

KEY EQUATIONS

CHAPTER 2

1. The balance sheet identity or equation:

$$\text{Assets} = \text{Liabilities} + \text{Shareholders' equity} \quad [2.1]$$
2. The income statement equation:

$$\text{Revenues} - \text{Expenses} = \text{Income} \quad [2.2]$$
3. The cash flow identity:

$$\text{Cash flow from assets} = \text{Cash flow to creditors} + \text{Cash flow to stockholders} \quad [2.3]$$

where

- a. Cash flow from assets = Operating cash flow (OCF) – Net capital spending – Change in net working capital (NWC)
 - (1) Operating cash flow = Earnings before interest and taxes (EBIT) + Depreciation – Taxes
 - (2) Net capital spending = Ending net fixed assets – Beginning net fixed assets + Depreciation
 - (3) Change in net working capital = Ending NWC – Beginning NWC
- b. Cash flow to creditors = Interest paid – Net new borrowing
- c. Cash flow to stockholders = Dividends paid – Net new equity raised

CHAPTER 3

1. The current ratio:

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} \quad [3.1]$$
2. The quick or acid-test ratio:

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{Inventory}}{\text{Current liabilities}} \quad [3.2]$$
3. The cash ratio:

$$\text{Cash ratio} = \frac{\text{Cash}}{\text{Current liabilities}} \quad [3.3]$$
4. The ratio of net working capital to total assets:

$$\text{Net working capital to total assets} = \frac{\text{Net working capital}}{\text{Total assets}} \quad [3.4]$$
5. The interval measure:

$$\text{Interval measure} = \frac{\text{Current assets}}{\text{Average daily operating costs}} \quad [3.5]$$
6. The total debt ratio:

$$\text{Total debt ratio} = \frac{\text{Total assets} - \text{Total equity}}{\text{Total assets}} \quad [3.6]$$
7. The debt–equity ratio:

$$\text{Debt–equity ratio} = \text{Total debt} / \text{Total equity} \quad [3.7]$$
8. The equity multiplier:

$$\text{Equity multiplier} = \text{Total assets} / \text{Total equity} \quad [3.8]$$
9. The long-term debt ratio:

$$\text{Long-term debt ratio} = \frac{\text{Long-term debt}}{\text{Long-term debt} + \text{Total equity}} \quad [3.9]$$
10. The times interest earned (TIE) ratio:

$$\text{Times interest earned ratio} = \frac{\text{EBIT}}{\text{Interest}} \quad [3.10]$$
11. The cash coverage ratio:

$$\text{Cash coverage ratio} = \frac{\text{EBIT} + \text{Depreciation}}{\text{Interest}} \quad [3.11]$$
12. The inventory turnover ratio:

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Inventory}} \quad [3.12]$$
13. The average days' sales in inventory:

$$\text{Days' sales in inventory} = \frac{365 \text{ days}}{\text{Inventory turnover}} \quad [3.13]$$

14. The receivables turnover ratio:

$$\begin{aligned} & \text{Receivables turnover} \\ &= \frac{\text{Sales}}{\text{Accounts receivable}} \end{aligned} \quad [3.14]$$

15. The days' sales in receivables:

$$\begin{aligned} & \text{Days' sales in receivables} \\ &= \frac{365 \text{ days}}{\text{Receivables turnover}} \end{aligned} \quad [3.15]$$

16. The net working capital (NWC) turnover ratio:

$$\text{NWC turnover} = \frac{\text{Sales}}{\text{NWC}} \quad [3.16]$$

17. The fixed asset turnover ratio:

$$\text{Fixed asset turnover} = \frac{\text{Sales}}{\text{Net fixed assets}} \quad [3.17]$$

18. The total asset turnover ratio:

$$\text{Total asset turnover} = \frac{\text{Sales}}{\text{Total assets}} \quad [3.18]$$

19. Profit margin:

$$\text{Profit margin} = \frac{\text{Net income}}{\text{Sales}} \quad [3.19]$$

20. Return on assets (ROA):

$$\text{Return on assets} = \frac{\text{Net income}}{\text{Total assets}} \quad [3.20]$$

21. Return on equity (ROE):

$$\text{Return on equity} = \frac{\text{Net income}}{\text{Total equity}} \quad [3.21]$$

22. The price-earnings (PE) ratio:

$$\text{PE ratio} = \frac{\text{Price per share}}{\text{Earnings per share}} \quad [3.22]$$

23. The market-to-book ratio:

$$\begin{aligned} & \text{Market-to-book ratio} \\ &= \frac{\text{Market value per share}}{\text{Book value per share}} \end{aligned} \quad [3.23]$$

24. Enterprise value:

$$\begin{aligned} \text{Enterprise value} &= \text{Total market value of the stock} + \\ & \quad \text{Book value of all liabilities} - \\ & \quad \text{Cash} \end{aligned} \quad [3.24]$$

25. The EBITDA ratio:

$$\text{EBITDA ratio} = \frac{\text{Enterprise value}}{\text{EBITDA}} \quad [3.25]$$

26. The Du Pont identity:

$$\text{ROE} = \underbrace{\frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}}}_{\text{Return on assets}} \times \frac{\text{Assets}}{\text{Equity}} \quad [3.26]$$

$$\begin{aligned} \text{ROE} &= \text{Profit margin} \\ & \times \text{Total asset turnover} \\ & \times \text{Equity multiplier} \end{aligned}$$

CHAPTER 4

1. The dividend payout ratio:

$$\begin{aligned} & \text{Dividend payout ratio} \\ &= \text{Cash dividends/Net income} \end{aligned} \quad [4.1]$$

2. The internal growth rate:

$$\text{Internal growth rate} = \frac{\text{ROA} \times b}{1 - \text{ROA} \times b} \quad [4.2]$$

3. The sustainable growth rate:

$$\text{Sustainable growth rate} = \frac{\text{ROE} \times b}{1 - \text{ROE} \times b} \quad [4.3]$$

CHAPTER 5

1. The future value of \$1 invested for t periods at rate of r per period:

$$\text{Future value} = \$1 \times (1 + r)^t \quad [5.1]$$

2. The present value of \$1 to be received t periods in the future at a discount rate of r :

$$\text{PV} = \$1 \times [1/(1 + r)^t] = \$1/(1 + r)^t \quad [5.2]$$

3. The relationship between future value and present value (the basic present value equation):

$$\begin{aligned} \text{PV} \times (1 + r)^t &= \text{FV}_t \\ \text{PV} &= \text{FV}_t / (1 + r)^t = \text{FV}_t \times [1/(1 + r)^t] \end{aligned} \quad [5.3]$$

CHAPTER 6

1. The present value of an annuity of C dollars per period for t periods when the rate of return or interest rate is r :

$$\begin{aligned} & \text{Annuity present value} \\ &= C \times \left(\frac{1 - \text{Present value factor}}{r} \right) \\ &= C \times \left[\frac{1 - [1/(1 + r)^t]}{r} \right] \end{aligned} \quad [6.1]$$

2. The future value factor for an annuity:

$$\begin{aligned} & \text{Annuity FV factor} \\ &= (\text{Future value factor} - 1)/r \\ &= [(1 + r)^t - 1]/r \end{aligned} \quad [6.2]$$

3. Annuity due value = Ordinary annuity value $\times (1 + r)$ [6.3]

4. Present value for a perpetuity:

$$\text{PV for a perpetuity} = C/r = C \times (1/r) \quad [6.4]$$

5. Growing annuity present value

$$= C \left[\frac{1 - \left(\frac{1 + g}{1 + r} \right)^t}{r - g} \right] \quad [6.5]$$

6. Growing perpetuity present value

$$= \frac{C}{r - g} \quad [6.6]$$

7. Effective annual rate (EAR), where m is the number of times the interest is compounded during the year:

$$\text{EAR} = [1 + (\text{Quoted rate}/m)]^m - 1 \quad [6.7]$$

8. Effective annual rate (EAR), where q stands for the continuously compounded quoted rate:

$$\text{EAR} = e^q - 1 \quad [6.8]$$

CHAPTER 7

1. Bond value if bond has (1) a face value of F paid at maturity, (2) a coupon of C paid per period, (3) t periods to maturity, and (4) a yield of r per period:

$$\text{Bond value} = C \times [1 - 1/(1+r)^t]/r + F/(1+r)^t \quad [7.1]$$

$$\text{Bond value} = \text{Present value of the coupons} + \text{Present value of the face amount}$$

2. The Fisher effect:

$$1 + R = (1 + r) \times (1 + h) \quad [7.2]$$

$$R = r + h + r \times h \quad [7.3]$$

$$R \approx r + h \quad [7.4]$$

CHAPTER 8

1. The dividend growth model:

$$P_0 = \frac{D_0 \times (1 + g)}{R - g} = \frac{D_1}{R - g} \quad [8.3]$$

2. Required return:

$$R = D_1/P_0 + g \quad [8.7]$$

CHAPTER 9

1. Net present value (NPV):

$$\text{NPV} = \text{Present value of future cash flows} - \text{Investment cost}$$

2. Payback period:

Payback period = Number of years that pass before the sum of an investment's cash flows equals the cost of the investment

3. Discounted payback period:

Discounted payback period = Number of years that pass before the sum of an investment's *discounted* cash flows equals the cost of the investment

4. The average accounting return (AAR):

$$\text{AAR} = \frac{\text{Average net income}}{\text{Average book value}}$$

5. Internal rate of return (IRR):

IRR = Discount rate of required return such that the net present value of an investment is zero

6. Profitability index:

$$\text{Profitability index} = \frac{\text{PV of cash flows}}{\text{Cost of investment}}$$

CHAPTER 10

1. Bottom-up approach to operating cash flow (OCF):

$$\text{OCF} = \text{Net income} + \text{Depreciation} \quad [10.1]$$

2. Top-down approach to operating cash flow (OCF):

$$\text{OCF} = \text{Sales} - \text{Costs} - \text{Taxes} \quad [10.2]$$

3. Tax shield approach to operating cash flow (OCF):

$$\text{OCF} = (\text{Sales} - \text{Costs}) \times (1 - T) + \text{Depreciation} \times T \quad [10.3]$$

CHAPTER 11

1. Accounting break-even level:

$$Q = (\text{FC} + D)/(P - v) \quad [11.1]$$

2. Relationship between operating cash flow (OCF) and sales volume:

$$Q = (\text{FC} + \text{OCF})/(P - v) \quad [11.3]$$

3. Cash break-even level:

$$Q = \text{FC}/(P - v)$$

4. Financial break-even level:

$$Q = (\text{FC} + \text{OCF}^*)/(P - v)$$

where

$$\text{OCF}^* = \text{Zero NPV cash flow}$$

5. Degree of operating leverage (DOL):

$$\text{DOL} = 1 + \text{FC}/\text{OCF} \quad [11.4]$$

CHAPTER 12

1. Variance of returns, $\text{Var}(R)$ or σ^2 :

$$\text{Var}(R) = \frac{1}{T-1} [(R_1 - \bar{R})^2 + \dots + (R_T - \bar{R})^2] \quad [12.3]$$

2. Standard deviation of returns, $\text{SD}(R)$ or σ :

$$\text{SD}(R) = \sqrt{\text{Var}(R)}$$

CHAPTER 13

1. Risk premium:

$$\text{Risk premium} = \text{Expected return} - \text{Risk-free rate} \quad [13.1]$$

2. Expected return on a portfolio:

$$E(R_p) = x_1 \times E(R_1) + x_2 \times E(R_2) + \dots + x_n \times E(R_n) \quad [13.2]$$

3. The reward-to-risk ratio:

$$\text{Reward-to-risk ratio} = \frac{E(R_i) - R_f}{\beta_i}$$

4. The capital asset pricing model (CAPM):

$$E(R_i) = R_f + [E(R_M) - R_f] \times \beta_i \quad [13.7]$$

CHAPTER 14

1. Required return on equity, R_E (dividend growth model):

$$R_E = D_1/P_0 + g \quad [14.1]$$

2. Required return on equity, R_E (CAPM):

$$R_E = R_f + \beta_E \times (R_M - R_f) \quad [14.2]$$

3. Required return on preferred stock, R_p :

$$R_p = D/P_0 \quad [14.3]$$

4. The weighted average cost of capital (WACC):

$$\text{WACC} = (E/V) \times R_E + (D/V) \times R_D \times (1 - T_c) \quad [14.6]$$

5. Weighted average flotation cost, f_A :

$$f_A = \frac{E}{V} \times f_E + \frac{D}{V} \times f_D \quad [14.8]$$

CHAPTER 15

1. Rights offerings:

a. Number of new shares:

$$\begin{aligned} &\text{Number of new shares} \\ &= \frac{\text{Funds to be raised}}{\text{Subscription price}} \end{aligned} \quad [15.1]$$

b. Number of rights needed:

$$\begin{aligned} &\text{Number of rights needed to buy a share of stock} \\ &= \frac{\text{Old shares}}{\text{New shares}} \end{aligned} \quad [15.2]$$

c. Value of a right:

$$\text{Value of a right} = \text{Rights-on price} - \text{Ex-rights price}$$

CHAPTER 16

1. Modigliani–Miller propositions (no taxes):

a. Proposition I:

$$V_L = V_U$$

b. Proposition II:

$$R_E = R_A + (R_A - R_D) \times (D/E) \quad [16.1]$$

2. Modigliani–Miller propositions (with taxes):

a. Value of the interest tax shield:

$$\begin{aligned} &\text{Present value of the interest tax shield} \\ &= (T_c \times D \times R_D) / R_D \\ &= T_c \times D \end{aligned} \quad [16.2]$$

b. Proposition I:

$$V_L = V_U + T_c \times D \quad [16.3]$$

c. Proposition II:

$$R_E = R_U + (R_U - R_D) \times (D/E) \times (1 - T_c) \quad [16.4]$$

CHAPTER 18

1. The operating cycle:

$$\begin{aligned} &\text{Operating cycle} = \text{Inventory period} \\ &+ \text{Accounts receivable period} \end{aligned} \quad [18.4]$$

2. The cash cycle:

$$\begin{aligned} &\text{Cash cycle} = \text{Operating cycle} \\ &- \text{Accounts payable period} \end{aligned} \quad [18.5]$$

CHAPTER 19

1. Float measurement:

a. Average daily float:

$$\text{Average daily float} = \frac{\text{Total float}}{\text{Total days}} \quad [19.1]$$

b. Average daily float:

$$\begin{aligned} &\text{Average daily float} \\ &= \text{Average daily receipts} \\ &\times \text{Weighted average delay} \end{aligned} \quad [19.2]$$

2. The Baumol–Allais–Tobin (BAT) model:

a. Opportunity costs:

$$\text{Opportunity costs} = (C/2) \times R \quad [19A.1]$$

b. Trading costs:

$$\text{Trading costs} = (T/C) \times F \quad [19A.2]$$

c. Total cost:

$$\begin{aligned} &\text{Total cost} = \text{Opportunity costs} \\ &+ \text{Trading costs} \end{aligned} \quad [19A.3]$$

d. The optimal initial cash balance:

$$C^* = \sqrt{(2T \times F) / R} \quad [19A.4]$$

3. The Miller–Orr model:

a. The optimal cash balance:

$$C^* = L + (3/4 \times F \times \sigma^2 / R)^{1/3} \quad [19A.5]$$

b. The upper limit:

$$U^* = 3 \times C^* - 2 \times L \quad [19A.6]$$

CHAPTER 20

1. The size of receivables:

$$\begin{aligned} &\text{Accounts receivable} \\ &= \text{Average daily sales} \times \text{ACP} \end{aligned} \quad [20.1]$$

2. NPV of switching credit terms:

a. Present value of switching:

$$\text{PV} = [(P - v)(Q' - Q)] / R \quad [20.4]$$

b. Cost of switching:

$$\text{Cost of switching} = PQ + v(Q' - Q) \quad [20.5]$$

c. NPV of switching:

$$\begin{aligned} &\text{NPV of switching} = -[PQ + v(Q' - Q)] \\ &+ [(P - v) \\ &\times (Q' - Q)] / R \end{aligned} \quad [20.6]$$

3. NPV of granting credit:

a. With no repeat business:

$$\text{NPV} = -v + (1 - \pi)P / (1 + R) \quad [20.8]$$

b. With repeat business:

$$\text{NPV} = -v + (1 - \pi)(P - v) / R \quad [20.9]$$

4. The economic order quantity (EOQ) model:

a. Total carrying costs:

$$\begin{aligned} \text{Total carrying costs} \\ &= \text{Average inventory} \\ &\quad \times \text{Carrying costs per unit} \\ &= (Q/2) \times CC \end{aligned}$$

[20.10]

b. Total restocking costs:

$$\begin{aligned} \text{Total restocking costs} \\ &= \text{Fixed cost per order} \\ &\quad \times \text{Number of orders} = F \times (T/Q) \end{aligned}$$

[20.11]

c. Total costs:

$$\begin{aligned} \text{Total costs} &= \text{Carrying costs} \\ &\quad + \text{Restocking costs} \\ &= (Q/2) \times CC \\ &\quad + F \times (T/Q) \end{aligned}$$

[20.12]

d. The optimal order size Q^* :

$$Q^* = \sqrt{\frac{2T \times F}{CC}}$$

[20.15]

CHAPTER 21

1. Purchasing power parity (PPP):

$$E(S_t) = S_0 \times [1 + (h_{FC} - h_{US})]^t \quad [21.3]$$

2. Interest rate parity (IRP):

a. Exact, single period:

$$F_1/S_0 = (1 + R_{FC})/(1 + R_{US}) \quad [21.4]$$

b. Approximate, multiperiod:

$$F_t = S_0 \times [1 + (R_{FC} - R_{US})]^t \quad [21.7]$$

3. Uncovered interest parity (UIP):

$$E(S_t) = S_0 \times [1 + (R_{FC} - R_{US})]^t \quad [21.9]$$

4. International Fisher effect (IFE):

$$R_{US} - h_{US} = R_{FC} - h_{FC} \quad [21.10]$$