

# Chapter 7

## The Time Value of Money

# Chapter Overview

- Time Value of Money Concept
- Market Value Concept
- Time Value of Money Calculations
  - Future Value
  - Present Value
  - Time Period and Compounding
  - Loan Amortization

# Time Value of Money Concept

- Time Value of Money (TVM)
  - Based on face value and interest that can be earned
- Present Value (PV)
  - Current value of an asset based on the amount and timing of projected cash flows
- Future Value
  - Value of an asset some time in the future assuming a compounded rate of interest

# Market Value Concept

- Present value of an asset based on
  - Projected future cash flows
  - Factoring in the
    - Timing of the cash flow
    - Risk of the cash flow being generated
    - Mix of capital used to finance the deal

# Calculating TVM

- Calculations can be done utilizing
  - Complicated mathematical formulas
  - Shorter formulas using interest tables
  - Business calculator
  - Computer spreadsheets

# Introduction to the Business Calculator

- Five basic function keys
  - N = number of years
  - I/Y = interest or discount rate
  - PV = present value
  - PMT = annuity payment
  - FV = future value

# Introduction to the Business Calculator

- Set the calculator to four decimal places.
  - Steps to follow:
    - Press the “2nd” key and the “.” key
    - The calculator will display DEC = 2.00
    - Now enter “4” and press “ENTER”

# Introduction to the Business Calculator

- Set the calculator to annual compounding.
  - Steps to follow:
    - Press 2nd and I/Y.
    - For new calculators, the factory setting will display  $P/Y = 12$ .
    - Press the “1” key and the ENTER key which is on the top row of the calculator.
    - The display will show  $P/Y = 1.00$
    - To exit, press 2nd and CPT (QUIT)



# Single Sum

- Only a single sum of money is involved in the calculation

## Future Value of a Single Sum



# Single Sum

## Present Value of a Single Sum



PV = ?

\$1,762.34 at 12% interest

# Single Sum

- The following items must be known in order to calculate:

## Future Value

PV

N

I/Y

CPT FV

## Present Value

FV

N

I/Y

CPT PV

# Annuity

- Amount of money received or paid during each compounding period for a set time
  - Regular Annuity
    - Money is received or paid at the end of each compounding period
  - Annuity Due
    - Money is received or paid at the beginning of each compounding period

# Regular Annuity Calculations



$$\text{PMT} = \$600$$

$$N = 5$$

$$I/Y = 12\%$$

$$\text{CPT FV} = \$3,811.71$$

$$\text{CPT PV} = \$2,162.88$$

# Annuity Due Calculations



## Change calculator to Annuity Due mode

Steps to follow:

- [2<sup>nd</sup>][PMT]
- If display shows the word END, enter:
- [2<sup>nd</sup>][ENTER]
- [2<sup>nd</sup>][CPT]

PMT = \$600

N = 5

I/Y = 12%

CPT FV = \$4,269.11

CPT PV = \$2,422.41

# Perpetuity

- Special type of annuity that pays or receives cash with no time limit

PV perpetuity =  $PMT / r$ , where

PMT = annuity payment

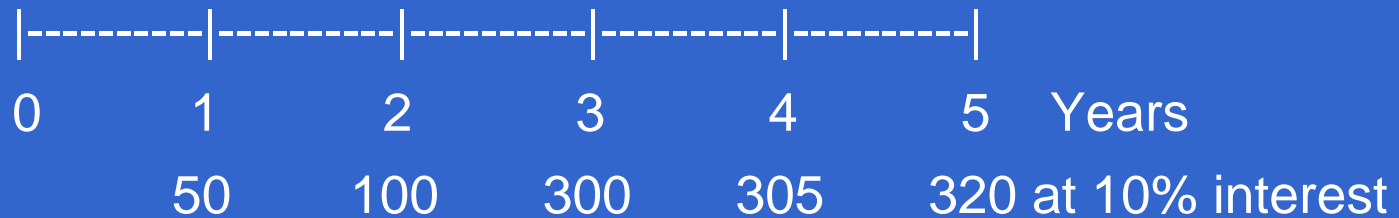
r = interest rate

# Uneven Stream of Cash Flow

- Where payments are not the same in all compounding periods



# Uneven Stream of Cash Flow



Utilize [CF] button and enter:

CF0 = 0  
CF1 = 50  
CF2 = 100  
CF3 = 300  
CF4 = 305  
CF5 = 320

Now enter [CPT][NPV]

I/Y = 10

CPT NPV = \$760.5075

# Compounding Period

- Monthly compounding favors the lender
- Interest expense is being accrued or paid monthly

## Annual Compounding

$$FV = \$1,762.34$$

$$N = 5$$

$$I/Y = 12\%$$

$$CPT PV = \$1,000.00$$

## Monthly Compounding

$$FV = \$1,762.34$$

$$N = 5 \times 12 = 60$$

$$I/Y = 12\% / 12 = 1\%$$

$$CPT PV = \$970.08$$

# Loan Amortization Schedule

## Steps in developing a Loan Amortization Schedule

Step 1 - Calculate debt service

Step 2 - Calculate the interest amount

Step 3 - Calculate principal paid

Step 4 - Calculate the balance

<u>Year</u>	<u>Payment</u>	<u>Principal</u>	<u>Interest</u>	<u>Balance</u>
1	40,211.48	30,211.48	10,000.00	69,788.52
2	40,211.48	33,232.63	6,978.85	36,555.89
3	40,211.48	36,555.89	3,655.59	0.00
Total	120,634.44	100,000.00	20,634.44	