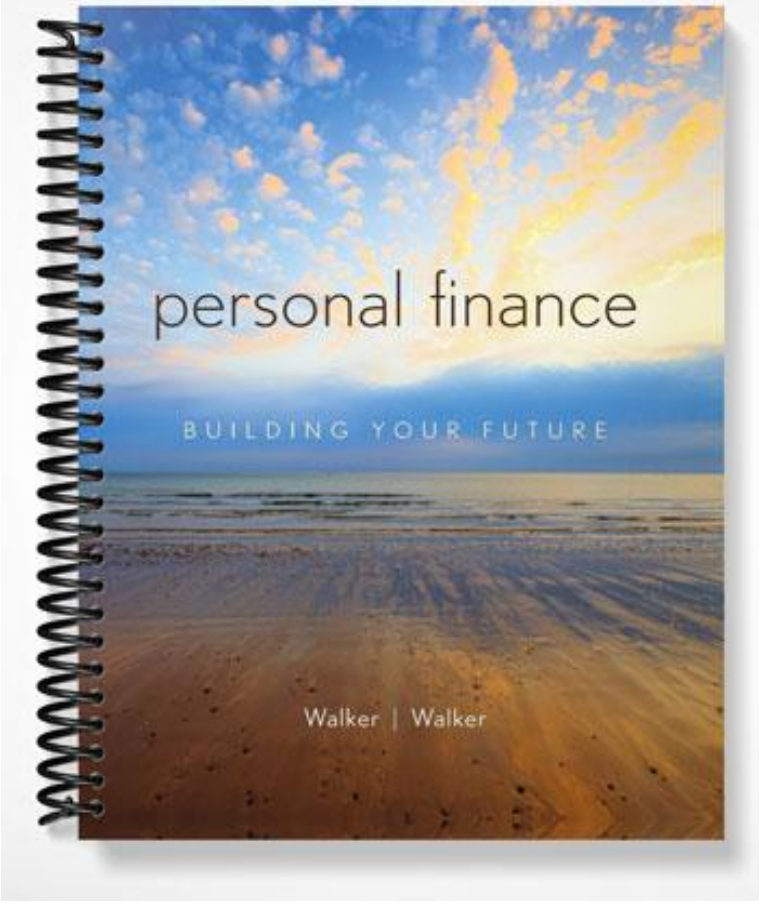
SOLUTIONS MANUAL



INSTRUCTOR'S MANUAL

2 Time Value of Money

Suggested Discussions and Activities

In this chapter we examine "The most powerful force in the universe" according to Albert Einstein…Compound Interest! We also take to look at what gives paper currency, the difference between simple and compound interest, the benefits of paying yourself first, and present values and future values of lump sums and annuities.

Ideas to begin discussion and have students think about this chapter:

- Ask the class how many people want to be a millionaire and in how many years from now. Alternatively, you could ask people how many years until they plan to retire, for example, at age 65. Then ask them how much money they would need to deposit every day for the next 30 years to become a millionaire.
    - Answers:
    - At 2%, 30 years, 365 payments/year, you would need to save $91.32
    - At 3%, 30 years, 365 payments/year, you would need to save $56.31
    - At 4%, 30 years, 365 payments/year, you would need to save $47.24
    - At 5%, 30 years, 365 payments/year, you would need to save $39.35
    - At 6%, 30 years, 365 payments/year, you would need to save $32.56
    - At 7%, 30 years, 365 payments/year, you would need to save $26.77
    - At 8%, 30 years, 365 payments/year, you would need to save $21.87
    - At 9%, 30 years, 365 payments/year, you would need to save $17.77
    - At 10%, 30 years, 365 payments/year, you would need to save $14.36
- At 35 years the answers are:
    - At 2%, 35 years, 365 payments/year, you would need to save $54.05
    - At 3%, 35 years, 365 payments/year, you would need to save $44.25
    - At 4%, 35 years, 365 payments/year, you would need to save $35.87
    - At 5%, 35 years, 365 payments/year, you would need to save $28.82
    - At 6%, 35 years, 365 payments/year, you would need to save $22.94
    - At 7%, 35 years, 365 payments/year, you would need to save $18.12
    - At 8%, 35 years, 365 payments/year, you would need to save $14.20
    - At 9%, 35 years, 365 payments/year, you would need to save $11.04
    - At 10%, 35 years, 365 payments/year, you would need to save $8.54
- At 40 years the answers are:
    - At 2%, 40 years, 365 payments/year, you would need to save $44.71
    - At 3%, 40 years, 365 payments/year, you would need to save $35.43
    - At 4%, 40 years, 365 payments/year, you would need to save $27.73
    - At 5%, 40 years, 365 payments/year, you would need to save $21.44

  - At 6%, 40 years, 365 payments/year, you would need to save $16.40
  - At 7%, 40 years, 365 payments/year, you would need to save $12.42
  - At 8%, 40 years, 365 payments/year, you would need to save $9.32
  - At 9%, 40 years, 365 payments/year, you would need to save $6.93
  - At 10%, 40 years, 365 payments/year, you would need to save $5.11
- At 45 years the answers are:
  - At 2%, 45 years, 365 payments/year, you would need to save $37.54
  - At 3%, 45 years, 365 payments/year, you would need to save $28.77
  - At 4%, 45 years, 365 payments/year, you would need to save $21.70
  - At 5%, 45 years, 365 payments/year, you would need to save $16.14
  - At 6%, 45 years, 365 payments/year, you would need to save $11.85
  - At 7%, 45 years, 365 payments/year, you would need to save $8.59
  - At 8%, 45 years, 365 payments/year, you would need to save $6.16
  - At 9%, 45 years, 365 payments/year, you would need to save $4.37
  - At 10%, 45 years, 365 payments/year, you would need to save $3.08

Through this illustration, you can talk about the importance of time and interest rates. It is important to save early and to receive a good interest rate if one wants to become a millionaire.

- Ask students if they were to win the lottery, would it be better to take the cash option now or choose to receive the amount in payments over their expected lifetime? Have the students justify their answers. These questions can provide lead-ins into what is an annuity, how to determine the interest rate of an annuity, what the benefits are of an annuity, and how you would invest the lump sum so you don't run out of cash. You can also talk about the "Lottery Curse" where people are worse off after winning the lottery than before. You can search the Internet to understand the Lottery Curse. Here are a few links to articles:
  - http://abcnews.go.com/GMA/story?id=2941589
  - http://www.mybanktracker.com/bank-news/2010/08/27/winning-the-lottery-curse/
  - http://www.cafeterra.info/2010/02/13-lottery-winners-who-lost-everything.html

- Ask students if they think it is important to save throughout college? Ask them how many save on a regular basis. Ask them why they save and what they are saving for. This can bring up discussions on making yourself a millionaire by paying yourself first. You can refer to figure 2.4 of Wild Willie, Smart Sam, and Dedicated Dave on how they all strive to become millionaires by the age of 70.

Problems

1. What is the APY of a 4% interest rate, compounded annually? *(LO 2-2)*

   a. $APY = (1 + r/n)^n - 1$
   $APY = (1 + 0.04)^1 - 1 = 0.04 = 4\%$

2. What is the APY of a 6% interest rate, compounded quarterly? *(LO 2-2)*

   a. $APY = (1 + r/n)^n - 1$
   $APY = (1 + 0.06/4)^4 - 1 = 0.0614 = 6.14\%$

3. Your parents gave you $1,000 for your sweet 16th birthday. You want to deposit it in a CD account that is earning 6% annually. Calculate how much your gift will be worth when you graduate from college on your 22nd birthday using the following methods*: (LO 2-3)*
   a. Long-hand formula

   $FV = PV (1 + i)^n$
   $FV = \$1,000 (1 + 0.06)^6$
   $FV = \$1,418.52$

   b. Reference table (Use Table A-1)

   $FV = PV (FVIF_{i,n})$
   $FV = \$1,000(FVIF_{6,6})$
   $FV = \$1,000 \times 1.4185$
   $FV = \$1,418.50$

   c. Financial calculator

   N = 6, I/YR = 6, PV = -$1,000, PMT = 0, CPT FV, FV = $1,418.52

4. You plan to buy a boat in 10 years for no more than $25,000. If interest rates are running 5% annually, calculate how much you need to put away each year using the following methods: *(LO 2-3)*

a. Long-hand formula

$FVA = PMT\{[(1 + i)^n - 1]/ i\}$
$PMT = FVA/\{[(1 + i)^n - 1]/i\}$
$PMT = \$25{,}000/\{[(1 + 0.05)^{10} - 1]/0.05\}$

$PMT = \$25{,}000/12.5779$

$PMT = \$1{,}987.61$

b. Reference table (Use Table A-3)

$FVA = PMT\ (FVIFA_{i,n})$

$PMT = FVA/FVIFA_{i,n}$

$PMT = \$25{,}000/FVIFA_{5,10}$

$PMT = \$25{,}000/12.578$

$PMT = \$1{,}987.60$

c. Financial calculator

N = 10, I/YR = 5, PV = 0, FV = -$25,000, CPT PMT, PMT = $1,987.61

5. You plan to contribute $1,200 each year to your nephew's college education. He will graduate from high school in 10 years. Interest rates are 6%. Calculate how much money you should have saved for him by the time he is ready to go to college using the following methods: *(LO 2-3)*

a. Reference table (Use Table A-3)

FVA = PMT ($FVIFA_{i,n}$)

FVA = $1,200 ($FVIFA_{6,10}$)

FVA = $1,200 (13.181)

FVA = $15,817.20

b. Financial calculator

N = 10, I/YR = 6%, PV = 0, PMT = -$1,200, CPT FV, FV = $15,816.95

6. You are about to set sail on your long-term goal of sailing the seven sees over a seven-year period. You anticipate expenses to run $300,000 per year and that you will be earning 3% interest on your savings. Calculate how much you will need in savings to cover the cost of the adventure using the following methods: *(LO 2-3)*

a. Reference table (Use Table A-4)

PVA = PMT ($PVIFA_{i,n}$)
PVA = $300,000 ($PVIFA_{3,7}$)
PVA = $300,000 (6.230)
PVA = $1,869,000

b. Financial calculator

N = 7, I/YR = 3%, PV = 0, PMT = -$300,000, CPT PV, PV = $1,869,084.89

7. You deposit $7,000 of your high school graduation gift money into a savings account. How much will it be worth when you graduate from med school in seven years if interest rates are: *(LO 2-3)*

a. 3%?

$FV = PV(1 + i)^n$
$FV = \$7{,}000\ (1 + 0.03)^7 = \$8{,}609.12$

b. 5%?

$FV = \$7{,}000\ (1 + 0.05)^7 = \$9{,}849.70$

c. 6%?

$FV = \$7{,}000\ (1 + 0.06)^7 = \$10{,}525.41$

You're the Expert

1) Each year on his child's birthday, Ben put $100 into a savings account that earns 5% annually; *(LO 2-3)*
   a. How much would the child have at age 65? = $45,679.80
   b. What would the outcome have been had Ben started the savings account on the day of the child's birth vs. the end of the child's first year? $47,963.79
   c. What accounts for the difference? The difference of $2,283.99 is due to an additional year of compounded interest due to the deposit of the funds at the beginning of the year.

2) Kip and Kay are about to get married and are looking for an apartment. Kay very much wants a nice downtown location in the center of the social life. Kip would prefer a cheaper location so they are able to still set aside a savings each month into a money market account. Kay believes that getting settled requires so many start-up costs that a monthly savings can wait for a few years until both of their salaries have increased. How would you suggest they resolve their differences? How would you lay out the numbers to present your recommendation? *(LO2.2)*
   Recommend that they sit down and go over their values, vision, mission, and goals. They should set a savings goal first and look for apartments second. They may have to sacrifice the size of their downtown location so they can save. They would also have to calculate in their transportation cost if they were to work downtown. If they were able to get by without a car, they would save money on insurance, gas, maintenance, and parking, which could offset the cost of living in a less expensive area.

3) Jerry and Dee have different opinions on how to save money. Jerry likes to have the highest possible amount withheld from his paycheck for their income taxes. That way, he knows that he will not come up short and he loves getting a big tax refund each spring. When the refund comes, he deposits it into savings; he feels that this is a less painful way to save. Dee prefers to calculate monthly tax withholdings closer to the actual amount owed. Jerry and Dee received an $8,000 tax refund check this year. *(LO 2-2, LO 2-3)*
    a. What is the cost of Jerry's method of savings vs. Dee's if the account they are depositing the money in has an APY of 5.4%? $8,000/12 = $666.66 at the end of one year, they would have accumulated $8,200.92.63 at 5.4
    b. What if they would deposit $666.66 monthly into the savings account that pays 3% interest compounded monthly? They would have $8,110.84 at the end of the year.
    c. What is the difference if their account earns 6% APR compounded monthly? $8,223.63 – $8,110.84 = $112.79

4) Wanda wants to take some time off in five years to backpack through Europe for three months. She estimates that her expenses of the trip for the three months in today's dollars would be approximately $20,000. *(LO 2-3)*
    d. If inflation is running 2% a year, what should her financial savings goal be to support the trip? $22,081.62
    e. Wanda could make a one-time deposit today in a savings account that earns 5% interest over the period. How much would she have to deposit today to support the trip? $17,301.52
    f. If Wanda is currently starting at $0, how much would she have to put away each month in her savings account that offers an APY of 4%? $333.06/month

Running Case Scenario

Leigh, Blake and Nicole's grandparents were over to the house visiting for brunch. After sharing the story of Wild Willie, Smart Sam, and Dedicated Dave, the grandparents offered each grandchild a gift of $10,000 if they can present a financially responsible plan for how to use the gift. In light of their intermediate-term goals, what plans would you recommend Leigh, Blake and Nicole offer?

Answers will vary:

- *Leigh could use the money to go backpacking through Europe now or she could save or invest the money in low risk funds and go backpacking in five years.*
- *Blake and Nicole could use the money for college, long term retirement savings like a Roth IRA if they worked, set some money aside for a new car, or down payment on the house, and set some money aside for Blake to make a trip to Hawaii to run the Ironman*

The other housemates, upon hearing the story, decided they would also begin to set aside $20/week to put toward savings. Keeping in mind the intermediate goals of each housemate and checking www.bankrate.com for the current options in today's market, create a savings plan for each member of the household (i.e., lump sum, annuities, what they would put away now, each period, and what each option would deliver in savings in the end).

Answers will vary as each student uses their own value in answering this question. The objective of the question is to cause the students to think critically to come up with a reasonable solution

LEIGH: *Art teacher, oldest sister; works part-time at local co-op for the discount, sells art work at local farmer's market, bikes to work. A vegetarian, who loves to garden, has 4 pet, egg laying back-yard hens.*
Intermediate Goal: Backpack through Europe for a summer in 5 years

BLAKE: *Junior business student, brother; Expected to someday come back to work in the family business but, he would like to first try his hand on Wall Street.*
Intermediate Goal: Hawaiian Iron Man Triathlon in 5 years

NICOLE: *Freshman, pre-nursing for the moment, youngest sister, somewhat spoiled.*
Intermediate Goal: Graduate in 4 years

KARRI: *Fifth year student, Communications major; Loves shoes and high fashion, chocolate and wine and the Big Apple.*
Intermediate Goal: Anchor for evening news for a local television network

PETER: *Graduated from Culinary Art School, Sous chef, did an internship in a Tokyo, would love someday go back and visit; originally from Colorado, wants to summit all the states 14,000 foot peaks someday.*
Intermediate Goal: Open his own sushi restaurant in 3 years

BRETT: *Second year Medical Student, focused on Emergency Medicine, interested in someday seeing the world via volunteerism for Doctors without Borders.*
Intermediate Goal: Complete med school and residency with as little debt as possible

JEN: *Freshman at the Community College, Undecided Major, very social, fastest texter in high school graduating class.*
Intermediate Goal: Pick a major, transfer to the University after 2 years, graduate with a bachelor's degree in 4 years

JACK: *Newly graduated in General Studies, currently tending bar part-time, no benefits, would like to advocate that paint ball should be an Olympic sport.*
Intermediate Goal: Not have to move back in with mom and dad, and wants to decide on a career

Slides and Notes

Slide 1 Time Value of Money

Bang on the Drum all Day by Todd Rundgren 3:62 minutes

All work and No Play by Van Morrison, : 4:48 minutes

Sixteen Tons by Tennessee Ernie Ford 2:40 minutes

The theme of the songs is that one doesn't want to work their entire life. Using Time Value of Money and investing early, one does not have to work their entire life.

Slide 2 Learning Objectives

Slide 3 What Gives Money Value

The Foreign Exchange link takes you to www.x-rates.com which can lead to a discussion about how the U.S. dollar its valued compared to other countries' currencies

The U.S. Debt Clock is a real-time debt clock stating how much the United State Government is in debt.

Have a discussion about supply and demand and what causes changes in the value of a dollar.

Slide 4 Look at a Dollar Bill

Have students pull out a dollar bill from their wallets and examine it. Point out the seal and the Federal Reserve Bank number and letter. There are 12 Federal reserve banks and they are listed below Layout of list below is poor. Correct margins.

1 = A = Boston, MA 7 = G = Chicago, IL

2 = B = New York, NY 8 = H = St. Louis, MO

3 = C = Philadelphia, PA 9 = I = Minneapolis, MN

4 = D = Cleveland, OH 10 = J = Kansas City, MO

5 = E = Richmond, VA 11 = K = Dallas, TX

6 = F = Atlanta, GA 12 = L = San Francisco, CA

Currency is printed by the Bureau of Engraving and Printing (BEP) in Washington D.C.(www.moneyfactory.gov) The BEP has a video quiz on the new $100 note at http://www.newmoney.gov/education/default.htm

The United States Mint, who produces coins, website is www.usmint.gov

Slide 5 Power of Compounding

Slide 6 Compounding Interest

Slide 7 Simple Interest vs. Compound Interest

Slide 8 Annual Percentage Yield (APY)

Slide 9 Annual Percentage Yield (APY)

Slide 10 APY Example

Use this example to show the value of compounding and annual percentage yield (APY) vs. annual percentage rate (APR). December 19, 1991, the Trust and Savings Act required that the Annual Percentage Rate (APR) and the Annual Percentage Yield (APY) be disclosed for all interest bearing accounts. Before this act, banks only had to disclose the APR, which could have different yields based on the compounding frequency, which could be confusing to investors.

Slide 11 Time Value of Money

Slide 12	Time Value of Money Example	The example of Smart Sam, Wild Willie, and Dedicated Dave really drives home the power of compounding and starting to save early. Ask the students who would have more money between Smart Sam and Wild Willie when they turned 70.
Slide 13	Time Value of Money Example (Continued)	
Slide 14	Secrets to Making Compounding Work	A great book to suggest to read is the Automatic Millionaire

Slide 15 Time Value of Money definitions

Slide 16 Future Value (FV), Long-Hand Method

Slide 17 Problem

Slide 18 Future Value Long-Hand Example

Slide 19 Example Continued

Slide 20 Example Continued

Slide 21 Future Value Interest Factor (FVIF) Table Method

Refer student to FVIF tables in the Chapter 1 Appendix

Slide 22 FVIF Table Method Example

Slide 23 Example Continued

Slide 24 Financial Calculator Method

Slide 25 FV Calculator Method Example

Slide 26 Present Value of a Lump Sum

Slide 27 Present Value (PV) Long-Hand Method

Slide 28 Problem

Slide 29 PV Long-Hand Method Example

Slide 30	Present Value Interest Factor (PVIF) Table Method	Refer student to PVIF tables in the Chapter 1 Appendix
Slide 31	PVIF Table Method Example	
Slide 32	PV Calculator Method Example	

Slide 33 Future Value of an Annuity

Slide 34 Future Value of an Annuity (FVA)

Long-Hand Method

Slide 35 Problem

Slide 36 PVA Long-Hand Example Method

Slide 37 Future Value Interest Factor of an Annuity (FVIFA)

Refer student to FVIFA tables in the Chapter 1 Appendix

Slide 38 FVA Table Method Example

Slide 39 FV Calculator Method Example

Slide 40 Calculating an Annuity Due

Slide 41 Annuity Due from Previous Example

Slide 42 PVA Long-Hand Method

Slide 43 Problem

Slide 44 PVA Long-Hand Method Example

Slide 45 Present Value Interest Factor of an Annuity (PVIFA)

Refer student to PVIFA tables in the Chapter 1 Appendix

Slide 46 PVA Table Method Example

Slide 47 PVA Financial Calculator Method

Slide 48 Calculating Loan Payments

Slide 49 Problem

Slide 50 Annual Loan Payment Calculation – Long-Hand Method

Slide 51 Annual Loan Payment Calculation – Table Method

Refer student to PVIFA tables in the Chapter 1 Appendix

Slide 52 Annual Loan Payment Calculation – Calculator Method

Slide 53 Monthly Payments

Slide 54 Monthly Loan Payment Calculation – Long-Hand Method

Slide 55 Monthly Loan Payment Calculation – Table Method

Slide 56 Monthly Loan Payment Calculation – Calculator Method

Slide 57 Learn

Slide 58 Plan and Act

Slide 59 Evaluate

Slide 60 Running Scenario: Investment Option?