Chapter 7
Share valuation

■ Instructor's resources

Overview

This chapter continues on the valuation process introduced in Chapter 6 for bonds. Models for valuing preference and ordinary share are presented. For ordinary share, the zero growth, constant growth, and variable growth models are examined. The relationship between share valuation and efficient markets is presented. The role of venture capitalists and investment bankers is also discussed. The free cash flow model is explained and compared with the dividend discount models. Other approaches to ordinary share valuation and their shortcomings are explained. The chapter ends with a discussion of the interrelationship between financial decisions, expected return, risk, and a firm's value. Share valuation from the perspective of the one's professional life is contrasted with share valuation from a personal perspective.

Study Guide

Suggested **Study Guide** examples for classroom presentation:

Example	Topic
1	Constant growth rate model
4	Mixed growth rates

■ Suggested answer to chapter opening critical thinking question

How might the current owners of a closely held company react to an initial public offering (IPO) that immediately rises significantly above its initial offering price?

Setting the proper price for an initial public offering is not an exact science. If the price is set too high, there will not be enough demand for the share. Set too low, the share price will likely rise immediately after the IPO. While such an increase will please all of the new shareholders, the original owners of the company will have left 'too much on the table' and may feel that the share underwriters did not do an adequate job of pricing the IPO.

Answers to Review Questions

1. *Equity capital* is permanent capital representing ownership, while *debt capital* represents a loan that must be repaid at some future date. The holders of equity capital receive a claim on the income and assets of the firm that is secondary to the claims of the firm's creditors. Suppliers of debt must receive all interest owed prior to any distribution to equity holders, and in liquidation all unpaid debts must be satisfied prior to any distribution to the firm's owners. Equity capital is perpetual while debt has a specified maturity date. Coupon payments, the interest payment on debt, are currently taxed as ordinary income, while dividends are currently taxed at a lower rate. To the company, debt interest is a tax deductible expense while dividends are not.

2. Ordinary shareholders are the true owners of the firm, since they invest in the firm only upon the expectation of future returns. They are not guaranteed any return, but merely get what is left over after all the other claims have been satisfied. Since the ordinary shareholders receive only what is left over after all other claims are satisfied, they are placed in a quite uncertain or risky position in respect of returns on invested capital. As a result of this risky position, they expect to be compensated in terms of both dividends and capital gains of sufficient quantity to justify the risk they take.

3. Rights offerings protect against *dilution of ownership* by allowing existing shareholders to purchase additional shares of any new share issues. Without this protection current shareholders may have their voting power reduced. *Rights* are financial instruments issued to current shareholders that permit these shareholders to purchase additional shares at a price below the market price, in direct proportion to their number of owned shares.

4.
   - *Authorised shares* are stated in the company's corporate charter that specifies the maximum number of shares the firm can sell without receiving approval from the shareholders.
   - When authorised shares are sold to the public and are in the hands of the public, they are called *issued shares*.
   - When a firm purchases back its own shares from the public, they are classified as *treasury share*. Treasury share is not considered issued since it is not in the hands of the public.
   - *Issued shares* are the shares of ordinary share that have been put into circulation. Issued shares include both issued shares and treasury share.

5. Issuing share outside of their home markets can benefit companies by broadening the investor base and also allowing them to become better integrated into the local business scene. A local share listing both increases local press coverage and serves as effective corporate advertising. Locally traded share can also be used to make corporate acquisitions.

   American depository receipts (ADRs) represent ownership of shares of a foreign company's share held on deposit by the U.S. bank in the companies' home country. ADRs are issued in dollars by an American bank to U.S. investors and are subject to U.S. securities laws, yet still give investors the opportunity to internationally diversify their portfolios. American depository shares (ADSs) are the actual securities that are traded in U.S. markets that represent foreign companies. ADRs are backed up by ADSs.

6. The claims of preference shareholders are senior to those of the ordinary shareholders with respect to the distribution of both earnings and assets.

7. *Cumulative preference share* gives the holder the right to receive any dividends in arrears prior to the payment of dividends to ordinary shareholders.

   The *call feature* in a preference share issue allows the issuer to retire issued preference share within a certain period of time at a pre-specified price. This feature is not usually exercisable until a few years after issuance. The call normally takes place at a price above the initial issuance price and may decrease according to a predefined schedule. The call feature allows the issuer to escape the fixed payment commitment of the preference share that would remain on the books indefinitely.
   The call feature is also needed in order to force conversion of convertible preference share.

8. *Venture capitalists* (*VC*) are typically business entities that are organised for the purpose of investing in attractive growth companies. *Angel capitalists* are generally wealthy individuals who provide private financing to new businesses. Firms usually obtain angel financing first, then as their funding needs get too large for individual investors they seek funds from venture capitalists.

9. There are four bodies into which institutional venture capitalists are most ordinarily organised.
   - *Small business investment companies* (*SBICs*) are companies chartered by the federal government.
   - *Financial VC funds* are subsidiaries of financial institutions, particularly banks.
   - *Corporate VC funds* are firms, sometimes subsidiaries, established by nonfinancial firms.
   - *VC limited partnerships* are limited partnerships organised by professional *VC* firms, who serve as general partner.

   VC investments are made under a legal contract that clearly allocates responsibilities and ownership interest between existing owners and the VC fund or limited partnership. The specific financial terms will depend on factors such as: the business structure, stage of development and outlook. Although each VC investment is unique, the transaction will be structured to provide the VC with a high rate of return that is consistent with the typically high risk of such transactions.

10. The general steps that a private firm must go through to go public via an *IPO* are listed below.
    - The firm must obtain the approval of its current shareholders.
    - The company's auditors and lawyers must certify that all documents for the company are legitimate.
    - The firm then finds an investment bank willing to underwrite the offering.
    - A registration statement must then be filed with the securities exchange commission (SEC).
    - Once the registration statement has been approved by the SEC the investment public can begin analysing the company's prospects.

11. The *investment banker's* (*IB*) main activity is to underwrite the issue. In addition to underwriting the *IB* provides the issuer with advice about pricing and other important aspects of the issue.

    The *IB* may organize an *underwriting syndicate* to help underwrite the issue and thus to share part of the risk. The *IB* and the syndicate will put together a *selling group* who share the responsibility of selling a portion of the issue.

12. The first item in the *Business Day's* share quotation is the company name, followed by last cash sale price for the day, the closing price variation for the day in cents, closing price variation for the day as a percentage, highest and lowest trade price for the day and volumes traded on day in thousands of shares.

13. The *efficient market hypothesis* says that in an efficient market, investors would buy an asset if the expected return exceeds the current return, thereby increasing its price (market value) and decreasing the expected return, until expected and required returns are equal.

14. According to the efficient market hypothesis:
    a. Securities prices are in equilibrium (fairly priced with expected returns equal to required returns);
    b. Securities prices fully reflect all public information available and will react quickly to new information; and
    c. Investors should therefore not waste time searching for mispriced (over- or undervalued) securities.

    The efficient market hypothesis is generally accepted as being reasonable for securities traded on major exchanges; this is supported by research on the subject. There is an increasing challenge to the efficient market hypothesis being offered by the study of behaviour finance. The challenge comes primarily from the fact that tests of the efficient market hypothesis assumes that investors are completely rational. A going body of research disputes this rationality assumption and shows that investors are driven by the irrational behaviors of greed, fear, and other emotions.

15. a. The *zero growth model* of ordinary share valuation assumes a constant, nongrowing dividend stream. The share is valued as a perpetuity and discounted at a rate k_s:

$$P_0 = \frac{P_0}{r_s}$$

    b. The *constant growth model* of ordinary share valuation, also called the Gordon model, assumes that dividends will grow at a constant rate, g. The share is valued as the *PV* of the constantly growing cash flow stream:

$$P_0 = \frac{D_1}{r_s - g}$$

    c. The *variable growth model* of ordinary share valuation assumes that dividends grow at a variable rate. The share with a single shift in the growth rate is valued as the *PV* of the dividend stream during the initial growth phase plus the *PV* of the price of share at the end of the initial growth phase:

$$P_0 = \sum_{t=1}^{N} \frac{D_0 \times (1+g_1)^t}{(1+r_s)^t} + \left(\frac{1}{(1+r_s)^N} \times \frac{D_{N+1}}{(r_s - g_2)} \right)$$

16. The *free cash flow valuation model* takes the *PV* of all future free cash flows. Since this *PV* represents the total value of the firm the value of debt and preference share must be subtracted to get the free cash flow available to shareholders. Dividing the resulting value by the number of shares issued arrives at the share price.

    The free cash flow model differs from the dividend valuation model in two main ways.
    a. The total cash flows of the company are evaluated, not just dividends.
    b. The firm's cost of capital is used as the discount rate, not the required return on share.

17. a. *Book value* is the value of the share in the event all assets are liquidated for their book value and the proceeds remaining after paying all liabilities are divided among the ordinary shareholders.

b. *Liquidation value* is the actual amount each ordinary shareholder would expect to receive if the firm's assets are sold, creditors and preference shareholders are paid, and any remaining money is divided among the ordinary shareholders.
c. *Price earnings multiples* are another way to estimate ordinary share value. The share value is estimated by multiplying expected earnings per share by the average price/earnings ratio for the industry.

Both the book value and liquidation value approaches ignore the earning power of a firm's assets and lack a relationship to the firm's value in the marketplace. The price/earnings multiples approach is considered the best approach to valuation since it considers expected earnings. The price-earnings (P/E) ratio also has the strongest theoretical roots. One divided by the P/E ratio can be viewed as the rate at which investors discount the firm's earnings. If the projected earnings per share are assumed to be earned indefinitely, the P/E multiple approach can be looked on as a method of finding the PV of a perpetuity of projected earnings per share (EPS) at a rate equal to the P/E ratio.

18. A decision or action by the financial manager can have an effect on the risk and expected return of the share, both of which are part of the share valuation model.

19. CAPM: $r_s = R_F + [b_j \times (r_m - R_F)]$ and $b_j > 1.00$:
    a. As beta (risk) increases, required return increases and share price falls.
    b. As the risk-free rate declines, the required return would also decline. Substituting k_s into the Gordon model $P_0 = D_1 \div (r_s - g)$, as r_s declines, P_0 increases.
    c. As D_1 decreases, the P_0 also decreases since the numerator in the dividend valuation models will decline.
    d. As g increases, the P_0 also increases. In the Gordon growth model the value of $(r - g)$ in the denominator will become smaller resulting in a higher value.

■ Suggested answer to critical thinking question for Focus on Practice

Theories of behavioural finance can apply to other areas of human behaviour in addition to investing. Think of a situation in which you may have demonstrated one of these behaviours. Share with a classmate.

Student answers will vary. Examples:

Specifically, *regret theory* may hold true for social and other situations in which a person makes a mistake. Subsequent decisions are based on avoiding embarrassment.

Fear of regret can sometimes be rationalised away with the thought that 'everyone else is doing it' (*herding theory*). This explains why some people will do silly things at parties.

Students may react to grades the same way an investor reacts to investment news, placing more importance on recent events without recognising the overall trend.

■ Suggested answer to critical thinking question for Focus on Ethics

What are some of the real costs a company must face in preparing quarterly earnings guidance?

The real costs associated with providing quarterly guidance include direct costs such as the time senior management and finance personnel must spend preparing the reports and the indirect costs of the excessive focus it encourages on managing short-term results to hit the targets. The difficulty of forecasting earnings accurately so as to provide guidance can lead to the often-painful result of missing quarterly forecasts. That, in turn, can be a powerful incentive for management to sacrifice longer-term, value-creating investments in favor of short-term results, and in some cases, to manage earnings inappropriately from quarter to quarter to create the illusion of stability.

■ Answers to Warm-up exercises

E7-1. Using debt ratio to calculate a firm's total liabilities

Answer: Debt ratio = total liabilities ÷ total assets

Total liabilities = debt ratio × total assets

$$= 0.75 \times \text{R}5,200,000 = \text{R}3,900,000$$

E7-2. Determining net proceeds from the sale of share

Answer: Net proceeds $= (1{,}000{,}000 \times \text{R}20 \times 0.95) + (250{,}000 \times \text{R}20 \times 0.90)$

$$= \text{R}19{,}000{,}000 + \text{R}4{,}500{,}000 = \text{R}23{,}500{,}000$$

E7-3. Preference and ordinary share dividends

Answer: Ordinary share dividend = (Cash available − preference dividends) ÷ number of ordinary shares

= [R12,000,000 − (3 × R2.50 × 750,000)] ÷ 3,000,000

= R2.125 per share

E7-4. Price/earning ratios

Answer: Earnings per share (EPS) = R11,200,000 ÷ 4,600,000 = R2.43 per share

Today's *P/E* ratio = R24.60 ÷ R2.43 = 10.12

Yesterday's *P/E* ratio = R24.95 ÷ R2.43 = 10.27

E7-5. Using the zero-growth model to value share

Answer: P_0 = [R1.20 (1.05)] ÷ 0.08 = R1.26 ÷ 0.08 = R15.75 per share

E7-6. Capital asset pricing model

Answer: Step 1: Calculate the required rate of return.

$r_s = 4.5\% + 1.8(10.5\% - 4.5\%) = 15.3\%$

Step 2: Calculate the value of the share using the zero-growth model.

P_0 = R2.25 ÷ 0.153 = R14.71 per share

■ Solutions to Problems

P7-1. LG 2: Authorised and available shares

Basic

a. Maximum shares available for sale

Authorised shares	2,000,000
Less: Shares issued	1,400,000
Available shares	600,000

b. $$\text{Total shares needed} = \frac{\text{R48,000,000}}{\text{R60}} = 800{,}000 \text{ shares}$$

The firm requires an additional 200,000 authorised shares to raise the necessary funds at R60 per share.

c. Aspin must amend its corporate charter to authorise the issuance of additional shares.

P7-2. LG 2: Preference dividends

Intermediate

a. R8.80 per year or R2.20 per quarter

b. R2.20 For a non-cumulative preference only the latest dividend has to be paid before dividends can be paid on ordinary share.

c. R8.80 For cumulative preference all dividends in arrears must be paid before dividends can be paid on ordinary share. In this case the board must pay the three dividends missed plus the current dividend.

P7-3. LG 2: Preference dividends

I**ntermediate**

A	R15.000	quarters in arrears plus the latest quarter
B	R 8.80	only the latest quarter
C	R 11.00	only the latest quarter
D	R25.500	quarters in arrears plus the latest quarter
E	R 8.10	only the latest quarter

P7-4. LG 2: Convertible preference share

Challenge

a. Conversion value = conversion ratio × share price = 5 × R20 = R100

b. Based on comparison of the preference share price versus the conversion value the investor should convert. If converted, the investor has R100 of value versus only R96 if she keeps ownership of the preference share.

c. If the investor converts to ordinary share she will begin receiving R1.00 per share per year of dividends. Conversion will generate R5.00 per year of total dividends. If the investor keeps the preference they will receive R10.00 per year of dividends. This additional R5.00 per year in dividends may cause the investor to keep the preference until forced to convert through use of the call feature. Furthermore, while ordinary share dividends may be cut or eliminated all together with no protection, preference dividends are typically fixed and cumulative provision.

P7-5. LG 2: Personal finance: Share quotation

Basic

a. Tuesday, June 30

b. R38.80

c. R38.80

d. H = R39.80; L = R38.26

P7-6. LG 4: Ordinary share valuation–zero growth: $P_0 = D_1 \div r_s$

Basic

a. $P_0 = \text{R}2.40 \div 0.12 = \text{R}20$

b. $P_0 = \text{R}2.40 \div 0.20 = \text{R}12$

c. As perceived risk increases, the required rate of return also increases, causing the share price to fall.

P7-7. LG 4: Personal finance: ordinary share valuation–zero growth

Intermediate

$$\text{Value of stock when purchased} = \frac{\text{R}5.00}{0.16} = \text{R}31.25$$

$$\text{Value of stock when sold} = \frac{\text{R}5.00}{0.12} = \text{R}41.67$$

Sally's capital gain is R10.42 (R41.67 – R31.25) per share.

Sally's total capital gain is $100 \times \text{R}1042.00$

P7-8. LG 4: Preference share valuation: $PS_0 = D_p \div r_p$

Intermediate

a. $PS_0 = \text{R}6.40 \div 0.093$

$PS_0 = \text{R}68.82$

b. $PS_0 = \text{R}6.40 \div 0.105$

$PS_0 = \text{R}60.95$

The investor would lose R7.87 per share (R68.82 – R60.95) because, as the required rate of return on preference share issues increases above the 9.3% return she receives, the value of her share declines.

P7-9. LG 4: Ordinary share value–constant growth: $P_0 = D_1 \div (r_s - g)$

Basic

Firm	$\boldsymbol{P_0 = D_1 \div (r_s - g)}$		Share price
A	$P_0 = \text{R}1.20 \div (0.13 - 0.08)$	=	R 24.00
B	$P_0 = \text{R}4.00 \div (0.15 - 0.05)$	=	R 40.00
C	$P_0 = \text{R}0.65 \div (0.14 - 0.10)$	=	R 16.25
D	$P_0 = \text{R}6.00 \div (0.09 - 0.08)$	=	R600.00
E	$P_0 = \text{R}2.25 \div (0.20 - 0.08)$	=	R 18.75

P7-10. LG 4: Ordinary share value–constant growth

Intermediate

a. $r_s = \frac{D_1}{P_0} + g\frac{n!}{r!(n-r)!}$

$r_s = \frac{\text{R}1.20 \times (1.05)}{\text{R}28} + 0.05$

$r_s = \frac{\text{R}1.26}{\text{R}28} + 0.05 = 0.045 + 0.05 = 0.095 = 9.5\%$

b. $r_s = \frac{\text{R}1.20 \times (1.10)}{\text{R}28} + 0.10$

$r_s = \frac{\text{R}1.32}{\text{R}28} + 0.10 = 0.047 + 0.10 = 0.147 = 14.7\%$

P7-11. LG 4: Personal finance: Ordinary share value–constant growth: $P_0 = D_1 \div (r_s - g)$

Intermediate

Computation of growth rate:

$FV = PV \times (1 + r)^n$

$\text{R}2.87 = \text{R}2.25 \times (1 + r)^5$

$\text{R}2.87 \div \text{R}2.25 = \text{FVIF}_{r\%,5}$

$1.276 = \text{FVIF}_{k\%,5}$

$g = r$ at 5%

a. Value at 13% required rate of return:

$P_0 = \frac{\text{R}3.02}{0.13 - 0.05} = \text{R}37.75$

b. Value at 10% required rate of return:

$P_0 = \frac{\text{R}3.02}{0.10 - 0.05} = \text{R}60.40$

c. As risk increases, the required rate of return increases, causing the share price to fall.

P7-12. LG 4: Ordinary share value – variable growth:

Challenge

$P_0 = PV$ of dividends during initial growth period

+ PV of price of share at end of growth period.

Steps 1 and 2: Value of cash dividends and *PV* of annual dividends

t	D_0	$\text{FVIF}_{25\%,t}$	D_t	$\text{PVIF}_{15\%,t}$	*PV* of dividends
1	R2.55	1.250	R3.19	0.870	R2.78
2	2.55	1.562	3.98	0.756	3.01
3	2.55	1.953	4.98	0.658	3.28
					R9.07

Step 3: *PV* of price of share at end of initial growth period

$D_{3+1} = \text{R}4.98 \times (1 + 0.10)$

$D_4 = \text{R}5.48$

$P_3 = [D_4 \div (r_s - g_2)]$

$P_3 = \text{R}5.48 \div (0.15 - 0.10)$

$P_3 = \text{R}109.60$

PV of share at end of year 3 $= P_3 \times (\text{PVIF}_{15\%,3})$

$PV = \text{R}109.60 \times (0.658)$

$PV = \text{R}72.12$

Step 4: Sum of *PV* of dividends during initial growth period and *PV* price of share at end of growth period

$P_0 = \text{R}9.07 + \text{R}72.12$

$P_0 = \text{R}81.19$

Calculator solution: R81.12

P7-13. LG 4: Personal finance: Ordinary share value–variable growth

Challenge

$$P_0 = \sum_{t=1}^{N} \frac{D_0 \times (1+g_1)^t}{(1+r_s)^t} + \frac{1}{(1+r_s)^N} \times \frac{D_{N+1}}{(r_s - g_2)}$$

$P_0 = PV$ of dividends during initial growth period + PV of price of share at end of growth period.

Steps 1 and 2: Value of cash dividends and *PV* of annual dividends

$D_1 = \text{R}3.40 \times (1.00) = \text{R}3.40$

$D_2 = \text{R}3.40 \times (1.05) = \text{R}3.57$

$D_3 = \text{R}3.57 \times (1.05) = \text{R}3.75$

$D_4 = \text{R}3.75 \times (1.15) = \text{R}4.31$

$D_5 = \text{R}4.31 \times (1.10) = \text{R}4.74$

t	D_t	$\text{PVIF}_{14\%,t}$	*PV* of dividends
1	R3.40	0.877	R 2.98
2	3.57	0.769	2.75
3	3.75	0.675	2.53
4	4.31	0.592	2.55
			R10.81

Step 3: *PV* of price of share at end of initial growth period

$P_4 = [D_5 \div (r_s - g)]$

$P_4 = \text{R}4.74 \div (0.14 - 0.10)$

$P_4 = \text{R}118.50$

PV of share at end of year 4 $= P_4 \times (\text{PVIF}_{14\%,4})$

$PV = \text{R}118.50 \times (0.592)$

$PV = \text{R}70.15$

Step 4: Sum of *PV* of dividends during initial growth period and *PV* price of share at end of growth period

P_0 = R10.81 + R70.15

P_0 = R80.96

Calculator solution: R80.97

P7-14. LG 4: Ordinary share value–variable growth

Challenge

a.

t	D_0	$FVIF_{8\%,t}$	D_t	$PVIF_{11\%,t}$	*PV* of dividends
1	R1.80	1.080	R1.94	0.901	R1.75
2	1.80	1.166	2.10	0.812	1.71
3	1.80	1.260	2.27	0.731	1.66
					R5.12

$D_4 = D_3(1.05)$ = R2.27 × (1.05) = R2.38

$P_3 = [D_4 \div (r_s - g)]$

P_3 = R2.38 ÷ (0.11 − 0.05)

P_3 = R39.67

PV of share at end of year 3 = $P_3 \times (PVIF_{11\%,3})$

PV = R39.67 × (0.731)

PV = R29.00

P_0 = R29.00 + R5.12 = R34.12 Calculator solution: R34.12

b. The *PV* of the first 3 year's dividends is the same as in part **a**.

$D_4 = D_3(1.0)$ = 2.27

$P_3 = [D_4 \div (r_s - g)]$

P_3 = R2.27 ÷ 0.11

P_3 = R20.64

PV of share at end of year 3 = $P_3 \times (PVIF_{11\%,3})$

PV = R20.64 × (0.731)

PV = R15.09

P_0 = R15.09 + R5.12 = R20.21

Calculator solution: R20.20

c. The *PV* of the first 3 year's dividends is the same as in part **a**.

$D_4 = D_3(1.10)$ = 2.50

$P_3 = [D_4 \div (r_s - g)]$

P_3 = R2.50 ÷ (0.11 − 0.10)

P_3 = R250.00

PV of share at end of year 3 = $P_3 \times (PVIF_{11\%,3})$

PV = R250.00 × (0.731)

PV = R182.75

P_0 = R182.75 + R5.12 = R187.87

Calculator solution: R187.91

P7-15. LG 4: Personal finance: Ordinary share value–all growth models

Challenge

a. $P_0 = (CF_0 \div r)$

$P_0 = \text{R}42{,}500 \div 0.18$

$P_0 = \text{R}236{,}111$

b. $P_0 = (CF_1 \div (r - g))$

$P_0 = (\text{R}45{,}475^* \div (0.18 - 0.07)$

$P_0 = \text{R}413{,}409.10$

Calculator solution: R413,409.09

$^*CF_1 = \text{R}42{,}500(1.07) = \text{R}45{,}475$

c. Steps 1 and 2: Value of cash dividends and *PV* of annual dividends

t	D_0	$\text{FVIF}_{12\%,t}$	D_t	$\text{PVIF}_{18\%,t}$	*PV* of dividends
1	R42,500	1.120	R47,600	0.847	R40,317.20
2	42,500	1.254	53,295	0.718	38,265.81
					R78,583.01

Step 3: *PV* of price of share at end of initial growth period

$D_{2+1} = \text{R}53{,}295 \times (1 + 0.07)$

$D_3 = \text{R}57{,}025.65$

$P_2 = [D_3 \div (r_s - g)]$

$P_2 = \text{R}57{,}025.65 \div (0.18 - 0.07)$

$P_2 = \text{R}518{,}415$

PV of share at end of year 2 $= P_2 \times (\text{PVIF}_{18\%,\,2})$

$PV = \text{R}518{,}415 \times (0.718) = \text{R}372{,}222$

Step 4: Sum of *PV* of dividends during initial growth period and *PV* price of share at end of growth period

$P_0 = \text{R}78{,}583 + \text{R}372{,}222$

$P_0 = \text{R}450{,}805$

Calculator solution: R451,063.17

P7-16. LG 5: Free cash flow (FCF) valuation

Challenge

a. The value of the total firm is accomplished in three steps.

1) Calculate the *PV* of FCF from 2015 to infinity.

$$\text{FCF}_{2115\to\infty} = \frac{\text{R}390{,}000(1.03)}{0.11 - 0.03} = \frac{\text{R}401{,}700}{0.08} = \text{R}5{,}021{,}250$$

(2) Add the *PV* of the cash flow obtained in (1) to the cash flow for 2014.

$\text{FCF}_{2014} = \text{R}5{,}021{,}250 + 390{,}000 = \text{R}5{,}411{,}250$

(3) Find the *PV* of the cash flows for 2010 through 2014.

Year	FCF	$PVIF_{11\%,n}$	*PV*
2010	R200,000	0.901	R 180,200
2011	250,000	0.812	203,000
2012	310,000	0.731	226,610
2013	350,000	0.659	230,650
2014	5,411,250	0.593	3,208,871
	Value of entire company, V_c =		R 4,049,331
	Calculator solution:		R 4,051,624

b. Calculate the value of the ordinary share.

$V_S = V_C - V_D - V_P$

V_S = R4,049,331 − R1,500,000 − R400,000 = R2,149,331

c. Value per share = $\frac{\text{R2,149,331}}{200,000} = \text{R10.75}$ Calculator solution: R10.76

P7-17. LG 5: Personal finance: Using the free cash flow valuation model to price an IPO

Challenge

a. The value of the firm's ordinary share is accomplished in four steps.

1) Calculate the *PV* of FCF from 2011 to infinity.

$$FCF_{2014\to\infty} = \frac{\text{R1,100,000(1.02)}}{0.08 - 0.02} = \frac{\text{R1,122,000}}{0.06} = \text{R18,700,000}$$

(2) Add the *PV* of the cash flow obtained in (1) to the cash flow for 2013.

FCF_{2013} = R18,700,000 + 1,100,000 = R19,800,000

(3) Find the *PV* of the cash flows for 2010 through 2013.

Year	FCF	$PVIF_{8\%,n}$	*PV*
2010	R700,000	0.926	R 648,200
2011	800,000	0.857	685,600
2012	950,000	0.794	754,300
2013	19,800,000	0.735	14,533,000
	Value of entire company, V_c =		R16,621,100

(4) Calculate the value of the ordinary share using Equation 7.8.

$V_S = V_C - V_D - V_P$

V_S = R16,621,100 − R2,700,000 − R1,000,000 = R12,921,100

Value per share = $\frac{\text{R12,921,100}}{1,100,000} = \text{R11.75}$

Calculator solution: R10.77

b. Based on this analysis the IPO price of the share is over valued by R0.75 (R12.50 − R11.75) and you should not buy the share.

c. The value of the firm's ordinary share is accomplished in four steps.

(1) Calculate the *PV* of FCF from 2014 to infinity.

$$FCF_{2014\to\infty} = \frac{R1{,}100{,}000(1.03)}{0.08 - 0.03} = \frac{R1{,}133{,}000}{0.05} = R22{,}660{,}000$$

(2) Add the *PV* of the cash flow obtained in (1) to the cash flow for 2013.

FCF_{2013} = R22,660,000 + 1,100,000 = R23,760,000

(3) Find the *PV* of the cash flows for 2010 through 2013.

Year	FCF	$PVIF_{8\%,n}$	*PV*
2010	R 700,000	0.926	R 648,200
2011	800,000	0.857	685,600
2012	950,000	0.794	754,300
2013	23,760,000	0.735	17,463,000
	Value of entire company, V_c =		R19,551,700

(4) Calculate the value of the ordinary share using Equation 7.8.

$V_S = V_C - V_D - V_P$

V_S = R19,551,700 – R2,700,000 – R1,000,000 = R15,851,700

$$\text{Value per share} = \frac{R15{,}851{,}700}{1{,}100{,}000} = R14.41$$

If the growth rate is changed to 3% the IPO price of the share is under valued by R1.91 (R14.41 – R12.50) and you should buy the share.

P7-18. LG 5: Book and liquidation value

Intermediate

a. Book value per share:

$$\frac{\text{Book value of assets} - (\text{liabilities} + \text{preferred stock at book value})}{\text{number of shares outstanding}}$$

$$\text{Book value per share} = \frac{R780{,}000 - R420{,}000}{10{,}000} = R36 \text{ per share}$$ [R1]

b. Liquidation value:

Cash	R40,000	Liquidation value of assets	722,000
Marketable Securities	60,000	Less: Current Liabilities	(160,000)
Trade receivables (0.90 × R120,000)	108,000	Long-term debt	(180,000)
		Preferred Stock	(80,000)
Inventory (0.90 × R160,000)	144,000	Available for *CS*	R302,000
Land and Buildings (1.30 × R150,000)	195,000		
Machinery & Equip. (0.70 × R250,000)	175,000		
Liq. Value of Assets	R722,000		

$$\text{Liquidation value per share} = \frac{\text{Liquidation value of assets}}{\text{Number of shares outstanding}}$$

$$\text{Liquidation value per share} = \frac{\text{R}302{,}000}{10{,}000} = \text{R}30.20 \text{ per share} \quad [R2]$$

c. Liquidation value is below book value per share and represents the minimum value for the firm. It is possible for liquidation value to be greater than book value if assets are undervalued. Generally, they are overvalued on a book value basis, as is the case here.

P7-19. LG 5: Valuation with price/earnings multiples

Basic

Firm	EPS × *P*/*E*	=	Share price
A	3.0 × (6.2)	=	R18.60
B	4.5 × (10.0)	=	R45.00
C	1.8 × (12.6)	=	R22.68
D	2.4 × (8.9)	=	R21.36
E	5.1 × (15.0)	=	R76.50

P7-20. LG 6: Management action and share value: $P_0 = D_1 \div (r_s - g)$

Intermediate

a. $P_0 = \text{R}3.15 \div (0.15 - 0.05) = \text{R}31.50$

b. $P_0 = \text{R}3.18 \div (0.14 - 0.06) = \text{R}39.75$

c. $P_0 = \text{R}3.21 \div (0.17 - 0.07) = \text{R}32.10$

d. $P_0 = \text{R}3.12 \div (0.16 - 0.04) = \text{R}26.00$

e. $P_0 = \text{R}3.24 \div (0.17 - 0.08) = \text{R}36.00$

The best alternative in terms of maximizing share price is (b).

P7-21. LG 4, 6: Integrative–valuation and CAPM formulas

Intermediate

P_0	$= D_1 \div (r_s - g)$	r_s	$= R_F + [b \times (r_m - R_F)]$
R50	$= \text{R}3.00 \div (r_s - 0.09)$	0.15	$= 0.07 + [b \times (0.10 - 0.07)]$
r_s	$= 0.15$	b	$= 2.67$

P7-22. LG 4: 6: Integrative–risk and valuation

Challenge

a. $r_s = R_F + [b \times (r_m - R_F)]$

$r_s = 0.10 + [1.20 \times (0.14 - 0.10)]$

$r_s = 0.148$

b. Calculation of g:

Calculator solution: PV = -1.73; FV = 2.45; n = 6; then I = 5.96, say 6%

g: $FV = PV \times (1 + r)^n$

$\text{R}2.45 = \text{R}1.73 \times (1 + r)^6$

$\frac{\$2.45}{\$1.73} = \text{FVIF}_{r\%,6}$

$1.416 = \text{FVIF}_{6\%,6}$

g = approximately 6%

$P_0 = D_1 \div (r_s - g)$

$P_0 = \text{R}2.60 \div (0.148 - 0.06)$

$P_0 = \text{R}29.55$

c. A decrease in beta would decrease the required rate of return, which in turn would increase the price of the stock.

P7-23 LG 4, 6: Integrative–valuation and CAPM

Challenge

a. Calculation of g:

Calculator solution: PV = -2.45; FV = 3.44; n = 5; then I = 7.02, say 7%

g: $FV = PV \times (1 + r)^n$

$\text{R}3.44 = \text{R}2.45 \times (1 + r)^5$

$\text{R}3.44 = \text{R}2.45 \times (1 + r)^5$

$\text{R}3.44 \div \text{R}2.45 = \text{FVIF}_{r\%,5}$

$1.404 = \text{FVIF}_{7\%,5}$

r = approximately 7%

$r_s = 0.09 + [1.25 \times (0.13 - 0.10)]$

$r_s = 0.14$

$D_1 = (\text{R}3.44 \times 1.07) = \text{R}3.68$

$P_0 = \text{R}3.68 \div (0.14 - 0.07)$

$P_0 = \text{R}52.57$ per share

b. (1) $r_s = 0.09 + [1.25 \times (0.13 - 0.09)]$

$D_1 = \text{R}3.61(\text{R}3.44 \times 1.05)$

$P_0 = \text{R}3.61 \div (0.14 - 0.05)$

$P_0 = \text{R}40.11$ per share

(2) $r_s = 0.09 + [1.00 \times (0.13 - 0.09)]$

$r_s = 0.13$

$D_1 = \text{R}3.68$

$P_0 = \text{R}3.68 \div (0.13 - 0.07)$

$P_0 = \text{R}61.33$ per share

The CAPM supplies an estimate of the required rate of return for ordinary shares. The resulting price per share is a result of the interaction of the risk-free rate, the risk level of the security, and the required rate of return on the market. For Craft, the lowering of the dividend growth rate reduced future cash flows resulting in a reduction in share price. The decrease in the beta reflected a reduction in risk leading to an increase in share price.

P7-24. Ethics problem

Intermediate

a. This is a zero-growth dividend valuation problem, so:

$P_0 = D/r$ = R5/0.11 = R45.45

b. Using the new discount rate of 12% (11% + 1% credibility risk premium), we have:

$P_0 = D/r$ = R5/0.12 = R41.67

The value decline is the difference between Problems **a** and **b**:

Value decline = R41.67 – R45.45

= –R3.78

The share sells for almost R4 less because of company's financial reports cannot be fully trusted. Lack of integrity is seen to hurt share prices because of the credibility premium.

■ Case

Assessing the impact of Sibuku Manufacturing's proposed risky investment on its share values

This case demonstrates how a risky investment can affect a firm's value. First, students must calculate the current value of Sibuku's share, rework the calculations assuming that the firm makes the risky investment, and then draw some conclusions about the value of the firm in this situation. In addition to gaining experience in valuation of shares, students will see the relationship between risk and valuation.

a. Current per share value of common stock growth rate of dividends:

g can be solved for by using the calculator, geometric growth equation as shown below in (1) or by finding the PVIF for the growth as shown in (2).

Calculator solution: PV = -1.30; FV = 1.90; n = 4; then I = 9.95, say 10%

1. $g = \sqrt[4]{\frac{1.90}{1.30}} = (1.46154)^{1/4} - 1 = 1.0995 - 1 = 0.0995 = 10.0\%$

2. $g = \frac{1.30}{1.90} = 0.6842$

PV factor for 4 years closest to 0.6842 is 10% (0.683).

Use the constant growth rate model to calculate the value of the firm's ordinary share.

$$P_0 = \frac{D_1}{r_s - g} = \frac{\text{R1.90}(1.10)}{0.14 - 0.10} = \frac{\text{R2.09}}{0.04} = \text{R52.25}$$ [R3]

b. Value of ordinary shares if risky investment is made:

$$P_0 = \frac{D_1}{r_s - g} = \frac{\text{R1.90}(1.13)}{0.16 - 0.13} = \frac{\text{R2.15}}{0.03} = \text{R71.67}$$ [R4]

b.

The higher growth rate associated with undertaking the investment increases the market value of the share.

c. The firm should undertake the proposed project. The price per share increases by R19.42 (from R52.25 to R71.67). Although risk increased and increased the required return, the higher dividend growth offsets this higher risk resulting in a net increase in value.

d. $D_{2010} = 2.15$(stated in case)

$D_{2011} = 2.15(1 + 0.13) = 2.43$

$D_{2012} = 2.43(1 + 0.13) = 2.75$

$D_{2013} = 2.75(1 + 0.10) = 3.02$

$$P_{2012} = \frac{D_{2013}}{r_s - g} = \frac{\text{R}3.02}{0.16 - 0.10} = \frac{\text{R}3.02}{0.06} = \text{R}50.33$$ [R5]

Year	Cash flow	$PVIF_{16\%,n}$	*PV*
2010	2.15	0.862	R 1.85
2011	2.43	0.743	1.81
2012	2.75 + 50.33	0.641	34.02
			P_0 = R37.67

Now the firm should not undertake the proposed project. The price per share decreases by R14.58 (from R52.25 to R37.67). Now the increase in risk and increased the required return is not offset by the increase in cash flows. The longer term of the growth is an important factor in this decision.

■ Spreadsheet Exercise

The answer to Chapter 7's Azure Corporation spreadsheet problem is located in the Instructor's Resource Center at *www.prenhall.com/irc*.

■ Group exercises

This chapter's exercise takes the groups back to the future. The semester began with the fictitious firms having recently become publicly-traded companies. Out of necessity there were few details given. The groups now get to rectify this situation. Using the details of recent IPO's each group is asked to write a detailed prospectus following closely the example presented in the text. This includes, but is not limited to, the per share price/quantity of the offering.

Students should quickly realise the similarities of the various IPO's. Most are offered within the R10–R30 range. The process is often the same with few shares available at the offer price forcing the general public to pay a premium above this offer price on, and around, the issuance date.

The final task for the groups is to get the most recent information on their shadow firm. This includes market numbers, as well as any recent news/analyses. Often this information will be fairly innocuous. Point out that recent regulatory requirements have increased the stringency public information regarding publicly-held companies.

■ Integrative Case 2: Encore International

This case focuses on the valuation of a firm. The student explores various methods of valuation, including the price/earnings multiple, book value, no growth, constant growth, as well as variable growth models. Risk and return are integrated into the case with the addition of the security market line and the capital asset pricing model. The student is asked to compare stock values generated by various models, discuss the differences, and select the one that best represents the true value of the firm.

a. $$\text{Book value per share} = \frac{\text{R}60{,}000{,}000}{2{,}500{,}000} = \text{R}24$$ [R6]

b. $$P/E \text{ ratio} = \frac{\text{R}40}{\text{R}6.25} = 6.4$$ [R7]

c. 1. $r_s = R_F + [b_j \times (r_m - R_F)]$
$r_s = 6\% + [1.10 \times (14\% - 6\%)]$
$r_s = 6\% + 8.8\%$
$r_s = 14.8\%$
Required return = 14.8%
Risk premium = 8.8%

2. $r_s = 6\% + [1.25 \times (14\% - 6\%)]$
$r_s = 6\% + 10\%$
$r_s = 16\%$
Required return = 16%
Risk premium = 10%

3. As beta rises, the risk premium and required return also rise.

d. d. Zero growth:

$$P_0 = \frac{D_1}{r_s}$$

$$P_0 = \frac{\text{R}4.00}{0.16} = \text{R}25$$ [R8]

e. 1. Constant growth:

$$P_0 = \frac{D_1}{(r_s - g)}$$

$$P_0 = \frac{(\text{R}4.00 \times 1.06)}{(0.16 - 0.06)} = \frac{\text{R}4.24}{0.10} = \text{R}42.40$$ [R9]

2. Variable growth model: *PV* of dividends

$$P_0 = \sum_{t=1}^{n}\left(\frac{D_0 \times (1+g_1)t}{(1+r_s)t}\right) + \left[\frac{1}{(1+r_s)^N} \times \frac{D_{N+1}}{(r_s - g_2)}\right]$$

P_o = *PV* of dividends during initial growth period + *PV* of price of share at end of growth period.

Steps 1 and 2: Value of cash dividends and *PV* of annual dividends

Year	*t*	D_0	$\text{FVIF}_{8\%,t}$	D_t	$\text{PVIF}_{16\%,t}$	*PV* of dividends
2010	1	R4.00	1.080	**R4.32**	0.862	R3.72
2011	2	4.00	1.166	**4.66**	0.743	3.46
						R7.18

Step 3: *PV* of price of stock at end of initial growth period

D_{2012} = R4.66 × (1 + 0.06) = R4.94

$P_{2011} = [D_{2012} \div (r_s - g_2)]$

P_{2011} = R4.94 ÷ (0.16 – 0.06)

P_{2011} = R49.40

PV of stock at end of year 2 (2011)

$PV = P_2 \times (\text{PVIF}_{16\%,2\text{yrs.}})$

PV = R49.40 × (0.743)

PV = R36.70

Step 4: Sum of *PV* of dividends during initial growth period and *PV* price of stock at end of growth period

P_{2009} = R7.18 + R36.70

P_{2009} = R43.88

Calculator solution:

CF_0 = 0;
CF_1 = 4.32;
CF_2 = 4.66+ 49.4 = 54.06;
I = 16
then NPV = 43.90

***P_{2009}* = R43.90**

f.

Valuation method	Per share
Market value	R40.00
Book value	24.00
Zero growth	25.00
Constant growth	42.40
Variable growth	43.90

The book value has no relevance to the true value of the firm. Of the remaining methods, the most conservative estimate of value is given by the zero growth model. Wary analysts may advise paying no more than R25 per share, yet this is hardly more than book value. The most optimistic prediction, the variable growth model, results in a value of R43.88, which is not far from the market value. The market is obviously not as cautious about Encore International's future as the analysts.

Note also the *P*/*E* and required return confirm one another. The inverse of the *P*/*E* is 1 ÷ 6.4, or 0.156. This is also a measure of required return to the investor. Therefore, the inverse of the *P*/*E* (15.6%) and 16% for the CAPM required return are quite close. The question may be asked of the students, "Is the market predicting the beta to rise from 1.10 to 1.25 as reflected in the *P*/*E* and the CAPM required return comparison?"