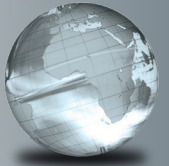# FINANCIAL MANAGEMENT

Principles and Applications

FOURTEENTH
GLOBAL EDITION

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Financial Management

Principles and Applications

6–6. **(Calculating annuity payments)** Donna Langley bought a new luxury car for €50,000. She made a down payment of €5,000 and agreed to pay the rest over the next eight years in eight equal annual payments that include both principal and 12 percent compound interest on unpaid balance. What will these equal payments be?

6–7. **(Calculating annuity payments)** Jamie Oliver has just graduated and found a job. He had taken a student loan of $40,000 to pay for his university. He has decided to pay off this loan by making equal annual payments over the next 20 years. If the loan charges him compound interest at 8 percent per annum, what is the annual amount, including interest and principal, that he needs to repay?

6–8. **(Calculating annuity payments)** Satya Kumar wishes to have £30,000 at the end of 20 years to pay for his daughter's pilot training. He plans to do so by depositing an equal amount every year in an account that pays 7 percent compounded annually. How much does he need to deposit every year to reach his goal?

6–9. **(Calculating annuity payments)** Kelly Yeo plans to buy her own apartment in Singapore in 10 years' time when she retires. She has identified a location where house prices average at $300,000 at present. She also expects a rise in the house price by 5 percent every year. She plans to have the funds to buy the apartment at the time of her retirement by depositing an equal amount of money every year in a bank account that pays 9 percent per annum compound interest. How much does she need to deposit every year in this account to reach her goal at the time of retirement?

6–10. **(Calculating annuity payments)** The Aggarwal Corporation needs to save $10 million to retire a $10 million mortgage that matures in 10 years. To retire this mortgage, the company plans to put a fixed amount into an account at the end of each year for 10 years. The Aggarwal Corporation expects to earn 9 percent annually on the money in this account. What equal annual contribution must the firm make to this account to accumulate the $10 million by the end of 10 years?

6–11. **(Calculating annuity payments)** Sheef Metal PLC's factory is on leasehold land. The lease will end in 15 years' time from now. The directors have decided to buy the title rights from the leaseholder at the end of the lease term, and this is expected to cost £500,000 at the time of the lease's expiry. The firm plans to put a fixed amount into an account at the end of every year for the next 15 years to buy the title rights. If the account earns 8 percent every year compounded annually, how much will be the fixed amount that Sheef Metal PLC needs to put in the account?

6–12. **(Calculating the future value of an annuity)** Upon graduating from college 35 years ago, Dr. Nick Riviera was already planning for his retirement. Since then, he has made $300 deposits into a retirement fund on a quarterly basis. Nick has just completed his final payment and is at last ready to retire. His retirement fund has earned 9 percent compounded quarterly.

a. How much has Nick accumulated in his retirement account?
b. In addition to this, 15 years ago Nick received an inheritance check for $20,000 from his beloved uncle. He decided to deposit the entire amount into his retirement fund. What is his current balance in the fund?

6–13. **(Calculating the number of annuity periods)** Greer is borrowing €300,000 to buy a house in Amsterdam at 5 percent per annum compounded monthly. How long will it take to pay off the amount if she makes monthly payments of €1,600?

6–14. **(Calculating the number of annuity periods)** Alex Karev has taken out a $200,000 loan with an annual rate of 8 percent compounded monthly to pay off hospital bills from his wife Izzy's illness. If the most Alex can afford to pay is $1,500 per month, how long will it take for him to pay off the loan? How long will it take for him to pay off the loan if he can pay $2,000 per month?

6–15. **(Calculating the present value of annuity)** What should be the present value of an eight-year annuity payment that pays $1,700 annually given an applicable discount rate of 5 percent?

6–16. **(Calculating an annuity's interest rate)** Your folks would like some advice from you. An insurance agent just called and offered them the opportunity to purchase an annuity for $21,074.25 that will pay them $3,000 per year for 20 years. They don't

have the slightest idea what return they would be making on their investment of $21,074.25. What rate of return would they be earning?

6–17. **(Calculating annuity payments)** **(Related to Checkpoint 6.1 on page 196)** On December 31, Beth Klemkosky bought a yacht for $50,000. She paid $10,000 down and agreed to pay the balance in 10 equal annual installments that include both principal and 10 percent interest on the declining balance. How big will the annual payments be?

6–18. **(Calculating an annuity's interest rate)** Rebecca Smyth has seen a deal for a new car worth £20,000 that she can take home now and start paying for only at the end of the year. She will have to make an annual payment of £6,000 every year for next four years. What will be the applicable rate of interest if she takes up the offer?

6–19. **(Calculating annuity payments)** **(Related to Checkpoint 6.1 on page 196)** Xiang Lu has started a business in Hong Kong and has borrowed $60,000 from a bank at 10 per-cent compounded annually. This loan will be repaid in equal installments at the end of each year over the next seven years. How much will each annual installment be?

6–20. **(Calculating annuity payments)** Mike and Bethan plan to buy their dream house in six years' time. They expect to need £30,000 to do so at that time. They are saving in an account that pays 10 percent per annum. How much do they have to deposit every year to have the required amount when the final deposit is made?

6–21. **(Calculating the number of annuity periods)** Rajesh has just bought a large flat screen TV for € 4,000 on hire purchase. He has agreed to pay 16 percent per annum compounded monthly interest on this amount. He has agreed to a monthly payment of €200. How long will he take to repay the loan? How much will he pay in interest on this loan?

6–22. **(Solving a comprehensive problem)** You would like to have $75,000 in 15 years. To accumulate this amount, you plan to deposit an equal sum in the bank each year that will earn 8 percent interest compounded annually. Your first payment will be made at the end of the year.
   a. How much must you deposit annually to accumulate this amount?
   b. If you decide to make a large lump-sum deposit today instead of the annual deposits, how large should the lump-sum deposit be? (Assume you can earn 8 percent on this deposit.)
   c. At the end of five years, you will receive $20,000 and deposit it in the bank in an effort to reach your goal of $75,000 at the end of 15 years. In addition to the deposit, how large must your equal annual deposits for all 15 years be to reach your goal? (Again, assume you can earn 8 percent on this deposit.)

6–23. **(Calculating annuity payments)** Shuting has given herself five years to save $40,000 to buy a commercial property in Hong Kong for her business. She plans to make annual deposits in an account paying 10 percent per annum. If she makes her first deposit at the end of this year, what amount does she need to deposit every year to get the required amount of $40,000 at the end of a five-year period?

6–24. **(Calculating the future value of an annuity and annuity payments)** You are trying to plan for retirement in 10 years, and, currently, you have $150,000 in a savings ac-count and $250,000 in stocks. In addition, you plan to deposit $8,000 per year into your savings account at the end of each of the next five years and then $10,000 per year at the end of each year for the final five years until you retire.
   a. Assuming your savings account returns 8 percent compounded annually and your investment in stocks returns 12 percent compounded annually, how much will you have at the end of 10 years?
   b. If you expect to live for 20 years after you retire and at retirement you deposit all of your savings in a bank account paying 11 percent, how much can you withdraw each year after you retire (making 20 equal withdrawals beginning one year after you retire) so that you end up with a zero balance at death?

6–25. **(Calculating annuity payments)** On December 31, Son-Nan Chen borrowed $100,000, agreeing to repay this sum in 20 equal annual installments that include both principal and 15 percent interest on the declining balance. How large will the annual payments be?

6–26. **(Calculating annuity payments)** Amrit Kolar bought a new house by borrowing £300,000 on a mortgage at 6 percent per annum repayable over 30 years in equal annual payments. How large will his annual payments be?

6–27. **(Calculating components of annuity payments)** Omar Khalid has started a new factory and bought a commercial building for $160,000 with an 8 percent mortgage to be paid over 20 years, calling for payment semi-annually. What will be the semiannual payment? What will the interest and principal components be in the first two installments of the first year?

6–28. **(Calculating the present value of annuity payments)** (**Related to Checkpoint 6.2 on page 199**) The state lottery's million-dollar payout provides for $1 million to be paid over the course of 19 years in amounts of $50,000. The first $50,000 payment is made immediately, and the 19 remaining $50,000 payments occur at the end of each of the next 19 years. If 10 percent is the discount rate, what is the present value of this stream of cash flows? If 20 percent is the discount rate, what is the present value of the cash flows?

6–29. **(Calculating the future value of an annuity)** Find the future value of an annuity that pays €8,000 a year for 10 years at 6 percent compounded annually. What will be the future value if it was compounded at 10 percent?

6–30. **(Calculating the present value of an annuity due)** What will be the present value of an annuity due of £800 a year for 12 years, discounted back to the present at an annual rate of 5 percent? What will be the present value of this annuity if the discount rate is 8 percent?

6–31. **(Calculating the present value of annuity)** You have agreed to invest in a new business scheme that has promised to pay £2,000 every year starting at the end of Year 5 from now, assuming it earns 9 percent per annum. This will continue to pay the same amount each year for 10 years once started. What will the present value of this business opportunity be?

6–32. **(Calculating the components of an annuity payment)** You have just bought a house for €270,000 by taking a 20-year mortgage for the same amount at 8 percent per annum payable in monthly installments. What will your monthly payments be? Use a spreadsheet to calculate your answer. Now calculate the amounts in the 50th monthly payment that goes toward interest and principal, respectively.

6–33. **(Solving a comprehensive problem)** Over the past few years, Microsoft founder Bill Gates's net worth has fluctuated between $20 and $130 billion. In early 2006, it was about $26 billion—after he reduced his stake in Microsoft from 21 percent to around 14 percent by moving billions into his charitable foundation. Let's see what Bill Gates can do with his money in the following problems.

   a. Manhattan's native tribe sold Manhattan Island to Peter Minuit for $24 in 1626. Now, 390 years later in 2016, Bill Gates wants to buy the island from the "current natives." How much will Bill have to pay for Manhattan if the "current natives" want a 6 percent annual return on the original $24 purchase price?

   b. Bill Gates decides to pass on Manhattan and instead plans to buy the city of Seattle, Washington, for $50 billion in 10 years. How much will Bill have to invest today at 10 percent compounded annually in order to purchase Seattle in 10 years?

   c. Now assume Bill Gates wants to invest only about 17 percent of his net worth, which stood at around $76 billion in 2016, or $13 billion, in order to buy Seattle for $50 billion in 10 years. What annual rate of return will he have to earn in order to complete his purchase in 10 years?

   d. Instead of buying and running large cities, Bill Gates is considering quitting the rigors of the business world and retiring to work on his golf game. To fund his retirement, Bill wants to invest his $20 billion fortune in safe investments with an expected annual rate of return of 7 percent. He also wants to make 40 equal annual withdrawals from this retirement fund beginning a year from today, running his retirement fund to $0 at the end of 40 years. How much can his annual withdrawal be in this case?

6–34. **(Calculating annuity payments)** (**Related to Checkpoint 6.1 on page 196**) Sheryl Williams wants to have a million dollars when she retires, 40 years from now. She is planning to do this by depositing an equal amount at the end of every year for the next 40 years. If her tax-free savings account pays her 9 percent per annum, how much does she need to deposit every year?

6–35. **(Calculating the present value of annuity)** **(Related to Checkpoint 6.2 on page 199)** Xiang Lu received €80,000 four years ago as an inheritance, which he immediately deposited in an account paying him 5 percent every year. Now he has started to put in €3,000 every year in the same account, starting now. How much money will he have at the end of 25 years?

6–36. **(Calculating annuity payments)** Professor Finance is thinking about trading cars. She estimates she will still have to borrow $25,000 to pay for her new car. How large will Prof. Finance's monthly car loan payment be if she can get a five-year (60 equal monthly payments) car loan from the VTech Credit Union at 6.2 percent APR?

6–37. **(Calculating annuity payments)** Ford Motor Company's current incentives include a choice between 4.9 percent APR financing for 60 months and $1,000 cash back on a Mustang. Let's assume Suzie Student wants to buy the premium Mustang convertible, which costs $25,000, and she has no down payment other than the cash back from Ford. If she chooses $1,000 cash back, Suzie can borrow from the VTech Credit Union at 6.9 percent APR for 60 months (Suzie's credit isn't as good as that of Prof. Finance). What will Suzie Student's monthly payment be under each option? Which option should she choose?

6–38. **(Determining the outstanding balance of a loan)** **(Related to Checkpoint 6.3 on page 202)** Mrs. Khan took a mortgage of £140,000 at 5 percent per annum 10 years ago for a period of 25 years. She pays a monthly payment of £818.43. What is the outstanding balance on her current loan if she has just paid her 120th payment?

6–39. **(Calculating annuity payments)** Calvin Johnson has a $5,000 debt balance on his Visa card that charges 12.9 percent APR compounded monthly. Let's assume Calvin's only needed to make a minimum monthly payment of 3 percent of his debt balance, which is $150. How many months (round up) will it take Calvin Johnson to pay off his credit card if he pays $150 at the end of each month? Now let's assume that the minimum monthly payment on credit cards rises to 4 percent. If Calvin makes monthly payments of $200 at the end of each month, how long will it take to pay off his credit card?

6–40. **(Calculating the future value of an annuity)** Let's say you deposited $160,000 in a 529 plan (a tax-advantaged college savings plan), hoping to have $420,000 available 12 years later when your first child starts college. However, you didn't invest very well, and two years later the account's balance dropped to $140,000. Let's look at what you need to do to get the college savings plan back on track.

   a. What was the original annual rate of return needed to reach your goal when you started the fund two years ago?
   b. With only $140,000 in the fund and 10 years remaining until your first child starts college, what annual rate of return will the fund have to make to reach your $420,000 goal if you add nothing to the account?
   c. Shocked by your experience of the past two years, you feel the college fund has invested too much in stocks, and you want a low-risk fund in order to ensure you have the necessary $420,000 in 10 years. You are willing to make end-of-the-month deposits to the fund as well. You find you can get a fund that promises to pay a guaranteed annual return of 6 percent that is compounded monthly. You decide to transfer the $140,000 to this new fund and make the necessary monthly deposits. How large of a monthly deposit must you make in this new fund each month?
   d. After seeing how large the monthly deposit has to be (in part c of this problem), you decide to invest the $140,000 today and $500 at the end of each month for the next 10 years in a fund consisting of 50 percent stock and 50 percent bonds and to hope for the best. What APR will the fund have to earn in order to reach your $420,000 goal?

6–41. **(Calculating the future value of an annuity)** Selma and Patty Bouvier, twins who work at the Springfield DMV, have decided to save for retirement, which is 35 years away. They will both receive an 8 percent annual return on their investment over the next 35 years. Selma invests $2,000 at the end of each year *only* for the first 10 years of the 35-year period—for a total of $20,000 saved. Patty doesn't start saving for 10 years and then saves $2,000 at the end of each year for the remaining 25 years—for a total of $50,000 saved. How much will each of them have when they retire?

Perpetuities

6–42. **(Calculating the present value of a perpetuity)** (**Related to Checkpoint 6.4 on page 206**) What is the present value of the following?

    a. A $300 perpetuity discounted back to the present at 8 percent
    b. A $1,000 perpetuity discounted back to the present at 12 percent
    c. A $100 perpetuity discounted back to the present at 9 percent
    d. A $95 perpetuity discounted back to the present at 5 percent

6–43. **(Calculating the present value of a perpetuity)** What will be the present value of a perpetual payment of £400 per year if the applicable discount rate is 6 percent? What will be its value if the discount rate is changed to 3 percent?

6–44. **(Calculating the present value of a growing perpetuity)** (**Related to Checkpoint 6.5 on page 207**) A perpetuity pays $1,000 at the end of Year 1, and the annual cash flows grow at a rate of 4 percent per year indefinitely. What is the present value if the appropriate discount rate is 8 percent? If the appropriate discount rate is 6 percent?

6–45. **(Calculating the present value of a growing perpetuity)** A pension plan pays €30,000 at the end of Year 1 and then grows at the rate of 3 percent per year indefinitely. What is the present value if the rate of interest to discount the cash flow is 7 percent?

6–46. **(Calculating the present value of a growing perpetuity)** Jonathan Lee wants to start an annual bursary of €50,000 for his alma mater in Berlin. The first payment will occur at the end of this year and it will then grow by 5 percent each year to cover for inflation. If the bank account pays 8 percent per annum, how much does Jonathan needs to invest now to support this bursary forever?

6–47. **(Calculating the present value of a negatively growing perpetuity)** Your firm has taken cost-saving measures that will provide a benefit of $10,000 in the first year. These cost savings will decrease each year at a rate of 3 percent forever. If the appropriate interest rate is 6 percent, what is the present value of these savings?

Complex Cash Flow Streams

6–48. **(Calculating the present value of annuities and complex cash flows)** (**Related to Checkpoint 6.6 on page 209**) You are given three investment alternatives to analyze. The cash flows from these three investments are as follows:

End of Year	A	B	C
1	$10,000		$10,000
2	10,000		
3	10,000		
4	10,000		
5	10,000	$10,000	
6		10,000	50,000
7		10,000	
8		10,000	
9		10,000	
10		10,000	10,000

Assuming a 20 percent discount rate, find the present value of each investment.

6–49. **(Calculating the present value of annuities and complex cash flows)** You are given three investment alternatives to analyze. The cash flows from these three investments are as follows:

End of Year	A	B	C
1	$15,000		$20,000
2	15,000		
3	15,000		
4	15,000		
5	15,000	$15,000	
6		15,000	60,000
7		15,000	
8		15,000	
9		15,000	
10		15,000	20,000

Assuming a 20 percent discount rate, find the present value of each investment.

6–50. **(Calculating the present value of an uneven stream of payments)** You are given three investment alternatives to analyze. The cash flows from these three investments are as follows:

End of Year	A	B	C
1	$2,000	$2,000	$ 5,000
2	3,000	2,000	5,000
3	4,000	2,000	(5,000)
4	(5,000)	2,000	(5,000)
5	5,000	5,000	15,000

What is the present value of each of these three investments if the appropriate discount rate is 10 percent?

6–51. **(Calculating the present value of complex cash flows)** You have an opportunity to make an investment that will pay $100 at the end of the first year, $400 at the end of the second year, $400 at the end of the third year, $400 at the end of the fourth year, and $300 at the end of the fifth year.

   a. Find the present value if the interest rate is 8 percent. (Hint: You can simply bring each cash flow back to the present and then add them up. Another way to work this problem is to use either the $=$ NPV function in Excel or the CF key on your financial calculator—but you'll want to check your calculator's manual before you use this key. Keep in mind that with the $=$ NPV function in Excel, there is no initial outlay. That is, all this function does is bring all of the future cash flows back to the present. With a financial calculator, you should keep in mind that CF_0 is the initial outlay or cash flow at time 0 and, because there is no cash flow at time 0, $CF_0 = 0$.)
   b. What would happen to the present value of this stream of cash flows if the interest rate was 0 percent?

6–52. **(Calculating the present value of complex cash flows)** How much do you have to deposit in an account paying 8 percent per annum if you want to withdraw £15,000 at the end of Year 5 and then £5,000 each year for next five years (from Year 6 to Year 10)?

6–53. **(Solving a comprehensive problem)** You would like to have $50,000 in 15 years. To accumulate this amount, you plan to deposit an equal sum in the bank each year that will earn 7 percent interest compounded annually. Your first payment will be made at the end of the year.

   a. How much must you deposit annually to accumulate this amount?
   b. If you decide to make a large lump-sum deposit today instead of the annual deposits, how large should this lump-sum deposit be? (Assume you can earn 7 percent on this deposit.)