Mortgage-backed securities

Real estate capital markets (RE740)

An amazing technology

- Basic idea:
  1. Pool a large number of mortgages
  2. Sell the pool as a security, or use the pool as collateral for one or more debt instruments (bonds)
- Purpose:
  1. Allow more investors to invest in real estate debt instruments
  2. Make that investment more liquid
  3. Pool/fine-tune risk

A machine to generate AAA paper

- Why did securitization take off after 2000?
- Among other things because AAA paper became scarce largely due to the global saving glut (US paper hogs)
- AAA paper lubricates many key markets, the repo market in particular
- Where to find it? There is, after all, only so many blue chip issuers
- Answer: CMOs
- Housing boom created endless supply of mortgages, only trick is to somehow issue safe bonds backed by unsafe assets
- Sounds crazy, but it "works": no AAA tranche of any CMO deal has defaulted to date (many have been downgraded, but none have formally defaulted)

The subordination theorem(s)

Theorem I: Risk-free debt can be written against a pool *if and only if* the worst-case scenario CF realization from the pool is strictly positive

Proof: Let A be the lowest possible CF realization associated with the pool. Make the quantity of debt small enough that the promise is A or less.

Theorem II: Debt with less than a probability p of default can be written against a pool *if and only if* the CF realization is strictly positive with probability 1-p

Proof: Let A be such that P(CF>A) > 1-p. Make the quantity of debt small enough that the promise is A or less.

How about them CDOs and CDO^{2}s?

- Junior tranches of MBS are often pooled into new deals, often out of necessity (*investors won't pay much for stand-alone B tranches*)
- If combining these tranches ~~*compresses*~~ raises the lower bounds on overall cash-flows, more AAA paper can be produced with the right level of credit support
- The problem: getting the level of credit support right
- Top tranches of many CDO deals defaulted, which means that people overestimated the ability of pooling to dissipate risk

The game investment banks play

- If you get the following trivial point, you understand securitization better than most people who say they understand securitization

- Given a pool of assets, investment banks choose a feasible security scheme E to write against a given pool of assets to solve:

$$\text{Max } MV(E) - C(E)$$

where MV(E) is the market value of scheme E given investors' willingness to pay for various type of assets while C(E) is the cost of issuing that combination of securities and funding the assets

- After 2000, the scope of securitization widened markedly to include riskier pools of assets because the willingness to pay for top tranches made deals profitable that weren't before

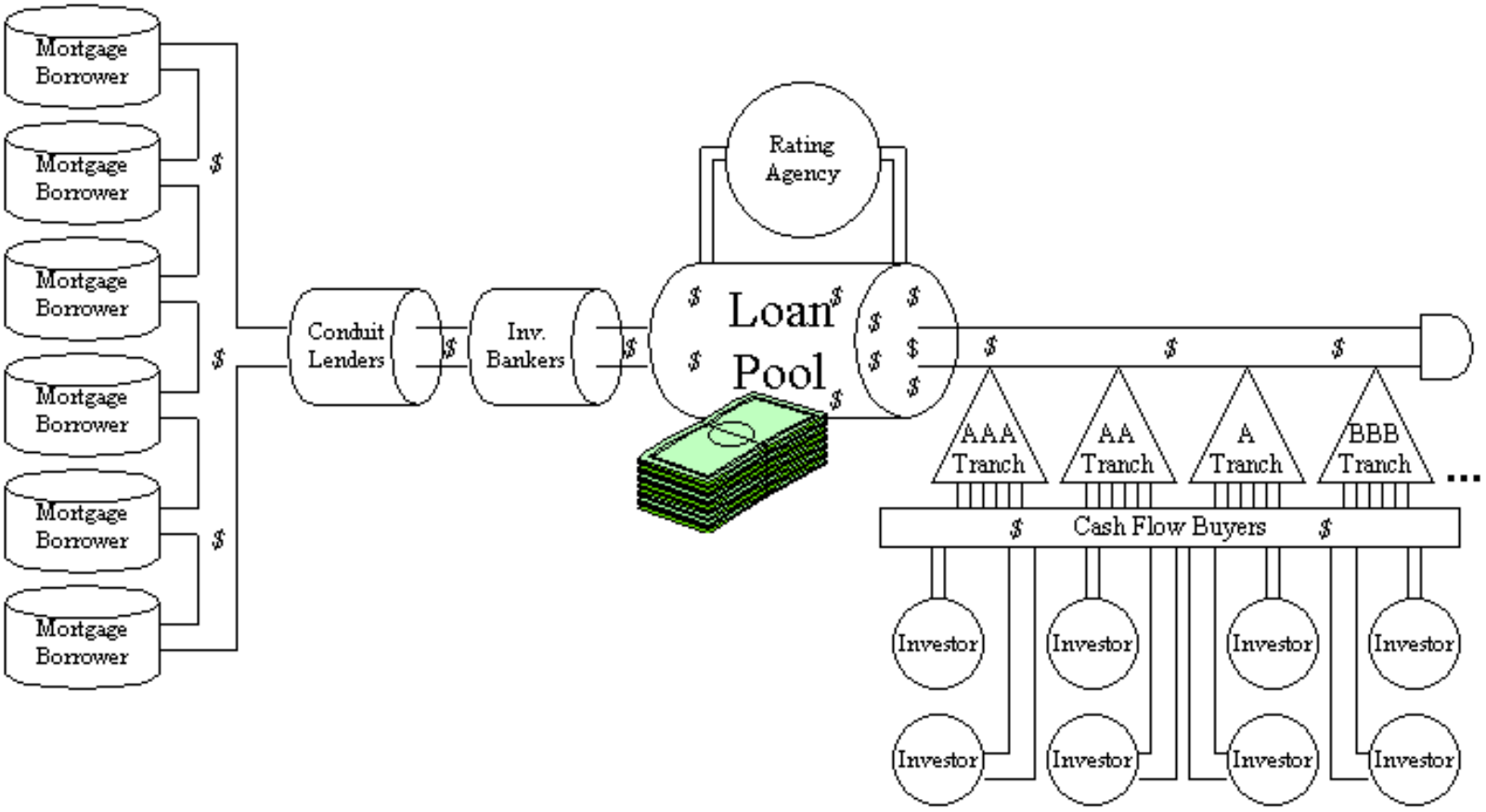
Mortgage securitization: a short history

- The US government wanted liquid secondary markets for mortgages after the great depression: FNMA (1938), GNMA (1968), FHLMC (1970)
- Ginnie issues first pass-through in 1968
- Bank of America issues first private label pass-through in 1977
- Solomon Brothers and First Boston create the CMO concept in 1983

Securitization process

1. Mortgages are originated
2. Sold to and pooled by investment banker
3. Pool is used to create one or several securities:
    i. Mortgage-backed bonds (MBBs)
    ii. Mortgage pass-through securities (MPTSs)
    iii. Mortgage pay-through bonds (MPTBs)
    iv. Collateralized Mortgage Obligations (CMOs)

CMBS Securitization Process



More CMBS language

- Once pooled, mortgages are usually transferred to a trust
- *Real Estate Mortgage Investment Conduit* (REMIC) are untaxed, pass-through entities that:
  1. Hold a fixed pool of mortgages
  2. Distribute payments to investors
- *Pooling and servicing agreement (PSA):* specifies how loans will be serviced, and how proceeds and losses are to be distributed to investors
- *Servicers (Primary, Master, Special):* administer the loans

Basic example

- Consider a pool of 1,000 identical FRMs with initial balance $75,000 (each), contract rate 11%, and yearly payments
- If all goes according to the plan, $12,735,107 in P&I will be collected each year on these mortgages until maturity
- This pool can be securitized in at least 4 different ways

Mortgage-backed bond (MBB)

- Pool owner issues a bond collateralized by the pool
- Mortgages are placed in a trust
- Issuer retains ownership of the pool
- MBBs are usually issued at a face value below the face value of the bond (MBBs are *overcollateralized*)
- Overcollateralization represents the issuer's equity in the deal
- Usually, trustee must "mark all mortgage collateral to market" and issuer must replenish the pool if its value falls below a specified threshold

MBB example

- A bond with face value $60M and coupon payment 11% is issued against our pool of 1,000 FRMs
- All principal comes due at maturity
- Investors require a10% YTM from this sort of investment
- Bond will sell at a premium over face value (why?)
- Underwriting costs are 2.5% of issue price

Alternating cash flows

- IRR criterion cannot be applied for issuer in most MBB cases, because of the bond's balloon payment
- Use PV criterion instead:
  1. Ask what the discount rate is on deals of similar risk level
  2. Use that discount rate to discount cash flows

Mortgage pass-through security (MPTS)

- Mortgage originator pools mortgages and sells equity (ownership) rights to investors
- All cash flows net of fees are "passed through" to investors
- No overcollateralization necessary

Basic example of an agency MPTS

- Take same pool as before
- Investors purchase certificates (equity shares) in the $75M pool and receive payments in proportion to their initial investment
- 0.5% goes to GSE, 10.5% is passed through, along with the principal

Mortgage pay-through bond (MPTB)

- Mortgage originator pools mortgages and issues one bond collateralized by the pool
- Unlike in MBB deal, bond payments depend directly on pool's performance
- All principal payments are passed through
- Interest payments paid at a given coupon rate
- Overcollateralization provides some shelter against default
- Overcollateralization represents the issuer's equity in the deal

MPTB example

- A bond with face value $72M and coupon payment 10.5% is issued against our pool of 1,000 FRMs
- All principal is passed through
- Investors require a10.5% YTM from this sort of investment, hence bond sells at par ($72M)
- Underwriting costs are 2.5% of issue price

Collateralized Mortgage Obligations (CMOs)

- CMOs are debt instruments issued using a pool of mortgages as collateral, with the pass-through features of MPTBs
- *Ex Uno Plures*: several classes of securities are issued against the same pool of mortgage, ordered by priority
- Each class of security is called a *tranche* (slice)
- Each tranche has its own risk characteristics, and can be sold to investors with different objectives
- Completes the market: new sources of fairly safe fixed income instruments
- Sum of PV of the pieces > PV(Pool)

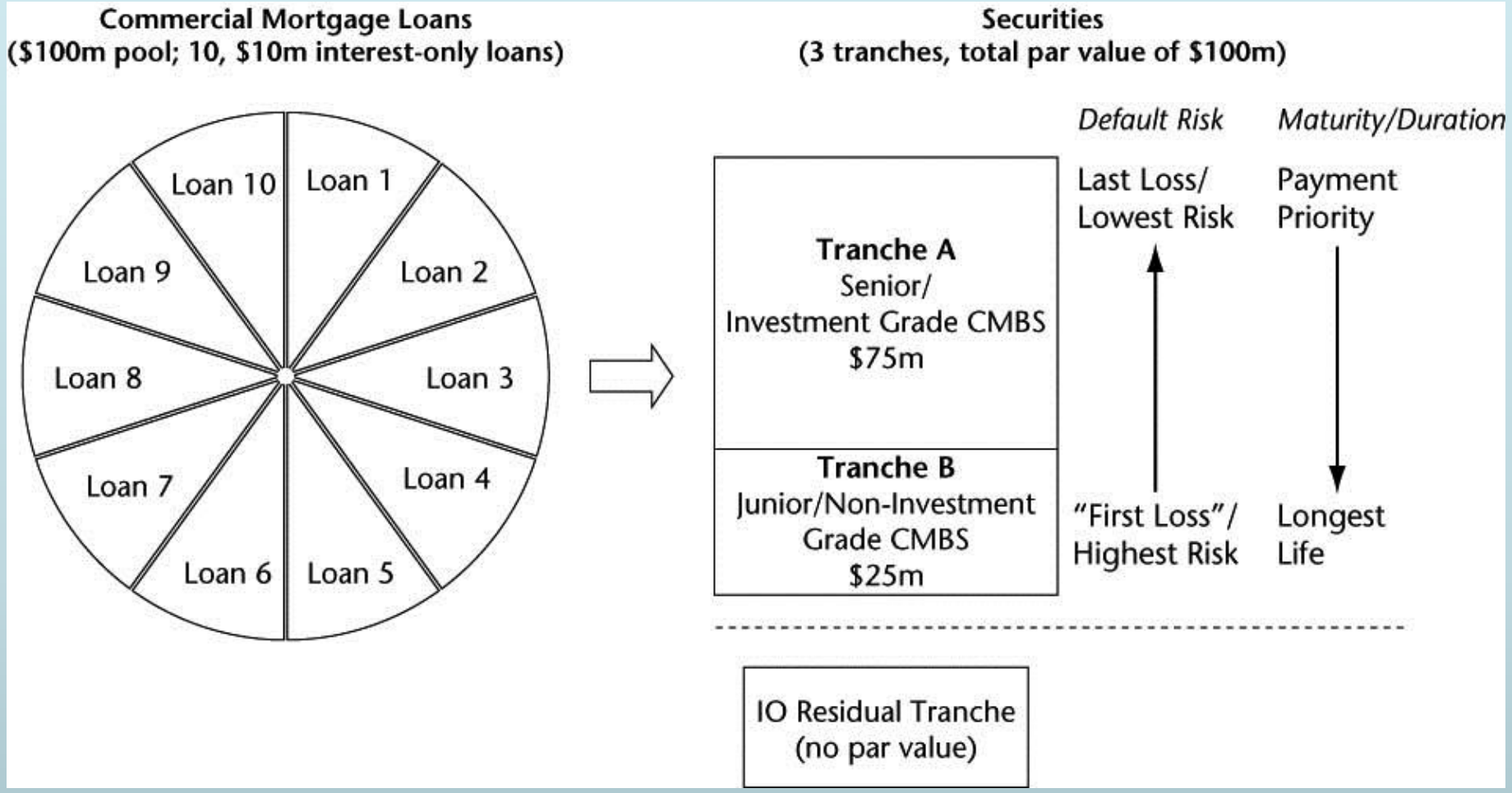
CMOs: example 1

- Back to our $75M pool of FRMs
- 3 tranches:
  1. A: 9.25% rate, $27M face value
  2. B: 10% rate, $15M face value
  3. Z: 11% rate, $30M face value
- Payments available for reduction of principal of A and B: Principal payments from pool + Interest Payments on Z
- Go to A first, then B
- Once A and B are retired, Z gets paid

Default

- Payments go to A first, then B, then Z, and then, finally to the equity tranche (*waterfall structure)*
- If anything is lost to default, equity tranche is the most likely to be affected
- This is why the IRR on the equity tranche must be high, and why subordinated tranches have to be rewarded
- Assume for instance that 20% of the last three principal and interest payments are lost to default

CMOs: example 2 (GM, section 20.2.1)



Value of deal to the issuer

- The value of the deal is the difference between the sum of issue prices for each tranche (net of underwriting costs) and the cost of funding the mortgages ($100M)
- This depends on the YTM various buyers require given the risk associated with each tranche:

Class	Par Value (millions)	WAM (yrs.)	Credit Support	Coupon	YTM	Value as CMBS* (millions)
A	$75	1.33	25%	8%	8%	$75.00
B	$25	2.00	0% (1st-loss)	10%	12%	$24.15
IO	NA	1.25	NA	NA	14%	$1.70
Pool	$100	1.50	NA	10%(WAC)	NA	$100.85

More CMBS language

- Since pools typically comprise very heterogeneous mortgages, summary statistics are useful:
  1. Total par value
  2. "Weighted average maturity" (WAM)
  3. "Weighted average coupon" (WAC)
  4. LTV ratio = Par value / Market value of underlying properties

Pool risk

1. Overall LTV and DCR, and their distribution
2. Quality of the documentation and appraisal
3. Property types
4. Loan maturities (WAM + distribution)
5. Loan types (terms, age,…)
6. Overcollateralization, credit enhancement

Tranche-specific risk

- Subordination of a given tranche =

  Par value of junior tranches / Par value of the Pool
- If a tranche has 25% subordination, the par value of the pool would have to fall by 25% for the tranche to begin experiencing losses
- Tranche's effective LTV = Pool LTV x (1-subordination)
- Tranche's effective DCR= Pool DCR / (1-subordination)

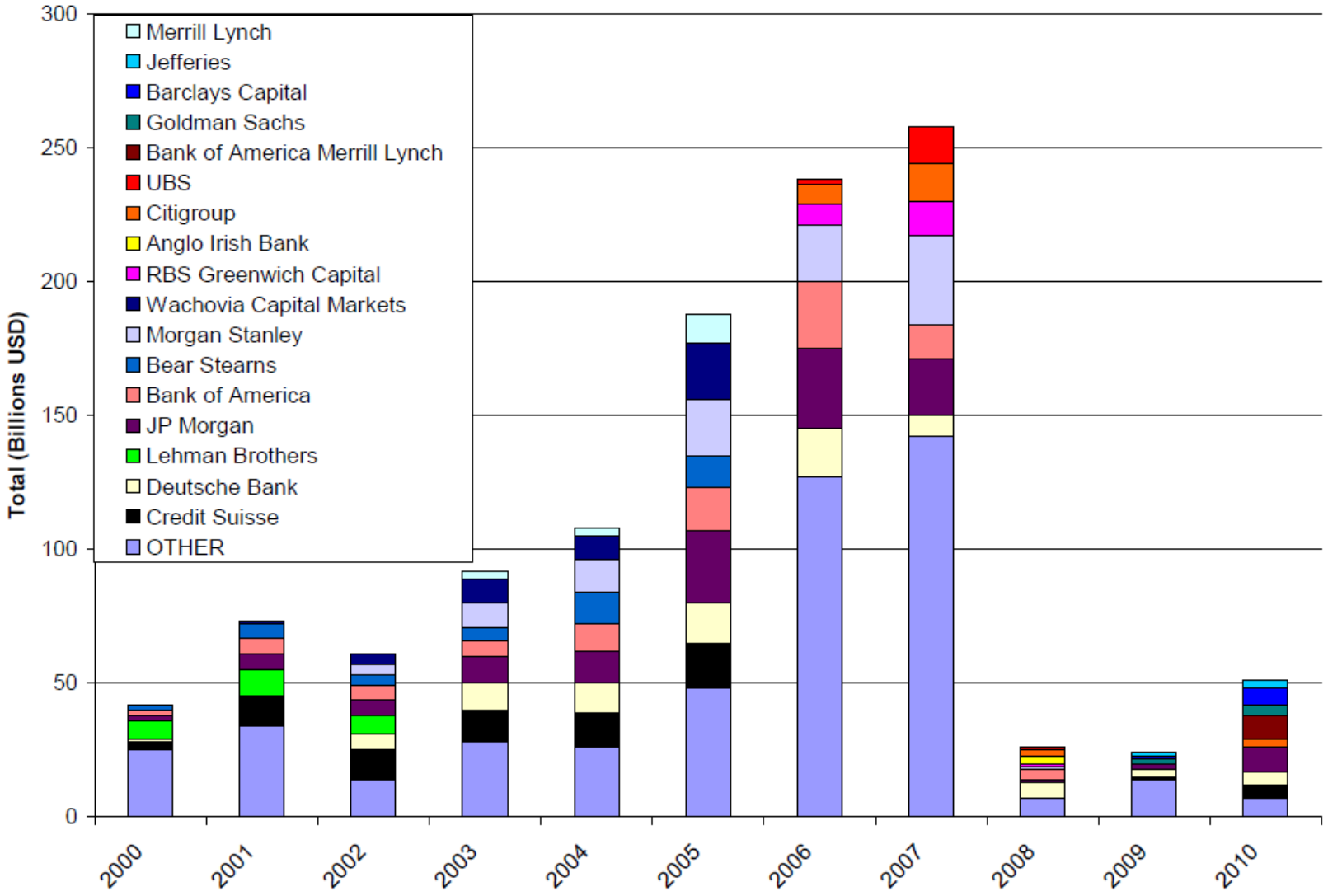
Credit rating and yield spreads

- Credit rating agencies assign risk ratings to tranches as function of the pool risk, subordination and WAM
- This helps investors decide what yield they should expect on various tranches relative to:
  1. Treasury yields at maturity ≈ tranche WAM
  2. The fixed rate component of LIBOR swaps at maturity ≈ tranche WAM

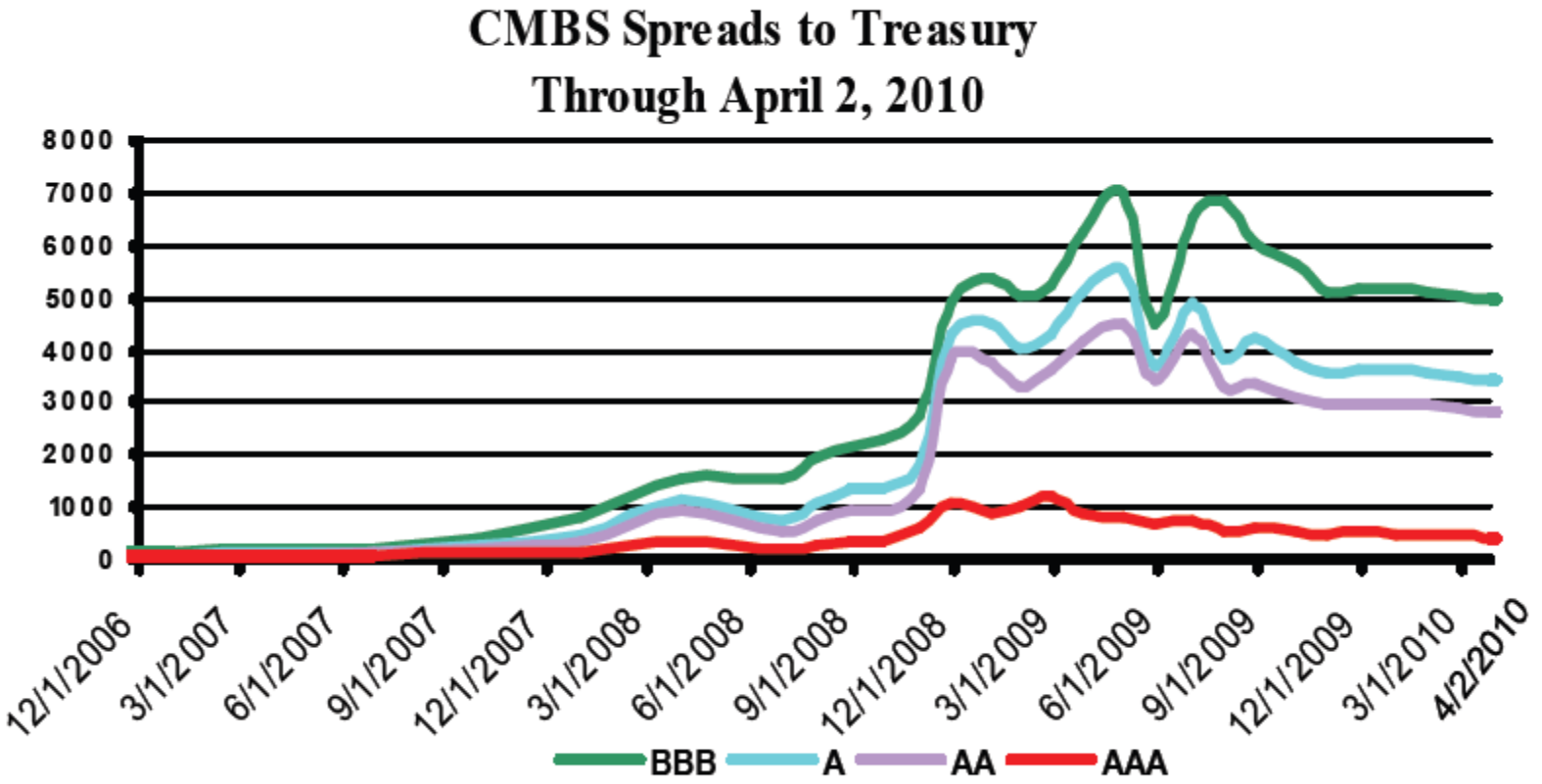
More financial engineering

- CDOs (Collateralized Debt Obligations) are debt instruments backed by pools of assets
- CMOs are CDOs where the assets are mortgages
- But CDOs can be backed by CMOs, REIT debt, unsecured real estate loans (*mezzanine loans*), preferred equity…
- The risk inherent to those deals is often insured via CDS (credit-default swaps)
- This creates a web of interrelated financial products
- When housing crisis struck in June 2006, the whole arrangement came crashing down, and it has yet to recover

Figure 3: Total CMBS issuance by underwriter (Billions USD) from 2000 to 2010



Source: Bloomberg[2]


CMBS Spreads to Treasury
Through April 2, 2010
8000
7000
6000
5000
4000
3000
2000
1000
0
12/1/2006
3/1/2007
6/1/2007
9/1/2007
12/1/2007
3/1/2008
6/1/2008
9/1/2008
12/1/2008
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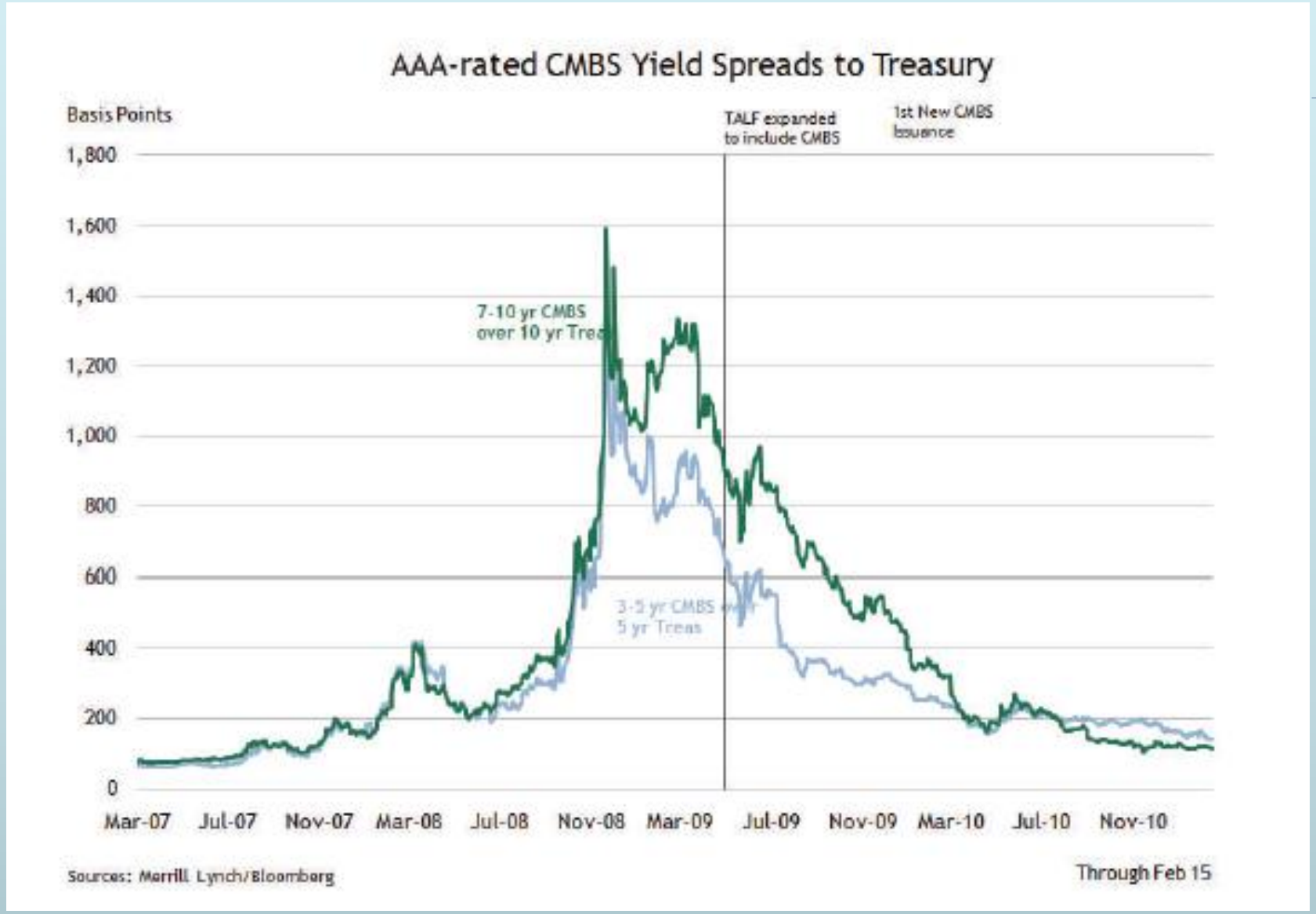
9/1/2009
12/1/2009
3/1/2010
4/2/2010
BBB
A
AA
AAA


AAA-rated CMBS Yield Spreads to Treasury
Basis Points
TALF expanded to include CMBS
1st New CMBS Issuance
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
7-10 yr CMBS over 10 yr Trea
3-5 yr CMBS over 5 yr Treas
Mar-07
Jul-07
Nov-07
Mar-08
Jul-08
Nov-08
Mar-09
Jul-09
Nov-09
Mar-10
Jul-10
Nov-10
Sources: Merrill Lynch/Bloomberg
Through Feb 15