6 Valuation

6.1 Learning outcomes

After studying this text the learner should / should be able to:

1. Explain the "balance sheet approach" to equity valuation.
2. Explain the "discounted cash flow approach" to equity valuation.
3. Explain the "relative valuation approach" to equity valuation.

6.2 Introduction

The mathematics of the equity market is concerned with the valuation of ordinary shares. Preference shares of course also trade and need to be valued. However, those with fixed maturity dates and fixed rates are valued the same way as bonds. Preference shares with floating rates are usually valued at 100%, because the rate floats in line with market rates[35]. Perpetual preference shares (which are found in many other countries) are valued as perpetual bonds are:

Price = coupon (or dividend) rate / required rate of return.

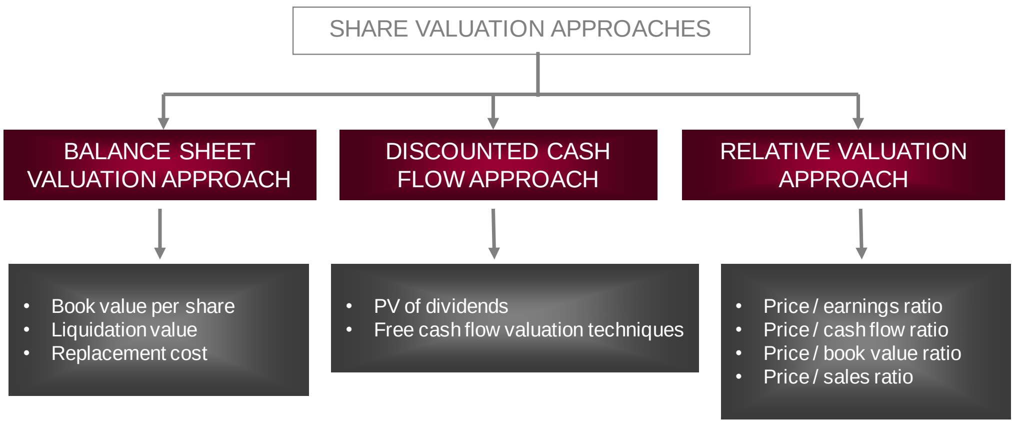

Figure 1: approaches to share valuation

In the case of the valuation of ordinary shares three approaches are generally followed.[36] These are shown in Figure 1.

We discuss each of these methods in some detail and end with a section of inflation and the valuation on equities.

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6.3 Balance sheet valuation approach

6.3.1 Introduction

There are three balance sheet valuation methods:

- Book value per share
- Liquidation value
- Replacement cost.

6.3.2 Book value per share

The book value per share of a company is also called the *net asset value per share*. This is simply calculated as follows:

$$BV_{ps} = (A - L) / NOS$$
$$= SF / NOS$$

where

A	= assets
L	= liabilities
SF	= shareholders' funds
NOS	= number of shares in issue.

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Assets		Equity and liabilities	
		Authorised share capital	
		(5 000 000 shares of LCC1 each)	
Stock (inventory)	3 563 050	Issued share capital	
Bank deposits	1 035 092	(4 000 000 shares of LCC1 each)	4 000 000
Debtors	3 216 925	Distributable reserves	2 564 500
		Total shareholders' funds	**6 564 500**
		Liabilities (bank overdraft and creditors)	1 250 567
Total assets	7 815 067	Total equity and liabilities	7 815 067

Table 1: Balance sheet of NEWCO (Pty) Limited (LCC)

In the example shown in Table 1, the NAV_{ps} of the company is:

$$
\begin{aligned}
BV_{ps} &= (A - L) / NOS \\
&= LCC7\ 815\ 067 - LCC1\ 259\ 567 / 4\ 000\ 000 \\
&= LCC6\ 564\ 500 / 4\ 000\ 000 \\
&= LCC1.64.
\end{aligned}
$$

This analysis *indicates* that each share is worth LCC1.64, that any higher market price means that the share is overvalued, and that a market price below LCC1.64 means that the share is undervalued.

It should be apparent that the book value approach is crude and is based on the balance sheet that is drawn up on the basis of certain accepted accounting rules, which may or may not value the assets and liabilities of the company at market value (an example is the valuing of certain assets at historical cost).

The questions that arise here are: *Can the share price be higher than the NAV per share, and does the NAV per share represent a "floor" price?* The answers are yes and no, respectively. As regards the first question, it is apparent that a share price is indicative of the market participants' perception of past and future cash flows (dividends), which means that if the company has performed well and is expected to perform well in future, the share price can be substantially higher than the NAV per share.

As regards the latter question, there are many examples where the share price of a company is lower that the NAV per share. This could indicate that the cash flows expected by the market are low or that the company is in trouble.

It is notable that in instances where a share price is lower than the NAV per share, this represents an opportunity for the company to *repurchase its own shares* in order to *improve the NAV per share*. This action of course amounts to a "message" from the directors of the company to the market that they are incorrect in their assessment of the company.

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Assets		Equity and liabilities	
Stock (inventory) Bank deposits Debtors	3 563 050 635 092 3 216 925	Authorised share capital (5 000 000 shares of LCC1 each) Issued share capital (3 600 000 shares of LCC1 each) Distributable reserves **Total shareholders' funds** Liabilities (bank overdraft and creditors)	 3 600 000 2 564 500 **6 164 500** 1 250 567
Total assets	7 415 067	Total equity and liabilities	7 415 067

Table 2: Balance sheet of NEWCO (Pty) Limited (LCC)

An example may be useful: If the *market price* of the share in the above example is LCC1.00, and the directors decide to buy 10% of the issued shares back (i.e. 400 000 shares for which they used bank deposits), and cancel the shares, the NAV per share of the remaining shares improves to:

$$\begin{aligned} BV_{ps} &= SF / NOS \\ &= LCC6\ 164\ 500 / 3\ 600\ 000 \\ &= LCC1.71. \end{aligned}$$

As noted, this action sends a powerful message to the market, and it is likely that the share price will improve. The actual market activity of purchasing the 400 000 shares would most likely also have pushed up the share price.

Although this valuation method is crude, it is *used to identify cheap shares*, particularly if the market price is substantially below the NAV per share, and to identify companies for the purpose of a takeover. This method of valuation is rarely used in isolation.

6.3.3 Liquidation value

This method is not foolproof because it is not easy to value assets and liabilities. Usually an austere valuation of assets and liabilities is undertaken and a proportion of the value is lopped off in order to allow for errors.

As in the case of the book value per share method, the liquidation value method is used to identify companies for takeover and/or liquidation in order to profit from the difference between market price and liquidation price. For example, if Newco (Pty) Limited is "raided" prior to the repurchase of its own shares, and all the shares are purchased at an average price of LCC1.00, the raider will profit as follows:

$$\text{Profit per share} = [(V_A - V_L) / NOS] - P_{ps}$$

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where

P_{ps}	= price paid per share
V_A	= value of assets
V_L	= value of liabilities
NOS	= number of shares in issue.

If V_A is LCC6 000 000 and V_L is LCC1 200 000, and number of shares is 4 000 000, then the profit per share made by the raider is:

$$\begin{aligned}\text{Profit per share} &= [(V_A - V_L) / \text{NOS}] - P_{ps} \\ &= [(\text{LCC6 000 000} - \text{LCC1 200 000}) / \text{4 000 000}] - \text{LCC1.00} \\ &= (\text{LCC4 800 000} / \text{4 000 000}) - \text{LCC1.00} \\ &= \text{LCC1.20} - \text{LCC1.00} \\ &= \text{LCC0.20.}\end{aligned}$$

As the raider bought all the shares, the total profit is LCC800 000 (4 000 000 × LCC0.20).

The alternative to this long-winded calculation is simply the NAV after liquidation (LCC4 800 000) less the mount paid by the raider for all the shares (LCC4 000 000), i.e. LCC800 000.

This method is rarely used in isolation.

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6.3.4 Replacement cost

Replacement cost amounts to the valuation of a company according to the replacement cost of its assets and liabilities. This method is premised on the notion that the market value of a company cannot be too removed (upwards) from the replacement cost of the assets and liabilities, because this will *enable competitors to duplicate the company*.

The economic logic of this approach is that if the market value of the company is substantially higher than the replacement cost of the company's assets and liabilities, many competitors will enter the relevant field of business. This will drive the market value of the firm down (lower profits and larger supply of shares of companies in this field) and increase the replacement value of the assets and liabilities (larger demand), until the market value of the companies becomes close to the replacement cost.

It is notable that James Tobin developed the concept of the *ratio of market value to replacement value* (known as **Tobin's *q***). In terms of this view, the value of q will tend toward 1 in the long-term. In the short-run, however, the ratio may differ from 1.

6.3.5 Concluding remark

The balance sheet valuation methods have a place, because they provide information on the *replacement and liquidation value* of a company. This information can be used to identify companies for takeover or raiding with the purpose of profiting from the breaking-up and sale of the assets.

However, these opportunities are rare, and analysts are mainly concerned with the value of a company *as a going concern*. They are interested in the cash flows generated by the company. For this, quantitative valuation methods are employed. These follow.

6.4 Discounted cash flow approach

6.4.1 Introduction

There are two methods to the discounted cash flow approach:[37]

- Present value of dividends.
- Free cash flow.

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6.4.2 Present value of dividends

6.4.2.1 Introduction

We know from the bond market that the plain vanilla bond has a finite life and pays a fixed rate of interest. We also know that *yield to maturity* is an average rate of return over the period of the bond. The price of the bond (= value = present value) is discounted value of the fixed coupons and the principal repayable at maturity, discounted at the yield to maturity (ytm). The formula is:

$$\text{Price} = \sum_{t=1}^{n} [cr / (1 + ytm)^t] + [1 / (1 + ytm)^n]$$

where

cr = coupon rate (cr / 2 if six-monthly)
ytm = yield to maturity (ytm / 2 if six-monthly)
n = number of periods (years × 2 if six-monthly).

This is nothing else than the classical PV-FV formula: it discounts future cash flows (coupons and principal) at the ytm to present value.

We also know that in the case of a perpetual bond, and a perpetual preference share, the formulae are:

Price (perpetual bond) = fixed coupon rate / required rate (ytm)
Price (perpetual preference share) = fixed dividend rate / required rate.

This formula (they are the same) is nothing else than the classical PV-FV formula: it discounts future cash flows (coupons / dividends) to present value.

Ordinary shares are nothing else than perpetual bonds / preference shares, but without a fixed dividend. Thus, with equities there is no finite period of investment, and therefore no face value to be repaid. Equities are permanent capital and only pay dividends.

At this stage a reminder of the perpetual bond / preference share formula is required (cf = annual cash flow = interest or dividends; rrr = required rate of return):

$$PV = [cf / (1 + rrr)^1] + [cf / (1 + rrr)^2] + \ldots[cf / (1 + rrr)^3] + \ldots \infty.$$

This simplifies to:

$$PV = cf / rrr$$

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6.4.2.2 Dividend discount model

In the case of ordinary shares, the pricing formula may be written as (D = dividend):

$$PV \quad = [D / (1 + rrr)^1] + [D / (1 + rrr)^2] + [D / (1 + rrr)^3] + \ldots \infty$$

As in the case of perpetual preference shares, this simplifies to:

$$PV \quad = D / rrr.$$

This model is called the **dividend discount model** (DDM), and it determines that the present value of a share is equal to the discounted value of future dividend flows (which are here assumed to be constant), at the rrr.

6.4.2.3 Constant growth dividend discount model

This model is not applicable to ordinary shares because it ignores the fact that *dividends grow over time*. In the case of growing dividends, the formula may be written as (D = dividends in year 1, year 2, year 3…etc. to infinity):

$$PV \quad = [D_1 / (1 + rrr)^1] + [D_2 / (1 + rrr)^2] + [D_3 / (1 + rrr)^3] + \ldots \infty$$

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However, there is a *big problem* here: it is not possible to make forecasts of dividend flows deep into the future. Thus, this formula becomes a *principle* rather than a useful tool, which leads us the so-called *Gordon constant-growth DDM.*

The formula above is made practical by assuming that the immediate past dividend (which of course was observed) will grow in the future at a *constant rate of growth*. The formula now becomes:

$$PV = \{[D_0 \times (1 + D_g)] / (1 + rrr)^1\} + \{[D_0 \times (1 + D_g)^2] / (1 + rrr)^2\} + \{[D_0 \times (1 + D_g)^3] / (1 + rrr)^3\} + \dots \infty$$

where

D_0 = past dividend
D_g = assumed growth rate in dividends.

This simplifies to:

$$PV = [D_0 \times (1 + D_g)] / (rrr - D_g)$$
$$= D_1 / (rrr - D_g).$$

If the *past* dividend of share XYZ was LCC6.0, the dividend growth rate is 8% (based on past growth rates), and the rrr = 14%, then $D_1 = D_0 \times 1.08$ = LCC6.0 × 1.08 = LCC6.48, and the present value of this share is:

PV = LCC6.48 / (0.14 – 0.08)
= LCC6.48 / 0.06
= LCC108.00.

It will be apparent that in terms of this **constant-growth DDM** (or CGDDM), the PV of the share will be higher under the following conditions:

- As the rrr falls the PV rises. Example: if the rrr = 12%, D_0 = LCC6.00, D_g = 8%, then the PV of the share is LCC162.00 [LCC6.48 / (0.12 – 0.08)].
- If the growth rate in dividends is higher, the PV rises. Example: if rrr = 14%, D_0 = LCC6.00, D_g = 9.5%, the PV of the share is LCC146.00 [LCC6.57 / (0.14 – 0.095)].

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6.4.2.4 Multi-stage growth model

Constancy in the growth in dividends is applicable to mature companies (and the valuation model can be called the *infinite period* CGDDM), but not to young companies whose dividend growth is higher in the early stages of operations and constant later. The valuation model in this case is called a multi-stage growth model. We assume the growth rates in dividends as indicated in Table 3 [we also assume the current dividend is LCC2 (D_0) and the rrr = 14%][38].

The PV of the company's share is LCC94.36. It will be evident that estimating the dividend growth rate and how long each phase will last is fraught with problems.

Year	Dividend growth rate	Dividend (LCC)	Discount factor (14%)	PV	PV formula
current (D_0)		2.00			
1	25%	2.50	0.8772	2.193	$(2.0 \times 1.25) / 1.14$
2	25%	3.12	0.7695	2.401	$(2.0 \times 1.25^2) / 1.14^2$
3	25%	3.91	0.6750	2.639	$(2.0 \times 1.25^3) / 1.14^3$
4	20%	4.69	0.5921	2.777	$(2.0 \times 1.25^3 \times 1.2) / 1.14^4$
5	20%	5.63	0.5194	2.924	$(2.0 \times 1.25^3 \times 1.2^2) / 1.14^5$
6	20%	6.76	0.4556	3.080	$(2.0 \times 1.25^3 \times 1.2^3) / 1.14^6$
7	15%	7.77	0.3996	3.105	$(2.0 \times 1.25^3 \times 1.2^3 \times 1.15) / 1.14^7$
8	15%	8.94	0.3506	3.134	$(2.0 \times 1.25^3 \times 1.2^3 \times 1.15^2) / 1.14^8$
9	15%	10.28	0.3075**	3.161	$(2.0 \times 1.25^3 \times 1.2^3 \times 1.15^3) / 1.14^9$
10 +	9% (constant)	11.21			
		LCC224.20*	0.3075**	68.941	$[(2.0 \times 1.25^3 \times 1.2^3 \times 1.15^3 \times 1.09) / (0.14 - 0.09)]1.14^9$
				LCC94.355	

* Value of dividend stream for year 10 and all future dividends [i.e. LCC11.21 / (0.14 – 0.09) = LCC224.20].
** Discount factor = 9th year factor because the valuation of the remaining stream is made at the end of year 9 to reflect the dividend in year10 and all future dividends.

Table 3: Assumed dividend growth rates and computation of PV of share

6.4.2.5 Required rate of return

It is now necessary to talk about the rrr. The rrr can be any number desired, but it must be above the risk-free rate, because this is the lowest rate that can be earned without assuming any risk. Thus, the rrr is made up of two parts:

rrr = rfr + rp (risk premium).

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The Capital Asset Pricing Model (CAPM) provides us with a neat explanation of risk. According to the CAPM, the risk premium is made up of two parts:

- The additional return that investing in shares offers above the rfr.
- The volatility of the particular share relative to the market as a whole, i.e. the beta (β). If a share has a beta of 2, this means that the share has a tendency to rise twice as much as the market over the chosen period of time, i.e. when the chosen index rises by z percent over a period, the share has a tendency to rise by 2 × z percent.

The additional return is the extent to which the return on the market (mr) exceeds the rfr (mr – rfr). Thus the rrr is:

$$\text{rrr} = \text{rfr} + (\text{mr} - \text{rfr})\beta.$$

The CAPM thus states that the rrr depends on the risk-free rate, the risk premium associated with investing in shares, and the risk associated with the specific share.

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How the model is used should be apparent. An example will be useful. If the rfr = 8.0%, the market is expected to rise 14%, and the security has a beta of 1.7, the rrr is equal to:

$$\begin{aligned} rrr &= rfr + (mr - rfr)\beta \\ &= 8.0 + (14.0 - 8.0)1.7 \\ &= 8.0 + (6.0)1.7 \\ &= 8.0 + 10.2 \\ &= 18.2\%. \end{aligned}$$

Assuming the past dividend of share XYZ = LCC6.0, the Dg = 8%, its value is:

$$\begin{aligned} PV &= (D_0 \times (1 + D_g)) / (rrr - D_g) \\ &= (LCC6 \times (1.08)) / (0.182 - 0.08) \\ &= LCC6.48 / 0.102 \\ &= LCC63.53. \end{aligned}$$

6.3 Free cash flow[39]

The free cash flow (FCF) approach to equity valuation recognises that fixed and working capital expenditure is required in order to grow the company and generate revenue and that such expenditure must be subtracted from operating income (after tax) in order to determine what cash is freely available to the company.

The FCF approach to valuing a company has two steps:

1. Determine the operational value of the company
2. Determine the value of the company to shareholders.

Step 1: operational value

This valuation technique discounts the company's free cash flow (FCF) by the company's weighted average cost of capital (WACC). Fundamentally the approach is to establish the cash flows available to the suppliers of capital (in the form of debt and equity) to the company.

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The FCF of a company is determined as follows:

Turnover
Less: operating expenses (including depreciation)
= earnings before interest, tax & amortisation (EBITA)
Less: cash taxes on EBITA
= net operating profit after tax (NOPAT)
Less: increase in fixed assets
Less: increase in working capital
Less: cash investment in goodwill
= **FREE CASH FLOW (FCF)**

The company's PV (or CV):

$$PV = \sum_{t=1}^{n} FCF_t / (1+ WACC)^t$$

where:

PV	= present value of the company
n	= number of periods (assumed to be infinite)
FCF_t	= free cash flow of company in period t
WACC	= weighted average cost of capital of company.

In determining WACC, the cost of equity and the after tax cost of debt are weighted and added together.

If we assume a constant growth rate (g) in FCF over the horizon period, our formula resembles the Gordon CGDDM:

$$PV = FCF \times (1 + g) / (WACC - g)$$

Step 2: shareholder value
To arrive at a share value using the free cash flow approach, items that affect the value of the company but which are not included in the operational value must be considered:

PV of FREE CASH FLOW (as derived above)
Plus: excess cash & marketable securities
Less: debt
Less: minorities
= FCF (shareholder or equity value)
Divide by number of shares issued
= FCF per share.

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Excess cash and marketable securities include cash not used for operational purposes, i.e. investments and cash that exclusively earn interest.

6.5 Relative valuation approach

6.5.1 Introduction

Analysts make use of four relative valuation techniques:

- Price / earnings ratio
- Price / cash flow ratio
- Price / book value ratio
- Price / sales ratio.

6.5.2 Price / earnings ratio

The old favourite way of valuing companies is the price / earnings ratio (P/E ratio). It is also called the price / earnings multiple (*m*). The *m* is simply:

$$m = P_0 / EPS_P$$

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where

P_0 = price of the share at time 0, i.e. now
EPS_p = earnings per share after tax as per *past* audited statements.

If the price of a share now is LCC125 and past audited EPS is LCC13.0 per share, then:

m = LCC125 / LCC13
= 9.62.

This says that the relevant share is trading at an earnings multiple of 9.62 and the implication is that the lower the multiple the cheaper the share. It will be apparent that this is the *historical* multiple. More usually, analysts predict earnings per share in the next year (EPS_f). Thus

$m = P_0 / EPS_f$.

This simple ratio translates to:

$P_0 = (m)(EPS_f)$.

This says that the price of the share now is equal to the product of the next (i.e. estimated) EPS number and some multiple. If an *acceptable multiple* is 10 and the expected EPS is LCC13.0, then the price should be (i.e. the value of the share is):

$P_0 = (m)(EPS_f)$
= (10)(LCC13.0)
= LCC130.00.

If the price of the share now is say LCC120, it is regarded as being undervalued, and if it is LCC140.00 it is overvalued. The problem with this measure is *what is the correct multiple*? Usually *analysts compare multiples with the average for the industry*, and keep an eye on the averages over time.

It is appropriate to point out the links between the Gordon CGDDM and the P/E ratio. The CGDDM (we use P instead of PV on the left of the equation):

$$P = [D_0 \times (1 + D_g)] / (rrr - D_g)$$
$$= D_1 / (rrr - D_g).$$

If we divide the equation by EPS_f we get:

$$P/EPS_f = (D_1 / EPS_f) / (rrr - D_g).$$

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Thus the P/E ratio is determined by the dividend payout ratio (D_1 / EPS_f), the rrr and the expected growth rate in dividends (D_g).

The major weakness of the P/E ratio was pointed out above: *what is the right level?* However, it has a major use: it is *useful for valuing companies that are not paying dividends*, such as younger companies that are conserving cash for purposes of growth.

Thus the company's value, according to this valuation method, is 13 times its earnings.

In conclusion, the P/E ratio is a reflection of the market's level of optimism regarding the growth prospects of the company. The higher the P/E is, the more optimistic is the view. The *analyst has to decide where s/he stands in relation to the market consensus as reflected in the ratio*. If s/he is less optimistic than the market (i.e. demands a lower P/E ratio), s/he will recommend a "sell".

The rational analyst will *not* rely solely on a company's P/E ratio to value a company. S/he will most likely view a company's P/E ratio now with the past history of the company, and with other valuation tools.

6.5.3 Price / cash flow ratio

This ratio (P/CF) is used by some analysts because of concerns about the manipulation of EPS by some companies. It is more difficult to manipulate cash flows. The formula is:

$$P/CF = P / CF_f$$

where

P = price of the share now
CF_f = cash flow per share expected in the next accounting period.

The cash flow used here is EBITDA (earnings before interest, tax, depreciation and amortisation).

6.5.4 Price / book value ratio

This ratio is the *price per share* to the *book value per share* ratio (P/BV) and it is computed as follows:

$$P/BV = P / BV_f$$

where

P = price of the share now
BV_f = expected book value per share at the end of the financial year.

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Book value is the sum of inventories, additional capital, and retained earnings. This measure is of interest to analysts in that the price per share is compared with the per-share book value in the same way as the P/E ratio. A low ratio suggests that the share is undervalued, and a high ratio suggest the opposite. What the correct ratio is is *the rub*.

As in the case of the P/E ratio, this ratio is used largely as a measure of relative value.

6.5.5 Price / sales ratio

The price / sales ratio (P/S) is computed as:

$$P/S \quad = P / S_f$$

where

P = price of share now
S_f = expected sales per share.

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A low ratio indicates a low valuation and a high one the opposite. This ratio is considered useful for the following reasons:

- Strong growth in sales is considered is a requirement for a growth company: earnings are ultimately related to sales growth.
- Sales manipulation is difficult to achieve; it is therefore a credible indicator.
- It measures the value of companies that are operating at a loss (whereas P/E cannot).

P/S ratios vary substantively between industries; therefore relative valuation analysis is confined to companies in the same industry.

6.6 Equity valuation, inflation and interest rates

Many other factors play a role in the valuation of companies. The most pertinent of these are inflation and interest rates.

Periods of low but rising inflation can bring about a rise in nominal GDE/GDP and this may be associated with a rise in company earnings and expected dividend payments and the growth rate in dividends (D_1 and D_g). Thus, in terms of the constant growth DDM, the value of companies will rise, and share prices will rise to reflect this.

However, the role played by interest rates in an inflation environment is crucial. Rising inflation in well-managed economies is accompanied by rising interest rates. Thus one of the components of rrr will rise: the risk-free rate. An example is required here.

The constant-growth DDM formula will be recalled:

$$PV = D_1 / (rrr - D_g).$$

And the earlier example will be remembered:

$$\begin{aligned} PV &= D_1 / (rrr - D_g) \\ &= LCC6.48 / (0.14 - 0.08) \\ &= LCC6.48 / 0.06 \\ &= LCC108.00. \end{aligned}$$

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If the expected dividend (D_1) increases by the inflation rate of 8% to LCC7 (LCC6.48 x 1.08), if the risk free rate component of the rrr increases the rrr to say 14.5%, and if the dividend growth rate increases from 8% to 10%, the numbers change as follows:

PV = LCC7.00 / (0.145 – 0.10)
= LCC7.00 / 0.045
= LCC155.56.

This usually happens in an inflationary climate. In real terms, however, there may not be a change in the numbers.

However, it must be kept in mind that under conditions of inflation, the economy may perform well in the short term, and it may be followed by a period of lower income and profits. An expectation of this occurring may prompt investors to lower their sights in respect of the expected growth rate in dividends (D_g) and to increase the risk premium part of the rrr.

Another scenario that may be envisaged is where inflation rises and the monetary authorities decide to keep rates unchanged for a long period. This may lead investors to expect high inflation in future. This scenario may prompt investors to increase the risk component of rrr substantially and to lower the growth rate in dividends.

6.7 Summary

Preference shares are valued as bonds are (because bonds have a fixed return and a fixed maturity date) (note: there are exceptions). Ordinary shares do not deliver a fixed return and do not have a maturity date. Therefore they cannot be valued easily. Other valuation techniques have been developed to value equity: (1) the "balance sheet approach" to equity valuation, (2) the "discounted cash flow approach" to equity valuation, (3) the "relative valuation approach" to equity valuation.

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