

# Chapter 6

## Mortgages: Additional Concepts, Analysis, and Applications

# Incremental Borrowing Cost

- Compare financing alternatives
  - What is the real cost of borrowing more money at a higher interest rate?
  - Alternatively, what is the required return to justify a lower down payment?
  - Basic principle when comparing choices: What are the cash flow differences?

# Incremental Borrowing Cost

- Example 6-1:
  - Home Value = \$150,000
  - Two Financing Alternatives
    - #1: 90% Loan to Value, 8.5% Interest Rate, 30 Years
    - #2: 80% Loan to Value, 8% Interest Rate, 30 Years
  - It appears there is only a 0.5% interest rate difference, but...

# Incremental Borrowing Cost

	<b>Alternative #1</b>	<b>Alternative #2</b>
<b>LTV</b>	90%	80%
<b>i</b>	8.5%	8%
<b>Term</b>	30 Years	30 Years
<b>Down payment</b>	\$15,000	\$30,000
<b>Loan</b>	\$135,000	\$120,000
<b>Payment</b>	\$1,038.03	\$880.52

# Take Home Message

The more you borrow, the higher the interest rate will be.

While we will discuss this in detail later on, there is a point at which you should not borrow more money. The interest rate will be just too high.

It is not economically rational to borrow as much money as possible.

# Incremental Borrowing Cost

- Cash Flow Differences
  - Borrow \$15,000 more
  - Pay \$157.51 per month more

<b>PV</b>	= \$15,000
<b>PMT</b>	= \$157.51
<b>n</b>	= 360
<b>FV</b>	= \$0
<b>CPT</b>	<b>i</b> = 12.28%

# Incremental Borrowing Cost

- 12.28% represents the real cost of borrowing the extra \$15,000.
- Can you earn an equivalent risk adjusted return on the \$15,000 that is not invested in the home?
- Alternatively, can you borrow the additional \$15,000 elsewhere at a lower cost?

# Incremental Borrowing Cost

- In example 6-1, what if the borrower expects to relocate after 8 years?
- We need the future expected loan balances:
  - Alt #1: \$123,810.30
  - Alt #2: \$109,221.24
  - Difference: \$14,589.06
- This becomes a future value in our analysis.

# Incremental Borrowing Cost

- Cash Flow Differences

<b>PV</b>	= \$15,000
<b>PMT</b>	= \$157.51
<b>n</b>	= 96
<b>FV</b>	= \$14,589.06
<b>CPT</b>	<b>i</b> = 12.40%

# Incremental Borrowing Cost

- Use of discount points
  - Analysis would change
    - Depending on the points, the cash flow difference at time zero would change.
    - In example 6-1, the \$15,000 difference would change.
- Different maturities
  - In Example 6-1, let's change the term of the alternative #2 to 25 years.

# Incremental Borrowing Cost

	<b>Alternative #1</b>	<b>Alternative #2</b>
<b>LTV</b>	90%	80%
<b>i</b>	8.5%	8%
<b>Term</b>	30 Years	25 Years
<b>Down payment</b>	\$15,000	\$30,000
<b>Loan</b>	\$135,000	\$120,000
<b>Payment</b>	\$1,038.03	\$926.18

# Incremental Borrowing Cost

- Cash Flow Differences
  - At time 0: \$15,000
  - For the first 300 months: \$111.85
  - For the final 60 months: \$1038.03

# Incremental Borrowing Cost

- Using the Cash Flow Register,

**C0** = \$15,000

**C1** = \$111.85

**F1** = 300

**C2** = \$1038.03

**F2** = 60

**CPT** **IRR** =  $.8926 \times 12 = 10.71\%$

# Loan Refinancing

- Borrower considerations
  - Terms on the present outstanding loan
  - What are the new loan terms?
  - What are the fees associated with paying off the old loan and obtaining a new one?
- Application of basic capital budgeting investment decision
  - What is our return on an investment in a new loan?

# Loan Refinancing

- Example 6-2:
  - A borrower has secured a 30 year, \$120,000 loan at 7%. Fifteen years later, the borrower has the opportunity to refinance with a fifteen year mortgage at 6%. However, the up front fees, which will be paid in cash, are \$2,500. What is the return on investment if the borrower expects to remain in the home for the next fifteen years?

# Loan Refinancing

- Initial Loan:
  - \$120,000
  - 30 Years
  - 7% Interest
  - Payment = \$789.36
- 15 Years Later
  - Loan Balance = \$88,822.64
  - New Payment at 6% = \$749.54

# Loan Refinancing

- Cost = \$2,500
- Benefit = \$48.82 per month for 15 years

$$\text{PV} = (\$2500)$$

$$\text{FV} = \$0$$

$$\text{PMT} = \$48.82$$

$$n = 180$$

$$\text{CPT } i = 22.62\%$$

# Loan Refinancing

- In Example 6-2, what is the return on investment if the borrower expects to relocate after seven years and not remain in the home for the full fifteen years?
  - Now we need the expected future loan balances for the original loan and the possible new loan.

# Loan Refinancing

- Original Loan Balance = \$58,557.76
- Refinanced Loan Balance = \$57,036.41
- Difference = \$1521.35

**PV** = (\$2500)

**FV** = \$1521.35

**PMT** = \$48.82

**n** = 84

**CPT** **i** = 20.93%

# Loan Refinancing

- In Example 6-2, refinancing appears to be a good investment.
- Effective cost of refinancing: Prepayment fees on old loan can be thought of as being of new fees for new loan
- Borrowing the refinancing cost
- Biweekly payments
  - Lower the amount of interest over the life of the loan
  - Repay the loan sooner

# Market Value of a Loan

- How much would an investor pay for the loan?
  - The investor is buying the cash flow stream of the loan.
  - Discount loan cash flow at the market rate of interest that the investor can earn on investments of equivalent risk.

# Market Value of a Loan

- Example 6-3:
  - \$100,000 Loan
  - 30 Years
  - 6% interest
  - Payment = \$599.55
  - One year later, book value = \$98,771.99
  - Assume interest rates have risen to 7%.

# Market Value of a Loan

- The investor will not pay book value.
- To compute the market value:

$$\text{PMT} = \$599.55$$

$$n = 348$$

$$FV = \$0$$

$$i = 7$$

$$\text{CPT PV} = \$89,201.49$$

Compare this to book value.

# Effective Cost of Two or More Loans

- Basic Technique
  - Compute the payments for the loans
  - Combine into a cash flow stream
  - Compute the effective cost of the amount borrowed, given the cash flow stream.
  - Compare the cost to alternative financing options.

# Effective Cost of Two or More Loans

- Example 6-4:
  - You need a \$500,000 financing package.
  - \$100,000 at 7%, 30 Years
    - Payment = \$665.30
  - \$200,000 at 7.5%, 20 Years
    - Payment = \$1611.19
  - \$200,000 at 8% 10 Years
    - Payment = \$2426.55

# Effective Cost of Two or More Loans

- Using the Cash Flow Register,

<b>CF0</b>	= \$500,000
<b>C1</b>	= \$4703.04
<b>F1</b>	= 120
<b>C2</b>	= \$2276.49
<b>F2</b>	= 120
<b>C3</b>	= \$665.30
<b>F3</b>	= 120
<b>CPT</b>	<b>IRR</b> = .6239 x 12 = 7.49%

# Below Market Financing

- A seller with a below market rate assumable loan in place may be able to sell the property for more than the seller would otherwise be able to.
- All else equal, a buyer is paying a higher purchase price now in exchange for lower debt payments over the life of the loan.
- Similar to other problems, we compute  $i$  and compare it to other equivalent risk investments.

# Below Market Financing

- Example 6-6: Identical Homes A & B

	<b>A</b>	<b>B</b>
<b>Price</b>	\$120,000	\$115,000
<b>Loan Balance</b>	\$80,000 (assumable)	\$80,000 (new loan)
<b>Down payment</b>	\$40,000	\$35,000
<b>I</b>	7%	8%
<b>Term</b>	20 Years	20 Years
<b>Payment</b>	\$620.24	\$669.15

# Below Market Financing

- In Example 6-6, the buyer can secure below market financing by paying \$5000 more for an identical home.
- The below market financing results in a monthly payment of \$48.91 less than if regular financing was used.

## Below Market Financing

$$\text{PV} = \$5000$$

$$\text{FV} = \$0$$

$$\text{PMT} = \$48.91$$

$$n = 240$$

$$\text{CPT } i = 10.20\%$$

- The buyer earns 10.20% on the \$5000 investment by reducing the monthly payment by \$48.91.

# Additional Financing Concepts

- Cash Equivalency
- Wraparound Loans
- Buydown Loans
- Home Equity Loans
- Home Equity Lines of Credit