Residential Mortgage Finance

Early American Mortgages

- Mortgages before the Great Depression
  - Generally were interest only (non- amortizing) loans
  - Had Loan to Value Ratios under 50 %
  - Were short term loans around 5 year or less
  - At maturity the entire balance was refinanced
  - Due to the non-amortizing nature mortgage default risk was greater
  - What type risk is reduced with such terms?

Early Mortgage Lenders

- Prior to 1913 Commercial Banks were not allowed to lend on residential mortgages
- The dominant lenders were private and institutional investors (Insurers)
  - Mortgage Bankers were used to place funds
- Thrift Institutions evolved from early Building Associations
  - Savings and Loans and Credit Unions today

The Great Depression

- The 1920's saw unprecedented growth in the money supply, causing real estate prices to soar.
- Bubble burst in 1929
- With the collapse of the credit markets and shrinking of the money supply in the early 1930's refinancing was severely limited and default picked up as real estate prices sank

New Deal Legislation

- In an attempt to salvage the real estate market the Federal government stepped in
- Several new government agencies were formed to assist the market's recovery

Agencies and Associations

- Reconstruction Finance Corporation (RFC)
  - Extended government credit to S&L's and mortgage companies to provide liquidity
- Federal Home Loan Bank System (FHLBS)
  - Established 12 regional home loan banks
  - Chartered federal and state lending institutions
  - Provided funding through treasury bond sales
- Home Owners Loan Corporation (HOLC)
  - Lent short term money directly to borrowers

Agencies and Associations

- Federal Savings and Loan Insurance Corp (FSLIC)
  - Provided insurance for deposits held in Savings and Loan Associations
  - FSLIC was dissolved in 1989 after the S&L crisis of the late 1980's
  - Today the comparable insurance fund is known as SAIF (Savings Association Insurance Fund) and is administered by the FDIC

Agencies and Associations

- Federal Housing Administration (FHA)
  - Provided mortgage insurance for long term amortizing loans (15-30 year term)
  - Insurance was provided up to 80% LTV
  - Interest Rate Risk replaced Default Risk
- Federal National Mortgage Assoc. (FNMA)
  - Agency established to buy and sell FHA loans
  - Funded through the Treasury and shareholders
  - Exists today as a publicly traded corporation

Mortgage Insurance

- Protects the lender in case of default
- Premium is paid along with monthly payments
- Required if LTV is greater than 80%
- FHA vs. Private Mortgage Insurance
- How does it work?
  - Lender's loss is generally co-insured
  - Lender receives difference between the value of the house and mortgage balance if Value < OB

Fixed Rate Mortgage Mechanics

- The Mortgage Constant
  - A factor to calculate the payment on a fixed rate amortizing mortgage (Ordinary Annuity)
  - The rate of return on the mortgage **(R_m)**

$$MC_{i,n} = \frac{i(1+i)^n}{(1+i)^n - 1}$$

FRM Example

- Calculate the annual payment for a $100,000 mortgage at 10% for 30 years

$$PV * (MC_{i,n})$$

$$PMT = \$100{,}000\left[\frac{0.10(1.10)^{30}}{(1.10)^{30}-1}\right]$$
$$= \$100{,}000(0.10607925)$$
$$= \$10{,}607.93$$

Monthly FRM Example

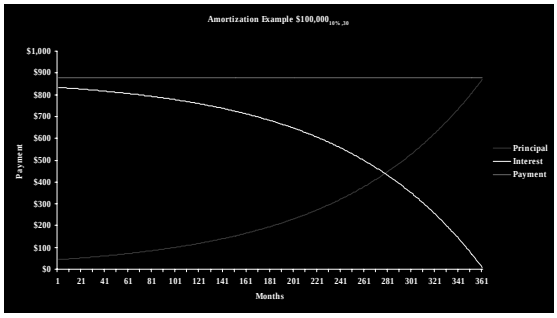
- Calculate the monthly payment for a $100,000 mortgage at 10% for 30 years

$$MC_{i,n} = \left[\frac{i/12(1+i/12)^{n*12}}{(1+i/12)^{n*12}-1}\right]$$

Amortization of the FRM

- Interest Only vs. Amortizing Loans
- Amortization is the process of periodically paying off a portion of the outstanding balance on a loan.
- A fully amortizing loan will have a remaining balance of zero ($0) at the end of the loan term.

Amortization of a 30 year Note



Calculating Amortization Tables

- We start by calculating the payment using the mortgage constant.
- Interest is calculated as the periodic interest on the outstanding balance of the loan.
- The difference between the mortgage payment and the interest on the balance is the payment toward principal.

Amortization Example

- Amortize a $100,000 mortgage at 7% for 30 years paid monthly.
  - Calculated (by hand) the first 3 months principal, interest and remaining balance
  - Calculate (using your calculator) the principal, interest and remaining balance for the 36th month
  - Calculate (using your calculator) the principal, interest and remaining balance for the 37th – 48th month

The Outstanding Balance

- The outstanding balance on a mortgage is calculated as the discounted present value of the remaining future payments, discounted at the contract interest rate.

$$OMB = \frac{PMT}{MC_{i,n}}$$

Outstanding Balance Example

- What is the remaining balance on a mortgage having a payment of $917.20 with an interest rate of 8% and remaining term of 30 months.

$24,864.24

Effective Cost of Borrowing

- This is the borrowers realized cost of borrowing
  - This cost can differ from the stated contract interest rate
- The borrowers effective cost is the lenders effective yield
  - If you include all cost of the mortgage
  - Often LEY does not include origination fees

Categories of Borrowing Cost

- Origination Fees
  - Finance Charges for underwriting the mortgage
  - Vary by loan type and lender
  - Good faith estimates are provided to illustrate these costs prior to closing
- Discount Points
  - A means of buying down the interest rate on a mortgage increasing the effective yield
  - One point = 1% of the loan amount
  - Front End vs. Back End

Annual Percentage Rate (APR)

- Federal law requires disclosure of effective borrowing cost known as APR.
- Since we view the cost of borrowing as an interest rate APR's are quoted as rates.
- APR assumes the borrower holds the mortgage to maturity.
- What impacts APR?
  - Discount Points
  - Underwriting Costs and Fees

Calculating APR

- In calculating APR, first calculate the payment using the contract rate.
- Next input the effect of points and fees
- Finally, compute the APR
- Example:
  - Calculate the APR for a $150,000 mortgage at 7% for 30 years which has 2 discount points and $2,250 in underwriting fees.

7.36%

APY and Prepayment

- Since APR assumes no prepayment, what is the effect of prepayment on Yield (APY)?
- This can be calculated as the IRR of the mortgage given prepayment
- Calculate the APY on a $100,000 loan with a 30 year amortization at 6% with 2 points and 1% origination. You expect to prepay at the end of 5 years.

6.73%

APY & Prepayment Penalties

- Prepayment penalties are back end points
  - Usually a % of the OMB
- Back end prepayment penalties will effect the yield (APY) on a mortgage.
- Calculate the APY on a $90,000 loan with a contract rate of 9% and term of 20. Prepayment before 10 years requires a penalty of 5% of the OMB. You must prepay after 4 years.

9.97%

Prepayment & Interest Paid

- Making additional payments toward principal allows early pay-off of the loan.
  - Payments in excess of the minimum are not automatically used to offset the OMB
- What is the effect on the term of a $100,000 mortgage at 8% for 30 years, when you pay an additional $250 per month.

170.39 months vs. 360

Interest Rates & Mortgage Value

- Interest rate risk effects the value of a mortgage similar to that of a bond.
- There is an inverse relationship between rates and value for debt instruments
- Assume you took out a $125,000, 30 year mortgage at 10%. 5 years into the loan, market interest rates for 25 years loans are 11%, what is the value of this mortgage today?

MV of $111,922 vs. OMB of $120,717

Measuring Interest Rate Risk

- Interest Rate Risk Sources
  - Reinvestment Risk – different rate to reinvest CF's
  - Price Risk – Risk of capital gain/loss in asset value
  - These are competing risk (move opposite directions)
- Duration
  - Duration is a measure of interest rate risk that considers both coupon rate and term to maturity.
  - Duration is the ratio of the sum of the time-weighted discounted cash flows divided by the current price of the bond.

Measuring Interest Rate Risk

$$D = \frac{\sum_{t=1}^{n} \frac{CF_t(t)}{(1+i)^t}}{\sum_{t=1}^{n} \frac{CF_t}{(1+i)^t}}$$

D = duration.
CF_t = interest or principal at time t.
t = time period in which cash flow is received.
n = number of periods to maturity.
i = the yield to maturity (interest rate).

Properties of Duration

- Greater duration = greater price volatility.
- Higher contract rates = shorter durations.
- Longer maturities = longer durations.
- The higher the yield to maturity, the shorter the duration.

Applications of Duration

- In assuring promised yield to maturity, investors select debt instruments with durations matching their desired holding periods. (Duration-Matching approach)
- Durations can be used to estimate the price volatility (variability) of a debt instrument.

$$\%\Delta P = -\left[\frac{1}{(1+y)}\right] \times Duration \times \Delta y$$