Dividend Valuation Models

In principle the value of a share is the present value of the cash flows that investors expect to receive as a result of holding the share. These cash flows consist of:

- the dividends expected during the planned holding period;
- the proceeds anticipated from the sale of the share at the end of the holding period.

The dividend discount model (DDM) is based on the rationale that the intrinsic value of stock is the present value of its future dividends.

Basic Share Valuation Model

$$V_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1 + k_e)^t}$$

Basic Share Valuation Model

- Cannot avoid the problems posed by the infinite life nature of shares – but discounting implies that dividends in the more distant future may contribute very little to value.

- The higher the rate of growth anticipated the greater the problem of more distant dividends

Basic Share Valuation Model

- The most general form of the DDM uses a n infinite holding period because a corporation has an indefinite life.
- In an infinite-period DDM model, the present value of all expected future dividends is calculated and there is no explicit terminal value for the stock.

Specified Holding Period Model

$$P_0 = \frac{E(D_1)}{(1+r)} + \frac{E(D_2)}{(1+r)^2} + \dots\dots\dots\dots + \frac{E(D_N)}{(1+r)^N} + \frac{E(P_N)}{(1+r)^N}$$

Investment Period of One Year

$$P_0 = E(D_1)\frac{1}{(1+r)} + E(P_1)\frac{1}{(1+r)}$$

Investment Period of One Year - The equilibrium rate of return

$$P_0 = E(D_1)\frac{1}{(1+r)} + E(P_1)\frac{1}{(1+r)}$$

$$P_0(1+r) = E(D_1) + E(P_1)$$

$$(1+r) = \frac{E(D_1)}{P_0} + \frac{E(P_1)}{P_0}$$

$$r = \frac{E(D_1)}{P_0} + \frac{E(P_1)}{P_0} - 1 = \frac{E(D_1)}{P_0} + \frac{E(P_1)}{P_0} - \frac{P_0}{P_0}$$

$$r = \frac{E(D_1)}{P_0} + \frac{E(P_1) - P_0}{P_0} = \mathit{Expected\ Dividend\ Yield} + \mathit{Expected\ Capital\ Gain\ Yield}$$

What Determines Next Year's Price?

$$E(P_1) = E(D_2)\frac{1}{(1+r)} + E(P_2)\frac{1}{(1+r)}$$

$$P_0 = E(D_1)\frac{1}{(1+r)} + E(P)_1\frac{1}{(1+r)}$$

$$P_0 = E(D_1)\frac{1}{(1+r)} + \frac{E(D_2)\frac{1}{(1+r)} + E(P_2)\frac{1}{(1+r)})}{(1+r)}$$

$$P_0 = E(D_1)\frac{1}{(1+r)} + E(D_2)\frac{1}{(1+r)^2} + E(P_2)\frac{1}{(1+r)^2}$$

Gordon growth model

The Gordon growth model (or constant growth model) assumes the annual growth rate of dividends, is constant.

The infinite period DDM has the following assumptions:

1. Dividends grow at a constant rate.
2. The constant growth rate will continue for an infinite period.
3. The required rate of return *(k) is greater than the infinite growth rate (g).*

$$P_0 = \frac{E(D_1)}{(1+r)} + \frac{E(D_1)(1+g)}{(1+r)^2} + \frac{E(D_1)(1+g)^2}{(1+r)^3} + \ldots.$$

$$P_0 = E(D_1)\frac{1}{(r-g)}$$

Gordon growth model

- Best suited - Gordon growth model is best suited for firms growing at a rate comparable to or lower than the nominal growth in the economy and which have well established dividend payout policies that they intend to continue into the future.
- Limitations - The Gordon growth model is a simple and convenient way of valuing stocks but it is extremely sensitive to the inputs for the growth rate. Used incorrectly, it can yield misleading or even absurd results, since, as the growth rate converges on the discount rate, the value goes to infinity.

Two-stage Dividend Discount Model

- The two-stage growth model allows for two stages of growth - an initial phase where the growth rate is not a stable growth rate and a subsequent steady state where the growth rate is stable and is expected to remain so for the long term.

- While, in most cases, the growth rate during the initial phase is higher than the stable growth rate, the model can be adapted to value companies that are expected to post low or even negative growth rates for a few years and then revert back to stable growth.

Two-stage Dividend Discount Model – continued

- The first practical problem is in defining the length of the extraordinary growth period.
- It would be much more realistic to assume that the shift from high growth to stable growth happens gradually over time.
- The focus on dividends in this model can lead to skewed estimates of value for firms that are not paying out what they can afford in dividends.
- It is best suited for firms which are in high growth and expect to maintain that growth rate for a specific time period, after which the sources of the high growth are expected to disappear. For example – firms having patent rights, industries with significant barriers to entry.

The H Model for valuing Growth

- The H model is a two-stage model for growth, but unlike the classical two-stage model, the growth rate in the initial growth phase is not constant but declines linearly over time to reach the stable growth rate in steady stage.
- The decline in the growth rate is expected to follow the strict structure laid out in the model - it drops in linear mode.
- The assumption that the payout ratio is constant through both phases of growth exposes the analyst to an inconsistency - as growth rates decline the payout ratio usually increases.

Three-stage Dividend Discount Model

The three-stage dividend discount model combines the features of the two-stage model and the H-model. It allows for an initial period of high growth, a transitional period where growth declines and a final stable growth phase. It is the most general of the models because it does not impose any restrictions on the payout ratio.

Three-stage Dividend Discount Model – continued

- This model removes many of the constraints imposed by other versions of the dividend discount model.
- In return, however, it requires a much larger number of inputs - year-specific payout ratios, growth rates.
- For firms where there is substantial noise in the estimation process, the errors in these inputs can overwhelm any benefits that accrue from the additional flexibility in the model.

Steps in using the multistage model

- Determine the discount rate, ke .
- Project the size and duration of the high initial dividend growth rate, g* .
- Estimate dividends during the high-growth period
- Estimate the constant growth rate at the end of the high-growth period, gc .
- Estimate the first dividend that will grow at the constant rate .
- Use the constant growth value to calculate the stock value at the end of the high growth period.
- Add the PVs of all dividends to the PV of the terminal value of the stock.

Criticisms of Dividend Discount Model

- It does not incorporate other ways of returning cash to stockholders (such as stock buybacks).
- It is argued that the dividend discount model does not reflect the value of 'unutilized assets'.
- Often the true potentiality of a firm is not reflected in dividend.
- When a firm does not pay dividends, estimates of dividend payments some years in the future are highly speculative. In this case, and in any case where future dividends cannot be estimated with much confidence, valuation based on FCFE is appropriate as long as growth rates of earnings can be estimated.

Using DDM in practice

- Challenge 1 – Determining the expected earnings
- Challenge 2 – Determining the appropriate cost of equity
- Challenge 3 – Determining the terminal growth rate
- Challenge 4 – Determining the expected dividend payout ratio

Challenge 1 – Determining the expected earnings

- When estimating the expected growth for a firm, we generally begin by looking at the firm's history.
- While past growth is not always a good indicator of future growth, it does convey information that can be valuable while making estimates for the future.
- The average growth rate can vary depending upon whether it is an arithmetic average or a geometric average

Challenge 1 – Determining the expected earnings

- The arithmetic mean weights percentage changes in earnings in each period equally and ignores compounding effects in earnings.
- The geometric mean considers compounding but focuses on the first and the last earnings observations in the series - it ignores the information in the intermediate observations and any trend in growth rates that may have developed over the period.
- These problems are at least partially overcome by using OLS regressions of earnings per share (EPS) against time.
- The log-linear version of this model converts the coefficient into a percentage change.
- ARIMA models a value in a time series as a linear combination of past values and past errors (shocks).
- SARIMA models can also be used since quarterly EPS have a strong seasonal component.

Challenge 1 – Sustainable earnings growth

The sustainable growth rate is the rate at which equity, earnings, and dividends can continue to grow indefinitely assuming that ROE is constant, the dividend payout ratio is constant, and no new equity is sold.

Sustainable growth = (1 - dividend payout ratio) x ROE

Challenge 1 – Sustainable earnings growth

$$ROE = \frac{Net\ income}{Sales}\ x\ \frac{Sales}{Total\ assets}\ x\ \frac{Total\ assets}{Equity} = \frac{Net\ income}{Equity}$$

$$= Profit\ Margin\ x\ Asset\ Turnover\ x\ Financial\ Leverage$$

Caveats in estimating earnings

- In general, revenue growth tends to be more persistent and predictable than earnings growth.
- The gain from using the firm-specific best models relative to using the same model for every firm is relatively small.
- Generating rates of return greater than the firm’s cost of capital is an addition to value.

Challenge two – Determining the appropriate pay-out ratio

- Firms have long-term target for dividends.
- Earnings increases are not always sustainable. As a result, dividend policy is not changed until managers can see that new earnings levels are sustainable.
- Managers focus more on dividend changes than on percentage levels.

Challenge three – Determining the appropriate cost of equity

Approach one - The capital asset pricing model approach:

- Step 1: Estimate the risk-free rate, RFR. Yields on default risk-free debt are usually used. The most appropriate maturity to choose is one that is close to the useful life of the project.
- Step 2: Estimate the stock's beta, This is the stock's risk measure.
- Step 3: Estimate the expected rate of return on the market
- Step 4: Use the capital asset pricing model (CAPM) equation to estimate the required rate of return

Challenge three – Determining the appropriate cost of equity

Challenges with CAPM approach:

- Beta is estimated using historical returns data. The estimate is sensitive to the length of time used and the frequency (daily, weekly, etc.) of the data.
- The estimate is affected by which index is chosen to represent the market return.
- Betas are believed to revert toward 1 over time, and the estimate may need to be adjusted for this tendency.
- Estimates of beta for small-capitalization firms may need to be adjusted upward to reflect risk inherent in small firms that is not captured by the usual estimation methods.
- Using the CAPM to estimate the cost of equity is problematic in developing countries beta does not adequately capture country risk.

Challenge three – Determining the appropriate cost of equity

Approach two: Decomposition

- Risk-free rate
- Expected inflation rate
- Risk premium for the industry versus the market
  - business risk (BR)
  - financial risk (FR)
  - liquidity risk (LR)
  - exchange rate risk (ERR)
  - country political risk (CR)

Challenge three – Determining the appropriate cost of equity

Approach three - Bond yield plus risk premium approach: Analysts often use an ad hoc approach to estimate the required rate of return. They add a risk premium (three to five percentage points) to the market yield on the firm's long-term debt.

$$ke = \text{bond yield} + \text{risk premium}$$

Challenge 4: What is a terminal growth rate?

- Given the uncertainty associated with estimates of expected inflation and real growth in the economy, there can be differences in the benchmark growth rate used by different analysts.
- The growth rate of a company may not be greater than that of the economy but it can be less. Firms can becomes smaller over time relative to the economy.
- An analyst may be stray from a strict limit imposed on the 'stable growth rate'. If a firm is likely to maintain a few years of 'above-stable' growth rates.