

ANSWERS TO CHAPTER QUESTIONS

Chapter 2 Time Value of Money

- 1) Compounding is interest paid on principal and interest accumulated. It is important because normal compounding over many years can result in a more accurate and greater accumulated sums at the end of the period than what may have been anticipated. On the other hand, returns on accumulated sums can be appreciably higher under compounding than calculated through simple return methods.
- 2) It is important to assess the value of a sum of money at different points in time. Among other things, it leads to incorporation of the required return on monies invested in forming decisions. These decisions may be too complex to determine through simple guesstimates and could lead to wrong conclusions.
- 3) The present value is the value today of sums to be paid in the future. The value is established by taking future cash flows and discounting them back to the present at an appropriate rate of return.

The future value is the accumulated sum at the end of the period. It is calculated by taking cash flows prior to that time frame and compounding them by the appropriate rate of return.
- 4) The rate of return that could be received on marketable investments having the same level of risk.
- 5) When a discount rate is raised, the present value of a future sum is reduced. Alternative investments are now providing a higher return which makes the future sum to be received on the investment being considered less valuable.
- 6) The lump sum today. The reason is the lump sum today has more compounding periods. Assuming a similar market established rate of return for both, a sum invested in the future will have a lower present value than one that exists today and a lump sum invested today will have a greater future value as well.

- 7) A regular annuity is a series of payments made or received at the end of the period. An annuity due indicates payments made or received at the beginning of the period. Annuity dues have higher values because they have one full period more of compounding. An example of an annuity due is annual payments made on January 1 each year as contributions toward retirement. Annual payments received on December 31 are an example of a regular annuity.
- 8) The rate of return is the sum you receive expressed as compensation to you for making an investment. An inflation adjusted return adjusts for a rise in the cost of living. Making that adjustment allows returns to be expressed in purchasing power terms. Doing so is particularly important in personal financial planning which uses investments to fund future expenditures with these future costs often rising with inflation.

Chapter 2 Time Value of Money

Excel Solution

Solution **27,065**

- 3) Jason was promised \$48,000 in 10 years if he would deposit \$14,000 today. What would his compounded annual return be?

Excel Solution

| | A | B | C | D |
|----|-------------------|----------|---------------------------|---|
| 6 | Inputs | | | |
| 7 | Present Cash Flow | \$14,000 | | |
| 8 | Future Cash Flow | \$48,000 | | |
| 9 | Number of Years | 10 | | |
| 10 | | | | |
| 11 | Solution | | | |
| 12 | Annual Return | 13% | =RATE(B9,0,-B7,B8) | |

Calculator Solution

| | | | | | |
|-----------------|----------|------------|-----------|------------|-----------|
| <i>Inputs</i> | 10 | | -14,000 | | 48,000 |
| | N | I/Y | PV | PMT | FV |
| <i>Solution</i> | | 13 | | | |

- 4) How many years would it take for a dollar to triple in value if it earns a 6 percent rate of return?

Excel Solution

| | A | B | C | D |
|----|-----------------|-----|---------------------------|---|
| 6 | Inputs | | | |
| 7 | Present Value | \$1 | | |
| 8 | Future Value | \$3 | | |
| 9 | Interest Rate | 6% | | |
| 10 | | | | |
| 11 | Solution | | | |
| 12 | Number of Years | 19 | =NPER(B9,0,-B7,B8) | |

Calculator Solution

Inputs

6

-1

3



Solution

19

- 5) Marcy placed \$3,000 a year into an investment returning 9 percent a year for her daughter's college education. She started when her daughter was 2. How much did she accumulate by her daughters 18th birthday?

Excel Solution

| | A | B | C | D |
|----|-----------------|----------|-------------------|---|
| 7 | Inputs | | | |
| 8 | Payment | \$3,000 | | |
| 9 | Interest Rate | 9% | | |
| 10 | Number of Years | 16 | | |
| 11 | | | | |
| 12 | Solution | | | |
| 13 | Future Value | \$99,010 | =FV(B9,B10,-B8,0) | |

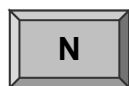
Calculator Solution

Inputs

16

9

-3,000



Solution

99,010






- 6) Todd was asked what he would pay for an investment that offered \$1,500 a year for the next 40 years. He required an 11 percent return to make that investment. What should he bid?

Excel Solution

| | A | B | C | D |
|----|-----------------|------------|------------------|---|
| 7 | Inputs | | | |
| 8 | Payment | \$1,500 | | |
| 9 | Interest Rate | 11% | | |
| 10 | Number of Years | 40 | | |
| 11 | | | | |
| 12 | Solution | | | |
| 13 | Present Value | (\$13,427) | =PV(B9,B10,B8,0) | |

Calculator Solution

Inputs 40 11 1,500

Solution -13,427






- 7) Ann was offered an annuity of \$20,000 a year for the rest of her life. She was 55 at the time and her life expectancy was 84. The investment would cost her \$180,000. What would the return on her investment be?

Excel Solution

| | A | B | C | D |
|----|-----------------|-----------|---------------------|---|
| 7 | Inputs | | | |
| 8 | Payment | \$20,000 | | |
| 9 | Present Value | \$180,000 | | |
| 10 | Number of Years | 29 | | |
| 11 | | | | |
| 12 | Solution | | | |
| 13 | Rate of Return | 10.5% | =RATE(B10,B8,-B9,0) | |

Calculator Solution

Inputs 29 -180,000 20,000

Solution 10.5

- 8) How many years would it take for \$2,000 a year in savings earning interest at 6 percent to amount to \$60,000?

Excel Solution

| | A | B | C | D |
|----|-----------------|----------|--------------------|---|
| 6 | Inputs | | | |
| 7 | Payment | \$2,000 | | |
| 8 | Future Value | \$60,000 | | |
| 9 | Interest Rate | 6% | | |
| 10 | | | | |
| 11 | Solution | | | |
| 12 | Number of Years | 18 | =NPER(B9,-B7,0,B8) | |

Calculator Solution

| | | | | | |
|----------|--------------|----------------|---------------|----------------|---------------|
| Inputs | 6 | | -2,000 | 60,000 | |
| | <div>N</div> | <div>I/Y</div> | <div>PV</div> | <div>PMT</div> | <div>FV</div> |
| Solution | 18 | | | | |

- 9) Aaron has \$50,000 in debt outstanding with interest payable at 12 percent annual. If Aaron intends to pay off the loan through 4 years of interest and principal payment, how much should he pay annually?

Excel Solution

| | A | B | C | D |
|----|---------------------------|------------|-------------------|---|
| 7 | Inputs | | | |
| 8 | Present Value of the Loan | \$50,000 | | |
| 9 | Interest Rate | 12% | | |
| 10 | Number of Years | 4 | | |
| 11 | | | | |
| 12 | Solution | | | |
| 13 | Payment | (\$16,462) | =PMT(B9,B10,B8,0) | |

Calculator Solution

Inputs 4 12 50,000



Solution

-16,462

10) What is the difference in amount accumulated between a \$10,000 sum with 12 percent interest compounded annually and one compounded monthly over one year period?

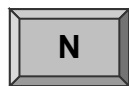
Excel Solution

| | A | B | C | D | E | F |
|----|-----------------------------------|-------------------------|-------------|--------------------------------------|---|---|
| 6 | Inputs | | | | | |
| 7 | Present Value | \$10,000 | | | | |
| 8 | Annual Interest Rate | 12% | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | Solution | | | | | |
| 12 | Comparison of Accumulated Amounts | | | | | |
| 13 | | | | | | |
| 14 | Frequency | Periods per Year | FV | =FV(\$B\$8/B15,B15,0,-\$B\$7) | | |
| 15 | Annual | 1 | \$11,200.00 | =-FV(\$B\$8/B16,B16,0,\$B\$7) | | |
| 16 | Monthly | 12 | \$11,268.25 | | | |
| 17 | | | | | | |
| 18 | Difference in Amounts | \$68.25 | | | | |

Calculator Solution

Annual Compounding:

Inputs 1 12 -10,000

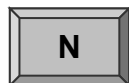


Solution

11,200

Monthly Compounding:

Inputs 12 1 -10,000



Solution

11,268.25

Difference in Amounts = 11,268.25 - 11,200 = 68.25

11) What is the difference in future value between savings in which \$3,000 is deposited each year at the beginning of the period and the same amount deposited at the end of the period? Assume an interest rate of 8 percent and that both are due at the end of 19 years.

Excel Solution

| | A | B | C | D | E |
|----|---|-----------|---------------------|---|---|
| 7 | Inputs | | | | |
| 8 | Payment | \$3,000 | | | |
| 9 | Interest Rate | 8% | | | |
| 10 | Number of Years | 19 | | | |
| 11 | | | | | |
| 12 | Solution | | | | |
| 13 | 1) Deposit at the beginning of the period | | =FV(B9,B10,-B8,0,1) | | |
| 14 | Future Value | \$134,286 | | | |
| 15 | | | | | |
| 16 | 2) Deposit at the end of the period | | =FV(B9,B10,-B8,0,0) | | |
| 17 | Future Value | \$124,339 | | | |
| 18 | | | | | |
| 19 | Difference in Amounts | \$9,947 | | | |

Calculator Solution

Deposit at the beginning of the period:

Set the calculator in the BEGIN mode

| | | | | | |
|---------------|----------|------------|-----------|------------|-----------|
| <i>Inputs</i> | 19 | 8 | | -3,000 | |
| | N | I/Y | PV | PMT | FV |

Solution 134,286

Deposit at the end of the period:

Set the calculator back to the END mode

| | | | | | |
|---------------|----------|------------|-----------|------------|-----------|
| <i>Inputs</i> | 19 | 8 | | -3,000 | |
| | N | I/Y | PV | PMT | FV |

Solution 124,339

Difference in Amounts = 134,286 – 124,339 = 9,947

12) Kenneth made a \$20,000 investment in year 1, received a \$5,000 return in year 2, made \$8,000 cash payment in year 3, and received his \$20,000 back in year 4. If his required rate of return is 8 percent, what was the net present value of his investment?

Excel Solution

| | A | B | C | D |
|----|-------------------|------------|------------------|---|
| 7 | Inputs | | | |
| 8 | Cash Flow Year 1 | (\$20,000) | | |
| 9 | Cash Flow Year 2 | \$5,000 | | |
| 10 | Cash Flow Year 3 | (\$8,000) | | |
| 11 | Cash Flow Year 4 | \$20,000 | | |
| 12 | Discount Rate | 8% | | |
| 13 | | | | |
| 14 | Solution | | | |
| 15 | Net Present Value | (\$5,882) | =NPV(B12,B8:B11) | |

13) John had \$50,000 in salary this year. If this salary is growing 4 percent annually and inflation is projected to rise 3 percent per year, calculate the amount of return he will receive in nominal and real dollars in the fifth year.

Excel Solution

| | | | | | | |
|--|-----------------------------|----------|----------|----------|----------|----------|
| Inputs | | | | | | |
| Present Value of Salary | \$50,000 | | | | | |
| Growth Rate | 4% | | | | | |
| Inflation Rate | 3% | | | | | |
| Number of Years | 5 | | | | | |
| Solution | | | | | | |
| 1) Calculate Real Rate of Return | | | | | | |
| Real Return | 1% | | | | | |
| | | | | | | |
| 2) Calculate the amount of reaturn in nominal and real dollars | | | | | | |
| | | | | | | |
| Year | 0 | 1 | 2 | 3 | 4 | 5 |
| Nominal Dollars | 50,000 | 52,000 | 54,080 | 56,243 | 58,493 | 60,833 |
| Real Dollars | 50,000 | 50,485 | 50,976 | 51,470 | 51,970 | 52,475 |
| | | | | | | |
| Formula in cell G20 | =FV(\$B\$9,G19,0,-\$B\$20) | | | | | |
| Formula in cell G21 | =FV(\$B\$15,G19,0,-\$B\$21) | | | | | |

14) Becky made a \$30,000 investment in year 1, received a \$10,000 return in year 2, \$8,000 in year 3, \$11,000 in year 4, and \$9,000 in year 5. What was her internal rate of return over the five year period?

Excel Solution

| | A | B | C | D |
|----|-------------------------|------------|--------------|---|
| 7 | Inputs | | | |
| 8 | Cash Flow Year 1 | (\$30,000) | | |
| 9 | Cash Flow Year 2 | \$10,000 | | |
| 10 | Cash Flow Year 3 | \$8,000 | | |
| 11 | Cash Flow Year 4 | \$11,000 | | |
| 12 | Cash Flow Year 5 | \$9,000 | | |
| 13 | | | | |
| 14 | Solution | | | |
| 15 | Internal Rate of Return | 10% | =IRR(B8:B12) | |

ANSWERS TO CASE APPLICATION QUESTIONS

Chapter 2 Time Value of Money

- 1) 15 N, 7 I/Y, 3000 CHS PMT, press FV = \$75,387.06
- 2) Compounding is interest on interest in addition to interest on principal. Without compounding the loss would be 15×3210 or \$48,150. The difference between \$75,387.06 and \$48,150.00 is \$27,237.06 representing the contribution due to compounding.
- 3) 20,000 CHS PV, 70,000 FV, 20 N press I/Y = 6.46%. The rate is lower than the appropriate market rate of 7% and should be rejected.
- 4) 100,000 CHS PV (at age 65), 8,000 PMT, 17 N Press I/Y = 3.65%. This rate of return is not attractive since it is below the market rate of return and therefore the investment should be rejected.
- 5) Richard and Monica, it is apparent that you are not that familiar with time value of money and compounding concepts. Available cash has worth. It is the amount that you could receive by investing in financial assets in the marketplace. It is important that you be able to calculate this return, particularly on a compound basis. Compounding indicates interest on interest. It is a “stealth” figure which when calculated clears up any misconceptions about what is a good return. Time value of money principles and the power of compounding have indicated that the twenty year investment offered and the annuity both have below market returns. This wouldn't have been apparent without the calculation. See the completed financial plan.