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### BACKGROUND ON THE MORTGAGE MARKET

- What is a mortgage?
  - Collateral & Foreclosure
  - Borrower's Equity
- Mortgage types
  - Credit risk: Prime, Subprime
    - Credit Score of Borrower
  - Interest rate type: FRM, ARM, Hybrid ARM
  - Amortization type: fully amortizing, interest-only (for lockout period)

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### AMORTIZATION SCHEDULE

- Monthly payment set so that the borrower will completely pay off interest and principal by the end of the loan's life
- Monthly payment consists of two components
  - Interest
  - Principal repayment

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AMORTIZATION SCHEDULE

Month	Beginning Mortgage Balance	Monthly Payment	Monthly Interest	Scheduled Principal Repayment	Ending Mortgage Balance
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2					
3					



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AMORTIZATION SCHEDULE: EXAMPLE 1A

- Consider a fixed-rate mortgage with the following characteristics:
- Original balance: \$200,000
  - Note rate: 7.5%
  - Term: 30 years
  - What should the monthly payment be?
    - $PMT(N=360,Y=7.5/12,PV=-200000,FV=0)=1398.4290 = 1398.43$
  - What does the amortization schedule look like? Fill in the first three lines.



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AMORTIZATION SCHEDULE

Mon th	Beginning Mortgage Balance	Monthly Payment	Monthly Interest	Scheduled Principal Repayment	Ending Mortgage Balance
①	200,000	1398.43	$200,000 \times (0.075/12)$ = 1250	$1398.43 - 1250$ = 148.43	$200,000 - 148.43$ = 199,851.57
2	199,851.57	1398.43	$199,851.57 \times (0.075/12)$ = 1249.072	$1398.43 - 1249.072$ = 149.36	$199,851.57 - 149.36$ = 199,702.21
3	199,702.21	1398.43	1248.139	150.29	199,551.92



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AMORTIZATION SCHEDULE: EXAMPLE 1B

- What if this were an ARM?
  - Assume the note rate resets to 8.5% in 6 months. What is the new monthly payment?
    - What is the remaining balance at the end of 6 months?  
 $FV(N=6,Y=7.5/12,PV=-200,000,PMT=1398.43) = 199,095.39$
    - New monthly payment:  
 $PMT(N=354,Y=8.5/12,PV=-199,095.39,FV=0) = 1536.56$
  - How does this change the amortization schedule?



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AMORTIZATION SCHEDULE

Mo nth	Beginning Mortgage Balance	Monthly Payment	Monthly Interest	Scheduled Principal Repayment	Ending Mortgage Balance
7	199,095.39	1536.56	$199,095.39 \times (0.085/12)$ =1244.35	$1536.56 - 1244.35$ =292.21	$199,095.39 - 292.21$ =198,803.18



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RISKS ASSOCIATED WITH INVESTING IN MORTGAGES

- Interest-rate risk
- Default risk
- Liquidity risk
- Prepayment risk
  - In Part
    - Balance paid down faster
  - In Full
    - 2 reasons



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PREPAYMENT OF MORTGAGES

- If you prepay and pay off the mortgage, you pay the balance at that point in time
- Prepayment is effectively a call option
  - What is the underlying?
  - What is the exercise price?



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PREPAYMENT OF MORTGAGES: EXAMPLE 1C

- Consider the fixed-rate mortgage we examined earlier:
  - Original balance: \$200,000
  - Note rate: 7.5%
  - Term: 30 years
- Assume that at the end of the second year all rates in the economy fall by 1%. Does it make sense to refinance?
- What is the gain from refinancing?
- Will you refinance if closing and transaction costs were \$20,000?



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PREPAYMENT OF MORTGAGES: EXAMPLE 1C

- Consider the fixed-rate mortgage we examined earlier:
  - Original balance: \$200,000
  - Note rate: 7.5%
  - Term: 30 years
- Remaining Balance:
  - $FV(N=24, Y=7.5/12, PMT=1,398.43, PV=-200,000) = 196,169.53$
- PV of remaining payments:
  - $PV(N=360-24= 336, Y=6.5/12, PMT= 1,398.43) = 216,135.12$
- Gain/loss from refinancing:  $216,135.12 - 196,169.53 = 19,965.59$
- If the costs were \$20,000, then no refinance.



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