***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:

$$r\_{V}=r\_{D}.\frac{D}{V} +r\_{E}.\frac{E}{V}=WACC\_{before tax}$$

$$r\_{p}=r\_{1}.w\_{1} +r\_{2}.w\_{2}=portfolio return$$

***Weighted Average Cost of Capital (WACC)***

$$WACC\_{before tax}=r\_{D}.\frac{D}{V}+r\_{E}.\frac{E}{V}$$

$$WACC\_{after tax}=r\_{D}.\left(1-t\_{c}\right).\frac{D}{V}+r\_{E}.\frac{E}{V}$$

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:

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

Taxes are a complicating factor.