Chapter 11
Valuation of Mortgage Securities

Learning Objectives
- Understand the valuation of mortgage securities
- Understand cash flows from various types of mortgage securities
- Understand how changes in interest rates affect mortgage securities values
- Understand mortgage securities and hedging against interest rate risk

Traditional Debt Security Valuation
- Typically fixed, semi-annual interest payments with face value paid at maturity
- Value moves inversely with market interest rates
- Yield to maturity at a given point in time is based on current market value

Mortgage Backed Bonds
- These bonds are sold to provide the funds to purchase mortgages
- Are corporate like bonds backed by mortgages and are rated like any corporate bond (tend to have high credit ratings)
- FNMA and FHLMC are the largest issuers
- Fixed coupon rate with stated maturity
- Issuer retains ownership of mortgages
- Mortgages pledged as security
- Over collateralization and possibly other credit enhancement if based on risky private or commercial mortgages

Mortgage Pass-Through Securities (MPT's)
- Mortgage origins are pooled by the loan originators, by investment bankers, or FNMA or FHLMC
- A pass through, basically passes through the Principal and Interest payments from the note holders to the securities holders. (an undivided equity interest in the pool of mortgages)
- The pass through market was created by GNMA through insuring the timely repayment of principal and interest on FHA and VA mortgages

Mortgage Pass-Through Securities
- Typically about 50 basis points of the interest rate on the mortgages goes to:
  - the servicer (about 25 bp), and
  - the organization guaranteeing the timely repayment of the P and I on the mortgages (guarantee fee of 25 bp)
- If the average note rate on a pool of mortgages (called the weighted average coupon) was say 6.5%, the investors would receive a coupon rate of 6.0%
Weighted Average Coupon (WAC)

- A mortgage pool may have some heterogeneity. For example, mortgages with interest rates of 6.375%, 6.5%, and 6.675% may be in the same pool. If there were $20,000,000, $30,000,000 and $50,000,000 of each then:
  \[
  \text{WAC} = 0.2 \times 6.375\% + 0.3 \times 6.50\% + 0.5 \times 6.775\% = 6.6125\% 
  \]
- The pass through rate might then be 6.1125%. The rest of the coupon payment from the underlying mortgages would go to pay the servicing and guarantee fees and to pay the equity portion of the pool.

Mortgage Pass-Through Securities

- A number of Mutual Funds invest exclusively in MPT's:
- Large or small investors may hold MPT's.
- A major financial risk for MPT's if the risk of early repayment when interest rates fall.

Mortgage Pass-Through Securities

- The actual payments to the security holders depends on the degree of mortgage prepayments, which the security holder has no control of.
- Sometimes an originator will swap a pool of mortgages for an equivalent value of MPT's.
- MPT's have a higher interest rate than a comparable bond because homeowners tend to refinance when interest rates fall.

MORTGAGE-RELATED SECURITIES

- Cash flows have three components: interest, principal amortization, and prepayments.
- Principal payments may be accelerated or delayed based on changes in market rates.
- If market rates rise, mortgage prepayment slows down as borrowers hold onto low-rate loans.
- If market rates decline, mortgage prepayment increases due to refinancing.

PASS-THROUGHS

- The rate of mortgage prepayment is crucial in pass-through valuation.
- Several models of expected prepayment:
  - FHA Twelve-Year Prepaid Life – assumes everyone pays off (balloon) after 12 years.
  - Constant Prepayment Rate
  - FHA Experience – use data of past prepayment patterns

PASS-THROUGHS

- Prepayment models (cont.):
  - Public Securities Association (PSA) Model
    - Current industry standard
    - Combines FHA experience with CPR model
  - Econometric Prepayment Models
  - Refinancing Models
    - Based on title search activity which precedes refinancing
PASS-THROUGHS

- No rearranging of the cash flows from the mortgage pool
- Prepayments have a significant impact on the timing of cash flows and thus the value of those cash flows
- If selling at a discount, accelerated (delayed) prepayment increases (decreases) the realized yield

PASS-THROUGHS

- Changes in market rates have two impacts on pass-through value: both the discount rate and the assumed prepayment will change
- In senior/subordinated pass-throughs the senior security has enhanced rights to cash flows and subordinated security bears all the default risk

The PSA Assumption

- The secondary mortgage industry wanted a way to mitigate the effect of the uncertain timing of mortgage payoffs of a pass through
- The solution was the creation of the CMO
- However, there was a potential tax problem
- A REMIC is a tax status for a pool of mortgages
- REMICs are only taxed at the CMO level and not at the entity (pool) level
- Must follow rules (as do mutual funds) to get this special tax status

Cash Flow by PSA Assumption

- Real Estate Mortgage Investment Conduits (REMICS)
  - Limited life and self liquidating with minimal management
  - No taxation at the entity level
  - REMIC assets consist only of:
    - Qualified mortgages
    - Foreclosure property only
    - Short term, passive, or interest bearing assets used to reinvest funds not yet paid to out to investors
    - Qualified reserve fund (more important if assets are not backed by GNMA, FNMA, or FHMLC)
Idea behind CMO’s

- A pool of mortgages can be seen as a set of cash flows, that can be split into pieces and sold as pieces rather than as an undivided fraction of the pool
- Like the Seinfeld episode where the muffin tops were being sold separately from the less desirable muffin bottom

Collateralized Mortgage Obligations

- Cash flows are made up of various tranches and residual class
- Any mortgage prepayments are passed to bondholders thus there is no sinking fund
- This means that the CMO issuer faces no interest rate or reinvestment risk (vs. someone that issues MBB)
- Yield is higher on longer tranches

Collateralized Mortgage Obligations (CMOs)

- CMOs are structured differently from pass-throughs thus prepayment behavior affects pricing and yield differently
- Price and yield on shorter-term tranches will not vary as much with prepayment as compared to pass-throughs

Collateralized Mortgage Obligation (CMOs)

- All payments flow through to the bond holders
- Security holder assumes prepayment risk
- Multiple classes of security (maturities) are issued
- Payment prioritization established by using Tranches of different maturity dates
  - Tranche is a French word meaning slice

CMO - example

- Mortgage Pool Consists of 102,000,000 of mortgages
- Tranche A is 20,000,000 of (short term) bonds which gets interest payments plus all of the principal payments until this class is paid off
- Tranche B is 30,000,000 of medium term bonds which receive interest only until Tranche A is fully paid off, and then receives all principal payments
CMO - example

- Tranche Z is 50,000,000 of zero coupon like bonds which get no payment (though they accrue interest) until the first 2 Tranches are paid off, at which time they get all the money paid into the pool until they are paid off.
- If the average interest rate on the mortgages was 6%, Tranche A might earn 4.75%, Tranche B 5.25% and Tranche Z 5.75%.
- The residual cash goes to the Equity, which began with $2,000,000, and represents the over collateralization of the pool.
- Recall that the servicer and guarantor also get a cut of the mortgage interest.

CMO’s

- Prepayment risk is now somewhat mitigated as Tranche A absorbs the earliest repayment, followed by Tranche B. Tranche Z keeps its money invested in the pool longer (Sequential Tranches).
- When putting together CMO’s the sponsor attempts to match investors with the expected cash flow of the Tranche.

CMO’s

- As the CMO market grew, so did the number of Tranches.
- It became increasingly common to sell investors the type of Tranche the investor desired.
- When all the desirable Tranches were sold off, what was left were dubbed “kitchen sink” bonds because the originator had sold off everything but the kitchen sink.

CMO’s

- To reduce prepayment risk further, some Tranches were set up as PAC’s (planned amortization classes, and TAC’s, targeted amortization classes) for which the structure tried to keep the cash timing as close as possible to projections.
- To take up the slack, companions were also issued which took the prepayments if they deviated from the expected pool prepayment.

See CMO payoff pattern examples

CMO’s

- Another way to slice up the mortgage cash flows is to separate the principal and interest part of the cash flows.
- IO is an interest only strip.
- PO is a principal only strip.
IO’s and PO’s

- An investor who buys a PO know for sure the amount she will receive in cash payments (the note amount). This investor does not know the timing of these cash flows.
- An investor that buys an IO knows neither the amount nor the timing of the cash flows (it depends on the prepayment). IO’s are thus very risky as if interest rates decline, refinancing will rise, cutting off the future interest payments.
- High prepayment is bad for IO holders and good for PO.

The PSA Assumption

 Interest, Principal, CF, PMT = 599.55
$100000 Mortgage, 30 yr at 6%

Interest, Principal, CF, PMT = 599.55
$100000 Mortgage, 30 yr at 6%

PV of IO/PO by PSA, discounted at 6%
Floating Tranches

- Some Tranches have variable interest rates
- May be from ARM mortgages
- Fixed rate mortgages may also be used as a pool for creating floater
- Inverse floaters are used to balance off floaters if fixed rates mortgages back up the pool
- If interest rates increase, the payments to floaters increases, and the payments to inverse floaters decrease

CMO data, WSJ, April 10, 2008

<table>
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<th>Maturity</th>
<th>Spread</th>
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<td>SEQUENTIALS</td>
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<tr>
<td>2-year</td>
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<td>160</td>
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<td>5-year</td>
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<td>20-year</td>
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CMO data, WSJ, April 10, 2008

<table>
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<tr>
<th>Price</th>
<th>PSA (Prepay Spread)</th>
<th>Yield to Maturity</th>
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<tr>
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<tr>
<td>MAC GOLD</td>
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<td>FNMA</td>
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<tr>
<td>FNMA **</td>
<td>5.50%</td>
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<td>FNMA **</td>
<td>5.00%</td>
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<tr>
<td>FNMA **</td>
<td>6.50%</td>
<td>103-31</td>
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Commercial Mortgage-Backed Securities

CMBS

- Take the form of MBB, MPT, or CMO
- Default risk is greater
- Secured by income properties
- Non-recourse loans must look to security to satisfy loan
- Shorter maturities
- Senior and subordinated Tranches
  - In other words, in the case of defaults some Tranches absorb more of the defaults than others
- Prepayment risk mitigated by "lockouts" or other forms of prepayment penalties

CMBS General Bond Risk Conditions

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<th>LTV</th>
<th>Price</th>
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<td>52.50%</td>
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<td>75.00%</td>
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CMBS- Enhancements

- Third party guarantees
- Surety bonds, LC’s
- Advance payment guarantees
- Repurchase agreements
- Lease assignments
- Overcollateralization
- Cross default provisions
SERVICING RIGHTS

- Lenders sell off loans and often retain the servicing rights.
- Servicing includes collecting monthly payments, maintaining escrow accounts, forwarding proper payments to purchasers, sending delinquency and default notices, initiating foreclosure proceedings and collecting on PMI.

SERVICING RIGHTS

- Revenue from servicing includes the servicing fee, float on the escrow accounts, and float between receipt of monthly payments and payments to purchasers.
- Costs include administrative costs and overhead.

SERVICING RIGHTS

- Fee is usually between 0.25 and 0.50 percent of the mortgage balance.
- Value is affected by interest rate changes similar to IO strips.
- Rates rise, discount rate goes up and prepayment accelerates. Combines to reduce the value of servicing rights.

SERVICING RIGHTS

- Excess servicing rights are fees greater than “normal.”
- Usually occurs when mortgages are sold with a promised rate less than the coupon on the mortgages.
- The greater the spread, the larger the excess servicing fees.

VALUE CREATION IN MBSs

- Value is created even though no additional cash flow is created.
- Securitization eliminates liquidity risk and makes the market larger.
- Securitization rearranges the cash flows into more and less risky components.
- Asymmetric information may distort values - lenders may have superior.