Basic Definitions:

Book Value is the net worth of a company as reported on its balance sheet.

Current market price of stocks of companies can sell below their book value.

The liquidation value per share is the net amount that can be realized by selling the assets of a firm and paying off the debt.

Replacement cost is the cost to replace a firm’s assets.

Intrinsic Value vs Market Price

Intrinsic value is the present value of a firm’s expected future net cash flows discounted by the required rate of return.

$$\text{Expected Holding Period Return (HPR)} = E(r) = \frac{E(D_1) + [E(P_1) - P_0]}{P_0}$$

Where

\(E(D_1)\) = expected dividend per share  
\(E(P_1)\) = expected price of a share at the end of period  
\(P_0\) = current price of a share

Intrinsic Value using a one year investment horizon:

$$V_0 = \frac{E(D_1) + E(P_1)}{1 + k}$$

Where

\(V_0\) = intrinsic value  
\(r\) = required rate of return
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Example: ABC Stock

Expected dividend per share during a year = 4$
Current price = 48$

Expected price at the end of the year = 52$

Expected HPR = \frac{4 + (52 - 48)}{48} = 16.7\%

Required rate of return(expected) = k, CAPM

k = r_f + \beta \left[ E(r_M) - r_f \right]

where

r_f = return on risk free asset (risk free rate)
r_m = expected rate of return in the market portfolio
\beta = risk level of the security

rf = 6%
r_m = 11%
\beta = 1.2

k = 6\% + 1.2 \times 5\% = 12\%

Intrinsic Value = V_0 = \frac{4$ + 52$}{1 + 0.12} = 50$ for a one year investment horizon

Concept check 13.1 in page 405.

Dividend Discount Models

According to the DDM, \( V_0 = \frac{E(D_1) + E(P_1)}{1 + k} + \frac{E(D_2) + E(P_2)}{(1 + k)^2} + \ldots + \frac{E(D_N) + E(P_N)}{(1 + k)^N} \)

But because of uncertainty in forecasted market prices and the lack of fixed maturity date, DDM can be re-written as:

\( V_0 = \frac{D_1}{1 + k} + \frac{D_2}{(1 + k)^2} + \ldots \)
The Constant Growth DDM

The previous DDM model is still again not very useful because it requires dividend forecasts for every year into the indefinite future.

To make the DDM more practical, we can assume trending upward at a stable growth rate (g).

Then, if $g = 0.05$, $D_0 = 3.81$:  

\[
D_1 = D_0 (1+g) = 3.81 \times 1.05 = 4.00
\]

\[
D_2 = D_0 (1+g)^2 = 3.81 \times (1.05)^2 = 4.20
\]

\[
D_3 = D_0 (1+g)^3 = 3.81 \times (1.05)^3 = 4.41 \text{ etc.}
\]

So,

\[
V_0 = \frac{D_0 (1+g)}{1+k} + \frac{D_0 (1+g)^2}{(1+k)^2} + ....
\]

This can be simplified as:

\[
V_0 = \frac{D_0 (1+g)}{k-g} = \frac{D_1}{k-g}
\]

So,

$k = 12\%$

$g = 5\%$

\[
V_0 = \frac{4\$}{0.12 - 0.05} = $57.14 \text{ in the case of ABC stock}
\]

The Constant Growth DDM is valid only when $g$ is less than $k$. If dividends are expected to grow forever at a rate faster than $k$, the value of the stock would be infinite.

The Constant Growth DDM implies that a stock’s value will be greater:

1. The greater its expected dividend per share
2. The lower the market capitalization rate, $k$.
3. The higher the expected growth rate of dividends.
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Another implication of the constant growth model is that the stock price expected to grow at the same rate as dividends.

Example:

\[ k = 12\% \]
\[ g = 5\% \]
\[ V_0 = \frac{4\$}{0.12 - 0.05} = 57.14 \text{ in the case of ABC stock} \]

If \( V_0 = P_0 \), then

\[ P_0 = \frac{D_i}{k - g} \]

If dividends grow by 5% next year, stock price also grows at the same rate:

\[ D_2 = 4\$ (1.05) = 4.20\$ \]
\[ P_1 = \frac{4.20}{0.12 - 0.05} = 60.00\$ \]

So, \( \frac{60.00}{57.14} = 1.05 = 5\% \)

\[ P_1 = \frac{D_2}{k - g} = \frac{D_i (1 + g)}{k - g} = \frac{D_i}{k - g} (1 + g) \]
\[ = P_0 (1 + g) \]

Therefore, if the stock is selling at intrinsic value, then \( E (r) = k \).

And \( k = \frac{D_i}{P_0} + g \)

Concept Check 13.2
CHAPTER 13. EQUITY VALUATION

Stock Prices and Investment Opportunities

Dividend = 5$
k = 12.5%
Then, the value of the company, \( V_0 = \frac{5}{0.125} = 40 \) per share

The firm might not select to distribute all the earnings as dividends, they may select to consider reinvestment opportunities, for example, generating 15% return. Therefore, dividend payout ratio can be reduced from 100% to 40%.

Dividend payout ratio is the percentage of earnings paid out as dividends.

And company may maintain a plowback by 60%, which is the proportion of the firm’s earnings that is reinvested in the business (and not paid out as dividends). This is also known as earnings retention ratio.

Then, dividend of the company will be \( 0.4 \times 5 = 2 \) per share.

Since dividends are reduced today, it will rise in the future due to reinvestment opportunities. The share price will also rise.

If reinvestment rates are low, then the firm will pay higher dividends but these results in a lower dividend growth rate.

If reinvestment rates are high, then, the firm will pay lower dividends but these results in a higher dividend growth rate.

See Figure 13.1

Then, how much growth in capital will be generated?

Investment = 100 million USD (all equity financed)
ROE = 15%
Outstanding shares = 3 million

Total earnings = 100 million \times 0.15 = 15 million USD.
Earnings per share = 15 million USD / 3 million = 5 USD per share

If reinvestment ratio is 60%, then \( 0.60 \times 15 \text{ billion} = 9 \text{ billion USD} \) will be reinvested. Thus, the value of capital will growth by:

\[ g = \text{ROE} \times b = 15\% \times 0.60 = 9\% \]

The company earns 9% more income and pays out 9% higher dividends.

If \( V_0 = P_0 \), this growth rate can be sustained:
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\[ P_0 = \frac{D_1}{k - g} = \frac{\$2}{0.125 - 0.09} = \$57.14 \]

Where in the previous case, \( g \) was 5% and \( D_1 \) was 4$:

\[ P_0 = \frac{4\$}{0.12 - 0.05} = \$57.14 \]

However, in the case of no-growth policy, \( P_0 = 40\$ \).

But in the case of growth policy:

Price = No-growth value per share + PVGO (Present Value of Growth Opportunities=

\[ P_0 = \frac{E_1}{k} + PVGO \]

57.14 USD = 40 USD + 17.14 USD

Example 13.4, p. 412.

In this example, company continues to reinvest although, ROE < \( k \). Thus, it faces a negative PVGO and it is take-overed by another company. Price per share would be less than no-growth value.

Concept Check 13.3

Price Earning Ratios

This is the ratio of a stock’s price to its earnings per share.

Recall previous equation:

\[ P_0 = \frac{E_1}{k} + PVGO \]

\[ \frac{P_0}{E_1} = \frac{1}{k} \left[ 1 + \frac{PVGO}{E_1/k} \right] \]
Example 13.5 linked to Example 13.4:

\[ E_1 = 5 \] $  
\[ k = 15\% \]  
Reinvestment rate = 0.60  
No growth value = \[ \frac{E_1}{k} = \frac{5}{0.15} = 33.33 \] $  
Stock Price = 22.22$  
PVGO = -11.11$  

Then,  
\[
\frac{P_0}{E_1} = \frac{1}{k} \left[ 1 + \frac{PVGO}{E_1/k} \right] = \frac{1}{0.15} \left[ 1 + \frac{-11.11}{33.33} \right] = 4.44
\]

And,  
\[
\frac{P_0}{E_1} = \frac{22.22}{5} = 4.44
\]

Price Earning Ratios and Growth Prospects

\[ P_0 = \frac{D_1}{k - g} \]

Then,  
\[ D_1 = E_1 (1 - b) \]

\[ g = \text{ROE} \times b \]

Then,  
\[
P_0 = \frac{E_1 (1 - b)}{k - (\text{ROE} \times b)}
\]

And,  
\[
\frac{P_0}{E_1} = \frac{1 - b}{(k - (\text{ROE} \times b))}
\]

P/E ratio increases with ROE and higher plowback ratio as long as ROE > k.

See Table 13.3
Example: No Growth

E0 = $2.50
g = 0
k = 12.5%

P0 = D/k = $2.50/.125 = $20.00

P/E = 1/k = 1/.125 = 8

Or P/E = P0 / E0 = 20 / 2.5 = 8

Example: With Growth

b = 60%
ROE = 15%
(1-b) = 40%
E1 = $2.50 (1 + (.6)(.15)) = $2.73
D1 = $2.73 (1-.6) = $1.09
k = 12.5%  g = 9%

P0 = 1.09/(.125-.09) = $31.14
P/E = 31.14/2.73 = 11.4
P/E = (1 - .60) / (.125 - .09) = 11.4