Financial Management

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Lecture 5

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Weighted Average Cost of capital

The **Weighted Average Cost of Capital (WACC)** is the average return required by all of the firm's investors.

It is determined by the firm's capital structure (the firm's relative amounts of debt and equity), interest rates, the firm's risk, and the market's attitude toward risk.

We can compute it as

$$R_{wacc} = \frac{E}{E+D} R_E + \frac{D}{E+D} R_D (1-T)$$

where E is the market value of the firm's equity, D is the market value of the firm's debt, R_E is the cost of equity, R_D is the cost of debt, and T is the corporate tax rate.

Valuing stocks – Dividend-discount model

The first stock valuation model we consider is the **dividend-discount model**.

The cash flows received by stock owners (dividends, capital gain) are risky, and therefore they are discounted by the **equity cost of capital** R_E.

In a perfectly competitive market, buying or selling a share must be a zero-NPV investment opportunity, and the price P_0 of the stock at time 0 has to be:

$$P_0 = \frac{Div_1 + P_1}{1 + R_E}$$

Valuing stocks – Dividend-discount model

If we multiply by $1 + R_E$, divide by P_0, and subtract 1 from both sides we get:

$$R_E = \frac{Div_1 + P_1}{P_0} - 1 = \frac{Div_1}{P_0} + \frac{P_1 - P_0}{P_0}$$

$\frac{Div_1}{P_0}$ is the **dividend yield**

$\frac{P_1 - P_0}{P_0}$ is the **capital gain rate**

The sum of the two is called the **total return** of the stock.

The equation states that the stock’s total return should equal the equity cost of capital.

Valuing stocks – Dividend-discount model

In $P_0 = \frac{Div_1 + P_1}{1 + R_E}$ we can replace the final stock price with the value that the next holder of the stock, with any investment horizon *H*, would be willing to pay, obtaining:

$$P_0 = \sum_{n=1}^{\infty} \frac{Div_n}{(1 + R_E)^n}$$

<u>If investors have exactly the same beliefs</u> about the future cash flows, their valuation of the stock will not depend on their investment horizon.

Valuing stocks – Dividend-discount model

Dividend-discount model: the stock price is equal to the present value of the expected future dividends it will pay.

In practice, a certain dividend growth rate g has to be assumed to apply this model. In the **simplest case where $\boldsymbol{g}$ is constant**, the price of stock can be computed as:

$$P_0 = \frac{Div_1}{R_E - g}$$

The main limitation of the dividend-discount model is that there is a tremendous amount of uncertainty associated with any forecast of a firm's future dividends.

Valuing stocks – Total payout model

Recently, an increasing number of firms have replaced dividend payouts with **share repurchases**, that is, the firm uses excess cash to buy back its own stock. Two effects:

- the more cash the firm uses to repurchase shares, the less it has available to pay dividends;
- by repurchasing shares, the firm decreases its share count, which increases its per-share earnings and dividends.

Valuing stocks – Total payout model

The **total payout model** values all of the firm's equity, rather than a single share. To do so, we discount the total payouts that the firm makes to shareholders (dividends + share repurchases). Then, we divide by the current number of shares outstanding to determine the share price.

$$P_0 = \frac{PV(Future\ Total\ Dividends\ and\ Repurchases)}{Shares\ Outstanding_0}$$

Forecasting the growth rate of total earnings (rather than earnings per share) when forecasting the growth of the firm's total payouts can be more reliable and easier to apply when the firm uses share repurchases.

Valuing stocks – Total payout model

To apply the total payout model, we still need to make assumptions regarding the growth rate of future payouts.

We can again make a simple assumption of constant growth rate g, in which case we have:

$$PV(Future\ Total\ Dividends\ and\ Repurchases)$$

$$= \frac{Div_1 + Repurchases_1}{R_E - g}$$

Valuing stocks – Discounted free cash flow model

The **discounted free cash flow model** begins by determining the firm's enterprise value, i.e. the total value of the firm to all investors, both equity and debt holders:

$$Enterprise\,Value\ =\ Market\,Value\ of\ Equity + Debt - Cash$$

The advantage is that we don't have to explicitly forecast the firm's dividends, share repurchases, or its use of debt.

To estimate the enterprise value, we compute the present value of the **free cash flow (FCF)** that the firm has available to pay all investors, both debt and equity holders. The FCF is the cash a company generates after accounting for cash outflows to support operations and maintain its assets.

Valuing stocks – Discounted free cash flow model

The share price is than given by:

$$P_0 = \frac{PV(Future\ Free\ Cash\ Flow\ of\ Firm) + Cash_0 - Debt_0}{Shares\ Outstanding_0}$$

In discounting the free cash flow that will be paid to both debt and equity holders we should use the firm's **weighted average cost of capital (WACC)**, R_{wacc}, which is the average cost of capital the firm must pay to all of its investors.

If the firm has no debt, R_{wacc}= R_E. But when a firm has debt, R_{wacc} is an average of the firm's debt and equity cost of capital. In that case, because debt is generally less risky than equity, R_{wacc} is generally less than R_E.

Valuing stocks – Discounted free cash flow model

Given the firm's weighted average cost of capital, the current value of the enterprise V_0 is:

$$V_0 = \sum_{t=1}^{\infty} \frac{FCF_t}{(1 + R_{wacc})^t}$$

As there is an infinite sum, to implement the discounted free cash flow model we need to make some assumptions.

The easiest case is if we assume that cash flows are constant forever. In this case we have a perpetuity:

$$V_0 = \frac{FCF}{R_{wacc}}$$

Valuing stocks – Discounted free cash flow model

Alternatively, we can assume that the FCF grow at a constant rate g forever (from period 1). In this case we have a growing perpetuity:

$$V_0 = \frac{FCF_1}{R_{wacc} - g}$$

Both these assumptions are unrealistic.

A more realistic assumption is that the free cash flows currently grow at non-constant rates, but that long-term growth will level off to a constant rate.

Valuing stocks – Discounted free cash flow model

In the last scenario, we forecast the firm's free cash flow up to some horizon, together with a terminal (continuation) value of the enterprise V_N:

$$V_0 = \frac{FCF_1}{1 + R_{wacc}} + \frac{FCF_2}{(1 + R_{wacc})^2} + \cdots + \frac{FCF_N + V_N}{(1 + R_{wacc})^N}$$

where

$$V_N = \frac{FCF_{N+1}}{R_{wacc} - g} = \frac{FCF_N + gFCF_N}{R_{wacc} - g}$$

The long-run growth rate g is typically based on the expected long-run growth rate of the firm's revenues.

Valuing stocks

No single technique provides a final answer regarding a stock's true value.

All approaches require forecasts that are too uncertain to provide a definitive assessment of the firm's value.

Most real-world practitioners use a combination of these approaches and gain confidence if the results are consistent across a variety of methods.