ANSWERS TO STUDY QUESTIONS

Chapter 8

8.1. $15{,}000/1.12 = \$13{,}393$

8.3. $15{,}000/1.12^2 = \$11{,}958$

8.5. $20{,}000 \times 1.12^2 = \$25{,}088$

8.7. $15{,}000/\{[1 + (0.12/12)]^{12}\} = 15{,}000/1.01^{12} = 15{,}000/1.126825 = \$13{,}312$

8.9. $20{,}000 \times \{[1 + (0.12/12)]^{(2 \times 12)}\} = \$25{,}395$

8.11. $[1 + (0.08/12)]^{12} - 1 = 0.0830 = 8.30\%$

8.13. $[1 + (0.08/2)]^2 - 1 = 0.0816 = 8.16\%$

8.15. 10% BER $\rightarrow [1 + (0.10/2)]^2 - 1 = 0.1025 = 10.25\%$ EAR
10.25% EAR $\rightarrow [(1 + 0.1025)^{1/12} - 1] \times 12 = 0.0980 = 9.80\%$ MER

8.17. 10% MER $\rightarrow [1 + (0.10/12)]^{12} - 1 = 0.104713 = 10.4713\%$ EAR
10.4713% EAR $\rightarrow [(1 + 0.104713)^{1/2} - 1] \times 2 = 0.1021 = 10.21\%$ BER

8.19. $\exp(.08) - 1 = 1.0833 - 1 = 8.33\%$

8.21. $(30{,}000/15{,}000)^{(1/5)} - 1 = 14.87\%$

8.23. $12 \times [(30{,}000/15{,}000)^{[1/(5 \times 12)]} - 1] = 13.94\%$

8.25. $\mathrm{LN}(30{,}000/15{,}000)/5 = 13.86\%$

8.27. $\mathrm{LN}(30{,}000/15{,}000)/\mathrm{LN}(1 + 0.10) = 0.69315/0.09531 = 7.27$ years

8.29. $[\mathrm{LN}(30{,}000/15{,}000)/\mathrm{LN}(1 + 0.10/12)]/12 = (0.69315/0.00830)/12 = 6.96$ years

8.31. $\mathrm{LN}(30{,}000/15{,}000)/0.10 = 6.93$ years

8.33. $15{,}000 - [1 - (1/1.09)^{10}]/0.09 = \$96{,}265$

8.35. $\mathrm{EAR} = \{[1 + (.09/12)]^{12}\} - 1 = 9.38\%$. $15{,}000 \times [1 - (1/1.0938)^{10}]/0.0938 = \$94{,}675$

8.37. $1{,}250 \times (1 - \{1/[1 + (.09/12)]\}^{(10 \times 12)})/(0.09/12) = \$98{,}677$

8.39. $\$98{,}677$ (from question 8.37) $+ \$50{,}000/[1 + (0.09/12)]^{(10 \times 12)}$
$\$98{,}677 + \$20{,}397 = \$119{,}074$

8.41. $80{,}000 \times (0.10/12)/\{1 - 1/[1 + (0.10/12)]^{(25 \times 12)}\} = \$726.96$

8.43. $-\mathrm{LN}[1 - (0.10/12)(50{,}000/500)]/LN(1 + 0.10/12)$
$= -LN(0.16667)/LN(1.00833) = -1.7918/.0083$
$= 215.9$ months

8.45. $1{,}000 \times (1 + 0.10/12) \times (1 - \{1/[1 + (0.10/12)]\}^{(5 \times 12)})/(0.10/12) = \$47{,}458$

*8.47. $\$1{,}000{,}000 \times (0.06/12)/([1 - 1/(1 + 0.06/12)^{60}](1 + 0.06/12)^{60}) = \$14{,}332.80$. (This takes the formula for the *PV* as a function of *PMT* and *FV*, converts it to a formula for *FV* as a function of *PMT* by multiplying by $(1 + i/m)^N$, then inverts this to solve for PMT as a function of FV.)

*8.49. Level annuity value is
$PV = \$30(1 - 1/1.08^{10})/0.08 = \$201.30/\mathrm{SF}$
Plug this into growth-annuity formula and invert:
$CF^1 = 201.30(0.08 - 0.03)/[(1 - (1.03/1.08)^{10}] = \$26.66/\mathrm{SF}$

8.51. $\$10/[0.10 - (-0.01)] = \$10/0.11 = \$90.91/\mathrm{SF}$

8.53. (a) NPV at \$180,000 and 11% discount rate is +\$4,394:

$$4,394 = -180,000 + \left(\frac{15,000}{1+0.11}\right) + \left(\frac{16,000}{(1+0.11)^2}\right) + \left(\frac{20,000}{(1+0.11)^3}\right) + \left(\frac{22,000}{(1+0.11)^4}\right) + \left(\frac{(17,000+200,000)}{(1+0.11)^5}\right)$$

(b) IRR at \$170,000 is 13.15%:

$$0 = -170,000 + \left(\frac{15,000}{1+0.1315}\right) + \left(\frac{16,000}{(1+0.1315)^2}\right) + \left(\frac{20,000}{(1+0.1315)^3}\right) + \left(\frac{22,000}{(1+0.1315)^4}\right) + \left(\frac{17,000+200,000}{(1+0.1315)^5}\right)$$

*8.55. The rent in the initial lease will be 20 × 100,000 = \$2,000,000 per year. The first lease when it is signed will have a *PV* of \$8,624,254. This is a level annuity in advance: 2(1.08/0.08) [1 − $(1/1.08)^5$] = 8.624254. The *PV* today of that first lease is 8,624,254/1.12 = \$7,700,227. The rent on each subsequent lease will be 1.02^5 higher than the rent on the previous lease, but its PV will be discounted by five more years at 12%. This is a constant-growth perpetuity with a common ratio of $(1.02/1.12)^5$. Thus, apply the perpetuity formula of the geometric series: $PV = a/(1 - d)$ = 7,700,227/[1 − $(1.02/1.12)^5$] = 20,615,582. The space is worth \$20,615,582 today.