Fin 5413
CHAPTER FOUR

FIXED RATE
MORTGAGE LOANS

Interest Due

- Interest Due is the mirror image of interest earned
- In previous finance course you learned that interest earned is:
  - Interest rate * Amount Deposited
- Interest due is:
  - Interest rate * Amount Borrowed

Periodic Interest Rate

- The periodic interest rate is the Note Rate divided by the periods per year
- For mortgages, the period is usually one month (12 periods per year)
- The monthly interest rate charged can then be computed as:
  - **Rate%/1200**

Interest Due Example

- You borrowed $250,000 last month at 6 3/8%. How much interest is due now?
- 250,000*6.375/1200 = 1328.13
- If you make a payment more than 1328.13, you will be “amortizing” your loan
- If you make a payment less than 1,328.13 you will have negative amortization, or more pleasantly called, positive accrual

Application of payments to loan balances

- Your loan contract will specify the use of payments on your loan. Typically money will first be used to make up any arrears in payments or any penalties you have incurred
- If you are paying according to schedule, your payment will first be applied to interest due.
- Any amount of your payment that exceeds the interest due will be used to amortize (pay down) the principal

Amortization Example

- For the previous Interest Due example, say you made of payment of $1500.
- First the 1328.13 interest would be subtracted from your payment and the remaining amount (1500 – 1328.13 = 171.88) would be used to pay down the principal. Your new principal amount would be
- 250,000.00 – 171.88 = 249,828.12
- **See handout for additional practice**

Loan Amortization using calculator

- If your loan payment and interest rate are constant, your calculator can do the amortization calculations for you.
- If your loan payment changes every month, and if the interest rate changes every month, you will need to do a month by month amortization of the loan which allows for these changes.

Calculator hints

- Clear the calculator before new problems (Use the C ALL)
- Make sure:
  - The desired number of decimal places are displayed
    - Set using DISP followed by entering a digit
  - You have the correct payments (periods) per year
    - Set by typing a number then press P/YR
    - Check by holding down C ALL

Calculator hints (continued)

BEGIN indicator is not displayed, unless you are told this problem has beginning of period cash flows

- Set using BEG/END

If you have a comma where you should have a decimal point (European notation) then toggle to decimal by:

- Toggle using ./,

Notation when using Calculator

- P/YR = 12 (indicate the periods per year)
- PMT(PV=-270,000, I/Yr = 6, N=180) = 2278.41
- Order of inputs does not matter
- Negative sign for PV indicates a cash outflow
- N = number of periods
- I/YR = stated annual interest rate
- The last button one pushes is what you want to solve for: in this case PMT.

Amortization function on Calculator

- One sets up the Amortization table in the calculator by entering the starting period and pressing the INPUT key, and then entering the ending period and pressing the AMORT key.
- Press the = key to cycle through the principal paid, the interest paid, and the ending balance.

Amortization Example

- For the previous example, how much interest will be paid in the second year?
- First solve for the monthly payment
  - PMT(PV=-270,000, I/Yr = 6, N=180) = 2278.41
- Then:
  - 13 INPUT
  - 24 AMORT
- Press the = sign twice to get the interest payment of 15,182.12

Chapter 4 Objectives

- Characteristics of bullet, constant amortization (CAM), constant payment (CPM), graduated payment mortgages (GPM), and Reverse Annuity Mortgages (RAM)
- Some of the costs to close a mortgage loan
- Federal Truth in Lending APR calculations (FTLAPR)
- Return to Lender, Cost to borrower
- Calculate discount points or loan origination fees to meet a target yield

Determinants of Mortgage Interest Rates

- Compare to bonds of similar duration and default risk – add an allowance for prepayment risk
- Real rate of interest- the required rate at which economic units save rather than consume
- Nominal rate= real rate plus a premium for inflation

Determinants of Mortgage Interest Rates

- Default risk: creditworthiness of borrowers
- Interest rate risk: rate change due to market conditions and economic conditions
- Prepayment risk: falling interest rates
- Liquidity risk
- i=r + f + P + …

Development of Mortgage Payment Patterns

- Interest only with specified principal repayment dates (typically a constant payment)
- Constant amortization mortgage (CAM) (payment amount decreases over the life of the loan)
- Constant payment, fully amortizing over the life of the loan (payment is the same every period)
- Graduated payment mortgage, fully amortizing over the life of the loan. Payment increases over time then levels off
- Reverse Annuity Mortgages

Bullet Loan (Interest Only)

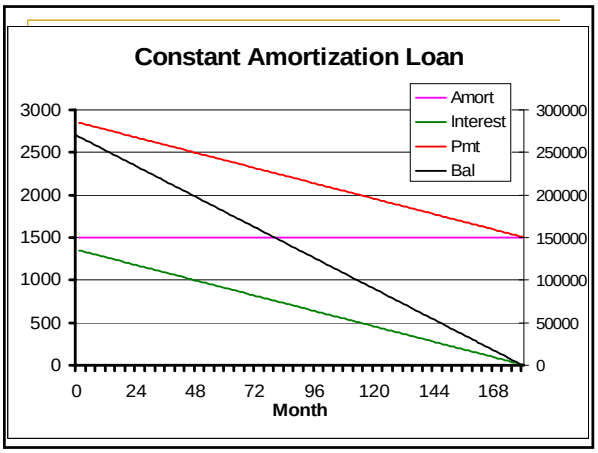
- Commonly used in commercial lending
- Balloon amount of balance due at end of period
- Example. What is the payment pattern on a 5 year bullet loan of $5,000,000 at 6 3/8%?
- 5,000,000 * 6.375/1200 = $26,562.50 monthly payment for 59 months
- Final payment of 5,026,562.50 at month 60
- Note: This is like the payment pattern for a bond

Constant Amortization Mortgage

- Used as an early mortgage type, though not commonly used today
- The amount of amortization (principal payment) is the same each period
- To compute the principal payment each period divide the loan amount by the term
- Typically has a fixed interest rate
- The interest owed each month declines as the balance declines
- The sum of the principal plus the interest is the monthly payment

Constant Amortization Mortgage Example

- Borrow $270,000 over 15 years (180 months)
- Assume 6% APR or 0.5% per month
- What is the 27th payment?
  - Monthly amortization is $270,000/180 = $1500
  - Amortization after 26 months is 1500 * 26 = 39000, so balance is 270000 – 39000 = 231,000
  - Interest Due is 231,000*0.005 = 1155
  - Total Pmt (Month 27) = 1500 + 1155 = 2655
- Monthly Pmt declines by 1500*0.005 = $7.50/mo

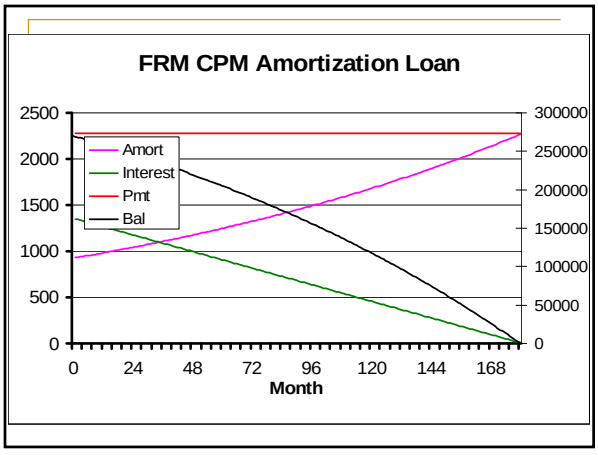


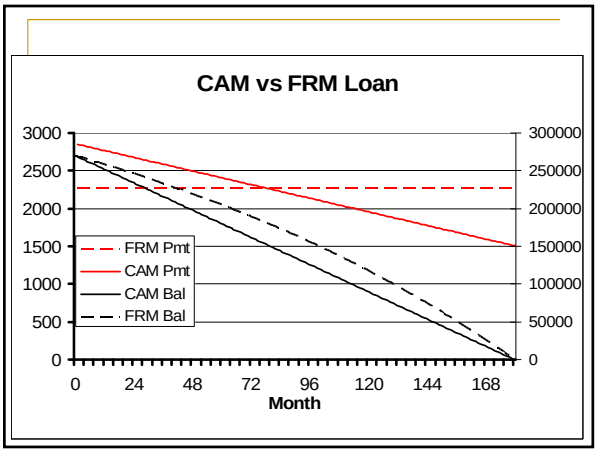
FRM Fixed Rate Constant Payment Mortgage

- Constant payment mortgage (CPM)
- Constant monthly payment on original loan
- Fixed rate of interest for a specified term
- Amount of amortization varies each month
- Completely repaid over the term of the loan unless it is a balloon loan which is amortized over a given period, with a final large (balloon) payment. Example: 30 year amortization period with 5 year balloon pmt.

FRM Constant Payment Mortgage Example

- Borrow $270,000 over 15 years (180 months)
- Assume 6% APR or 0.5% per month
- What is the 27th payment?
  - P/YR=12
  - Pmt(PV=-270,000, I/Yr = 6, N=180) = 2278.41
  - Interest Due is: 1221.45
  - Principal Payment is: 1056.96
- Monthly Pmt is the same every month





FRM Constant Payment Mortgage Example with Balloon Payment

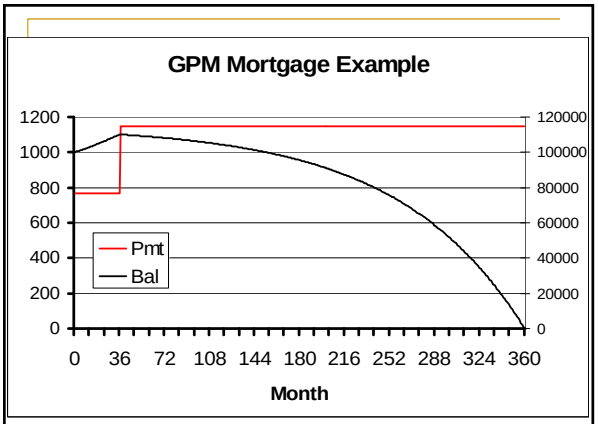
- If the previous loan has a 5 year balloon payment, what will the final payment be (due at month 60)
- Amount due on the final date is the balance after the 60th payment, plus the amount of the 60th payment.
- To get balance, use 1 INPUT, 60 AMORT to get Bal60 = 205,224.81, then add the regular monthly payment of $2,278.41 to get a final payment of 207,503.22

GPM Graduated Payment Loan

- Mortgage payments are lower in the initial years of the loan
- GPM payments are gradually increased at predetermined rates
- Can predict in advance what the payments will be by solving the appropriate TVM equations

GPM loan computation example

- Assume 30-year, 12% APR and lower payment for first three years followed by a single 50% increase. Solve Pmt for 100,000 loan.
- PV = Pmt/(1.01) + Pmt/$(1.01)^2$ + . . . + Pmt/$(1.01)^{36}$ + Pmt(1.5)/$1.01)^{37}$ + . . . Pmt(1.5)/$(1.01)^{360}$
- Or PV = Pmt*AF1 + Pmt(1.5)/$(1.01)^{36}$*AF2
- AF1 = [1/0.01 – 1/0.01$(1.01)^{36}$] = 30.1075
- AF2 = [1/0.01 – 1/0.01$(1.01)^{324}$] = 96.0201
- Pmt = 764.68



Loan Closing Costs and Effective Borrowing Costs

1. **Statutory costs** – Legally mandated costs such as recording fees (Cost to borrower no direct benefit to lender)
2. **Third party charges** - money paid to third parties such as title insurance premiums
3. **Additional finance charges** - loan discount fees, points, loan underwriting fees. These fees are collected by the lender and add to lender profitability. They have the same effect as lending a smaller amount to the borrower.

Effective Cost of Loan

- It is costly to originate mortgages; thus, the originator must be compensated for this cost
- For example, it is common to pay a loan officer a commission for finding the borrower – often 1% of the loan amount
- If the loan officer draws a salary, that cost must be paid from business proceeds
- Also, borrowers may pay “points” to buy down the note rate
- A point, or discount point is 1/100 of the loan amount
- The note amount is often higher than the amount of cash dispersed due to origination fees, points, and other fees

Effective Interest Cost Example

- Contractual loan amount $120,000
- Less discount points (3%) $ 3,600
- Net cash disbursed by lender $116,400
- Interest rate= 7%
- Term 30 years
- Note amount is $120,000 which must be repaid, though only $116,400 is received by the borrower
- The payment is based on the $120,000 note amount

Effective Interest Cost Example (Cont)

- Calculator solution: P/Yr = 12
  - PMT(PV=120,000, I/YR=7, N=360) =798.36
  - However you only received $116,400
  - Compute Yield to Lender who gets a payment of 798.36 for disbursing 116,400
  - I/YR(PV=-116,400, N=360, PMT= 798.36) = 7.30%
- Federal Truth in Lending will require reporting an APR=7.30% (may be rounded to closest 1/8%, or 7.25%)

Regulation Z- truth in lending (APR)

- RESPA- Real Estate Settlement Procedures Act
- FTLAPR – This APR computation adjusts measures the costs of funds as a percentage amount that makes it easier to compare among lenders of loans with differing fees and points. Assumes mortgage paid off over its stated term.
- As with other APR computations, it understates the cost of funds as the true cost is an EAR
- Prepayment penalties increase the cost of borrowing without affecting the FTLAPR

Cost to borrower

- Because a borrower can not get a loan without paying statutory costs and third party charges the cost to borrower will typically be higher than the yield to the lender. Suppose for the previous example, the borrower paid an additional $900 in other costs. The net cash to the borrower is reduced by $900 so the cost to borrower can be computed as:
- I/YR(PV=-115,500, N=360, PMT= 798.36) = 7.38%

Effect of Prepayment Penalty on Yield to Lender

- For the previous example, assume the lender charges a 2% prepayment penalty if the loan is paid off during the first 5 years, and that you prepay the loan on the 2nd anniversary. What is the yield to lender?
- First compute the loan balance after 2 years
- 1 INPUT 24 AMORT Bal = 114,086.44
- Increase balance by 2% for prepay penalty
- I/YR(PV=-116,400, PMT=798.36, N=24, FV= 116,368.17) = 8.22%

Ex. 4.1 Points to achieve a target yield

- How many points must a lender charge for a 6 percent, 15-year note to achieve a yield of 6.5%? (Though the loan amount does not matter, assume a $100,000 loan for computations)
  - A. Assume the borrower holds the note for the entire term
  - B. Assume the borrower holds the note for 3-years

An Alternate View

- What if the loan was originated at 6%, which was a fair rate on the day the loan rate was "locked" but interest rates had increased to 6.5% when the lender wanted to sell the loan.
  - How much could the lender sell this loan for?
- What if interest rates had fallen to 5.5%? What could the lender sell this loan for?
- How does the prepayment assumption affect the selling price of a loan?

Example 4.2: Construction Finance

- You are offered a bullet loan at Prime plus 3 for 6 months, with 3 points. Prime is currently at 6% and we will assume it will remain stable. What is your expected cost of construction financing expressed as an EAR?

Reverse Annuity Mortgage Example

- Allows seniors to tap equity in their house without selling and moving
- Ex: Residential property value $500,000
- Loan value at end of term $300,000
- Term 120 months, Int Rate 8%
- PMT(FV=-300,000, I/YR=8, N=120) = 1639.83
- When the house is sold, the balance on the loan will be repaid