

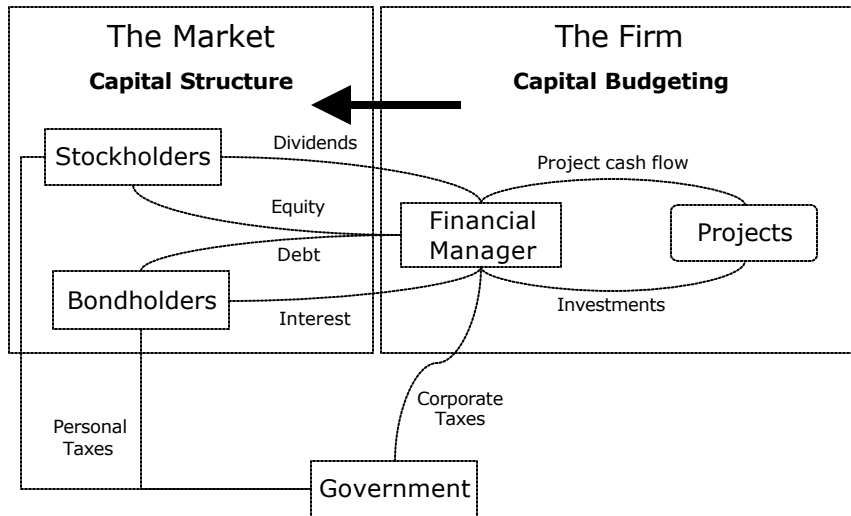
Cash Flow, Taxes, and Project Evaluation

- Of the four steps in calculating NPV, the most difficult is the first: Forecasting cash flows.
- We now focus on this problem, with special attention to
 - What is cash flow from assets?
 - What do we include, and what do we exclude?
 - Incremental cash flow principal
 - How do taxes impact cash flow
 - Capital Cost Allowance

Remember Income versus Cashflow

- Examples:
 - We make a big sale today but allow the customer to pay in 24 months. When should we record the revenue?
 - We buy a delivery truck that will last us ten years. When should we record the expense?
- Cashflow
 - simple to measure, highly variable and hence not a good measure of profitability
- Income
 - income & expense accrual and matching principles
 - non-cash items (ex.:depreciation expense)
- How do we translate from Income to Cash flow?

Cash Flow From Assets



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Two ways to measure Cash flow from assets

Cash flow to creditors (bondholders)	Interest paid – Net new borrowing
+	
Cash flow to owners (stockholders)	Dividends paid – Net new equity

Operating cash flow	Earnings before interest & taxes (EBIT) + depreciation – taxes
–	
Net capital spending	Ending net fixed assets – beginning net fixed assets + depreciation
–	
Additions to net working capital (NWC)	Ending NWC – beginning NWC

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Net Working Capital (NWC)

- **Definition:** Current Assets minus Current Liabilities
- We can approximate NWC as
Cash + Inventory + Accounts receivable – Accounts payable
- Only the **change** in NWC is included in our cash flows.
 - NWC is an asset, just like a truck. When we buy a truck, we count the cash flow only at the purchase. We don't continue counting it each year we own the truck.
- When NWC increases, we have less money available for other investments. So:
 - An increase in NWC leads to a **decrease** in cash flows to assets.
 - Any NWC used by a project is **returned** at the end of the project as an increase in cash flows to assets.

Corporate Taxes

- **Interest paid** to the firm's debtholders
 - interest payment is tax deductible (a major source of savings)
- **Dividends paid** to the firm's equityholders
 - no tax deduction for the firm (paid out of net income which is already taxed)
- Depreciation tax deductions for investments:
through Capital Cost Allowance

Capital Cost Allowance (CCA)

- **Definition:** *Depreciation for tax purposes, that is, the amount of an asset's value that you are allowed to deduct from taxable income each year.*
- Not necessarily the same as depreciation under GAAP (Generally Accepted Accounting Principles).
- **Asset classes:**
 - intangible assets (straight-line depreciation)
 - tangible assets (declining balance method)
- **Question:** *How does CCA affect corporate cash flows? (Hint: Depreciation is not a cash expense.)*

CCA (continued)

Example:

Suppose your firm purchased 2 trucks in the beginning of 1995 for \$10,000 each. The CCA rate for this class of assets is 30 % .

1) Determine the undepreciated capital cost (UCC) at the end of 1998.

Rule I (half year): Upon purchasing a capital asset, you are only allowed to add half of the asset's capital cost (CC) to the pool. The remaining half is added to the pool in the beginning of the following year.

2) Find the UCC at the end of year 1999 if one of the trucks is sold for \$3,000 in 1999.

*Rule II: Upon **disposition** (i.e. sale) of an asset in a pool, you must deduct the adjusted cost of disposal (the lesser of the asset's original cost and the net proceeds from the sale).*

CCA Example (continued)

- 3) Find the UCC for the end of 1999 if an additional 3 trucks were purchased for \$9,000 each in 1999.

Rule III: *When assets of the same assets class are both bought and sold in the same year, the asset pool is adjusted according to the **net acquisitions rule** (total installed cost of capital acquisitions minus adjusted cost of any disposal within the asset pool - don't forget to apply the half-year rule if the difference is positive)*

- 4) What are the tax implications if the entire fleet of trucks is sold in year 2001 for total proceeds of \$25,000 ? How about if the proceeds from the sale only totaled \$10,000 ?

Rule IV: *If UCC > adjusted cost of disposal, the firm must declare a **terminal loss** and realizes a tax savings.*

*If UCC < adjusted cost of disposal, the firm must declare a **recaptured depreciation** and incur an additional tax expense.*

Fundamental Principles of Project Evaluation

- **Project evaluation:** the application of one or more capital budgeting decision rules to estimated **relevant project cash flows** in order to make the investment decision.
- **Relevant cash flows:** the **incremental cash flows** associated with the decision to invest in a project.
- The incremental cash flows for project evaluation consist of *any and all* changes in the firm's future cash flows that are a direct consequence of taking the project.
- **Stand-alone principle** - evaluation of a project based on the project's incremental cash flows.

Incremental Cash flows

- Incremental cash flow **excludes**:
 - A. Sunk costs:** Expenses that must be paid whether or not the project is accepted, including all past costs, whether associated with the project or not.
 - B. Financing Costs:** Only cash flow from assets, not financing costs such as interest expenses are considered. NPV uses the cost of capital to incorporate financing costs into the decision rule.
 - C. Allocated Overhead:** Administration costs that exist with or without the project

Incremental Cash flows cont.

- Incremental cash flow **includes**:
 - D. Opportunity costs:** Benefits forgone in order to accept the project
 - E. Side effects:** Impacts on other projects from accepting this project.
 - F. Net working capital:** Increased cash and short-term-asset requirements.
 - G. Tax:** Corporate income tax and adjustments from capital cost allowance.

DCF: A Detailed Example

The Trucksalot company is planning to expand its current fleet of delivery trucks and has hired you as a financial advisor to estimate the investment project's net present value (NPV). After days of careful analysis you have determined that the initial cost of the project would involve a capital investment of \$2,000,000. The expansion would also require an additional investment in inventory of \$200,000 two years from now. Subsequently, total NWC at the end of each year would be 15% of sales for that year. This additional inventory would no longer be required once the trucks are taken off the road. The company's opportunity cost of capital is 7%. The additional trucks would increase Trucksalot annual sales by \$2,000,000 for the next 4 years at which time the trucks will be scrapped. Additional annual expenses of \$500,000 would also be incurred due to maintenance fees on the trucks. Under Canadian tax laws, trucks are typically in a 30% depreciation class. The company's tax rate is 40%.

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Alternative Definitions of Operating CF

Let:

OCF	=	operating cash flow;	S	=	sales;
C	=	operating costs;	D	=	depreciation;
T_c	=	corporate tax rate.			

Example:

Let's look at Trucksalot cash flows for the first year. Recall $S = \$2M$, $C = \$500,000$, $T_c = 40\%$, and $D = \$300,000$.

$$\begin{aligned} EBIT &= S - C - D \\ &= \$2M - 500K - 300K = \mathbf{\$1.2M} \end{aligned}$$

$$\begin{aligned} \text{Taxes} &= EBIT * T_c \\ &= \$1.2M * 40\% = \mathbf{\$480K} \end{aligned}$$

$$\begin{aligned} OCF &= EBIT + D - \text{Taxes} \\ &= \$1.2M + 300K - 480K = \mathbf{\$1.02M} \end{aligned}$$

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Alternative Definitions of Operating CF

The Bottom-Up Approach

$$\begin{aligned}
 OCF &= (S - C - D) + D - (S - C - D) \times T_c \\
 &= (S - C - D) \times (1 - T_c) + D \\
 &= \text{Net income} + \text{depreciation} \\
 &= (\$2\text{ M} - 500\text{K} - 300\text{K}) \times (1 - 40\%) + 300\text{K} \\
 &= \mathbf{\$1.02\text{ M}}
 \end{aligned}$$

The Top-Down Approach

$$\begin{aligned}
 OCF &= (S - C - D) + D - (S - C - D) \times T_c \\
 &= (S - C) - (S - C - D) \times T_c \\
 &= \text{Sales} - \text{costs} - \text{taxes} \\
 &= \$2\text{ M} - 500\text{K} - 480\text{K} = \mathbf{\$1.02\text{ M}}
 \end{aligned}$$

The Tax-Shield Approach

$$\begin{aligned}
 OCF &= (S - C - D) + D - (S - C - D) \times T_c \\
 &= (S - C) \times (1 - T_c) + (D \times T_c) \\
 &= (S - C) \times (1 - T_c) + \text{depreciation tax shield} \\
 &= (\$2\text{ M} - 500\text{K}) \times (1 - 40\%) + 300\text{K} \times 40\% \\
 &= \mathbf{\$1.02\text{ M}}
 \end{aligned}$$

Applying the Tax Shield Approach

Present value of the CCA tax shield (PVCCATS):

Definition: CCA tax shield (or depreciation tax shield) is the reduction in taxes payable due to CCA

So if the company has capital expenses, how can it calculate the tax implications?

- things get complicated fast
- we'll look at a very simple base case
- then we'll talk about a few complications

In this course, we're interested in calculating taxes because they affect cashflows and therefore NPVs.

- The main thing we need to know about CCAs is the PV of their tax shield

CCA Tax Shield

- Suppose we have
 - C = capital cost of asset bought at $t = 0$
 - d = CCA rate for this asset class
 - T_c = corporate tax rate
 - r = discount rate
- In that case, the PV of the stream of tax shields is

$$PV = C * d * T_c / (r + d)$$

Intuition:

- $C * d * T_c$ is the savings in the first year.
- Growing perpetuity with growth rate of $-d$.

CCA and Depreciation

Effects of Changing d

- The PV of the tax shield changes as $d / (r + d)$ changes.
- raising d raises PV and vice-versa
- fast depreciation \Leftrightarrow a tax break for corporations

Straight-Line Depreciation

- Most asset classes use the declining-balance (CCA based on UCC) method we've just see.
- However, some special kinds of assets (pollution controls, patents & some others) give straight-line depreciation.

You get $CCA = d * C$ for $1/d$ years.

- PV requires an annuity formula instead of perpetuity

PV CCA Tax Shield

Effects of the half year rule:

$$\begin{aligned} \text{PVCCATS} &= \frac{1/2 * C * d * T_c}{r + d} + \left[\frac{1/2 * C * d * T_c}{r + d} \right] / (1 + r) \\ &= \frac{C * d * T_c}{r + d} * \left[\frac{1 + 0.5r}{1 + r} \right] \end{aligned}$$

Effects of salvage value:

$$\text{PVCCATS} = \frac{C * d * T_c}{r + d} * \left[\frac{1 + 0.5r}{1 + r} \right] - \frac{S * d * T_c}{r + d} * \frac{1}{(1 + r)^t}$$

DCF Analysis using the Tax Shield Approach

- Step #1: Required capital investment
- Step #2: Remember working capital
CF = year to year change in NWC
recaptured at the end of the project
- Step #3: Operating cash flow
Operating CF = (Incremental Revenues - Incremental Costs) * (1 - T_c)
remember to exclude financing charges
- Step #4: PV (#1 , #2 , #3) @ appropriate discount rate
- Step #5: Find the depreciation tax shield
If CCA => big formulae
If straight line depreciation
=> PV (annual tax shield) using annuity formula