Chapter 8: Using DCF Analysis to Make Investment Decisions

Capital Budgeting: is the process of planning for capital expenditures (long term investment).
Planning process involves
1- Estimating the cash flows associated with the investment project (ch. 8)
2- Evaluating the stream of the cash flows associated with the project (ch. 7).

Examples of Capital expenditures:

- The purchase of a new piece of equipment, land, or a building.
- The replacement of an existing machine or equipment.
- Lease vs. Buy analysis

Principles of Estimating Cash Flows:
- Net investment (NINV)
- Net cash flows (NCF's)

1. **Measure on an incremental basis:** NINV and NCF both are measured on incremental basis, i.e. you only include the cash flows that result from adopting project and these cash flows would not exist had we not adopt the project. For example, XYZ Co. owns an old equipment that produce 10,000 units a year which results in an annual sales of $10,000,000. If XYZ Co. sell this equipment and buy a new one, it will be able to produce and sell 15,000 items a year for a total of $15,000,000. The cash flow estimated from this replacement project is: NINV = the Cash flows associated with buying the new equipment - the Cash flows associated with selling the old equipment. NCF should include only
15,000,000 – 10,000,000 = 5,000.

2. **Include changes in NWC:** Net Working Capital = Current Assets – Current Liabilities. NWC is the additional investment in current assets (cash, receivables, and inventory) that is not financed by spontaneous increase in current liabilities. Initial NWC is included in the cash flow estimation of NINV. Further NWC is included in the cash flow estimation of NCF. All NWC should be recovered by the end of the period.

3. **Include indirect effects:** Example, GM estimate $2.5 billion revenue from selling the new Saturn cars. Some of those sales ($400 million) will come from customers who otherwise would have bought another model form GM, say Pontiac. Therefore, Saturn takes away $400 million in sales from the other model. For cash flow purposes only $2.1 billion will be considered as the revenue form Saturn.

4. **Exclude sunk costs:** A **sunk cost** is a cash outlay that has already occurred or that will occur regardless of whether the project is accepted. Thus they have no incremental effect and are irrelevant to the analysis. For Example, you decided to use part of a location that you already own to place new equipment. The value of the location or the used part of it is not relevant to the cash flow estimation since you pay for it regardless of the project. Sunk Cost is not included in the ash flow estimation of the project because it can not be recovered.

5. **Measure value of resources in terms of their opportunity costs:** Always ask yourself: what if I did not use this asset in this project, how much cash flow it would generate? If this asset would generate cash flows had you not use it in the project, then you should include theses cash flows as opportunity cost. For example, if you are not using the current location to place your assets, you could sell it to someone else for $60,000. You will basically lose $60,000 because you decided to use the location and not sell it. This $60,000 should be included in NINV because it is the opportunity cost.

6. **If inflation is expected during the life of the project**, cash flows must be adjusted upward to nominal values. The adjustment should reflect the added price changes in the prices of the products, labor costs, etc., rather than a general inflation rate, such as the Consumer Price Index.

ESTIMATING PROJECT CASH FLOWS

Two Types:
   1- **New Project**
   2- **Replacement project**

Estimating cash flows for a new project

1- Calculating the Net Investment (NINV)

NINV = [New project cost + installation and shipping costs
+ Initial investment in NWC]

2- Calculating the Annual Net Cash Flows (NCF)

Net cash flows are the cash inflows from the project minus cash outflows associated with project, all on after tax basis. **Net Cash flow is two parts**:

A- Operating cash flows (OCF) which recognize the operating aspects of the projects such as revenue and expenses.

B- Changes in NWC required operating the project.

$$NCF = \underbrace{(R - O - Dep)(1 - T) + Dep}_{OCF} - \Delta NWC \quad \text{for every year}$$

R = Cash inflow from **revenue**
O = Cash outflow due to **cash operating expenses**
Dep = Depreciation expenses ➔ Dep = $\frac{\text{(Project cost + installation and shipping)}}{\text{Number of periods}}$

T = Marginal Tax rate
ΔNWC = NWC (this year) – NWC (previous year)

3- Calculating the Net Cash Flows (NCF) for the Terminal Year

$$NCF(Ter \min al) = \underbrace{(R - O - Dep)(1 - T) + Dep}_{OCF} - \Delta NWC + ATSV$$

ATSV = After Tax Salvage Value
ATSV = Selling Price – (Selling Price - book value)(T)

Book Value of the asset (for terminal year) =
(cost of the asset + installation and shipping) – Accumulated deprecation).

For fully depreciated asset the book value at the end of the period is zero.

Gain (loss) on sale of assets = selling price – book value

Estimating cash flows for a **Replacement Project**

1- Calculating the Net Investment (NINV)

NINV =   [Cost of the new project + installation and shipping]
+   Initial Increases in net working capital
-      ATSV of the old asset

2- Calculating the Annual Net Cash Flows (NCF)

$$\text{NCF} = [(R_w - R_{wo}) - (O_w - O_{wo}) - (Dep_w - Dep_{wo})] \times (1-T) + (Dep_w - Dep_{wo}) - \Delta \text{NWC}$$

3- Calculating the Net Cash Flows (NCF) for the Terminal Year

$$\text{NCF}(Ter\min al) = [(R_w - R_{wo}) - (O_w - O_{wo}) - (Dep_w - Dep_{wo})] \times$$
$$(1-T) + (Dep_w - Dep_{wo}) - \Delta \text{NWC} + ATSV$$

NOTES:

⬤ **Any increase in NWC (initial or further increases) should be recovered by the end of the project. The sum of all ΔNWC from year 0 to the terminal year should equal zero.**
Interest Charges
⬤ **Interest charges are considered separate from NCF's**
  ➢ **Investment decision is separate from finance decision**
  ➢ **Finding the PV of the NCF's already incorporates the interest charges**

Problems in Cash Flow Estimation
⬤ **Uncertainty of future cash flows**
⬤ **Accuracy of forecasts dependent on the nature of the project**
  ➢ **Replacement projects easier than new product introductions**

NOTES:

MACRS schedules

Congress established depreciation schedules, called the **modified accelerated cost recovery system (MACRS)**, that provide an accelerated rate of depreciation, depending on the class of asset, which offsets the reduced real value of the tax shield when inflation exists. See Table 8-2 for the MACRS schedules.

Year(s)	Recovery Period Class					
	3-Year	5-Year	7-Year	10-Year	15-Year	20-Year
1	33.33	20.00	14.29	10.00	5.00	3.75
2	44.45	32.00	24.49	18.00	9.50	7.22
3	14.81	19.20	17.49	14.40	8.55	6.68
4	7.41	11.52	12.49	11.52	7.70	6.18
5		11.52	8.93	9.22	6.93	5.71
6		5.76	8.93	7.37	6.23	5.28
7			8.93	6.55	5.90	4.89
8			4.45	6.55	5.90	4.52
9				6.55	5.90	4.46
10				6.55	5.90	4.46
11				3.29	5.90	4.46
12					5.90	4.46
13					5.90	4.46
14					5.90	4.46
15					5.90	4.46
16					2.99	4.46
17-20						4.46
21						2.25

The MACRS provides a faster depreciation rate (double-declining balance) and tax shield recovery compared to the **straight-line depreciation** rate, which provides for equal depreciation amounts over the useful life of the project. See Table 8-3.

Year	Straight-Line Depreciation			MACRS Depreciation		
	Depreciation	Tax Shield	PV Tax Shield At 12%	Depreciation	Tax Shield	PV Tax Shield At 12%
1	2,000	700	625	2,000	700	625
2	2,000	700	558	3,200	1,120	893
3	2,000	700	498	1,920	672	478
4	2,000	700	445	1,152	403	256
5	2,000	700	397	1,152	403	229
6	0	0	0	576	202	102
Totals	10,000	3,500	2,523	10,000	3,500	2,583

Cash Flows from Operations

Cash flows from operations may be calculated three ways:

1- Cash flow from operations = cash revenues – cash expenses – cash taxes
2- Cash flow from operations = Net Income + depreciation
3- Cash flow from operations = (cash revenues – cash expenses)(1-T) + depreciation*(T)

EXAMPLE: BLOOPER INDUSTRIES

	Year:	0	1	2	3	4	5
A. NINV							
Investments in fixed assets		10,000					
Initial investment in NWC		3,900					
Net Investment		13,900					
B. Working capital							
Working capital (0.26 of next year revenue)		3,900	4,095	4,300	4,515	4,740	0
Change in working capital		3,900	195	205	215	226	-4,740
C. Operations							
Revenues			15,000	15,750	16,538	17,364	18,233
- Expenses			10,000	10,500	11,025	11,576	12,155
- Depreciation			2,000	2,000	2,000	2,000	2,000
= Earnings before taxes			3,000	3,250	3,513	3,788	4,078
- Tax			1,050	1,138	1,229	1,326	1,427
= Earnings after taxes			1,950	2,113	2,283	2,462	2,650
+ Depreciation			2,000	2,000	2,000	2,000	2,000
= Cash flow from operations			3,950	4,113	4,283	4,462	4,650
- Change in NWC			195	205	215	226	-4,740
+ATSV							1,300
D. Project valuation							
Total project cash flow		-13,900	3,755	3,908	4,068	4,237	10,691
Discount factor		1.0	0.8929	0.7972	0.7118	0.6355	0.5674
PV of cash flow		-13,900	3,353	3,115	2,896	2,692	6,066
Net present value (NPV)		4,222					
E. Other inputs							
Inflation rate		0.05					
Discount rate		0.12					
Tax rate		0.35					