# THE TIME VALUE OF MONEY

#### SOME FUTURE VALUE DEFINITIONS

 <u>Future Value (FV)</u>: The amount an investment is worth after one or more periods.

<u>Simple Interest</u>: Interest earned only on the original principal amount invested.

# MORE FUTURE VALUE DEFINITIONS

- <u>Compound Interest</u>: Interest earned on both the initial principal and the interest reinvested from prior periods.
- <u>Compounding</u>: The process of accumulating interest on an investment over time to earn more interest.

## CALCULATING FUTURE VALUE

• Future Value:

$$FV_t = PV_0 \times (1 + r)^t$$

• Future Value Factor: (1 + r)<sup>t</sup>

## FUTURE VALUE: EXAMPLE #1

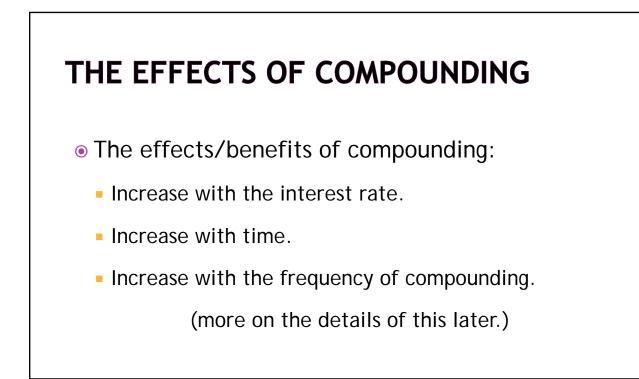
 You deposit \$500 into a savings account. You plan on withdrawing the money and closing the account exactly two years from today. Interest rates are 10%, compounded annually, and will remain constant over the two years.

#### FUTURE VALUE: EXAMPLE #1

 How much money will you have when you close the account (future value)?

• How much simple interest did you accumulate?

• How much compound interest did you accumulate?



## FUTURE VALUE: EXAMPLE #2

 You are scheduled to receive \$17,000 in two years. When you receive it, you will invest it for six more years at 6 percent per year. How much will you have in eight years?

## FUTURE VALUE: EXAMPLE #3

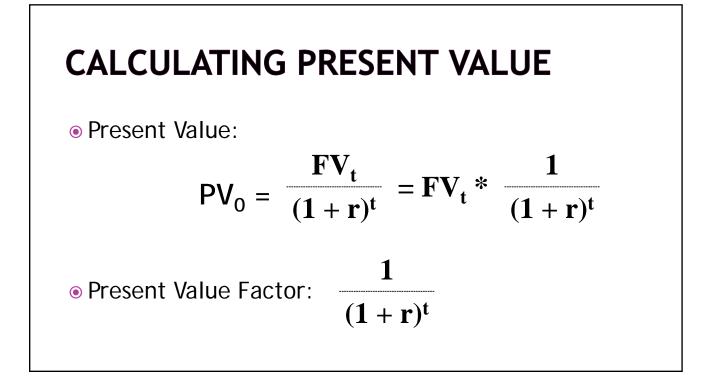
 You are trying to save to buy a new \$60,000 car. You have \$22,000 today that can be invested at your bank. The bank pays 4 percent annual interest on its accounts. How long will it be before you have enough to buy the car?

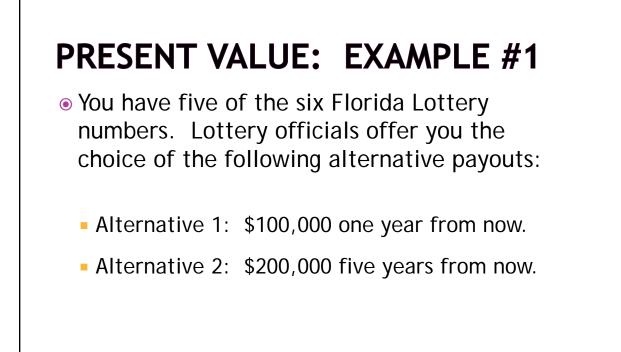
## FUTURE VALUE: EXAMPLE #4

 Assume you are only willing to wait 15 years in the previous example. What rate of return would you need to earn?

#### SOME PRESENT VALUE DEFINITIONS

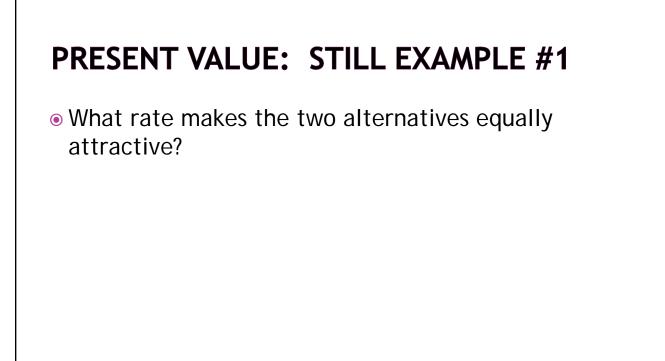
- <u>Present Value (PV)</u>: The current value of future cash flows discounted at the appropriate discount rate.
- <u>Discount</u>: Calculate the present value of some future amount.
- <u>Discount Rate</u>: The rate used to calculate the present value of future cash flows.





#### PRESENT VALUE: STILL EXAMPLE #1

• Which alternative would you choose if interest rates are 12%?



## PRESENT VALUE: EXAMPLE #2

 You have just received notification that you have won the \$1 million first prize in the Centennial Lottery. However, the prize will be awarded on your 100<sup>th</sup> birthday (assuming you are around to collect), 80 years from now. What is the present value of your windfall if the appropriate discount rate is 15%?

# PRESENT VALUE: EXAMPLE #3

 Suppose you are still committed to owning a \$60,000 car. If you believe your mutual fund can achieve a 9 percent annual rate of return and you want to buy the car in 10 years, how much must you invest today?

#### TIPS ON SOLVING PRESENT VALUE AND FUTURE VALUE PROBLEMS

 $\odot FV_t = PV_0 \times (1 + r)^t$ 

•  $PV_0 = FV_t / (1 + r)^t$ 

• For multiple cash flows, just add up the individual present (or future) values.



 $\bullet$  As t  $\uparrow$ , PV  $\downarrow$  and FV  $\uparrow$ 

• As r  $\uparrow$ , PV ↓ and FV  $\uparrow$ 

- There are (currently) only 4 components: PV, FV, t, and r
  - With ANY 3 components, you can solve for the 4th

## CHAPTER 5 SUGGESTED PROBLEMS

 Concepts Review and Critical Thinking Questions:

1, 2, 3, and 4

#### • Questions and Problems:

1, 2, 3, 6, 9, 13, 14, 15, 16, 18, and 20

ADDITIONAL PRACTICE			
Present Value	Years	Interest Rate	Future Value
\$40,000	7	5%	
	13	9%	\$18,395
\$15,000		15%	\$245,498
\$25,000	9		\$50,000

## **ADDITIONAL PRACTICE**

 You are offered an investment that requires you to put up \$13,000 today in exchange for \$40,000 twelve years from now. What is the average annual rate of return on this investment?



 Would you accept it if the appropriate discount rate was 8%?

## **ADDITIONAL PRACTICE**

 You have the opportunity to make an investment that costs \$900,000. If you make this investment now, you will receive \$120,000 one year from today, \$250,000 and \$800,000 two and three years from today, respectively. The appropriate discount rate for this investment is 12%.

# ADDITIONAL PRACTICE (CONTINUED)

Should you make the investment? What is the net present value?

#### ADDITIONAL PRACTICE (CONTINUED)

• If the discount rate is 10%, should you invest?

# CALCULATOR TIPS

- Make sure you set the number of payments per year to 1.
- Clear when necessary.
- Either PV or FV must be negative.
- Enter the interest rate as a whole number.