Relevant Cash Flows: Principles

Issue
Which cash flows to include for project evaluation?

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+k)^t}$$

Incremental (Marginal) Cash Flows

$$\text{Project } CF_t = \text{Firm } CF_t \text{ w/ project} - \text{Firm } CF_t \text{ w/o project}$$

Cash Flow (CF) v. Net Income (NI)
Credit vs. Cash Sales and Expenses
Capital Outlays vs. Depreciation
Timing

Relevant Cash Flows: Details

Some Specifics
Depreciation
Sunk Costs
Allocated Costs
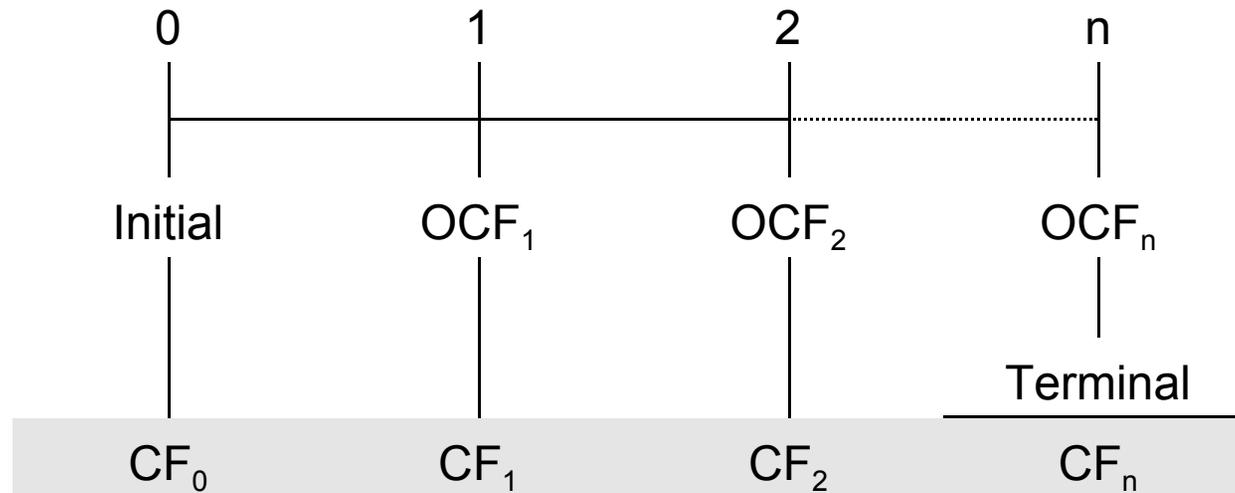Financing Costs
Implicit Costs (including "excess" capacity)
Externalities: cannibalization & synergy
Change in Net Working Capital (ΔNWC)
Taxes

Classifying Cash Flows

Chronological Classification

$$
\begin{array}{cccc}
0 & 1 & 2 & n
\end{array}
$$

Initial OCF_1 OCF_2 OCF_n

Terminal

CF_0 CF_1 CF_2 CF_n

Examples

Initial (t=0):   purchase, shipping & installation; ΔNWC

Operating (t=1,...n):   cash sales/expenses, taxes

Terminal (t=n):   net salvage value, reversal of ΔNWC

Calculating Project Cash Flows

Initial Cash Flows

Cost of asset Purchase, shipping, installation

Initial ΔNWC $\Delta CA_0 -$ spontaneous ΔCL_0

Operating Cash Flows

bottom-up:

$$OCF_t = NI_t + Dep_t + Int_t$$

$$OCF_t = EBIT_t + Dep_t - Tax_t$$

top-down:

$$OCF_t = \left(R_t - C_t\right)\left(1 - T_c\right) + T_c Dep_t$$

Terminal Cash Flows

Reversal of initial ΔNWC

$$\Delta NWC_T = -\Delta NWC_0$$

Net Salvage Value

$$NSV_T = SV_T - T_c\left(SV_T - BV_T\right)$$

Miscellaneous Issues

Replacement

every period: $\Delta OCF_t = (\Delta R_t - \Delta C_t)(1 - T_C) + T_C \Delta Dep_t$

once: NSV of old equipment "shifted" to present

Inflation

Be consistent: nominal cash flows discounted at nominal rate

Market rates already contain an inflation forecast: $k_{RF} \approx k^* + IRP$

If cash flows not similarly "grossed up," NPV biased downward

$$NPV = \sum_{t=0}^{n} \frac{real\ CF_t (1 + IRP)^t}{(1 + k)^t}$$

Abandonment

Disinvestment also a capital budgeting decision

A "real" option

Abandonment (Optimal Life): Example

k = 10%

t	OCF(t)	NSV(t)	NPV(t)
0	(4,800)	4,800	0.00
1	2,000	3,000	(254.55)
2	1,875	1,900	138.02
3	1,750	0	(117.43)

Or abandon when NSV > PV(all future CFs)

Calculations:

$$NPV(0) = -4800 + 4800 = 0$$

$$NPV(1) = -4800 + \frac{2000}{1.10} + \frac{3000}{1.10} = -254.55$$

$$NPV(2) = -4800 + \frac{2000}{1.10} + \frac{1875}{(1.10)^2} + \frac{1900}{(1.10)^2} = 138.02$$

$$NPV(3) = -4800 + \frac{2000}{1.10} + \frac{1875}{(1.10)^2} + \frac{1750}{(1.10)^3} = -117.43$$