

THE TIME VALUE OF MONEY

SOME FUTURE VALUE DEFINITIONS

- ◉ Future Value (FV): The amount an investment is worth after one or more periods.
- ◉ Simple Interest: Interest earned only on the original principal amount invested.

MORE FUTURE VALUE DEFINITIONS

- ◉ Compound Interest: Interest earned on both the initial principal and the interest reinvested from prior periods.
- ◉ Compounding: 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: $(1 + r)^t$

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?

THE EFFECTS OF COMPOUNDING

- ◉ The effects/benefits of compounding:
 - Increase with the interest rate.
 - Increase with time.
 - Increase with the frequency of compounding.

(more on the details of this later.)

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

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

CALCULATING PRESENT VALUE

- ◉ Present Value:

$$PV_0 = \frac{FV_t}{(1 + r)^t} = FV_t * \frac{1}{(1 + r)^t}$$

- ◉ Present Value Factor: $\frac{1}{(1 + r)^t}$

PRESENT VALUE: EXAMPLE #1

- ◉ You have five of the six Florida Lottery numbers. Lottery officials offer you the choice of the following alternative payouts:
 - Alternative 1: \$100,000 one year from now.
 - Alternative 2: \$200,000 five years from now.

PRESENT VALUE: STILL EXAMPLE #1

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

PRESENT VALUE: STILL EXAMPLE #1

- ◉ What rate makes the two alternatives equally attractive?

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 100th 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

- $FV_t = PV_0 \times (1 + r)^t$
- $PV_0 = FV_t / (1 + r)^t$
- For multiple cash flows, just add up the individual present (or future) values.

TIPS ON SOLVING PRESENT VALUE AND FUTURE VALUE PROBLEMS

- ◉ As $t \uparrow$, $PV \downarrow$ and $FV \uparrow$
- ◉ As $r \uparrow$, $PV \downarrow$ 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?

ADDITIONAL PRACTICE

- ◉ 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.