss rate for a pool of securities is less volatile than that of an individual security
- But pooling assets does not diminish systematic risk
  - Systematic risk factors induce correlations in losses across securities
- Loss rate for a large pool of securities has less dispersion overall, but systematic factors play a bigger role

Pooling assets does not reduce systematic risk

Loss Exceedance Probabilities for
Five Hypothetical Loan Pools

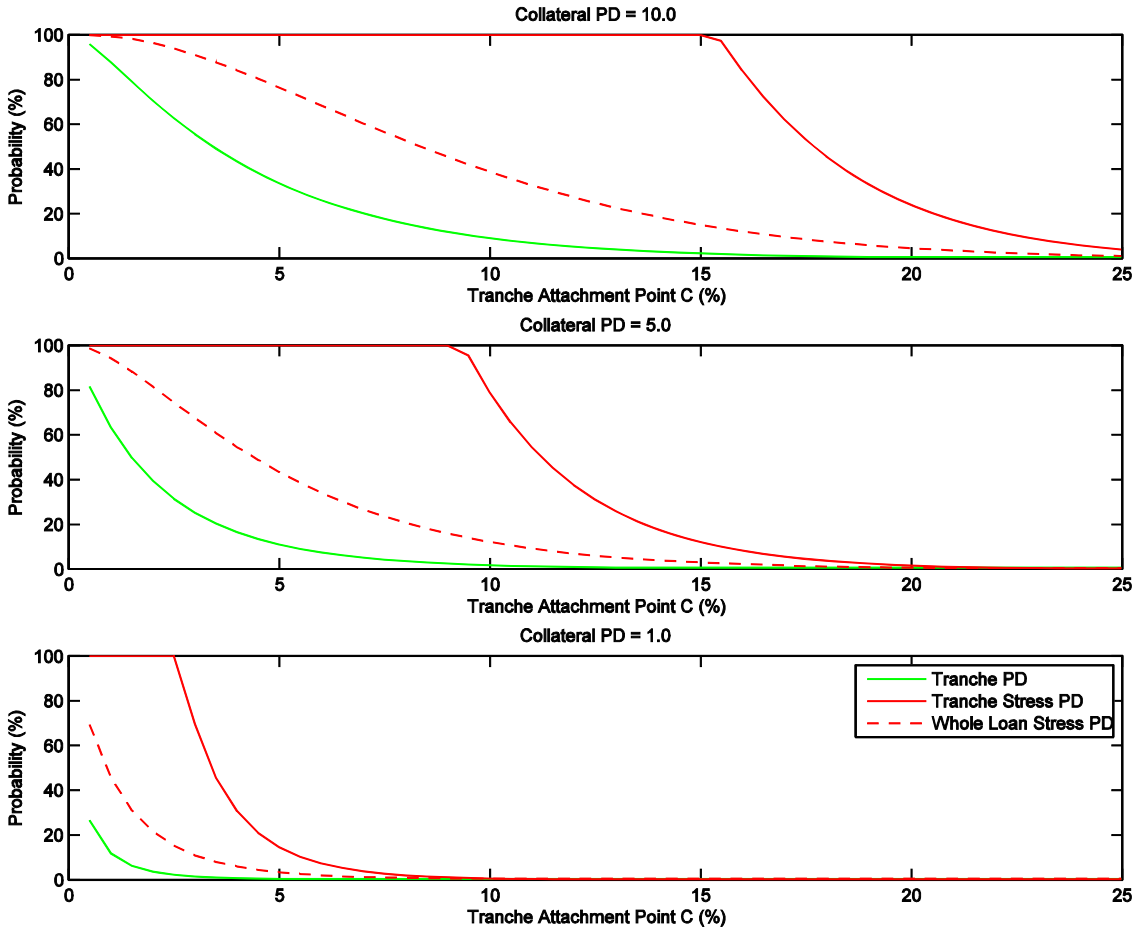
	Number of Loans	Loss Exceedance Probability		
		Loss > 10%	Loss > 15%	Loss > 20%
Unconditional	1	10.0	10.0	10.0
	25	12.1	3.4	0.8
	50	9.7	3.1	0.7
	100	9.5	2.5	0.6
	∞	9.1	2.3	0.5
Conditional on 98th Percentile or Worse Systematic Shock	1	41.2	41.2	41.2
	25	96.2	72.2	32.3
	50	98.8	81.1	31.2
	100	99.9	84.6	29.4
	∞	100.0	100.0	24.3

Structuring liabilities leverages exposure to systematic risk

Unconditional and Stress Condition Default Probabilities
for Four Hypothetical Senior Tranches

Number of Loans in Collateral Pool	Senior Tranche Attachment Point	Unconditional Senior Tranche Default Probability	Stress Condition Senior Tranche Default Probability
Whole Loan	n.a.	0.90	7.86
25	20.0	0.85	32.25
50	19.0	0.89	38.88
100	18.5	0.90	42.95
∞	18.0	0.92	45.82

Senior tranches perform worse under stress than comparable whole loans



Under systematic stress, tranche conditional default probabilities are much higher than those of whole loans with the same unconditional default probabilities

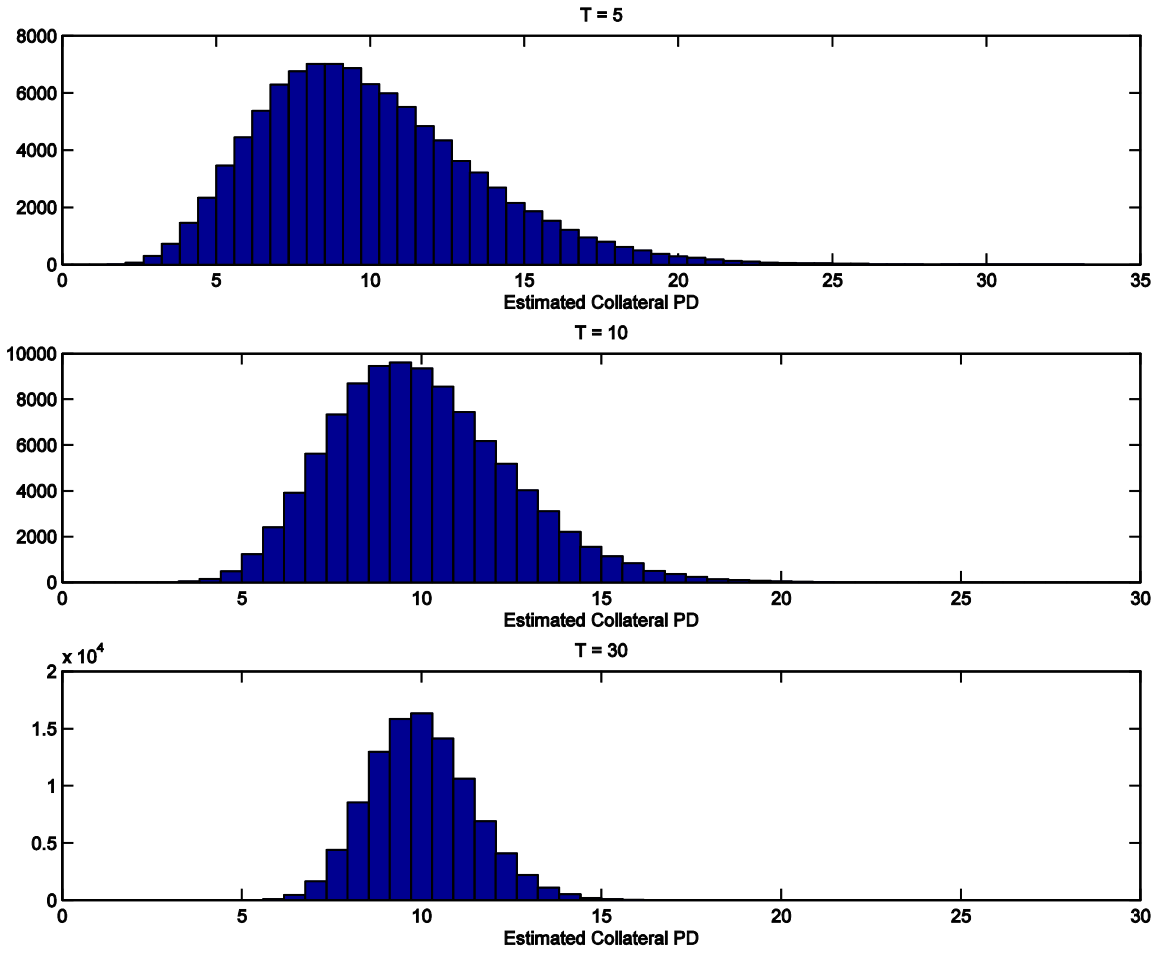
Ratings focused on the wrong metrics

- Rating models were specified to reflect unconditional default probabilities or expected losses
- Liabilities of structured finance deals were finely tuned to achieve the best possible distribution of ratings given the collateral backing them
  - Example: benefits of higher quality or better diversified collateral were offset by lower attachment points for AAA tranches
- Structured securities designed to perform well under *average* conditions where highly exposed to systematic risk

Structured finance ratings are particularly sensitive to model risk

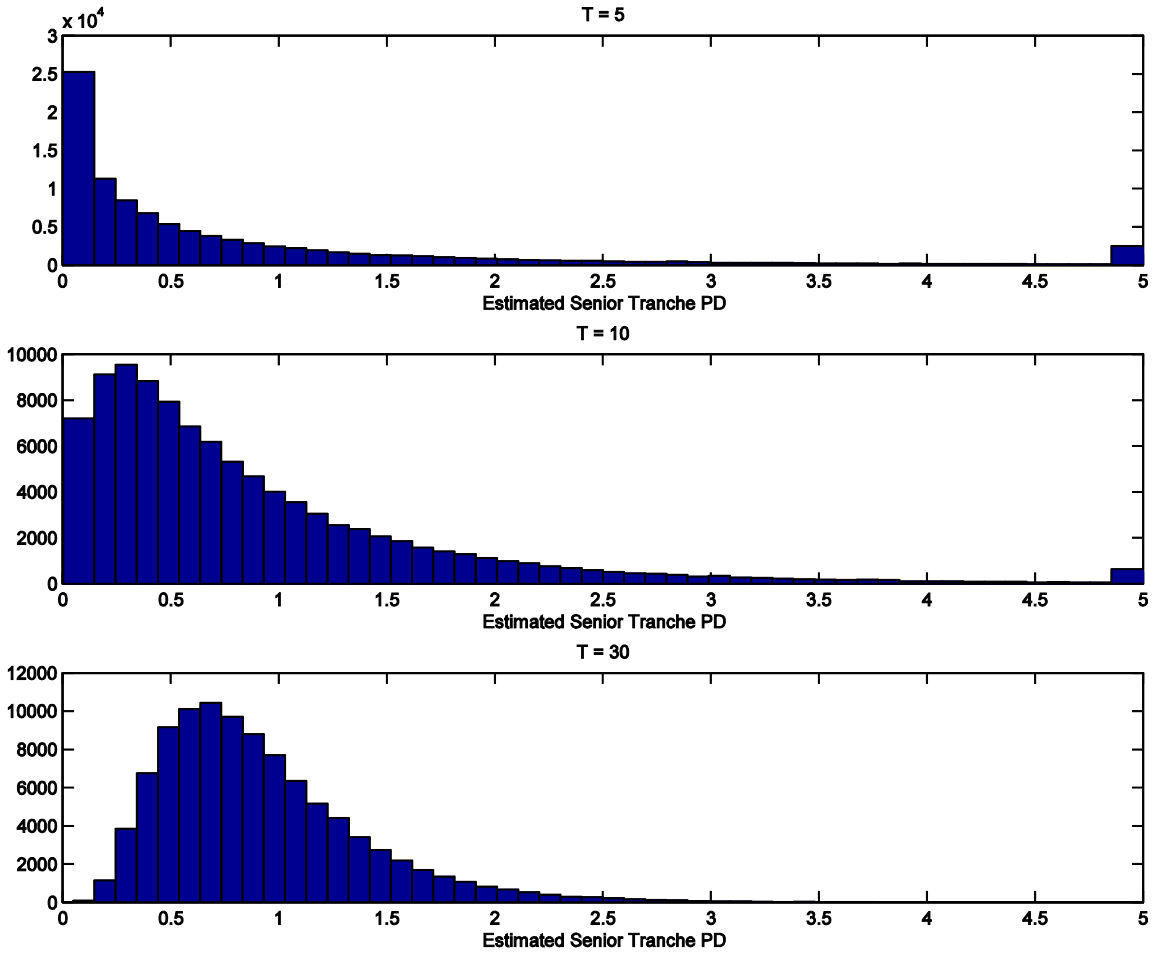
- All credit ratings are imperfect, but some are more imperfect than others
- The credit performance of a senior tranche depends on the extreme right-tail of the collateral loss distribution
- Small errors in rating the collateral of a structured finance deal can translate into large errors in rating the deal's senior tranche(s)

Accurately rating deal collateral requires a long historical record



Simulated sampling distribution of the best unbiased PD estimator of a whole loan with a true default probability of 10%

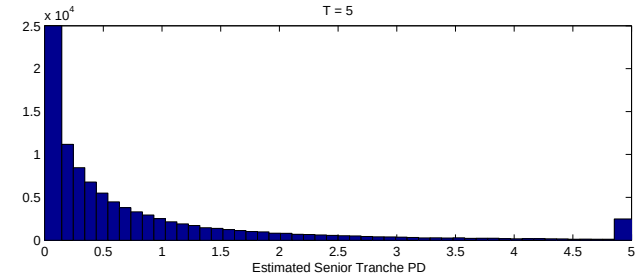
Modest uncertainty about deal assets implies large uncertainty about liabilities

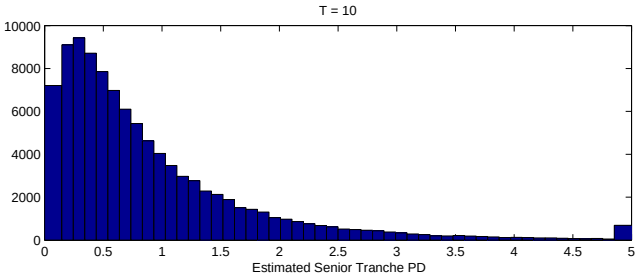


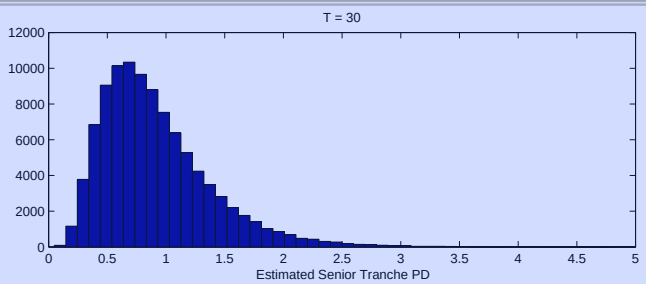
Simulated sampling distribution of the best unbiased PD estimator for the senior trance of a CDO with a true default probability of 92 b.p.

Structured securities are much harder to rate than whole loans

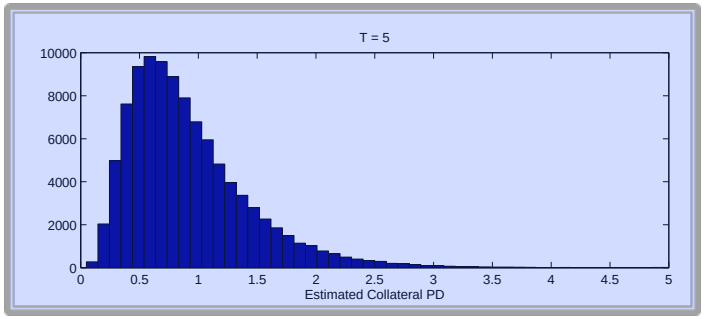
Senior Tranche

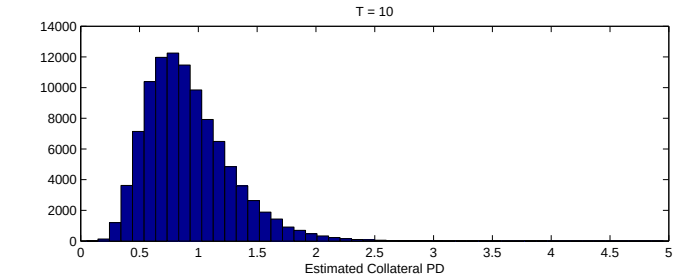


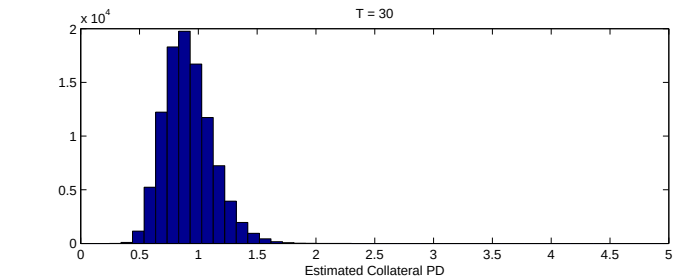




Whole Loan

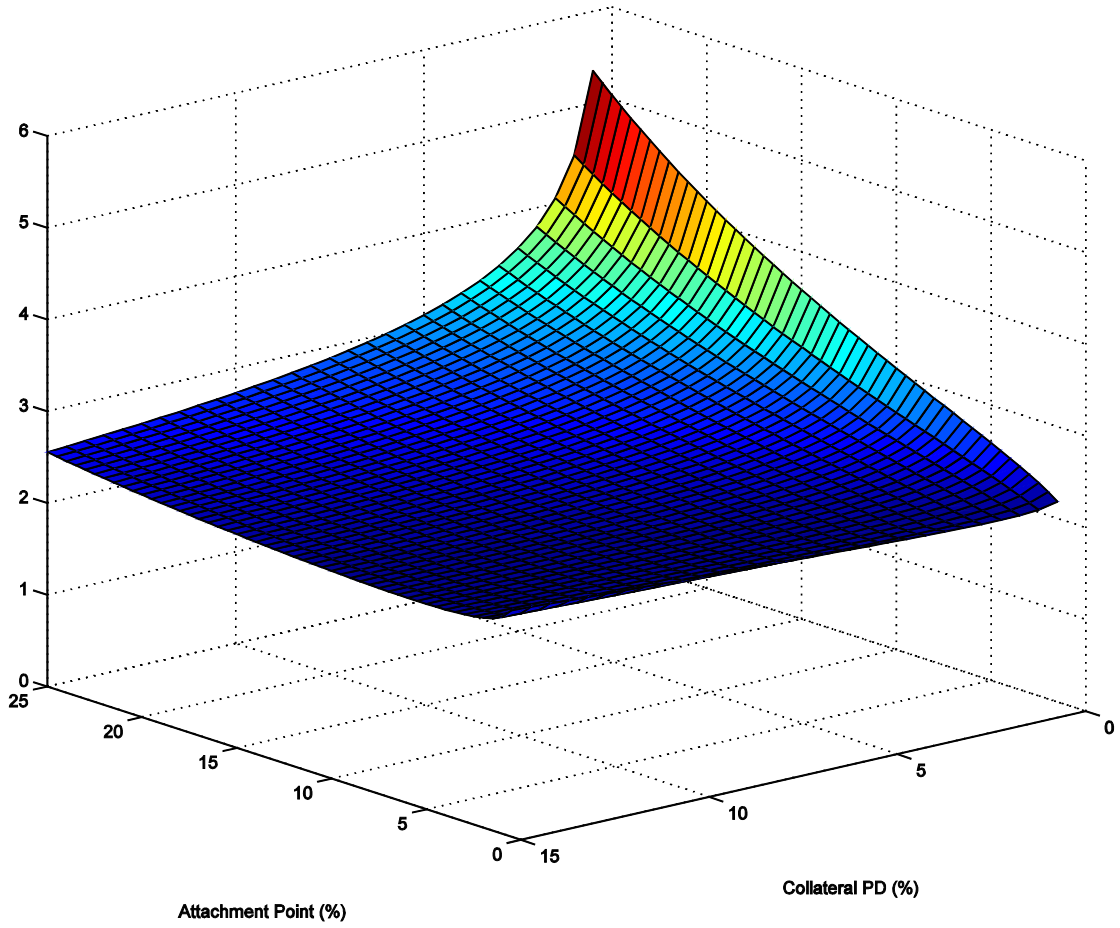






Six times as much historical data are needed to rate a senior tranche with the same accuracy as a whole loan with the same true (92 b.p.) default probability

Sampling variation for tranche PDs is always higher than for whole loans



Ratio of the standard deviation of the best unbiased PD estimator for a structured finance tranche and a whole loan with the same true default probability

So what have we learned?

- Implications for credit analysts
  - Focus on measuring exposures' marginal contributions to portfolio risk, not unconditional default probabilities or expected losses
  - It is vital to account for model risk
    - "Classical" approach – stress test point estimates using scenarios calibrated to reflect measured parameter uncertainty
    - Bayesian approach – embed prior distribution of unknown parameters in risk metrics
- Implications for regulators and senior managers
  - One-dimensional credit ratings provide only limited information about credit quality
  - Assertions by rating agencies that letter grades are readily comparable across asset classes are, at best, aspirational
  - Regulations and investment guidelines should not treat all similarly-rated credit products the same