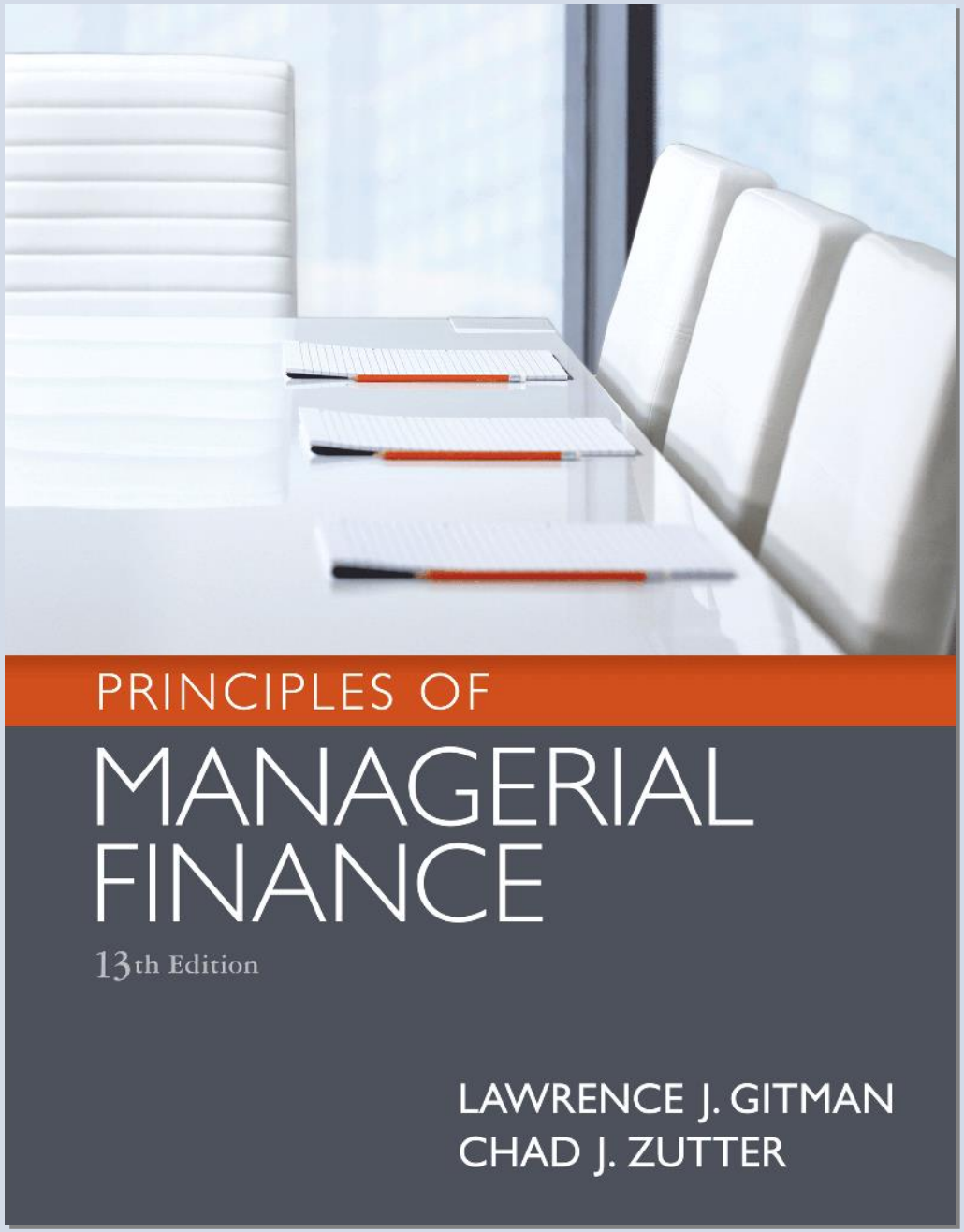
Chapter 11

Capital Budgeting Cash Flows



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Relevant Cash Flows

- To evaluate investment opportunities, financial managers must determine the **relevant cash flows** associated with the project. These are the *incremental cash outflow (investment)* and *inflows (return)*. The incremental cash flows represent the additional cash flows (outflows or inflows) – expected to result from a proposed capital expenditure.

Relevant Cash Flows: Major Cash Flow Components

The cash flows of any project may include three basic components:

1. **Initial investment**: the relevant cash outflow for a proposed project at time zero.
2. **Operating cash inflows**: the incremental after-tax cash inflows resulting from implementation of a project during its life.
3. **Terminal cash flow**: the after-tax nonoperating cash flow occurring in the final year of a project. It is usually attributable to liquidation of the project.

Figure 11.1
Cash Flow Components

FIGURE 11.1

Cash Flow Components
Time line for major cash flow components

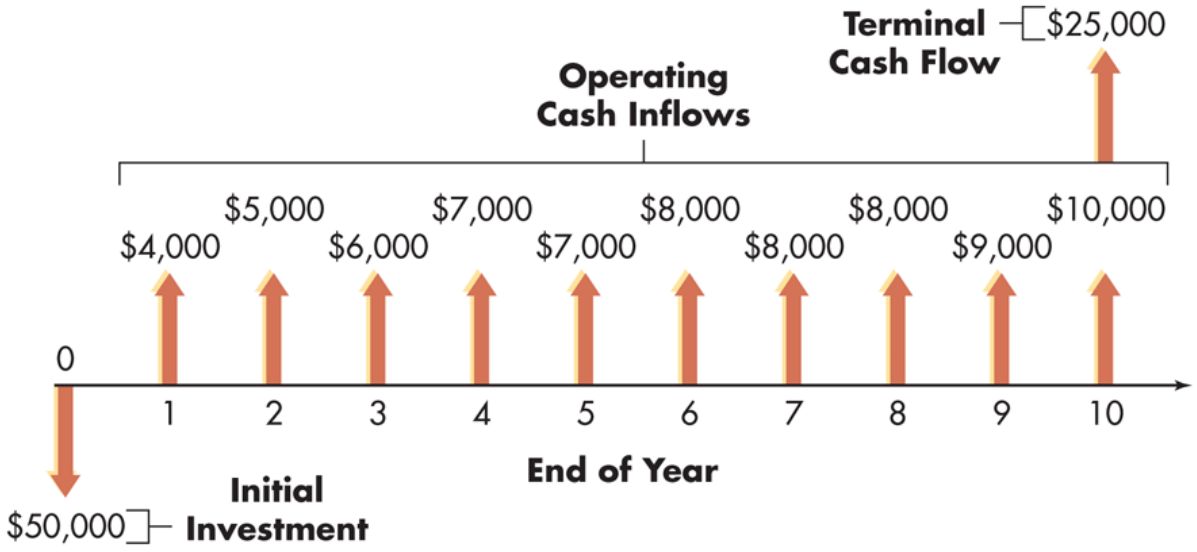

Table 11.1 The Basic Format for Determining Initial Investment

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Installed cost of new asset =
Cost of new asset
+ Installation costs
− After-tax proceeds from sale of old asset =
Proceeds from sale of old asset
∓ Tax on sale of old asset
± Change in net working capital
Initial investment

Finding the Initial Investment: Installed Cost of New Asset

- The **cost of new asset** is the net outflow necessary to acquire a new asset.
- **Installation costs** are any added costs that are necessary to place an asset into operation.
- The **installed cost of new asset** is the cost of new asset plus its installation costs; equals the asset's depreciable value.

Finding the Initial Investment: After-Tax Proceeds from Sale of Old Asset

- The **after-tax proceeds from sale of old asset** are the difference between the old asset's sale proceeds and any applicable taxes or tax refunds related to its sale.
- The **proceeds from sale of old asset** are the cash inflows, net of any removal or cleanup costs, resulting from the sale of an existing asset.
- The **tax on sale of old asset** is the tax that depends on the relationship between the old asset's sale price and book value, and on existing government tax rules.
- **Book value** is the strict accounting value of an asset, calculated by subtracting its accumulated depreciation from its installed cost.

Book Value = Installed Cost – Accumulated Depreciation

TABLE 4.2 Rounded Depreciation Percentages by Recovery Year Using MACRS for First Four Property Classes

Recovery year	Percentage by recovery year[a]			
	3 years	5 years	7 years	10 years
1	33%	20%	14%	10%
2	45	32	25	18
3	15	19	18	14
4	7	12	12	12
5		12	9	9
6		5	9	8
7			9	7
8			4	6
9				6
10				6
11				4
Totals	100%	100%	100%	100%

[a] These percentages have been rounded to the nearest whole percent to simplify calculations while retaining realism. To calculate the *actual* depreciation for tax purposes, be sure to apply the actual unrounded percentages or directly apply double-declining balance depreciation using the half-year convention.

Table 11.2 Tax Treatment on Sale of Assets

TABLE 11.2 Tax Treatment on Sales of Assets

Form of taxable income	Definition	Tax treatment	Assumed tax rate
Gain on sale of asset	Portion of the sale price that is *greater than* book value.	All gains above book value are taxed as ordinary income.	40%
Loss on sale of asset	Amount by which sale price is *less than* book value.	If the asset is depreciable and used in business, loss is deducted from ordinary income.	40% of loss is a tax savings
		If the asset is *not* depreciable or is *not* used in business, loss is deductible only against capital gains.	40% of loss is a tax savings

Finding the Initial Investment: Change in Net Working Capital

- **Net working capital** is the amount by which a firm's current assets exceed its current liabilities.
- The **change in net working capital** is the difference between a change in current assets and a change in current liabilities.
  - Generally, current assets increase by more than current liabilities, resulting in an increased investment in net working capital. This increased investment is treated as an initial outflow.
  - If the change in net working capital were negative, it would be shown as an initial inflow.

Table 11.3 Calculation of Net Working Capital for Danson Company

TABLE 11.3 Calculation of Change in Net Working Capital for Danson Company

Current account	Change in balance	
Cash	+ $ 4,000	
Accounts receivable	+ 10,000	
Inventories	+ 8,000	
(1) Current assets		+$22,000
Accounts payable	+ $ 7,000	
Accruals	+ 2,000	
(2) Current liabilities		+ 9,000
Change in net working capital [(1) − (2)]		+$13,000

Finding the Initial Investment: Calculating the Initial Investment

Powell Corporation is trying to determine the initial investment required to replace an old machine with a new, more sophisticated model. The proposed machine's purchase price is $380,000, and an additional $20,000 will be necessary to install it. It will be depreciated under MACRS using a 5-year recovery period. The present (old) machine was purchased 3 years ago at a cost of $240,000 and was being depreciated under MACRS using a 5-year recovery period. The firm has found a buyer willing to pay $280,000 for the present machine and to remove it at the buyer's expense. The firm expects that a $35,000 increase in current assets and an $18,000 increase in current liabilities will accompany the replacement. The firm pays taxes at a rate of 40%.

Finding the Initial Investment: Calculating the Initial Investment (cont.)

Installed cost of proposed machine		
Cost of proposed machine	$380,000	
+ Installation costs	20,000	
Total installed cost—proposed (depreciable value)		$400,000
– After-tax proceeds from sale of present machine		
Proceeds from sale of present machine	$280,000	
– Tax on sale of present machine	84,160	
Total after-tax proceeds—present		195,840
+ Change in net working capital		17,000
Initial investment		$221,160

Finding the Initial Investment: Calculating the Initial Investment (cont.)

The resulting book value is:

$69,600 = (240,000 – [(0.20 + 0.32 + 0.19) x 240,000]

A gain of **$210,400** = (280,000 – 69,600) is realized on the sale.

The total taxes on the gain are

$84,160 = (0.40 x 210,400)

Finding the Operating Cash Inflows

- Benefits expected to result from proposed capital expenditures must be measured on an after-tax basis, because the firm will not have the use of any benefits until it has satisfied the government's tax claims.
- All benefits expected from a proposed project must be measured on a cash flow basis.
  - Cash inflows represent dollars that can be spent, not merely "accounting profits."
  - The basic calculation for converting after-tax net profits into operating cash inflows requires adding depreciation and any other noncash charges (amortization and depletion) deducted as expenses on the firm's income statement back to net profits after taxes.

Finding the Operating Cash Inflows (cont.)

- The final step in estimating the operating cash inflows for a proposed replacement project is to calculate the incremental (relevant) cash inflows.
- Incremental operating cash inflows are needed because our concern is only with the change in operating cash inflows that result from the proposed project.

Table 11.4 Powell Corporation's Revenue and Expenses for Proposed and Present Machines

TABLE 11.4 Powell Corporation's Revenue and Expenses (Excluding Depreciation and Interest) for Proposed and Present Machines

	With proposed machine			With present machine	
Year	Revenue (1)	Expenses (excl. depr. and int.) (2)	Year	Revenue (1)	Expenses (excl. depr. and int.) (2)
1	$2,520,000	$2,300,000	1	$2,200,000	$1,990,000
2	2,520,000	2,300,000	2	2,300,000	2,110,000
3	2,520,000	2,300,000	3	2,400,000	2,230,000
4	2,520,000	2,300,000	4	2,400,000	2,250,000
5	2,520,000	2,300,000	5	2,250,000	2,120,000

Table 11.5a Depreciation Expense for Proposed and Present Machines for Powell Corporation

TABLE 11.5 Depreciation Expense for Proposed and Present Machines for Powell Corporation

Year	Cost (1)	Applicable MACRS depreciation percentages (from Table 4.2) (2)	Depreciation [(1) × (2)] (3)
With proposed machine			
1	$400,000	20%	$ 80,000
2	400,000	32	128,000
3	400,000	19	76,000
4	400,000	12	48,000
5	400,000	12	48,000
6	400,000	5	20,000
Totals		100%	$400,000

Table 11.5b Depreciation Expense for Proposed and Present Machines for Powell Corporation

With present machine			
1	$240,000	12% (year-4 depreciation)	$28,800
2	240,000	12 (year-5 depreciation)	28,800
3	240,000	5 (year-6 depreciation)	12,000
4	Because the present machine is at the end of the third year of its cost recovery at the time the analysis is performed, it has only the final 3 years of depreciation (as noted above) still applicable.		0
5			0
6			0
Total			$69,600[a]

[a]The total $69,600 represents the book value of the present machine at the end of the third year, as calculated in Example 11.5.

Table 11.6 Calculation of Operating Cash Inflows Using the Income Statement Format

TABLE 11.6 Calculation of Operating Cash Inflows Using the Income Statement Format

Revenue
− Expenses (excluding depreciation and interest)
Earnings before depreciation, interest, and taxes (EBDIT)
− Depreciation
Earnings before interest and taxes (EBIT)
− Taxes (rate = T)
Net operating profit after taxes [NOPAT = EBIT × (1 − T)]
+ Depreciation
Operating cash inflows (same as OCF in Equation 4.3)

Table 11.7a Calculation of Operating Cash Inflows for Powell Corporation's Proposed and Present Machines

TABLE 11.7 Calculation of Operating Cash Inflows for Powell Corporation's Proposed and Present Machines

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
With proposed machine						
Revenue[a]	$2,520,000	$2,520,000	$2,520,000	$2,520,000	$2,520,000	$ 0
− Expenses (excluding depreciation and interest)[b]	2,300,000	2,300,000	2,300,000	2,300,000	2,300,000	0
Earnings before depreciation, interest, and taxes	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 0
− Depreciation[c]	80,000	128,000	76,000	48,000	48,000	20,000
Earnings before interest and taxes	$ 140,000	$ 92,000	$ 144,000	$ 172,000	$ 172,000	−$20,000
− Taxes (rate, $T = 40\%$)	56,000	36,800	57,600	68,800	68,800	− 8,000
Net operating profit after taxes	$ 84,000	$ 55,200	$ 86,400	$ 103,200	$ 103,200	−$12,000
+ Depreciation[c]	80,000	128,000	76,000	48,000	48,000	20,000
Operating cash inflows	$ 164,000	$ 183,200	$ 162,400	$ 151,200	$ 151,200	$ 8,000

Table 11.7b Calculation of Operating Cash Inflows for Powell Corporation's Proposed and Present Machines

With present machine						
Revenue[a]	$2,200,000	$2,300,000	$2,400,000	$2,400,000	$2,250,000	$ 0
− Expenses (excluding depreciation and interest)[b]	1,990,000	2,110,000	2,230,000	2,250,000	2,120,000	0
Earnings before depreciation, interest, and taxes	$ 210,000	$ 190,000	$ 170,000	$ 150,000	$ 130,000	$ 0
− Depreciation[c]	28,800	28,800	12,000	0	0	0
Earnings before interest and taxes	$ 181,200	$ 161,200	$ 158,000	$ 150,000	$ 130,000	$ 0
− Taxes (rate, $T = 40\%$)	72,480	64,480	63,200	60,000	52,000	0
Net operating profit after taxes	$ 108,720	$ 96,720	$ 94,800	$ 90,000	$ 78,000	$ 0
+ Depreciation[c]	28,800	28,800	12,000	0	0	0
Operating cash inflows	$ 137,520	$ 125,520	$ 106,800	$ 90,000	$ 78,000	$ 0

[a]From column 1 of Table 11.4.
[b]From column 2 of Table 11.4.
[c]From column 3 of Table 11.5.

Table 11.8 Incremental (Relevant) Operating Cash Inflows for Powell Corporation

TABLE 11.8 Incremental (Relevant) Operating Cash Inflows for Powell Corporation

	Operating cash inflows		
Year	Proposed machine[a] (1)	Present machine[a] (2)	Incremental (relevant) [(1) − (2)] (3)
1	$164,000	$137,520	$26,480
2	183,200	125,520	57,680
3	162,400	106,800	55,600
4	151,200	90,000	61,200
5	151,200	78,000	73,200
6	8,000	0	8,000

[a]From final row for respective machine in Table 11.7.

Finding the Terminal Cash Flow

- Terminal cash flow is the cash flow resulting from termination and liquidation of a project at the end of its economic life.
- It represents the after-tax cash flow, exclusive of operating cash inflows, that occurs in the final year of the project.
- The proceeds from sale of the new and the old asset, often called "salvage value," represent the amount net of any removal or cleanup costs expected upon termination of the project.
  - If the net proceeds from the sale are expected to exceed book value, a tax payment shown as an outflow (deduction from sale proceeds) will occur.
  - When the net proceeds from the sale are less than book value, a tax rebate shown as a cash inflow (addition to sale proceeds) will result.

Finding the Terminal Cash Flow (cont.)

- When we calculate the terminal cash flow, the change in net working capital represents the reversion of any initial net working capital investment.
- Most often, this will show up as a cash inflow due to the reduction in net working capital; with termination of the project, the need for the increased net working capital investment is assumed to end.

Table 11.9 The Basic Format for Determining Terminal Cash Flow

TABLE 11.9 The Basic Format for Determining Terminal Cash Flow

	After-tax proceeds from sale of new asset =
	Proceeds from sale of new asset
∓	Tax on sale of new asset
−	After-tax proceeds from sale of old asset =
	Proceeds from sale of old asset
∓	Tax on sale of old asset
±	Change in net working capital
	Terminal cash flow

Finding the Terminal Cash Flow (cont.)

Powell Corporation expects to be able to liquidate the new machine at the end of its 5-year usable life to net $50,000 after paying removal and cleanup costs. The old machine can be liquidated at the end of the 5 years to net $10,000. The firm expects to recover its $17,000 net working capital investment upon termination of the project. The firm pays taxes at a rate of 40%.

Finding the Terminal Cash Flow (cont.)

After-tax proceeds from sale of proposed machine		
Proceeds from sale of proposed machine	$50,000	
− Tax on sale of proposed machine	12,000	
Total after-tax proceeds—proposed		$38,000
− After-tax proceeds from sale of present machine		
Proceeds from sale of present machine	$10,000	
− Tax on sale of present machine	4,000	
Total after-tax proceeds—present		6,000
+ Change in net working capital		17,000
Terminal cash flow		$49,000

Summarizing the Relevant Cash Flows

- The initial investment, operating cash inflows, and terminal cash flow together represent a project's relevant cash flows.
- These cash flows can be viewed as the incremental after-tax cash flows attributable to the proposed project.
- They represent, in a cash flow sense, how much better or worse off the firm will be if it chooses to implement the proposal.

Summarizing the Relevant Cash Flows (cont.)

Time line for Powell Corporation's relevant cash flows with the proposed machine