Credit Ratings and the Securitization of Subprime Mortgages

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Agenda

- To examine the derivatives that were created from subprime mortgages
- To determine whether the AAA ratings assigned to tranches were reasonable, given the criteria used by rating agencies
- To determine whether the criteria used by rating agencies were reasonable
- To identify some lessons for the future of structured finance

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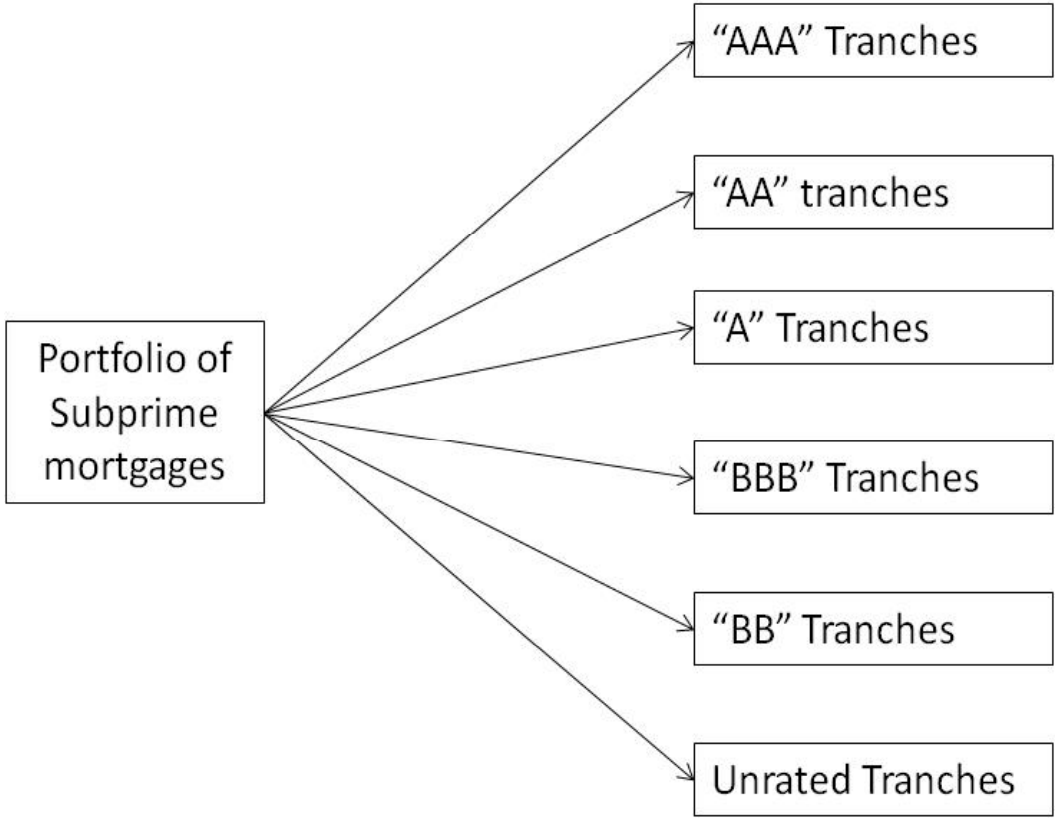
Asset Backed Security



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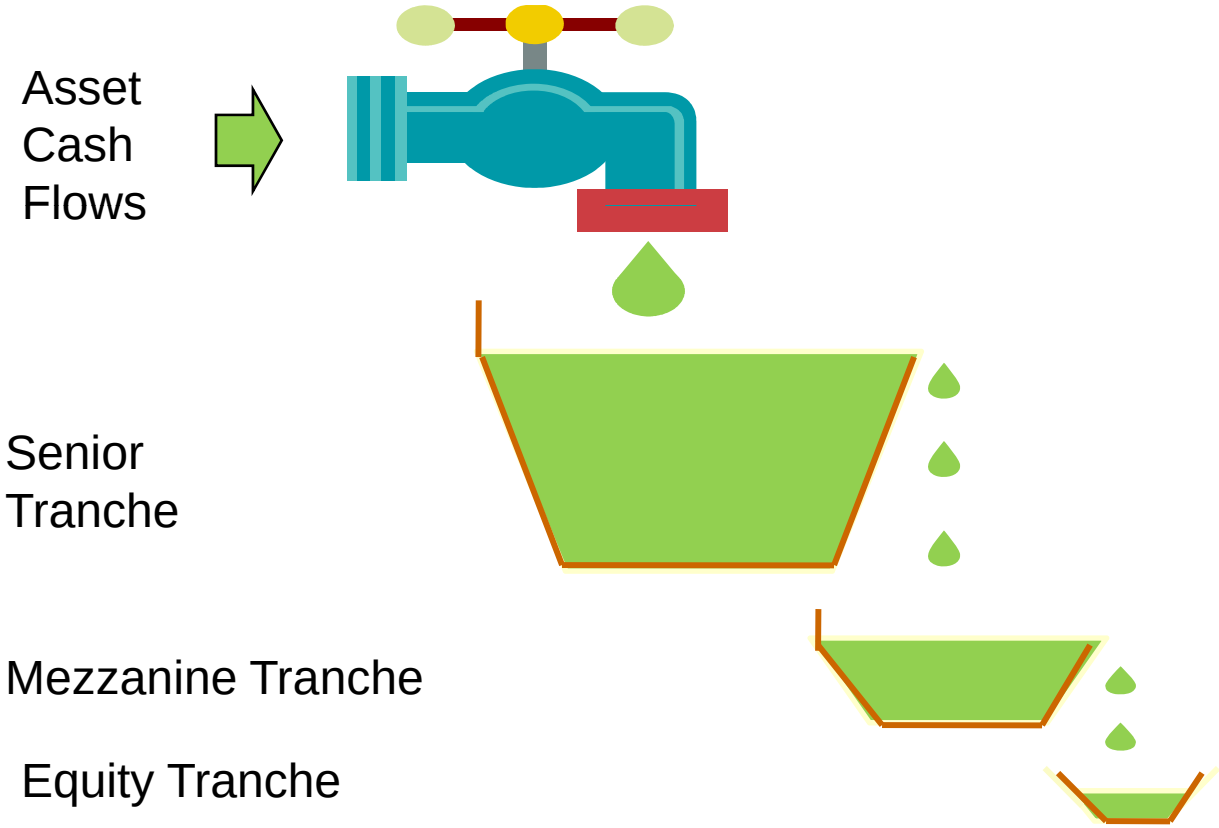
The Waterfall



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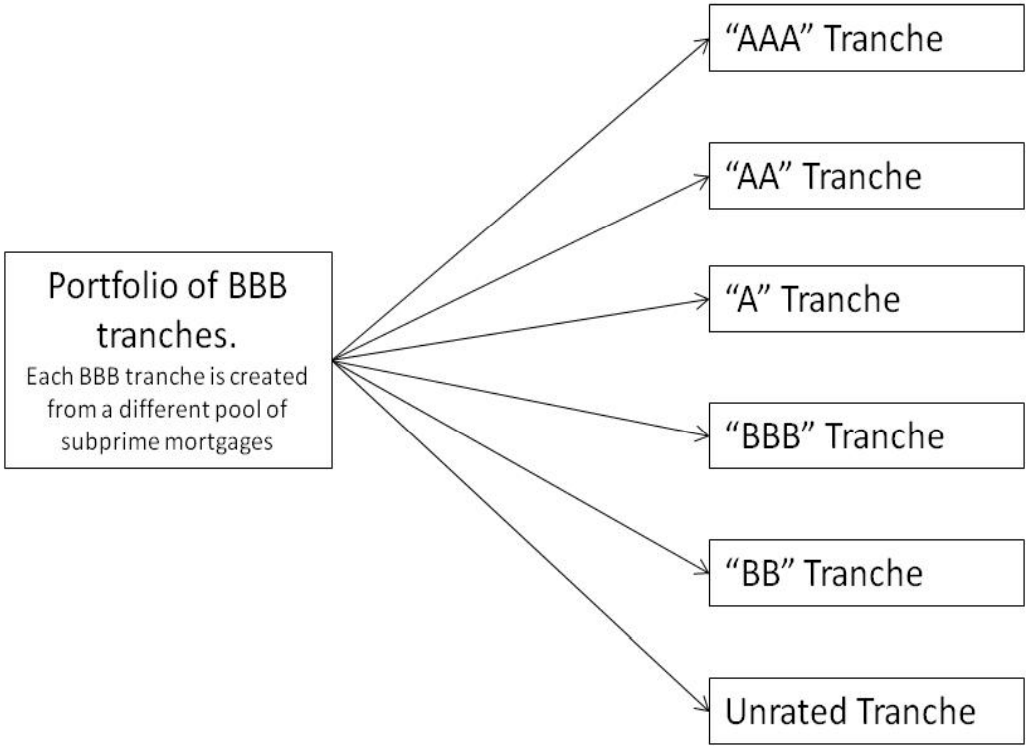
Mezz ABS CDO



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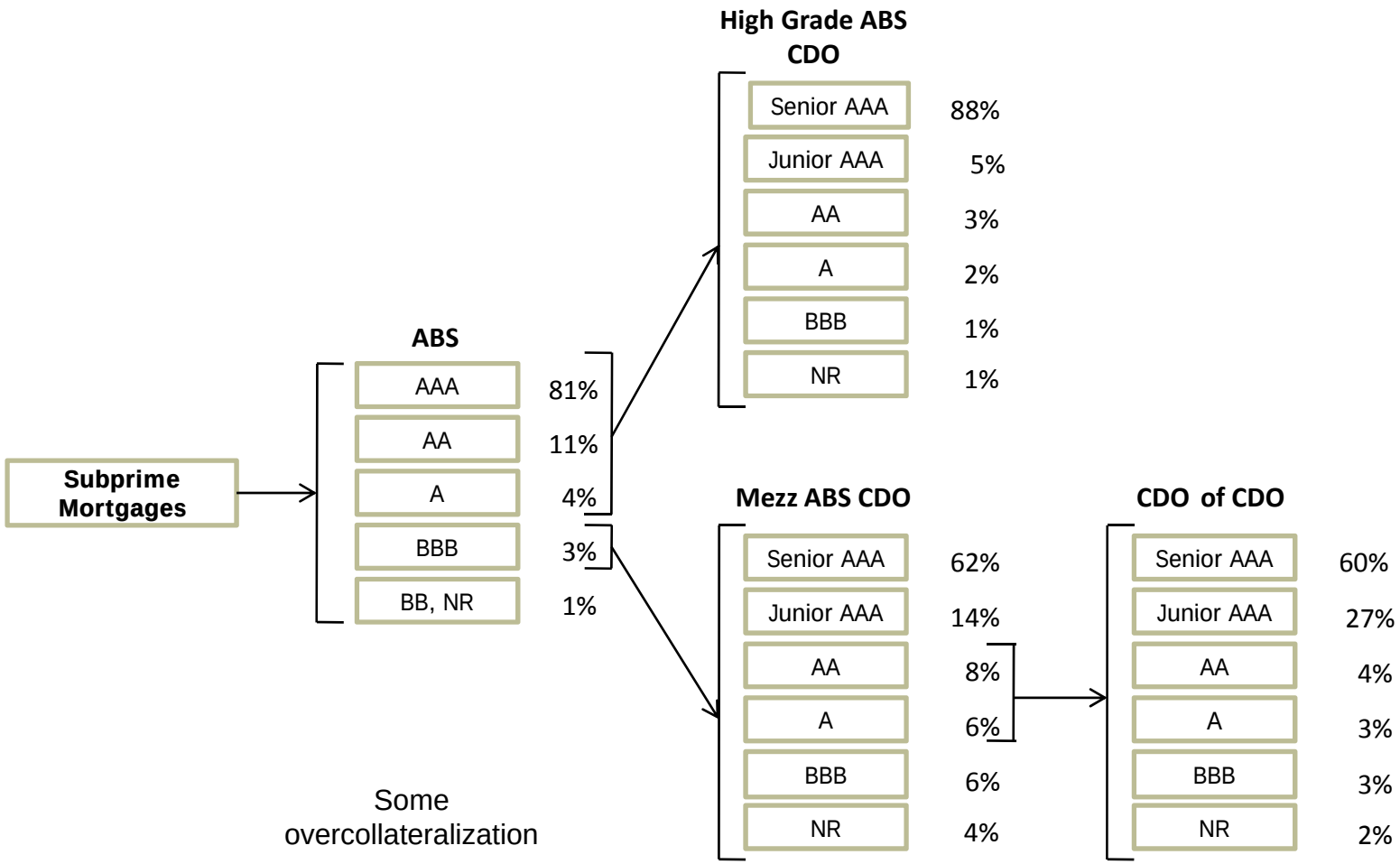
The Pattern of Securitization



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Rating Structured Products vs Rating Bonds

- Bond ratings are based on judgment and analysis; structured product ratings are based on a model
- Structured products required an assumption about correlation
- Design of structured products can easily be changed to achieve desired ratings
- Structured products are arguably more likely to be downgraded than bonds

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The Criteria Used By Rating Agencies

- Moody's calculates the expected loss (as a percent of principal) on a tranche and tries to ensure that this is consistent with the expected loss on a similarly rated bond
- S&P and Fitch calculate the probability of a loss on a tranche and try to ensure that this is consistent with the probability of loss on a similarly rated bond

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Assumptions

- Principal payments are sequential so that losses are borne by tranches in order of reverse seniority (not unreasonable as we are mostly concerned with high-default-rate situations)
- Homogeneity for mortgage defaults, mortgage principals, number of mortgages per pool, etc
- All mortgage pools have a 5 year weighted average life
- Mortgage pool is sufficiently large that actual default rate equals PD
- ABS losses modeled with one-factor copula model for default correlation.
- ABS CDO losses modeled with a two-factor copula model of default correlation

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Minimum Attachment Point for AAA-rated ABS Tranche.

Prob Loss=0.1% over 5 yrs. ρ is copula correlation

		Expected Default Rate		
		5%	10%	20%
Gaussian Copula	$\rho = 0.05$	4.1%	6.8%	11.0%
Constant Recovery	$\rho = 0.10$	6.0%	9.4%	13.9%
	$\rho = 0.20$	9.6%	13.6%	18.2%
	$\rho = 0.30$	13.1%	17.2%	21.1%
Double *t* Copula	$\rho = 0.05$	7.6%	13.0%	18.2%
Constant Recovery	$\rho = 0.10$	13.6%	18.7%	21.9%
	$\rho = 0.20$	21.1%	23.2%	24.1%
	$\rho = 0.30$	23.7%	24.4%	24.7%

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Minimum Attachment Point for AAA-rated ABS Tranche *continued.*

Prob Loss = 0.1% over 5 yrs. ρ is copula correlation

		Expected Default Rate		
		5%	10%	20%
Gaussian Copula	$\rho = 0.05$	7.3%	11.6%	17.1%
Stochastic Recovery	$\rho = 0.10$	11.6%	17.3%	23.8%
	$\rho = 0.20$	19.1%	26.6%	33.4%
	$\rho = 0.30$	26.1%	34.1%	40.0%
Double *t* Copula	$\rho = 0.05$	15.0%	25.3%	33.4%
Stochastic Recovery	$\rho = 0.10$	27.2%	37.2%	41.8%
	$\rho = 0.20$	42.2%	46.3%	46.6%
	$\rho = 0.30$	47.4%	48.7%	47.8%

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Minimum Attachment Point for AAA-rated ABS CDO Tranche Created from BBB Rated Tranches (att=4%, det =5%).

Prob Loss=0.1% over 5 yrs. ρ is copula correlation. α is proportion of correlation that comes from a factor common to all mortgage pools

		$\alpha = 0.05$	$\alpha = 0.25$	$\alpha = 0.50$	$\alpha = 0.75$	$\alpha = 0.95$
Gaussian Copula	$\rho = 0.05$	17.1%	42.7%	73.5%	96.2%	99.9%
Constant Recovery	$\rho = 0.10$	29.7%	62.3%	89.7%	99.8%	99.9%
EDR=10%	$\rho = 0.20$	39.7%	73.6%	95.4%	99.9%	99.9%
	$\rho = 0.30$	43.5%	77.2%	96.7%	99.9%	99.9%
Gaussian Copula	$\rho = 0.05$	0.9%	2.6%	5.9%	10.1%	10.4%
Constant Recovery	$\rho = 0.10$	5.3%	16.1%	36.2%	66.3%	98.3%
EDR=5%	$\rho = 0.20$	14.5%	37.9%	69.1%	95.2%	99.9%
	$\rho = 0.30$	20.5%	48.8%	80.2%	98.7%	99.9%

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Minimum Attachment Point for AAA-rated ABS CDO Tranche Created from BBB Rated Tranches (att=4%, det =5%) continued

Prob Loss=0.1% over 5 yrs. ρ is copula correlation. α is proportion of correlation that comes from a factor common to all mortgage pools

		$\alpha = 0.05$	$\alpha = 0.25$	$\alpha = 0.50$	$\alpha = 0.75$	$\alpha = 0.95$
Triple *t* copula	$\rho = 0.05$	95.9%	100.0%	100.0%	100.0%	100.0%
Stochastic Recovery	$\rho = 0.10$	93.8%	100.0%	100.0%	100.0%	100.0%
EDR=10%	$\rho = 0.20$	92.0%	100.0%	100.0%	100.0%	100.0%
	$\rho = 0.30$	90.3%	100.0%	100.0%	100.0%	100.0%
Triple *t* Copula	$\rho = 0.05$	82.9%	99.0%	100.0%	100.0%	100.0%
Stochastic Recovery	$\rho = 0.10$	84.1%	99.0%	100.0%	100.0%	100.0%
EDR=5%	$\rho = 0.20$	85.0%	99.0%	100.0%	100.0%	100.0%
	$\rho = 0.30$	80.0%	99.0%	100.0%	100.0%	100.0%

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Explanation of Results

- When BBB tranches are thin the probability distribution for the loss on a tranche is quite different from that for the loss on a BBB bond
- Consider an extreme situation when tranches are very thin and α=1 so that all mortgage pools have the same default rate….

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How Reasonable Were the Ratings, Given the Criteria Used?

- ABS ratings were not too unreasonable
- Mezz ABS CDOs ratings are much more difficult to defend
- Mezz ABS CDOs accounted for only about 3% of all securitizations
- But the tranches were widely used to create synthetic products.

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Were the Criteria Used by Rating Agencies Reasonable?

- Probability of loss does not satisfy a basic no-arbitrage condition in the sense that it allows one portfolio to be restructured into another in such a way that the ratings of the new portfolio unambiguously dominate those of the old portfolio

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Example

- Any Portfolio X can be restructured into a new Portfolio Y consisting of two securities (or tranches)
- The first security is responsible for losses in the 0 to 50% range
- The second security is responsible for the remaining losses.
- Portfolio Y dominates portfolio X

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Further Restructuring

- Every time we create a new tranche we achieve an extra level of dominance
- If Portfolio Z has three tranches (0 to 25%, 25% to 50%, and 50% to 100%) it dominates Portfolio Y

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Expected Loss Percentage (EL)

- EL has much better properties than probability of loss
- Satisfies our necessary condition for no arbitrage
- Allows bond portfolios to be rated in the same way as bonds
- But market participants that base valuations solely on EL are liable to be arbitraged by market participants that use more complete valuation models

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Lessons from the Crisis for Structured Products

- When evaluating credit derivatives (particularly, when evaluating how they will perform in extreme market conditions), it is important to take account of
  - tail default correlation
  - dependence of recovery rates on default rates
- Thin tranches have “all or nothing” risk characteristics and should be treated with caution
- Structured products should not be considered to be equivalent to similarly rated bonds
- It is important to understand what ratings measuree and their limitations

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Lessons from the Crisis for Structured Products continued

- Resecuritization was a badly flawed idea
- We should aim to achieve diversification benefits with the first level of securitization
- Can we securitize across asset classes? Basing securitization on the price of a single good is dangerous
- Transparency is important. Issuers should provide scenario analysis software

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