FIN 300

Dividend Discount Model

Lecture 7

TOPICS COVERED

- Dividend Discount Model
  - DDM with Constant Growth
  - Building on the DDM
  - DDM with Two-Stage Growth
- Valuation Ratios
- Common Stock Features

DIVIDEND DISCOUNT MODEL

- A dividend is a cash payment to the stockholder
- Dividends usually occur quarterly
- The value of the stock can be modelled as the present value of the dividends over time
- A model is a description of reality.
  - DDM does not always describe the stock value very well.

Perpetual Level Dividend

$$Value_{\text{Stock}} = \frac{D}{(1+R)} + \frac{D}{(1+R)^2} + \frac{D}{(1+R)^3} + \frac{D}{(1+R)^4} + \frac{D}{(1+R)}$$

$$Value_{\text{Stock}} = \frac{D}{R}$$

Example: Level (Annual) Dividend

Suppose a stock had an annual dividend of $\$1$ that was to be paid in perpetuity. If the discount rate is 10%, what is the stock worth according to the DDM?

$$Value_{\text{Stock}} = \frac{D}{R} = \frac{\$1}{0.10} = \$10$$

Example: Quarterly Dividend

Suppose a stock had a quarterly dividend of $\$0.25$ that was to be paid in perpetuity. If the discount rate is 10% annually, what is the stock worth according to the DDM?

Step 1: Get quarterly discount rate

$$R_q = (1 + 0.10)^{\frac{1}{4}} - 1 = 0.02411$$

Step 2: Calculate perpetuity with quarterly dividend and quarterly discount rate:

$$Value_{\text{Stock}} = \frac{D}{R} = \frac{\$0.25}{0.02411} = \$10.36$$

DDM WITH CONSTANT GROWTH

The dividend discount model values the stock as a perpetuity of dividends.

We can add growth to this model:

$$Value_{\text{Stock}} = \frac{D_1}{R-g} = \frac{D_0 \times (1+g)}{R-g}$$

g is the rate of dividend growth

Example: Quarterly Dividend with Growth

A stock stock paid a quarterly dividend of $\$0.25$. The dividend is expected to grow at a rate of 0.5% quarterly, forever. What is the stock's value under DDM if $R = 2.411\%$.

$$Value_{\text{Stock}} = \frac{D_0 \times (1+g)}{R-g}$$

$$= \frac{\$0.25 \times (1+0.005)}{0.02411 - 0.005} = \$13.15$$

BUILDING ON THE DDM

- The Dividend Discount Model can be elaborated
- We are not restricted to a single growth rate
- Consider the case where a dividend will be initiated in 5 quarters.
- Once it begins, it will be $\$0.25$ per quarter forever.

With $R = 2.411\%$, the stock's price in 4 quarters should be:

$$P_{4\ quarters} = \frac{\$0.25}{0.02411} = \$10.36$$

What is P_0, the price today?

The price today [with no interim dividends] is the discounted future price:

$$P_0 = \frac{P_{4\,quarters}}{(1 + R_q)^4}$$

$$P_0 = \frac{\$10.36}{(1 + 0.02411)^4} = \$9.42$$

Now consider a stock that pays a dividend of D_0 each quarter. Starting in 9 quarters the dividend will grow at a rate of g per quarter.

$$P_0 = \frac{D_0}{(1+R)} + \frac{D_0}{(1+R)^2} + \frac{D_0}{(1+R)^3} + \frac{D_0}{(1+R)^4} + \frac{D_0}{(1+R)^5} + \frac{D_0}{(1+R)^6} + \frac{D_0}{(1+R)^7} + \frac{D_0}{(1+R)^8} + \frac{D_0 \times (1+g)}{(1+R)^9} + \frac{D_0 \times (1+g)^2}{(1+R)^{10}} + \dots$$

In quarter 8, the growing dividend perpetuity will be worth:

$$P_{Q8} = \frac{D_0 \times (1+g)}{r-g}$$

Today, that's only worth:

$$\frac{\frac{D_0 \times (1+g)}{r-g}}{(1+R)^8} = \frac{P_{Q8}}{(1+R)^8}$$

$$P_0 = \frac{D_0}{(1+R)} + \frac{D_0}{(1+R)^2} + \frac{D_0}{(1+R)^3} + \frac{D_0}{(1+R)^4} + \frac{D_0}{(1+R)^5} + \frac{D_0}{(1+R)^6} + \frac{D_0}{(1+R)^7} + \frac{D_0}{(1+R)^8} + \frac{P_{Q8}}{(1+R)^8}$$

$$Annuity_{\text{Quarters 1-8}} = D_0 \times \left[\frac{1 - \frac{1}{(1+R)^8}}{R} \right]$$

$$P_0 = D_0 \times \left[\frac{1 - \frac{1}{(1+R)^8}}{R} \right] + \frac{P_{Q8}}{(1+R)^8}$$

This represents a simple annuity of dividends for 8 quarters, plus the stock price in 8 quarters, discounted to present value.

Zero growth dividends followed by a growth stage:

$$P_0 = D_0 \times \left[\frac{1 - \frac{1}{(1+R)^t}}{R} \right] + \frac{P_t}{(1+R)^t}$$

$$P_t = \frac{D_0 \times (1+g)}{R-g}$$

DDM WITH TWO-STAGE GROWTH

- We can add growth to the first stage annuity
- The first stage becomes:
  - $PV_{first\ stage} = D_0 \times (1 + g_1) \times \left[\frac{1 - \left(\frac{1 + g_1}{1 + R} \right)^t}{R - g_1} \right]$

The DDM with two stage growth becomes:

$$Value_{stock} = D_0 \times (1 + g_1) \times \left[\frac{1 - \left(\frac{1 + g_1}{1 + R} \right)^t}{R - g_1} \right] + \frac{P_t}{(1 + R)^t}$$

$$P_t = \frac{D_0 \times (1 + g_1)^t \times (1 + g_2)}{R - g_2}$$

THE REQUIRED RETURN

- Usually we can observe the stock's price
- We can find the required rate of return using the DDM

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

$$R = \frac{D_1}{P_0} + g$$

$$R = Dividend\,Yield + Capital\,Gains\,Yield$$

Example:

$$P_0 = \$25, R = 12\%, g = 1\%$$

VALUATION USING MULTIPLES

- Sometimes stocks don't pay dividends
- We could look at the Free Cash Flow [Not in this course]
- We can also compare Earnings or Sales ratios
- Assume similar earnings risk and market efficiency

$$P_t = PE_{Benchmark} \times EPS_t$$

$$P_t = \text{Price-Sales}_{Benchmark} \times EPS_t$$

Example: Firm A has an EPS of $\$2.21$ per share. The benchmark PE is 18. Is the share price of $\$36$ overvalued?

COMMON STOCK FEATURES

- Voting
  - Cummalative Voting [Good for minority holders]
  - Straight Voting
- Proxy Voting
- Dual Class Shares

  Some shares can't vote.
- Dividends

  Proportional to holdings

SUMMARY

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