

Capital budgeting formulas

Cash flows

$$\Delta OCF = (\Delta R - \Delta E - \Delta D) (1 - t) + \Delta D - \Delta NWC \quad \text{or} \quad \Delta OCF = (\Delta R - \Delta E) (1 - t) + \Delta Dt - \Delta NWC$$

where

- ΔOCF = change in operating cash flow;
- ΔR = change in revenues;
- ΔE = change in expenses;
- ΔD = change in depreciation;
- t = tax rate; and
- ΔNWC = change in working capital

Techniques

$$\text{Net present value} = NPV = \sum_{t=1}^N \frac{CF_t}{(1+r)^t} \qquad \text{Profitability index} = PI = \frac{\sum_{t=1}^N \frac{CIF_t}{(1+r)^t}}{\sum_{t=1}^N \frac{COF_t}{(1+r)^t}}$$

$$\text{IRR is the rate that solves the following: } \$0 = \sum_{t=1}^N \frac{CF_t}{(1+IRR)^t}$$

$$\text{Modified internal rate of return} = MIRR = \sqrt[N]{\frac{\sum_{t=1}^N CIF_t (1+i)^{N-t}}{\sum_{t=1}^N \frac{COF_t}{(1+i)^t}}}$$

where CF_t is the cash flow at the end of period t , and CIF_t and COF_t are cash inflows and cash outflows, respectively, at the end of period t .

Risk

$$\mathcal{E}(x) = \sum_{n=1}^N p_n x_n \qquad \sigma(x) = \sqrt{\sum_{n=1}^N p_n (x_n - \mathcal{E}(x))^2} \qquad \text{Coefficient of variation} = \frac{\sigma_x}{\mathcal{E}_x}$$

$$\beta_{\text{asset}} = \beta_{\text{equity}} \left[\frac{1}{\left(1 + \left((1 - \tau) \frac{\text{debt}}{\text{equity}} \right) \right)} \right]$$

$$\text{Compensation for market risk} = \beta_{\text{asset}} (r_m - r_f)$$

$$\text{Cost of capital} = r_f + \beta_{\text{asset}} (r_m - r_f)$$