

ANSWERS TO CHAPTER QUESTIONS

Chapter 2 The 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 sum 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.

9) When payments are due at the end of the period they are called a regular annuity. When payments are due at the beginning of the period they are called an annuity due.

10) The Rule of 72 gives a quick estimate on when your investment return will double based on the investment return percentage.

11) Future value is the value that a set amount of money will be worth using today's dollars and discounted by the rate of inflation.

$$\text{a) Future value} = \text{Cash Flow} \times (1 + \text{interest rate})^{\text{number of periods}}$$

12) The consequence of not accounting for inflation means not accounting for the decrease in the purchasing power of the dollar. That same dollar that could have

bought you a candy bar today may only be able to purchase half a candy bar 10 years from now.

13) The internal rate of return takes into account the time valuation of money, and cash inflows and outflows. The IRR is often used to determine the profitability of a capital expenditure.

ANSWERS TO CHAPTER PROBLEMS

Chapter 2 Time Value of Money

- 1) What is the present value of a \$20,000 sum to be given 6 years from now if the discount rate is 8 percent?

Excel Solution

	A	B	C	D
6	Inputs			
7	Future Cash Flow	\$20,000		
8	Discount Rate	8%		
9	Number of Years	6		
10				
11	Solution			
12	Present Value	(\$12,603)	=PV(B8,B9,0,B7)	

Calculator Solution

<i>Inputs</i>	6	8			20,000
	N	I/Y	PV	PMT	FV

Solution **-12,603**

- 2) What is the future value of an investment of \$18,000 that will earn interest at 6 percent and fall due in 7 years?

Excel Solution

	A	B	C	D
6	Inputs			
7	Present Cash Flow	\$18,000		
8	Interest Rate	6%		
9	Number of Years	7		
10				
11	Solution			
12	Future Value	\$27,065	=FV(B8,B9,0,-B7)	

Calculator Solution

<i>Inputs</i>	7	6	-18,000		
	N	I/Y	PV	PMT	FV

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

Solution **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		=NPER(B9,0,-B7,B8)	
12	Number of Years	19		

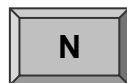
Calculator Solution

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		=FV(B9,B10,-B8,0)	
13	Future Value	\$99,010		

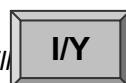
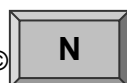
Calculator Solution

Inputs

16

9

-3,000



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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

<i>Inputs</i>	40	11		1,500	
	N	I/Y	PV	PMT	FV

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

<i>Inputs</i>	29		-180,000	20,000	
	N	I/Y	PV	PMT	FV

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

<i>Inputs</i>	6		-2,000	60,000	
	N	I/Y	PV	PMT	FV

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

<i>Inputs</i>	4	12	50,000		
	N	I/Y	PV	PMT	FV

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 a 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:

<i>Inputs</i>	1	12	-10,000		
	N	I/Y	PV	PMT	FV

Solution 11,200

Monthly Compounding:

<i>Inputs</i>	12	1	-10,000		
	N	I/Y	PV	PMT	FV

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%	=(1+B9)/(1+B10)-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 The 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.