Chapter 6
Learning Objectives
- Understand alternative mortgage instruments
- Understand how the characteristics of various AMIs solve the problems of a fixed-rate mortgage

Alternative Mortgage Instruments

Adjustable-Rate Mortgage (ARM)
Graduated-Payment Mortgage (GPM)
Price-Level Adjusted Mortgage (PLAM)
Shared Appreciation Mortgage (SAM)
Reverse Annuity Mortgage (RAM)
Pledged-Account Mortgage or Flexible Loan Insurance Program (FLIP)

Interest Rate Risk

- Mortgage Example:
  - $100,000 @ 8% for 30 years, monthly payments
  - \( \text{PMT} (PV=-100000, N=36, I/YR=8) = 733.76 \)

- If the market rate goes to 10%, the market value of this mortgage goes to (assuming amortized over the full term):
  - \( \text{PV} (\text{PMT} = 733.76, I/YR=10, N=360) = 83,613 \)
  - Lender loses $16,387

- If the lender could automatically adjust the contract rate to the market rate (10%), the market value of the loan remains
  - \( \text{Pmt} (PV=100000, I/YR=10, N=360) = 877.57 \)
  - \( \text{PV} (\text{PMT} = 877.57, I/YR=10, N=360) = 100,000 \)
Objectives for ARMs

- Calculate loan payments, loan balance, and interest charges on adjustable rate mortgages
- Effective cost of borrowing or lenders effective yield
- Calculate FTLAPR of an ARM
- Understanding the risks of both lender and borrower under an ARM

ARMS and Lender Considerations

- Who should bear the interest rate risk on a mortgage?
- Market interest rates change daily, but 30 year FRM's are common
- Fixed rate over life of the loan (FRMs): Lender bears the risk (presumably borrow pays a premium to escape this risk)
- ARMs – borrower bears some interest rate risk
- Unanticipated inflation – primary source of interest rate risk
- Uncertainty about all risk premiums (prepayment)

ARMS: An Overview

- The interest rate charged on the note is indexed to other market interest rates
- The loan payment is adjusted at specified periods. The interest rate may vary with a shorter periodicity than the payments (e.g. COFI type loans)
- ARMs do not eliminate all interest rate risks
- The longer the adjustment period the greater the interest rate risk to the lender

ARMS: Mechanics

- The borrower is charged an index based interest rate plus a spread – e.g. LIBOR plus 2.25%
- May be rounded to the nearest 1/8%
- Often limits on the amount the interest rate may adjust
- Often limits on the amount the payment may change

Some ARM Indexes

- Interest rates on six month treasury bills
- Interest rates on one year treasury bills
- Interest rates on three year treasury bills
- Interest rates on five year treasury bills
- Weighted average cost of funds
- National average of existing loans (fixed rate)
- LIBOR
Arm Indexes from
http://mortgage-x.com/general/mortgage_indexes.asp

From HSH, September 10, 2008

Latest ARM Indexes

<table>
<thead>
<tr>
<th>Index Type</th>
<th>Rate</th>
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<tbody>
<tr>
<td>1 year Treasury (TCM)</td>
<td>2.08%</td>
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<tr>
<td>3 year Treasury (TCM)</td>
<td>2.46%</td>
</tr>
<tr>
<td>5 year Treasury (TCM)</td>
<td>2.93%</td>
</tr>
<tr>
<td>11th District COFI</td>
<td>2.698%</td>
</tr>
<tr>
<td>6-Month LIBOR (HSH)</td>
<td>3.111%</td>
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</table>

Arm Characteristics

- Initial interest rate - sometimes called the start rate or the contract rate or interest.
  - If lower than index value plus margin, it is typically referred to as a “teaser rate”
- Index - stated in mortgage
- Adjustment interval - usually tied to the index
  - COFI – varies monthly and rate changes each month (though payment does not)
  - 1 Year Treasury based – changes each year
  - 3 Year Treasury based – changes every 3 years

ARM Characteristics Continued

- Margin - a constant spread, or premium added to the index
- Composite rate - the index plus the margin, sometimes called the market rate
- Margin typically depends on Index (see hsh.com)
  - LIBOR plus 225 basis points (a basis point is 1/100 percent)
  - 1 Year Treasury plus 275 bp
  - 1 Year MTA (12 month moving Treasury Average) plus 250 bp
  - COFI plus xx bp
  - Average composite rate within 10 bp for past 3 years for the three indexes (hsh)

Common Limitations (Caps and ceilings)

- Maximum increases allowed in interest rate at adjustment
- Maximum interest rate allowed on loan
- Maximum increase allowed in payment – though this maximum may reset every 5 years to deal with excess negative amortization, if the principal hits some trigger amount such as 110-125% of the original principal amount
- May be minimum interest rates, but less important if the loan is pre-payable as the borrower may prepay to get a better rate.
ARM Characteristics Continued

- Negative Amortization (also called positive accrual) occurs when payments are limited but interest rates rise so that the payment is below the interest amount due
- Floors - maximum reductions in payments or interest rates
- Assumability, Discount points, Prepayment Privilege, etc. are like any other mortgage

ARMs- Other Considerations

- Both lenders and borrowers face uncertainty when choosing ARMs
- Risk premium – ARMs typically have higher default rates, why?
- Interest rate risk – is now shared by the borrower and lender – amount depends on ARM terms
- Ceteris paribus, at time of origination the expected yield on an ARM should be less than on a FRM because the borrower is accepting some (or all) of the interest rate risk.

ARMs- Other Considerations

- Short term indexes are riskier to borrowers than long term indexes
- Shorter adjustment periods are riskier to borrowers
- Maximum caps on interest rate adjustments favor the borrower
- Borrowers should be careful of negative amortization
- In theory, sophisticated investors who buy mortgage backed securities should be able to bear interest rate risk than homeowners

ARM Variations

- 3/1, 5/1, etc. Hybrid ARMS
  - The rate is fixed for the first period, and then is a 1 year adjustable ARM after that period
- (Interest Only) Option ARMS
  - There is no required loan amortization though the payment adjusts as interest rates changes. The borrower has the option to pay down the principal. Four payment options may be specified:
    - Minimum payment (may have negative amortization)
    - Interest only payment
    - Amortize over 30 year lifetime
    - Amortize over 15 year lifetime

Teaser Rates

- Initial rates for ARMs are stated, and are typically lower than the sum of the index plus margin
- For loans with a strong teaser, that is an initial rate much lower than the composite rate would be the day the loan was originated, there will be a large expected payment increase on the adjustment date (payment shock)
- If the borrower was “qualified” on the teaser rate he or she may not be able to make the new, higher payments
- Many subprime mortgages were of a 2/1 structure with a teaser and so borrowers cannot afford the higher payment, leading to high default rates

Ex. 6.1: ARM example #1

- You are seeking a loan for your $250,000 house and have determined that you would like to choose an ARM because you expect to keep the house for just 3 years. Assume you make a 20% down payment and pay 3 points. What are your CF’s and the yield to lender? What do you pay each year in interest?
  - Initial rate 3.25%
  - Annual adjustments – Tbill + 2.25% (rounded to 1/8%)
  - No payment or interest rate caps
  - Index, now at 4.21, then changes annually to: 3.67, 6.23, 8.33
Ex. 6.2: ARM example #2

- You are seeking a loan for your $250,000 house and have determined that you would like to choose an ARM because you expect to keep the house for just 3 years. Assume you make a 20% down payment and pay 2 points. What are your CF’s and the yield to lender? What do you pay each year in interest?
  - Initial rate 3.5%
  - Annual adjustments – Tbill + 2.75% (rounded to 1/8%)
  - Max change of 2% per year interest rate
  - Max interest of 5% above initial rate
  - Index, now at 4.21, then changes annually to: 3.67, 6.23, 8.33

Ex 6.3: ARM example #3

- You are seeking a loan for your $250,000 house and have determined that you would like to choose an ARM because you expect to keep the house for just 3 years. Assume you make a 20% down payment and pay 1 points. What are your CF’s and the yield to lender? What do you pay each year in interest?
  - Initial rate 3.75%
  - Annual adjustments – Tbill + 2.75% (rounded to 1/8%)
  - Max payment change of 7.5% per year (negative amortization allowed)
  - Max interest of rate 6% above initial rate
  - Index, now at 4.21, then changes annually to: 3.67, 6.23, 8.33

FTLAPR for ARM’s

- The FTLAPR is computed assuming the index does not change, and may be rounded to the closest ¼%.
- Example 6.4: A 15-year ARM with 3 points ($100,000 note amount) is offered with an initial interest rate of 3% based on the 1 year Treasury Index that is currently at 5.82. The margin is 275 bp. Annual interest rate cap is 2%, with a 6% lifetime ceiling (increase). What is the FTLAPR?

Price Level Adjusted Mortgage

- When inflation is high, interest rates on either FRM’s or ARM’s will be high to compensate the lenders
- In real terms, the borrowers payment starts out very high, and then declines over time (payment tilt). This makes it hard to afford a very large loan.
- An alternative is to have a loan with a real interest rate, with a payment that is increased with inflation. The loan balance is also increase with inflation. This is much like TIPS.

Price-Level Adjusted Mortgage PLAM

- Solves tilt problem and interest rate risk problem by separating the return to the lender into two parts: the real rate of return and the inflation rate
- The contract rate is the real rate
- The loan balance is adjusted to reflect changes in inflation on an ex-post basis
- Lower contract rate versus negative amortization
Example 6.5: PLAM example

- Consider a $100,000 loan offered at a 3% real rate of interest over 20 years. Payments and loan balance will be adjusted annually. Assuming inflation over the next three years is 18%, 11%, and 15% respectively, what are the loan payments, and final payoff required at the end of year 3?

Problems with PLAM

- Payments could increase at a faster rate than income
- Mortgage balance might increase at a faster rate than price appreciation
- Adjustment to mortgage balance is not tax deductible for borrower
- Adjustment to mortgage balance is interest to lender and is taxed immediately though not received

Shared Appreciation Mortgage (SAM)

- Rather than charging a high interest rate to recover the effect of inflation, lender accepts compensation for inflation via the increasing value of the property. This allows the lender to charge a lower interest rate
- If the lender needs to pay depositors a high interest rate to attract deposits, it may not be able to offer SAM type mortgages. Lenders may wait years before receiving compensation
- Lenders need to be concerned about how well property will be maintained

Shared Appreciation Mortgage (SAM) Continued

- Appreciation in value of real estate depends on action of borrowers, such as maintenance
- Appreciation paid to a lender ruled a contingent interest

Example 6.6: SAM example

- You have a building currently valued at $1,200,000 for which you seek a $1,000,000 mortgage (30-year with 5 year balloon). You are offered a SAM at 5%, where you must also give the lender 45% of the appreciation after 5 years. For an 8% annual inflation rate for the building, and assuming you hold the building for 5 years, what are your cash flows on the loan. What is the yield to the lender?
Graduated-Payment Mortgage

- Tilt effect is when current payments reflect future expected inflation. Current FRM payments reflect future expected inflation rates. Mortgage payment becomes a greater portion of the borrower’s income and may become burdensome.
- GPM is designed to offset the tilt effect by lowering the payments on an FRM in the early periods and graduating them up over time.

Reverse Annuity Mortgage

RAM Characteristics

- Typical Mortgage - Borrower receives a lump sum up front and repays in a series of payments.
- RAM - Borrower receives a series of payments and repays in a lump sum at some future time.

RAM Characteristics

- RAM Can Be:
  - A cash advance
  - A line of credit
  - A monthly annuity
  - Some combination of above

RAM Example

Borrow $200,000 at 9% for 5 years, Annual Pmts.

<table>
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Pledged-Account Mortgage

- Also called the Flexible Loan Insurance Program (FLIP)
- Combines a deposit with the lender with a fixed-rate loan to form a graduated-payment structure
- Deposit is pledged as collateral with the house
- May result in lower payments for the borrower and thus greater affordability

Mortgage Refinancing

- Replaces an existing mortgage with a new mortgage without a property transaction
- Borrowers will most often refinance when market rates are low
- The refinancing decision compares the present value of the benefits (payment savings) to the present value of the costs (prepayment penalty on existing loan and financing costs on new loan)