



BANK FOR INTERNATIONAL SETTLEMENTS

Introduction to Mortgage-Backed Securities

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BANK FOR INTERNATIONAL SETTLEMENTS

Mortgage-Backed Securities

1. Introduction to MBS
2. Market Structure (30 mins)
3. Prepayment Risk (30 mins)
4. MBS as an Asset Class (20 mins.)



1. What are Mortgage-Backed Securities ?

- A security backed by loans to mortgage borrowers
- The security “passes through” interest and principal payments from the mortgage borrower to the MBS investor
- Usually, very high credit quality – No default risk – GNMA guaranteed by US government – FNMA implicit guarantee



1. MBS compared to ABS

- MBS pass through cash flows
- ABS are normal bonds that are collateralized by a designated set of assets
- ABS can have optionality and uncertain cash flows



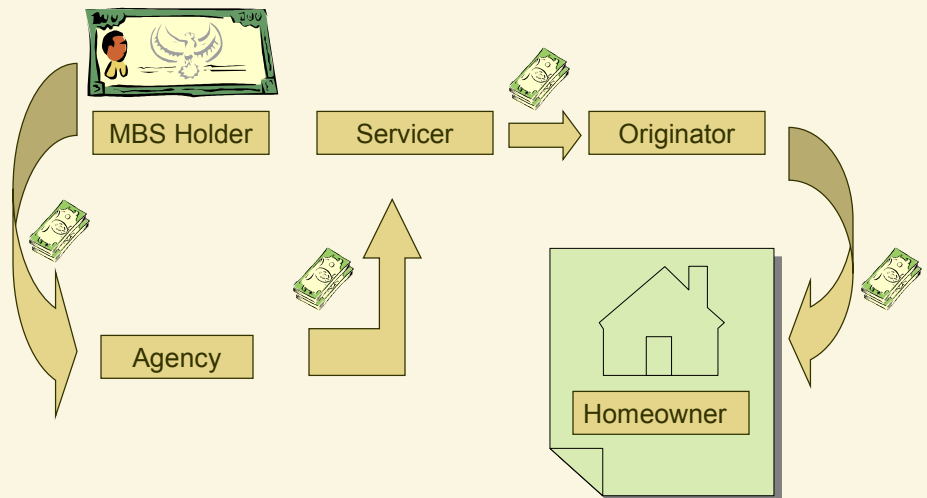
2. The MBS market¹

- USD 3.2 trillion (Agency Issued)
- 36% of the investment grade market
- Largest fixed-income market in the world
- Very liquid and active
- 83% of MBS market issued by agencies (FNMA/GNMA/FHLMC)

¹ As of 1st quarter 2003 – Source Bond Market Association and UBS

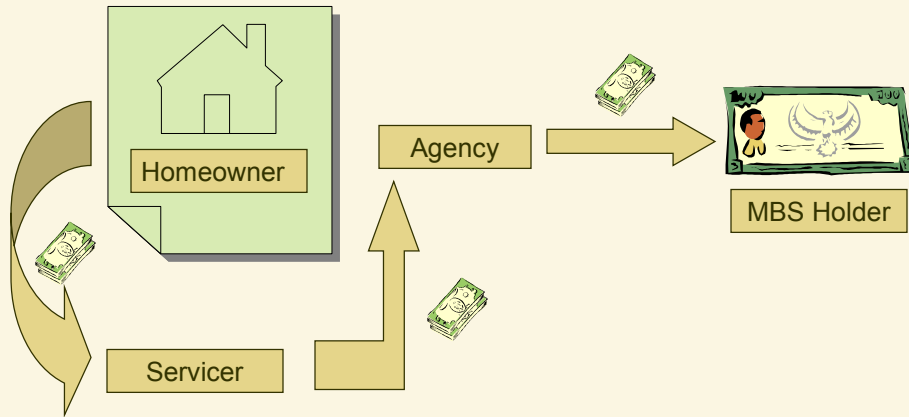


2. MBS cash flows: Mortgage origination





2. MBS cash flows: Monthly payments and refinancing



2. MBS market structure

Securities differ by:

- Maturity: 30-, 15-, 7-, 5- yrs
- Coupon: Floating (ARM) or Fixed
- Structure of issue – Generic, CMO, PAC, etc.
- Program – GNMA I, GNMA II, Gold, Midget, Balloon, Conventional



2. Credit risk and the agencies

- All agency MBS have their principal guaranteed by the issuing agency
- Homeowner default is treated as a 100% payoff of mortgage loan

- GNMA – Government National Mortgage Association - Ginnie Mae has explicit government guarantee
- FNMA – Federal National Mortgage Association - Fannie mae has only implicit government guarantee
- FHLMC – Federal Home Loan Mortgage Corporation – Freddie Mac has only implicit government guarantee

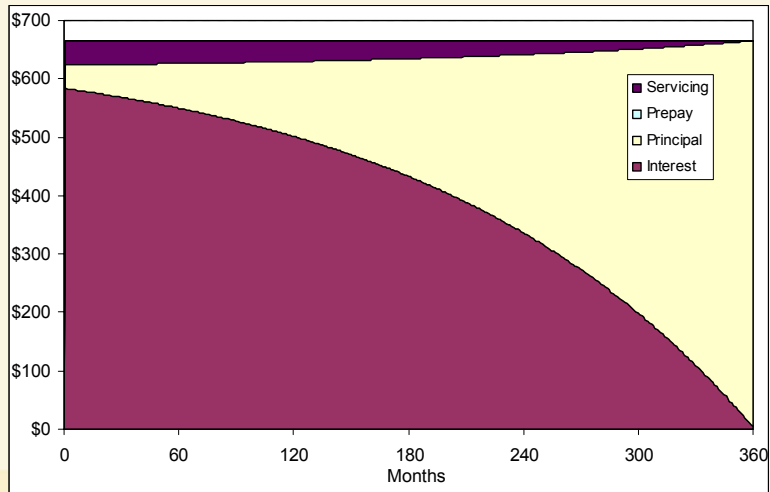


2. MBS cash flows

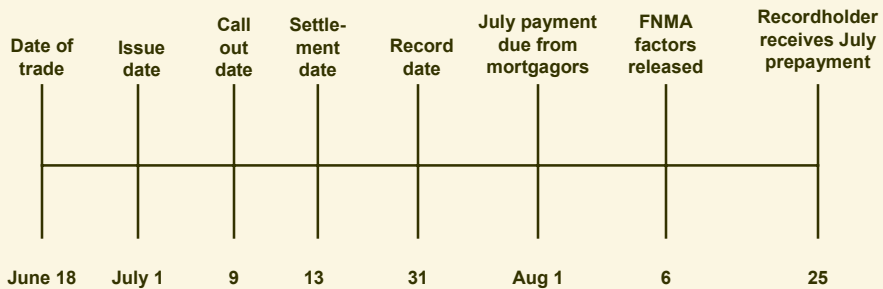
- Interest
- Principal pay downs
- Prepayment / Refinancing



2. MBS cash flows – No prepayments



2. Trading an MBS – FNMA 30 yr. purchase



Source: Fabozzi, *Handbook of MBS*, 1995



2. The delivery process

- Purchase is based on notional amount i.e. 100 million
- Good delivery is +/- 2% of traded face value
- 48 hr rule 2:45PM EST 2 days before settlement, seller provides pool information and delivered face value
- Up to 3 pools per million dollars can be delivered
- Cash paid at settlement = notional +/- 2% + accrued interest
- Any origination year can be delivered unless specified at trade



2. Trading TBAs (To Be Announced)

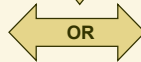
Purchase and Roll of August TBA Mortgage

On June 18

Buy \$100 million of August GNMAII 6% TBAs



On August 13th, sellers delivers
\$100 million of 6% GNMA II 6%
MBS in 1-3 pools



Until 48 hrs before delivery,

The TBA can be rolled:

Sell 100 million GNMAII 6% AUG

Buy 100 million GNMA II 6% SEP



3. Prepayments

- Homeowner has the **OPTION** to **prepay** some or all of the principal at any time
- A fixed-rate mortgage can be **refinanced** at the prevailing rate (i.e. 100% prepayment)
- These cash flows are uncertain and are the main source of risk of MBS (as compared to Treasuries)

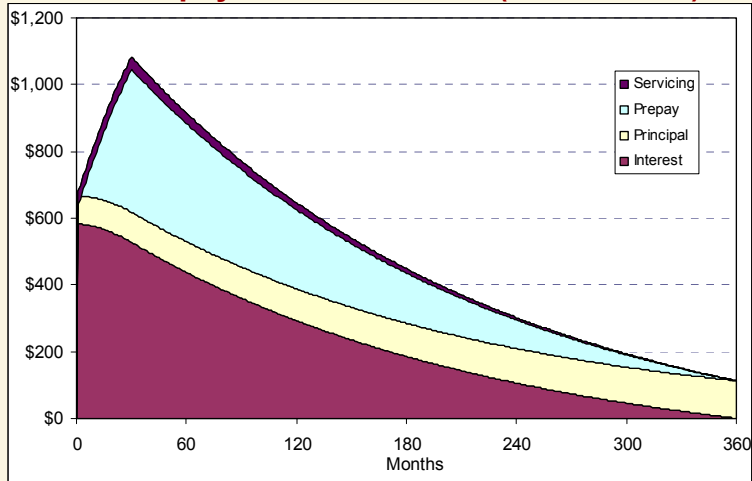


3. Factors affecting the refinancing decision

- Mortgage interest rate
- Refinancing costs or penalties (points)
- Housing value
- Amount of time since last refinancing
- Random effects – Paying attention ?, ease of applying, forced selling, default, moving, etc.

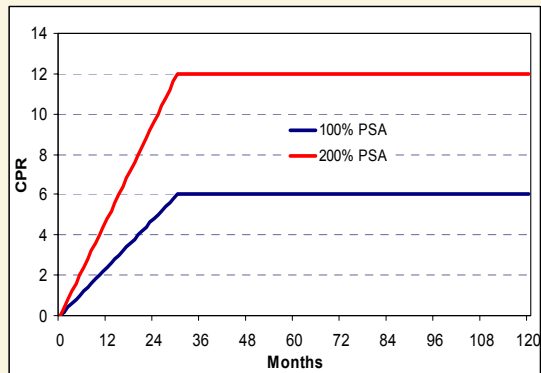


3. MBS payment breakdown (PSA = 100%)



3. Prepayment speeds – PSA, CPR and SMM

- PSA – Prepayment Standard Assumption
- CPR Constant prepayment rate
- 100% PSA starts at .2% CPR, increases by .2% per month until 30 months where it remains at 6%



Single-month mortality (SMM) = $1 - (1 - \text{CPR})^{1/12}$

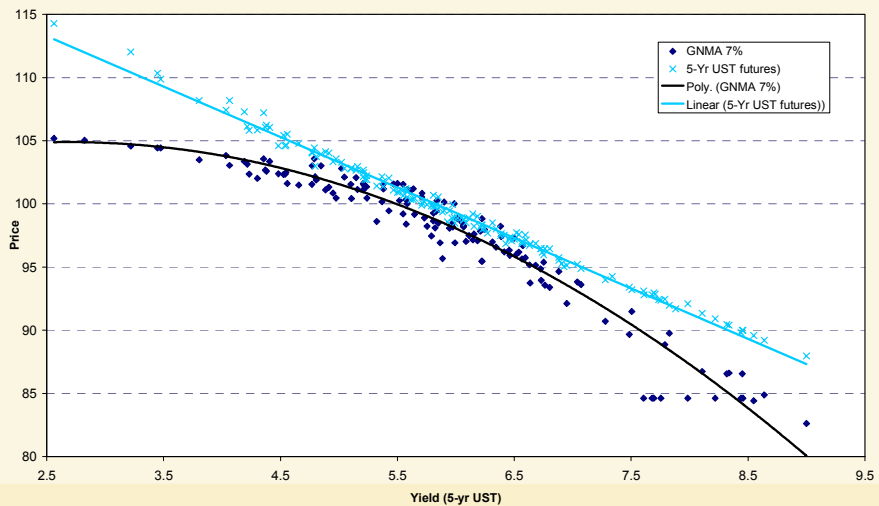


3. MBS 6% compared to Treasury 6% 10 yr

Cash Flow Simulation												
PSA	100%											
Disc Rate	6%											
Year		1	2	3	4	5	6	7	8	9	10	
A	6% Treas	6	6	6	6	6	6	6	6	6	106	
B	6% MBS	6.00	5.40	4.67	3.92	3.22	2.56	1.95	1.39	0.87	0.40	
C	Remaining	90	78	65	54	43	33	23	15	7	(0)	
D	Ann prepayment rate	2.4%	4.8%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	
Present Value												
F	Treasury	5.66	5.34	5.04	4.75	4.48	4.23	3.99	3.76	3.55	59.19	
G	MBS	15.08	15.62	14.45	12.37	10.55	8.96	7.55	6.31	5.20	4.12	
Price:												
H	Treasury	100.00	0.06	0.11	0.15	0.19	0.22	0.23	0.23	0.20	0.12	5.92
I	MBS	100.22	0.15	0.30	0.44	0.58	0.71	0.83	0.93	1.01	0.47	0.47
Duration												
J	Treasury	7.80										
K	MBS	4.36										

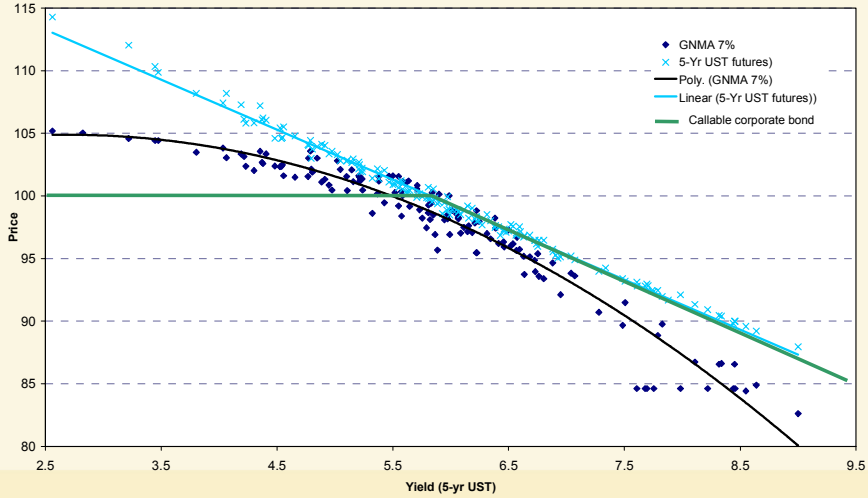


3. MBS vs. Treasuries

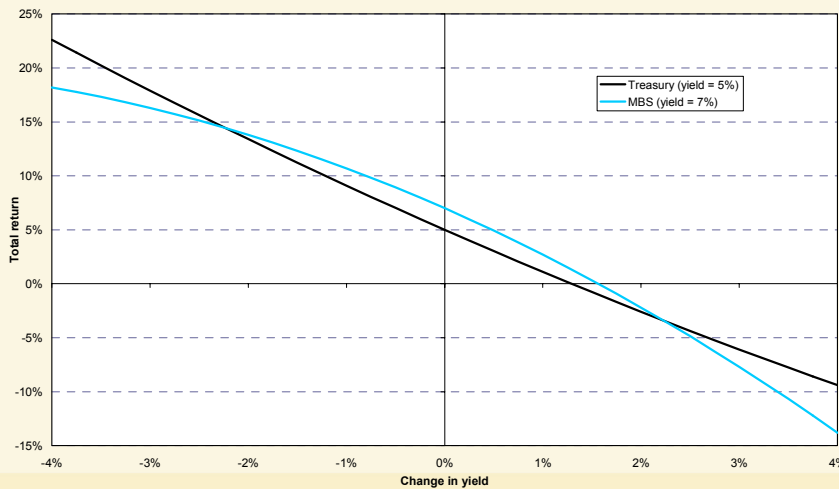




3. MBS vs. Treasuries and callable bonds

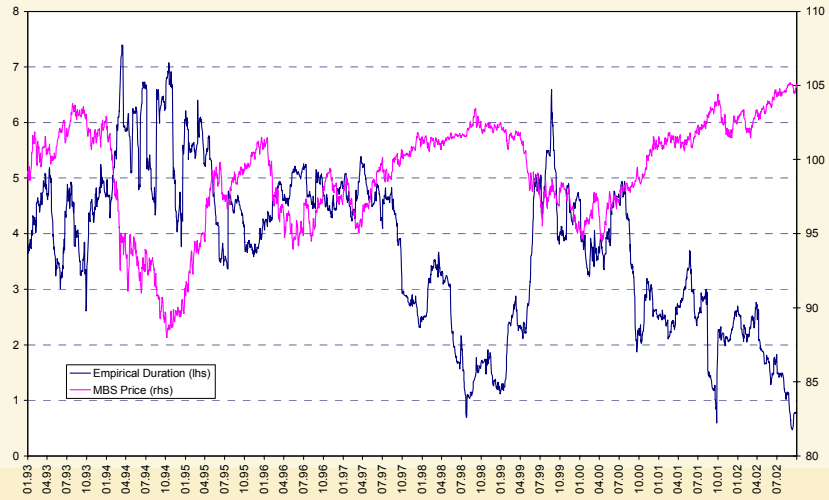


3. MBS vs. Treasuries total return simulation

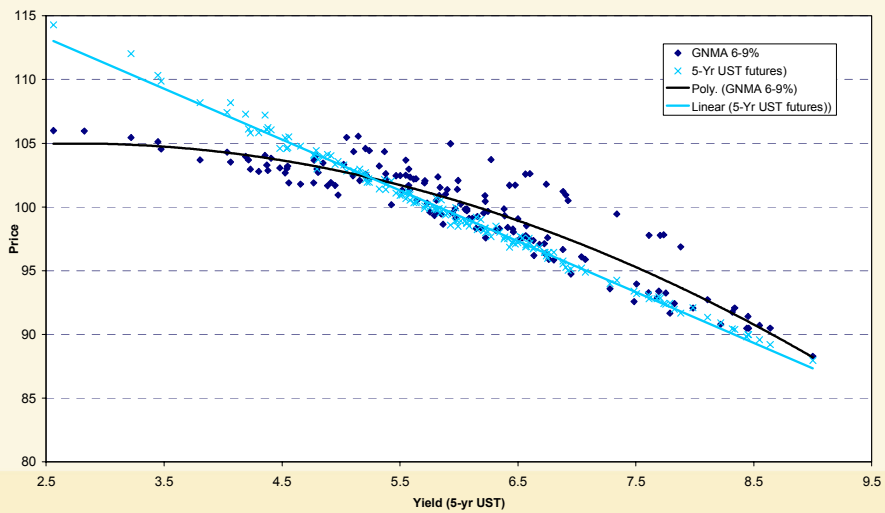




3. Market estimates of duration and prices



3. MBS portfolio vs. Treasuries





4. MBS as an asset class

- Investors receive compensation over and above the option premium (OAS)
- Extra return compensates for taking on the uncertainty of prepayment risk
- Prepayment risk cannot be diversified away



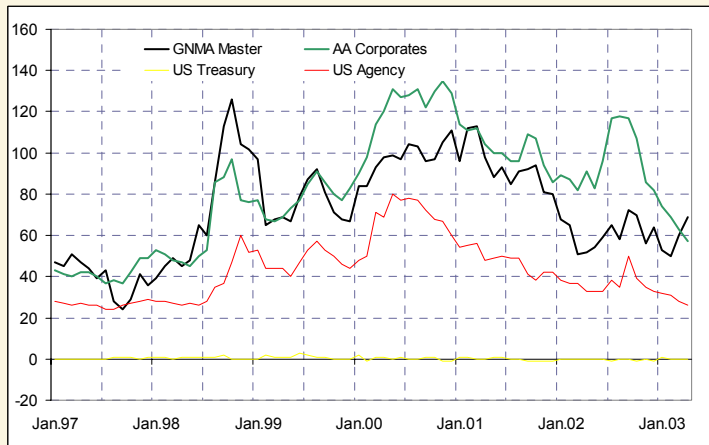
4. Quarterly returns for Merrill Lynch aggregate US dollar indexes

	<i>MBS^d</i>	<i>Agency</i>	<i>Treasury</i>	<i>Corporate</i>
Standard Dev.	1.92%	2.18%	2.51%	2.56%
Average Return	2.12%	2.03%	2.01%	2.17%
Maximum	8.00%	6.87%	7.89%	7.87%
Minimum	-2.32%	-2.61%	-3.01%	-3.61%
% of Negative Quarters	11.5%	21.2%	26.9%	19.2%
Lower Quartile	1.0%	0.2%	0.0%	0.4%
Upper Quartile	3.0%	3.5%	3.7%	4%
Sharpe Ratio	1.11	0.93	0.80	0.85

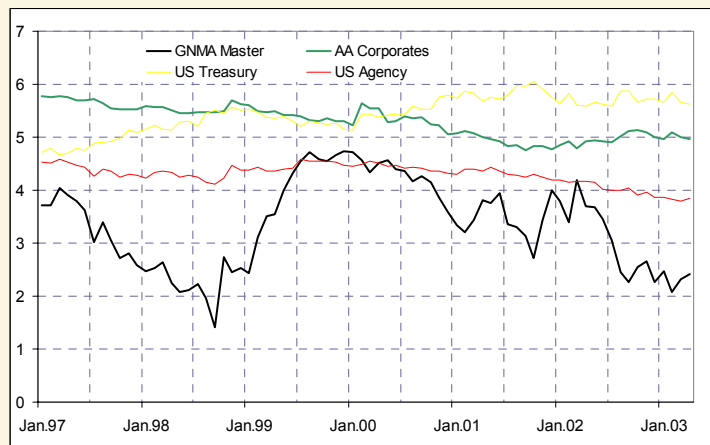
from 1st quarter 1989 to 4th quarter 2001



4. OAS



4. Index duration





4. What can go wrong ?

- Investors get principal returned to them in a low yield environment
- Operational risk is high due to complex structure and frequent cash flows
- Difficult to measure MBS duration – Empirical/OAS ?
- Market structure frequently changing



Key points

- MBS are backed by cash flows from mortgage loans
- Default free
- Interest rate risk
- Prepayment risk
- Investors are compensated for this risk