

ROI and Decision-Making Based on the Net Present Value of Cash Flows

In Comparing Product B and Product A, Product B is a better choice if the Net Present Value of its cash flows exceeds that of Product A, where the discount rate, r , is the annual hurdle rate. Net present values of each alternative in Table 1 are defined in a standard way:

$$\text{Net Present Value of Product B} = \frac{\text{Benefits}_{B1} - \text{Costs}_{B0}}{(1+r)}$$

$$\text{Net Present Value of Product A} = \frac{\text{Benefits}_{A1} - \text{Costs}_{A0}}{(1+r)}$$

where the first subscript refers to the Product and the second subscript refers to the year of the cashflow involved. Cashflows in year 1 should be discounted based on the hurdle rate. Costs, which in Table 1 all occur upfront, should not be discounted. Product B will be the better choice when its NPV is greater than that of Product A:

$$\frac{\text{Benefits}_{B1} - \text{Costs}_{B0}}{(1+r)} > \frac{\text{Benefits}_{A1} - \text{Costs}_{A0}}{(1+r)}$$

Multiplying through by $(1+r)$,

$$\text{Benefits}_{B1} - (1+r)*\text{Costs}_{B0} > \text{Benefits}_{A1} - (1+r)*\text{Costs}_{A0}$$

Rearranging terms,

$$(\text{Benefits}_{B1} - \text{Costs}_{B0}) - (\text{Benefits}_{A1} - \text{Costs}_{A0}) > r*(\text{Costs}_{B0} - \text{Costs}_{A0})$$

Regrouping and dividing, Product B is the better choice when:

$$\frac{(\text{Benefits}_{B1} - \text{Benefits}_{A1}) - (\text{Costs}_{B0} - \text{Costs}_{A0})}{(\text{Costs}_{B0} - \text{Costs}_{A0})} > r$$

In words, this decision criterion is:

The Incremental ROI of B vs A exceeds the hurdle rate.