Common Stock Analysis and Valuation

Chapter - 7

COMMON STOCK ANALYSIS AND VALUATION

* Dividend Discount Model (DDM)

There are so many model to calculate intrinsic value of common stock, among them DDM is most popular and widely used method in practise.

According to this model, intrinsic value of common stock is calculated by distributing all the dividends which are expected to received from the given common stock from year 1 to ∞ and summarized them.

i.e

$$P_0 = \frac{D_1}{(1+K_s)^1} + \frac{D_2}{(1+K_s)^2} + \frac{D_3}{(1+K_s)^3} + \ldots\ldots + \frac{D_\infty}{(1+K_s)^\infty}$$

where,

P_0 = Intrinsic Value of Common stock

D_1 = Dividend at the end of year 1

D_2 = Dividend at the end of year 2

K_s = Required rate of return

* Models of DDM :

1. Zero Growth Model
2. Constant Growth Model
3. Supernormal Growth Model

1. Zero Growth Model :

This model assumes that earnings and dividend will remain constant each year upto ∞ ($g = 0$). According to this model P_0 is calculated as follows:

$$P_0 = \frac{D}{K_s}$$

Where,

$$D = D_0 = D_1 = D_2 = D_3 = \ldots\ldots = D_\infty$$

2. Constant Growth Model :

This model assumes that earnings and dividends will grow at a same constant rate each year forever. According to this model, P_0 is calculated as follows:

$$P_0 = \frac{D_1}{K_s - g}, \quad P_1 = \frac{D_2}{K_s - g}, \quad P_2 = \frac{D_3}{K_s - g}$$

where,

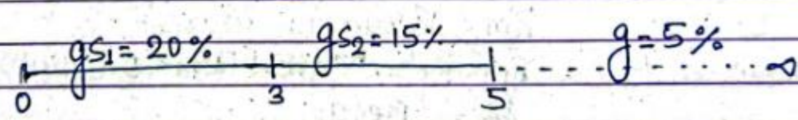
g = Constant growth rate

Note: To apply this model, K_s must be greater than g.

$$D_1 = D_0(1+g)^1$$
$$D_2 = D_1(1+g)^1 \quad \text{or} \quad D_2 = D_0(1+g)^2$$
$$D_3 = D_0(1+g)^3 \quad \text{or} \quad D_3 = D_1(1+g)^2 \quad \text{or} \quad D_3 = D_2(1+g)^1$$
and so on...

3. Supernormal Growth Model:

According to this model earnings and dividends will grow at different rate from year 1 to ∞. Under this model, P_0 is calculated as follows:



$$P_0 = \frac{D_1}{(1+K_s)^1} + \frac{D_2}{(1+K_s)^2} + \frac{D_3}{(1+K_s)^3} + \frac{D_4}{(1+K_s)^4} + \frac{D_5}{(1+K_s)^5} + \frac{P_5}{(1+K_s)^5}$$

$$P_1 = \frac{D_2}{(1+K_s)^1} + \frac{D_3}{(1+K_s)^2} + \frac{D_4}{(1+K_s)^3} + \frac{D_5}{(1+K_s)^4} + \frac{P_5}{(1+K_s)^4}$$

$$P_2 = \frac{D_3}{(1+K_s)^1} + \frac{D_4}{(1+K_s)^2} + \frac{D_5}{(1+K_s)^3} + \frac{P_5}{(1+K_s)^3}$$

Where,

$D_1 = D_0(1+gs_1)$ $\qquad$ $D_4 = D_3(1+gs_2)$ $\qquad$ $P_5 = \dfrac{D_6}{K_s - g}$

$D_2 = D_1(1+gs_1)$ $\qquad$ $D_5 = D_4(1+gs_2)$

$D_3 = D_2(1+gs_1)$ $\qquad$ $D_6 = D_5(1+g)$

Note:

D_0 = Current DPS | Present DPS | Dividend just paid | Past year's DPS | Previous year DPS.

D_1 = Expected Dividend | Dividend at the year

$K_s = R_f + (R_m - R_f)\beta$ → CAPM

Where,

R_f = Risk free Rate

R_m = Return on market

$R_m - R_f$ = Market Risk premium

β = Beta.

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Soln

Given:

Current Dividend (D_0) = Rs. 40

a. Constant Growth Model:

constant growth rate (g) = 5%

Dividend in Year 10 (D_{10}) $= D_0(1+g)^{10}$

$= 40(1+0.05)^{10}$

$=$ Rs. 65.16

b. Required rate of return $(K_s) = 12\%$

$$\text{Value of stock } (P_0) = \frac{D_1}{K_s - g} = \frac{D_0(1+g)}{K_s - g}$$

$$= \frac{40(1+0.05)}{0.12-0.05}$$

$$= \text{Rs. } 600$$

c. Dividend at the end of 5 year (D_5) = Rs. 50.87

Growth rate $(g) = ?$

$$D_5 = D_0(1+g)^5$$

$$50.87 = 40(1+g)^5$$

$$g = \left(\frac{50.87}{40}\right)^{1/5} - 1$$

$$= 4.93\%$$

d. Supernormal growth rate $(g_{s1}) = 5\%$ (Only for 3 Yrs)

Constant growth rate $(g) = 3\%$

$$\text{Value of stock } (P_0) = \frac{D_1}{(1+K_s)^1} + \frac{D_2}{(1+K_s)^2} + \frac{D_3}{(1+K_s)^3} + \frac{P_3}{(1+K_s)^3}$$

$$= \frac{42}{(1+0.12)^1} + \frac{44.1}{(1+0.12)^2} + \frac{46.305}{(1+0.12)^3} + \frac{529.89}{(1+0.12)^3}$$

$$= \text{Rs. } 482.79$$

Where,

$D_1 = D_0(1+g_{s1}) = 40(1+0.05) = Rs. 42$

$D_2 = D_1(1+g_{s1}) = 42(1+0.05) = Rs. 44.1$

$D_3 = D_2(1+g_{s1}) = 44.1(1+0.05) = Rs. 46.305$

$D_4 = D_3(1+g) = 46.305(1+0.03) = Rs. 47.69$

$$P_3 = \frac{D_4}{K_s - g} = \frac{47.69}{0.12-0.03} = Rs. 529.89$$

e. The assumptions of DDM are:

i. The dividend is expected to grow forever at a constant rate g.

ii. The stock price is expected to grow at same rate.

iii. The expected dividend yield is a constant.

iv. The expected rate of return is always greater than g.

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Soln

Given:

Current Dividend (D_0) = Rs. 25

Required rate of return (K_s) = 16%

a. Zero Growth Model:

$$\text{Value of stock } (P_0) = \frac{D}{K_s} = \frac{25}{0.16} = Rs. 156.25$$

b. Constant growth rate (g) = 8 %

Value of stock $(P_0) = \frac{D_1}{K_s - g} = \frac{D_0(1+g)}{K_s - g}$

$= \frac{25(1+0.08)}{0.16-0.08}$

$= Rs.\ 337.5$

Since, the stock is underpriced, we would buy the stock if it is selling at Rs. 300 per share.

c. Supernormal growth rate (g_{s1}) = 5 % (for 3 years)

Constant growth rate (g) = 0

Value of stock $(P_0) = \frac{D_1}{(1+K_s)^1} + \frac{D_2}{(1+K_s)^2} + \frac{D_3}{(1+K_s)^3} + \frac{P_3}{(1+K_s)^3}$

$= \frac{26.25}{(1+0.16)^1} + \frac{27.56}{(1+0.16)^2} + \frac{28.94}{(1+0.16)^3} + \frac{\cancel{28.94}\ 180.87}{(1+0.16)^3}$

$= Rs.\ 177.53$

where,

$D_1 = D_0(1+g_{s1}) = 25(1+0.05) = Rs.\ 26.25$

$D_2 = D_1(1+g_{s1}) = 26.25(1+0.05) = Rs.\ 27.56$

$D_3 = D_2(1+g_{s1}) = 27.56(1+0.05) = Rs.\ 28.94$

$D_4 = D_3(1+g) = 28.94(1+0) = Rs.\ 28.94$

$P_3 = \frac{D_4}{K_s - g} = \frac{28.94}{0.16-0} = Rs.\ 180.87$

Since the stock is overvalued, we would sell these stock.

d. If the stock is undervalued, we should purchase the stock and if it is overvalued we would sell it.

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Soln

Given:

Risk free Rate (R_f) = 5%

Return on market (R_m) = 15 %

Current Dividend (D_0) = Rs. 10

Beta coefficient (β) = 1

Supernormal growth rate (gs_1) = 20% (for 2 years)

Constant growth model rate (g) = 5%

a. Required rate of return (K_s) $= R_f + (R_m - R_f)\beta$

$= 5\% + (15\% - 5\%)\,1$

$= 15\%$

b. Dividend in year 1 (D_1) $= D_0(1+gs_1) = 10(1+0.20) =$ Rs. 1.

Dividend in year 2 (D_2) $= D_1(1+gs_1) = 12(1+0.20) =$ Rs. 14.4

c. Price at the end of year 2 (P_2) $= \dfrac{D_3}{K_s - g} = \dfrac{D_2(1+g)}{K_s - g}$

$= \dfrac{14.4(1+0.05)}{0.15-0.05}$

$=$ Rs. 151.2

d. Value of stock today (P_0) = $\frac{D_1}{(1+K_s)^1} + \frac{D_2}{(1+K_s)^2} + \frac{P_2}{(1+K_s)^2}$

$= \frac{12}{(1+0.15)^1} + \frac{14.4}{(1+0.15)^2} + \frac{151.2}{(1+0.15)^2}$

$=$ Rs. 135.65

e. If the stock is trading at Rs. 130, it is underpriced. So, we should buy the stock.

2077 Q.N.19

Soln

Given:

Latest dividend (D_0) = Rs. 40

Dividend next year (D_1) = Rs. 43.2

Dividend in year 2 (D_2) = Rs. 46.7

Dividend in year 3 (D_3) = Rs. 50.4

Current stock price (P_0) = Rs. 565

Price of stock in 3 years (P_3) = Rs. 777.50

a. Required rate of return (K_s) = 15%

Value of stock (P_0) = ?

$$P_0 = \frac{D_1}{(1+K_s)^1} + \frac{D_2}{(1+K_s)^2} + \frac{D_3}{(1+K_s)^3} + \frac{P_3}{(1+K_s)^3}$$

$$= \frac{43.2}{(1+0.15)^1} + \frac{46.7}{(1+0.15)^2} + \frac{50.4}{(1+0.15)^3} + \frac{777.50}{(1+0.15)^3}$$

$=$ Rs. 617.23

b. Calculation of Expected rate of return using IRR approach:

Step-1:

$$P_0 = \frac{D_1}{(1+K_s)^1} + \frac{D_2}{(1+K_s)^2} + \frac{D_3}{(1+K_s)^3} + \frac{P_3}{(1+K_s)^3}$$

$$565 = \frac{43.2}{(1+K_s)^1} + \frac{46.7}{(1+K_s)^2} + \frac{50.4}{(1+K_s)^3} + \frac{777.50}{(1+K_s)^3} \quad \text{—} (1)$$

Step-2: Try at 20%.

$$TPV_{HR} = \frac{43.2}{(1+0.20)^1} + \frac{46.7}{(1+0.20)^2} + \frac{50.4}{(1+0.20)^3} + \frac{777.50}{(1+0.20)^3}$$

$$= Rs.\ 547.53$$

Step-3: Try at 17%

$$TPV_{LR} = \frac{43.2}{(1+0.17)^1} + \frac{46.7}{(1+0.17)^2} + \frac{50.4}{(1+0.17)^3} + \frac{777.50}{(1+0.17)^3}$$

$$= Rs.\ 587.95$$

Step-4: By Interpolation:

$$\text{Annual Return} = LR\% + \frac{TPV_{LR} - P_0}{TPV_{LR} - TPV_{HR}} \times (HR - LR)$$

$$= 17\% + \frac{587.95 - 565}{587.95 - 547.53} \times (20\% - 17\%)$$

$$= 18.70\%$$

c. Constant growth rate(g) = 8%.
Required rate of return(Ks) = 15%

$$\text{Value of stock } (P_0) = \frac{D_1}{K_s - g} = \frac{D_0(1+g)}{K_s - g} = \frac{40(1+0.08)}{0.15-0.08}$$
$$= Rs.\ 617.14$$

d. If g is greater than Ks, it implies that dividend yield is negative, which does not hold true in real life.

e. D_3 = Rs. 50.4
g = 8%
Ks = 15%

$$P_3 = \frac{D_4}{K_s - g} = \frac{D_3(1+g)}{K_s - g} = \frac{50.4(1+0.08)}{0.15-0.08} = Rs.\ 777.6$$

The value of stock is similar because the valuation of common stock at the end of year 3 is also based on the same expected growth rate of 8%.

Problem 7.6

a. Given:
Dividend this year (D_0) = Rs. 20
constant growth rate (g) = 6%
Required rate of return (K_s) = 16%

$$\text{Value of stock } (P_0) = \frac{D_1}{K_s - g} = \frac{D_0(1+g)}{K_s - g}$$

$$= \frac{20(1+0.06)}{0.16-0.06}$$

$$= \text{Rs. } 212$$

b.

Dividend Per share (D) = Rs. 12

Required rate of return (K_s) = 14 %

$$\text{Value of stock } (P_0) = \frac{D}{K_s} = \frac{12}{0.14} = \text{Rs. } 85.71$$

c. Expected dividend at the end of the year (D_1) = Rs. 8

Constant growth rate (g) = 6 %

Required rate of return (K_s) = 14 %

$$\text{Value of stock } (P_0) = \frac{D_1}{K_s - g} = \frac{8}{0.14 - 0.06} = \text{Rs. } 100$$

d. Expected dividend (D_1) = Rs. 12

Market price at end (P_1) = Rs. 264

Required rate of return (K_s) = 15 %

$$\text{Value of stock } (P_0) = \frac{D_1}{(1+K_s)^1} + \frac{P_1}{(1+K_s)^1}$$

$$= \frac{12}{(1+0.15)^1} + \frac{264}{(1+0.15)^2}$$
$$= Rs.\ 240$$

Problem 7.7

Sol^n

Given:

Dividivid just paid (D_0) = Rs. 20

Required rate of return (K_s) = 15%

Constant growth rate (g) = 5%

a. Value of stock $(P_0) = \frac{D_0(1+g)}{K_s-g} = \frac{20(1+0.05)}{0.15-0.05} = Rs.\ 210$

b. Value of stock in 5 years $(P_5) = \frac{D_6}{K_s-g} = \frac{D_0(1+g)^6}{K_s-g}$

$$= \frac{20(1+0.05)^6}{0.15-0.05}$$
$$= Rs.\ 268$$

c. Supernormal growth rate (g_{s1}) = 10% (for 3 years)

Constant growth rate (g) = 5%

$$P_0 = \frac{D_1}{(1+K_s)^1} + \frac{D_2}{(1+K_s)^2} + \frac{D_3}{(1+K_s)^3} + \frac{P_3}{(1+K_s)^3}$$
$$= \frac{22}{(1+0.15)^1} + \frac{24.2}{(1+0.15)^2} + \frac{26.62}{(1+0.15)^3} + \frac{279.5}{(1+0.15)^3}$$
$$= Rs.\ 238.71$$

where,

$D_1 = D_0(1+g_{s1}) = 20(1+0.10) = Rs.\ 22$

$D_2 = D_1(1+g_{s1}) = 22(1+0.10) = Rs.\ 24.2$

$D_3 = D_2(1+g_{s1}) = 24.2(1+0.10) = Rs.\ 26.62$

$D_4 = D_3(1+g) = 26.62(1+0.05) = Rs.\ 27.95$

$P_3 = \frac{D_4}{K_s-g} = \frac{27.95}{0.15-0.05} = Rs.\ 279.5$