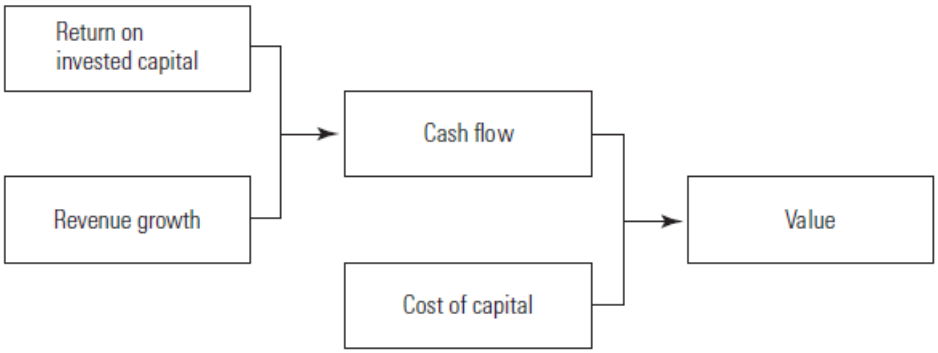
A Few Notes on Valuation

McKinsey & Company defines the value of a company as a function of the Free Cash Flows (FCF) discounted by the Cost of Capital (denoted as Weighted Average Cost of Capital or WACC). In turn it defines FCF as a function of Return on Invested Capital (ROIC) and Revenue Growth (g_r). The block diagram is represented as is from their book. [1]



$$Value = f\ (FCF,\ WACC)$$

$$Value = f\ (ROIC,\ g_r,\ WACC)\ ....(1)$$

In a normal scenario analysts try and arrive at the value of a firm today which essentially constitutes the *perceived* future value at present value today. This leads to assumptions and forecasting. But what about looking at the value of the firm in the past years and what correlations they had to their share prices?

Value is only created when a firm generates cash flows at rates of return which is greater than its cost of capital. Else value is destroyed. A derivative of this principle is that any firm activity which does not increase cash flows (at rates greater than the cost of capital) does not increase value.

Thus there can be only two scenarios:

$$Rate\ of\ FCF\ generation > Rate\ of\ cost\ of\ capital\ ....(A)$$

$$Rate\ of\ FCF\ generation < Rate\ of\ cost\ of\ capital\ ....(B)$$

In the rare case that the two rates are same then no matter what the growth or ROIC the firm will not change in value. Therefore omitting this scenario.

[1] Valuation, Measuring and Managing the Value of Companies 5^{th} edition, John Wiley & Sons, INC.

For Case B the situation is grim for the company. Meaning that even if they were to increase their ROIC and growth in revenues the firm would lose value. Infact the more they increase the inputs i.e. ROIC & g_r more the loss in value will get accentuated!

Therefore only Case A is worthwhile to pursue. The two inputs to the value function here can be reduced to the following:

$$Value = f(ROIC, g_r) \text{ ....(2)}$$

What is the behaviour of ROIC & g_r on the FCF and hence the value (for Case A)?
Value is more sensitive to changes in ROIC than in g_r. This means for a constant positive change in ROIC the value of the firm will rise to a greater extent than the same value of change in g_r. If we were to *believe* for the moment that Value is a linear function of ROIC & g_r then the coefficient of ROIC will be greater than that of g_r. Even if the function of Value is of any other form (polynomial, exponential etc.) the effect of the input ROIC on the output Value will be greater than that of the effect of g_r. This relationship has considerable real life implications.

Some generic math on how to arrive at the Value of a firm via a discounted cash flow method.

Terms and components used:
ROIC: *Return of Invested Capital*
FCF: *Free Cash Flow*
g_r: *Growth in Operating Revenue*
EBIT: *Earnings Before Interest & Taxes*
NOPLAT: *Net Operating Profit Less Adjusted Taxes*
g: *Growth in NOPLAT and Cash Flows*
IR: *Investment Rate*
IC: *Invested Capital*
NI: *Net Investments*
WACC: *Weighted Average Cost of Capital*
FA: *Fixed Assets*
CA: *Current Assets*
CL: *Current Liabilities*
C: *Cash & Cash Equivalents*
D: *Market Value of Debt*
E: *Market Value of Equity*
T: *Taxes*
k_d: *Cost of Debt*
k_e: *Cost of Equity*
r_f: *Risk Free Rate*
r_m: *Market Risk*
C_r: *Credit Risk Rate*
β: *Beta of the Stock*

Approach on arriving at Value
Find FCF and discount it at WACC for the given future periods. For the terminal value a different calculation is used.
Since in this note we are focusing on Case A and on historical values the aim is to calculate FCF. WACC and discounting step can be done later. At the end of day projections and forecasts are sensitive to the many assumptions taken and the unforeseen future.

The formulas:
(not to be treated with the iron clad rules like say as in Number Theory!)

$$EBIT = \frac{Operating\ Revenues}{Operating\ Expenses} \text{ .....(3)}$$

$$Invested\ Capital_t = FA_{t-1} + CA_{t-1} - CL_{t-1} - C_{t-1} \text{ .....(4)}$$

$$NOPLAT = EBIT(1 - T) \text{ .....(5)}$$

$$IR = \frac{Net\ Investment}{NOPLAT} \text{ .....(6)}$$

$$ROIC = \frac{NOPLAT}{Invested\ Capital_t} \text{ .....(7)}$$

$$g = \frac{NOPLAT_t - NOPLAT_{t-1}}{NOPLAT_{t-1}} \text{ .....(8)}$$

$$FCF = NOPLAT - NI \text{ .....(9)}$$

Substituting equation (6) in (9)

$$FCF = NOPLAT(1 - IR) \text{ .....(10)}$$

$$g = ROIC \times IR \text{ .....(11)}$$

Substituting equation (11) in (10)

$$FCF = NOPLAT\left(1 - \frac{g}{ROIC}\right) \text{ .....(12)}$$

$$Value = \frac{NOPLAT\left(1 - \frac{g}{ROIC}\right)}{WACC - g} \text{ .....(13)}$$

Some derivations of the components of WACC

$$WACC = \left(\frac{D}{D+E} \times k_d\right) + \left(\frac{E}{D+E} \times k_e\right) \text{ .....(14)}$$

$$k_d = (r_f + C_r)(1 - T) \text{ .....(15)}$$

As per Capital Asset Pricing Model (other ways also exist to arrive at the cost of equity)

$$k_e = r_f + \beta(r_m - r_f) \text{ .....(16)}$$

In brief though not doing justice to the methods of arriving at the following:
r_f can be arrived at by taking appropriate government bonds or in the case of India a term deposit rate would also suffice.
C_r can be got from the rating of the firm's bond/debt.
r_m is the return of the stock market index or a basket of stocks.
β is the variance of the return of the stock with that of the market.