Assets as a Portfolio of Debt and Equity

Assets (V) can be viewed as a portfolio of the debt (D) and equity (E) that fund the asset, which is the balance sheet:

$$V = D + E$$

If you own all of the debt (bonds and loans) and equity (shares), you own the assets. Therefore the return on assets (r_V) are a weighted average of the returns on the portfolio of debt (r_D) and equity (r_E) that fund them. This is called the weighted average cost of capital (WACC) before tax:

$$r_V = r_D . \frac{D}{V} + r_E . \frac{E}{V} = \text{WACC}_{\text{before tax}}$$

$$r_p = r_1 . w_1 + r_2 . w_2 = \text{portfolio return}$$

Weighted Average Cost of Capital (WACC)

$$\text{WACC}_{\text{before tax}} = r_D . \frac{D}{V} + r_E . \frac{E}{V}$$

$$\text{WACC}_{\text{after tax}} = r_D . (1 - t_c) . \frac{D}{V} + r_E . \frac{E}{V}$$

The weighted average cost of capital, the WACC, is the:

- Required total return of debt, r_D, also called the cost of debt, weighted by the proportion of debt (D); and the
- Required total return of equity, r_E, also called cost of equity, weighted by the proportion of equity (E) used to finance the firm's assets (V).

Note that V, D and E are all supposed to be *market* values not *book* values.

Valuation using Cash Flows and WACC

Now that we know how to calculate cash flows, present values and the costs of debt and equity, the last step to valuing a whole business or project is to calculate the discount rate applicable to the cash flows. One method is to use the WACC.

The value of a firm (V) is equal to its Firm Free Cash Flows (FFCF) discounted its WACC. If FFCF are a perpetuity, then:

$$V = PV[FFCF\ discounted\ by\ WACC] = \frac{FFCF}{WACC - g}$$

Taxes are a complicating factor.