

Section 5: Practice Problems

Tab 1: Introduction and Objectives Tab

Introduction

This section contains basic TVOM practice problems. To complete this section, you must fully understand the basis of TVOM and be familiar with definitions and terminologies used in TVOM.

- If you find that you are having difficulty completing the simple practice problems, you may want to review sections 1-4.
- If you find that you are able to complete the simple practice problems easily, you may want to proceed to the advanced practice problems.

This section will include the following:

- Five suggested steps for setting up a TVOM problem.
- Simple practice problems in which you have to option to set up the problem, solve the problem, or use a calculator.
- Advanced practice problems in which you have to option to set up the problem, solve the problem, or use a calculator.

Note: If you are not familiar with your calculator's functions, you may want to locate a copy of your manual.

Objectives

Upon completing this section of the tutorial, students will be able to:

- Set up simple and advanced TVOM.
- Solve simple and advanced TVOM problems.
- Use a calculator to find the answer to simple and advanced TVOM problems.

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Tab 2: Suggested Set-up

Steps for Solving a TVOM Problem

Below are suggested steps that students should follow when solving TVOM problems.

- 1) ***Draw a time line***, and put all information (both known and unknown) on the time line. For beginners, time line is a must. It might be tedious but it will pay off in long-run especially when dealing with complex problems.
- 2) ***Identify type of TVOM***. The easiest way to identify the types of TVOM is to consider the time line in Step#1. If the pattern of cash flows does not fit into one of the seven major types, break down the problem into sub-problems that fit into one of the major types, and consider each sub-problem separately.
- 3) ***Identify whether the problem is present or future value-type***. If future value is known or needed to be calculated, set up the appropriate future value equation based on type of TVOM identified in Step 2. If present value is known or needed to be calculated, set up the appropriate present value. If both present and future values are known, either present or future value equation can be used.
- 4) ***Identify the unknown variable***; FV, PV, C, t, or r? Each TVOM problem needs four variables to solve for the fifth one.
- 5) ***Assign the remaining variables to the appropriate equation***.
 - FV = value at the end of time period being considered
 - PV = value at the beginning of time period being considered
 - C = amount of equal payments
 - t = number of periods and number of payments
 - r = interest rate per period (i.e., periodic rate)

Important note:

- For an equation, r must be in decimal.
- For the calculator, r must be in percentage term.

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Tab 3: Simple Problems Tab - Questions

Problem 1

When Amy was four years old, she received \$500 from her relatives as a birthday gift. Her mom helped her deposit the money in a bank account. The interest rate on the account has been fixed at 5% compounded monthly. Now Amy is 16 years old. How much does she have on the account?

Problem 2

Jean's daughter is a freshman at a university. She plans to study abroad during her last semester at the university. The abroad program will cost her \$5000. Jean wants to pay for the program. How much money does Jean have to set aside today in order to pay for the program three and a half years from now? The money will be invested in a CD which pays 6% interest rate compounded annually.

Problem 3

Pat just graduated from Penn State. He was lucky to get a paid summer job for every summer, including this past summer, in the past four years. His pays were as follow:

Year	1	2	3	4
Pay	\$2,000	\$2,500	\$1,800	\$2,700

He has saved the money in a CD account which pays 5% interest rate compounded monthly. How much money does Pat have in his account after the last deposit?

Problem 4

Nicole is considering opening her own business – selling handcrafts on-line. She estimates that the initial cost to set up the business is \$3,000. She plans to keep the business running for the next three years. After that, she will evaluate the situation. She expects the business to generate the net cash flows of \$500, \$1,500 and \$2,500 for the next three years. If she wants to get 10% return, should she open the new business? Assume the return is compounded annually.

Problem 5

Mike wants to travel to Europe and Asia. His agent estimates that the costs of the two trips to Europe and Asia will be about \$5,000. Mike has been saving \$70 every month over the past five years for the trips. Does he have enough money for the trips? He earns 8% interest rate monthly compounding.

Problem 6

Kate wants to buy a bond which will pay a fixed interest of \$50 every six months over the next ten years. How much should Kate pay for the bond if she requires 10% rate of return compounded semiannually?

Problem 7

Andrew wants to save for his retirement. He expects to have \$300,000 when he retires in 25 years. How much does Andrew have to save per month, starting the first saving today and ending the last saving a month before his retirement? Assume that the interest rate Andrew earns will be fixed at 10% monthly compounding.

Problem 8

Nicole is going to retire in the near future. She wishes to spend her life after retirement in Bahamas. She expects to withdraw \$5,000 every three months, starting the first withdraw on the retirement day, over the 20 years. How much does she need to have in her account on the day that she retires? Her account earns 6% interest rate compounded quarterly.

Problem 9

Preferred stocks of a company will pay \$10 of fixed dividend per share indefinitely. How much should Kevin pay a share of preferred stocks if he requires 12% on the investment?

Problem 10

George just purchased a stock for \$20 per share. What is the rate of return that he gets on the investment if the stock pays \$3 dividend per share indefinitely?

Problem 11

A company expects to pay \$2 dividend per share next year and increases its dividend payout 5% every year thereafter. If investors require 10% rate of return on the company's stocks, how much are the stocks worth per share?

Problem 12

Pat is planning for his son's college education. His son will be a freshman next year. Pat predicts that the education costs will be \$15,000 for the first year and increase at an inflation rate of 3% after that. How much does Pat need to have in today's value to pay for his son's four-year college education? Assume that Pat will invest the money in a mutual fund that pays a fixed interest rate of 6% compounded annually.

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Tab 3: Simple Problems Tab - Answers

Problem 1

When Amy was four years old, she received \$500 from her relatives as a birthday gift. Her mom helped her deposit the money in a bank account. The interest rate on the account has been fixed at 5% compounded monthly. Now Amy is 16 years old. How much does she have on the account? **\$909.92**

Problem 2

Jean's daughter is a freshman at a university. She plans to study abroad during her last semester at the university. The abroad program will cost her \$5000. Jean wants to pay for the program. How much money does Jean have to set aside today in order to pay for the program three and a half years from now? The money will be invested in a CD which pays 6% interest rate compounded annually. **\$4,055.04**

Problem 3

Pat just graduated from Penn State. He was lucky to get a paid summer job for every summer, including this past summer, in the past four years. His pays were as follow:

Year	1	2	3	4
Pay	\$2,000	\$2,500	\$1,800	\$2,700

He has saved the money in a CD account which pays 5% interest rate compounded monthly. How much money does Pat have in his account after the last deposit?

\$9677.38 - Pat has this amount in his account after the last deposit.

Problem 4

Nicole is considering opening her own business – selling handcrafts on-line. She estimates that the initial cost to set up the business is \$3,000. She plans to keep the business running for the next three years. After that, she will evaluate the situation. She expects the business to generate the net cash flows of \$500, \$1,500 and \$2,500 for the next three years. If she wants to get 10% return, should she open the new business? Assume the return is compounded annually.

\$3572.50 – Since this amount is greater than \$3,000, Nicole should open a new business.

Problem 5

Mike wants to travel to Europe and Asia. His agent estimates that the costs of the two trips to Europe and Asia will be about \$5,000. Mike has been saving \$70 every month over the past five years for the trips. Does he have enough money for the trips? He earns 8% interest rate monthly compounding. **\$5,143.38 – Mike has enough money to cover his trip.**

Problem 6

Kate wants to buy a bond which will pay a fixed interest of \$50 every six months over the next ten years. How much should Kate pay for the bond if she requires 10% rate of return compounded semiannually? **PVA = \$623.11**

Problem 7

Andrew wants to save for his retirement. He expects to have \$300,000 when he retires in 25 years. How much does Andrew have to save per month, starting the first saving today and ending the last saving a month before his retirement? Assume that the interest rate Andrew earns will be fixed at 10% monthly compounding.

C = \$224.23 Andrew needs to save \$224.23 per month in order to have \$300,000 when he retires.

Problem 8

Nicole is going to retire in the near future. She wishes to spend her life after retirement in Bahamas. She expects to withdraw \$5,000 every three months, starting the first withdraw on the retirement day, over the 20 years. How much does she need to have in her account on the day that she retires? Her account earns 6% interest rate compounded quarterly. **Nicole needs to have \$235,517.17 in her account on the day she retires.**

Problem 9

Preferred stocks of a company will pay \$10 of fixed dividend per share indefinitely. How much should Kevin pay a share of preferred stocks if he requires 12% on the investment?

PV = \$83.33 – This is the maximum value of the stock.

Problem 10

George just purchased a stock for \$20 per share. What is the rate of return that he gets on the investment if the stock pays \$3 dividend per share indefinitely? **r = .15 – The return on investment is 15%.**

Problem 11

A company expects to pay \$2 dividend per share next year and increases its dividend payout 5% every year thereafter. If investors require 10% rate of return on the company's stocks, how much are the stocks worth per share?

PVG(∞) = 40 – The maximum value of the stock is \$40.

Problem 12

Pat is planning for his son's college education. His son will be a freshman next year. Pat predicts that the education costs will be \$15,000 for the first year and increase at an inflation rate of 3% after that. How much does Pat need to have in today's value to pay for his son's four-year college education? Assume that Pat will invest the money in a mutual fund that pays a fixed interest rate of 6% compounded annually.

PVGA = \$54,245.8

Pat needs to have \$54,245.8 today in order to pay for his son's college costs.

Section 5: Practice Problems

Tab 4: Advanced Problems Tab - Questions

Problem 1A

Mary offers you a fixed-coupon bond for \$1,100. Should you buy it if your required return is 12%? The bond will pay \$50 of coupon payments every six months over the next five years, and \$1,000 face value when the bond matures in five years. Assume that the interest rate is compounded semiannually. *(Solve by comparing PV of benefits (cash flows) that you will receive from the bond with the price of \$1,100.)*

Problem 1B

Mary offers you a fixed-coupon bond for \$1,100. Should you buy it if your required return is 12%? The bond will pay \$50 of coupon payments every six months over the next five years, and \$1,000 face value when the bond matures in five years. Assume that the interest rate is compounded semiannually. *(Solve by comparing the return on the bond with your required return of 12%.)*

Problem 2

You inherited 1,000 shares of stocks of MP4 Inc. Based on the company's history, dividend is expected to be \$1 per share next year, and increase 5% per year for the next ten years. After that, the dividend is expected to remain constant at \$1.60 per share. How much is the stock worth today? Assume that the appropriate discount rate is 10% (annual compounding).

Problem 3

You are interested in buying stock of an internet company. Financial analysts predict that the company will not make any dividend payment in the next five years. The first dividend payment will be \$3 in Year 6. After that, the dividend will increase 10% per year for the following ten years, and then will stay constant at \$8 per share. How much should you pay for the stock if you require 12% (annually compounding) on this investment?

Problem 4

Becky wants to buy a new car which costs \$30,000. A car dealer offers her two options; 1.99% APR 60 months, or \$3,000 cash back. Which option should Becky take if she has enough cash to pay for the car? If she finances the car with the dealer, she will use cash to buy 5-year CD at 4.5%. All interest rates are compounded monthly.

Problem 5

Jill does not have enough cash to buy a new car, but has a good credit record. She can finance the car with either a dealer or a bank. The car dealer offers her no payment for the first twelve months and then 5.99% APR 48 months. The auto loan at the bank is 4.99% APR 60 months. If the car costs \$25,000, should Jill finance the car with the dealer or the bank? Assume that Jill will be able to earn 2% on an investment over the next five years. Jill gets no discount if she finances the car with the bank.

Problem 6

Vance just graduated and got a good-paying job. His job pays bonus every three months. He thinks of going to a graduate school and wants to save all bonuses for the graduate degree. How much can Vance save in the next three years if his bonus is \$5,000? Vance plans to invest money in an investment account that pays 12% monthly compounding.

Problem 7

Rene has been saving for down payment of her first home. She saved \$100 per month over the past five years in a saving account. How much does she have for down payment today? The saving rates were 3% for the first two years, 2% for year 3 and 4, and 4% for year 5.

Problem 8

Charlie is 35 years old. He wants to save for his retirement. He expects to retire at age 65. He calculates the annual expense to be \$70,000. How much does Charlie have to save per year, starting the first saving one year from today and the last saving ends on the retirement year, in order to meet his retirement goal? Assume that his life expectancy is 90. The expense after the retirement will be withdrawn at the beginning of each year, starting at the retirement year. The interest rates before and after the retirement are 10% and 6% annually compounding.

Problem 9

Hudson is planning for his retirement. He is currently 30 years old and wants to retire early at age 60. Based on his family's history, his life expectancy is 85. He estimates that his spending will be \$5,000 per month after the retirement. He also wants to leave \$200,000 for his children when he dies. He will start the first withdraw on the retirement day and all withdraws will be at the beginning of each month. He currently has \$10,000 on his 401(k). How much does he have to save per month in order to achieve his goal? Before the retirement, all his money will be invested in a mutual fund account which pays 12% return. After the retirement, he will roll over the money to a more conservative fund which pays only 5% return. Assume all interest rates are compounded monthly.

Section 5: Practice Problems

Tab 4: Advanced Problems Tab - Answers

Problem 1A

Mary offers you a fixed-coupon bond for \$1,100. Should you buy it if your required return is 12%? The bond will pay \$50 of coupon payments every six months over the next five years, and \$1,000 face value when the bond matures in five years. Assume that the interest rate is compounded semiannually. (Solve by comparing PV of benefits (cash flows) that you will receive from the bond with the price of \$1,100.)

PV of the benefits = \$926.40

Problem 1B

Mary offers you a fixed-coupon bond for \$1,100. Should you buy it if your required return is 12%? The bond will pay \$50 of coupon payments every six months over the next five years, and \$1,000 face value when the bond matures in five years. Assume that the interest rate is compounded semiannually. (Solve by comparing the return on the bond with your required return of 12%.)

Rate = 7.56%. This is less than what you require of 12%. Therefore you should not take Mary's offer.

Problem 2

You inherited 1,000 shares of stocks of MP4 Inc. Based on the company's history, dividend is expected to be \$1 per share next year, and increase 5% per year for the next ten years. After that, the dividend is expected to remain constant at \$1.60 per share. How much is the stock worth today? Assume that the appropriate discount rate is 10% (annual compounding).

Price of Stock = \$13,610

Problem 3

You are interested in buying stock of an internet company. Financial analysts predict that the company will not make any dividend payment in the next five years. The first dividend payment will be \$3 in Year 6. After that, the dividend will increase 10% per year for the following ten years, and then will stay constant at \$8 per share. How much should you pay for the stock if you require 12% (annually compounding) on this investment?

Price of the stock = \$26.21

Problem 4

Becky wants to buy a new car which costs \$30,000. A car dealer offers her two options; 1.99% APR 60 months, or \$3,000 cash back. Which option should Becky take if she has enough cash to pay for the car? If she finances the car with the dealer, she will use cash to buy 5-year CD at 4.5%. All interest rates are compounded monthly.

Offer #1 = C = \$525.70

Offer #2 = C = \$503.36

Offer #2 is better because it costs less per month than Offer #1.

Problem 5

Jill does not have enough cash to buy a new car, but has a good credit record. She can finance the car with either a dealer or a bank. The car dealer offers her no payment for the first twelve months and then 5.99% APR 48 months. The auto loan at the bank is 4.99% APR 60 months. If the car costs \$25,000, should Jill finance the car with the dealer or the bank? Assume that Jill

will be able to earn 2% on an investment over the next five years. Jill gets no discount if she finances the car with the bank.

Car Dealer = \$26,521.95

Bank = \$26,906.67

Car Dealer is better because the total cost is less than the Bank.

Problem 6

Vance just graduated and got a good-paying job. His job pays bonus every three months. He thinks of going to a graduate school and wants to save all bonuses for the graduate degree. How much can Vance save in the next three years if his bonus is \$5,000? Vance plans to invest money in an investment account that pays 12% monthly compounding.

FVA = \$71,081.21 Therefore, Vance will have \$71,081.21 at the end of Year 3.

Problem 7

Rene has been saving for down payment of her first home. She saved \$100 per month over the past five years in a saving account. How much does she have for down payment today? The saving rates were 3% for the first two years, 2% for year 3 and 4, and 4% for year 5. **Down payment = \$6,444.25**

Problem 8

Charlie is 35 years old. He wants to save for his retirement. He expects to retire at age 65. He calculates the annual expense to be \$70,000. How much does Charlie have to save per year, starting the first saving one year from today and the last saving ends on the retirement year, in order to meet his retirement goal? Assume that his life expectancy is 90. The expense after the retirement will be withdrawn at the beginning of each year, starting at the retirement year. The interest rates before and after the retirement are 10% and 6% annually compounding.

C = \$5,766.32 Charlie has to save \$5,766.32 per year, starting the first saving next year, in order to meet his retirement goal.

Problem 9

Hudson is planning for his retirement. He is currently 30 years old and wants to retire early at age 60. Based on his family's history, his life expectancy is 85. He estimates that his spending will be \$5,000 per month after the retirement. He also wants to leave \$200,000 for his children when he dies. He will start the first withdraw on the retirement day and all withdraws will be at the beginning of each month. He currently has \$10,000 on his 401(k). How much does he have to save per month in order to achieve his goal? Before the retirement, all his money will be invested in a mutual fund account which pays 12% return. After the retirement, he will roll over the money to a more conservative fund which pays only 5% return. Assume all interest rates are compounded monthly.

C = \$159.32 Hudson has to save \$159.32 per month, starting the first deposit next month, to meet the retirement goal.