

This Week

Monday: NO CLASS

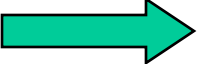
Wednesday

- Project Cash Flow Analysis
- Lab Exercise: Liquair-Pro Cash Flows

Topics

- **Evaluating Project Alternatives**
- **Incremental Cash Flow Analysis**
- **Impact of Taxes and Depreciation**

A Problem Solving Framework

- 1. Define the Problem*
- 2. Collect and Organize Data*
- 3. Characterize Uncertainty and Data Relationships*
-  *4. Build an Evaluation Model*
- 5. Formulate a Solution Approach*
- 6. Evaluate Potential Solutions*
- 7. Recommend a Course of Action*

Recall: Key TVOM Ideas

- Different series of cash flows can be compared by evaluating them at ***the same point in time***.
- Cash flows are ***equivalent with respect to a particular interest rate*** if they have the same economic value at any point in time.
- Given an interest rate and any combination of single cash flows, annuities, and/or perpetuities, we can easily calculate the equivalent:
 - Present Value
 - Future Value
 - Annuity Value
- These ideas are commonly used in ***evaluating proposed business project alternatives***.

Evaluating Business Projects

When is a proposed business project economically desirable?

- Typically, economic evaluation models consider the **cash flows** associated with a project, **not** the net income.
 - Initial cash investment
 - Cash flows from project operations
 - Cash flows from disinvestment (salvage, recovery of working capital, etc.)
- Factors such as taxes, depreciation methods, inflation rates, and currency exchange rates can all significantly affect cash flows and should be taken into account when conducting a detailed evaluation.

Minimum Attractive Rate of Return

- Project evaluation methods that consider TVOM require the specification of an ***interest rate that reflects the company's cost of investment capital*** and/or its ***desired rate of return for the project***.
- The smallest rate of return that a company considers acceptable for a project is called its ***Minimum Attractive Rate of Return*** (MARR), or its ***hurdle rate***.
- Determining an appropriate interest rate for project evaluation is complex. Factors may include:
 - The interest rate on the company's bonds.
 - The rate of return required by common or preferred stockholders.
 - The interest rate charged by the company's bank(s) for loans.
 - The rate that the company could earn on other investments.
 - The riskiness of the project.

Net Present Worth

- The **Net Present Worth** of a series of net cash flows $(A_0, A_1, A_2, \dots, A_N)$, denoted $PW(i)$, is the *sum of the present values* of these cash flows at interest rate i :

$$PW(i) = \sum_{k=0}^N \frac{A_k}{(1+i)^k} = \sum_{k=0}^N A_k (P/F, i, k)$$

Excel: `=NPV(i, A1:AN) + A0`

Excel: `=XNPV(i, A0:AN, date0:dateN)` for non-periodic cash flows

- The **NPW of a project** is simply the difference between the present value of the project's cash inflows and the present value of the project's cash outflows.

Net Present Worth Criterion

- A project is *profitable with respect to an interest rate* if the **NPW** of its associated cash flows is nonnegative.
- For each potential **Liquair-Pro customer**, you need to:

- Determine which (feasible) tank size has after-tax costs resulting in the least negative **NPW** over the contract period, and
- Determine the N -year breakeven price for the product, where N specifies the contract length.

Incremental Cash Flow Analysis

- Relevant for the analysis are the *incremental cash flows* that result *directly from the project alternative*.
- Involves developing a *project cash flow statement* consisting of three sections:
 - Operating Activities Section
Summarizes cash flows resulting from transactions involving the determination of ***net income***
 - Investing Activities Section
Summarizes cash flows resulting from transactions involving ***changes in current asset investment levels*** and/or the ***acquisition or disposal of noncurrent assets*** (property, plant, equipment, etc.)
 - Financing Activities Section
Summarizes cash flows resulting from transactions involving ***creditors and stockholders***

Operating Activities Section

- Typical incremental cash flows that appear in the ***operating activities section***:
 - Inflows: Sales revenues, operating cost savings
 - Outflows: Manufacturing expenses, operating and maintenance expenses, interest payments*, income taxes

**Included only if explicitly associated with project*

- This section is sometimes developed by beginning with after-tax net income from the income statement and:
 - Adding back non-cash operating expenses (e.g., depreciation, losses included in net income)
 - Subtracting non-cash operating revenues (e.g., gains included in net income)

Investing and Financing Activities Sections

- Typical incremental cash flows that appear in the ***investing activities section***:
 - Inflows: Sale of property, plant or equipment; tax savings from loss on sale; recovery of working capital investment (A/R, inventory, etc)
 - Outflows: Purchase of property, plant or equipment; capital improvements; gains taxes on sale; working capital investment
- Typical incremental cash flows that appear in the ***financing activities section****:
 - Inflows: Proceeds from borrowing (loans, bond issues, etc.)
 - Outflows: Principal repayments (but *not* interest)

**Included only if explicitly associated with project*

Impact of Taxes on Cash Flows

- Taxes affect cash flows for businesses in many ways:
 - Operating revenues are **taxable**
 - Operating expenses (including depreciation) are **tax deductible**
 - Interest expenses are **tax deductible**
 - Gains from the sale of assets are **taxable**
 - Losses from the sale of assets may be **tax deductible**
- The tax rates that apply to various project items depend upon **what** is being taxed (income vs. ordinary gain vs. capital gain)

Income Tax Rates for US Corporations

- The current U.S. corporate tax schedule is progressive. Different marginal tax rates apply as a firm's taxable income increases:

<u>Taxable Income</u>	<u>Marginal Tax Rate</u>
\$0 to \$50,000	15%
\$50,001 to \$75,000	25%
\$75,001 to \$100,000	34%
\$100,001 to \$335,000	39%
\$335,001 to \$10,000,000	34%
\$10,000,001 to \$15,000,000	35%
\$15,000,001 to \$18,333,333	38%
\$18,333,334 +	35%

Depreciation and Cash Flows

- Depreciation is a ***non-cash expense*** that is ***tax deductible***.
- If a project involves the acquisition of one or more depreciable assets, we must consider the tax effects of depreciation expense on the project's cash flows, since these ***tax shields*** can be substantial.
- To be depreciable, an asset must:
 - (1) Be *tangible* in the sense that it wears out or is used up in the course of business operations.
 - (2) Have a definite *service life of more than a year*.
 - (3) Be used in the *operation* of business - not for resale.

Depreciation Tax Shield

- Depreciation expense effectively gives rise to a ***tax savings cash inflow***.

Example:	Year 1	Year 2
Net cash inflow before taxes	\$30,000	\$30,000
Depreciation	6,000	3,600
Taxable income	\$24,000	\$26,400
Income Tax (40%)	9,600	10,560
Net Income	\$14,400	\$15,840

After-tax net cash inflow:	\$20,400	\$19,440
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Tax Savings in Year 1 = $\$6,000 \times 40\% = \$2,400$

Tax Savings in Year 2 = $\$3,600 \times 40\% = \$1,440$

MACRS Depreciation

- Intended to standardize and simplify depreciation guidelines for tax purposes. Originally enacted in 1981 as ACRS (Accelerated Cost Recovery System), and modified in 1982 and 1986.
- Assets are grouped into **classes**. Each asset class has a specified “recovery period” that serves as its depreciable life for tax purposes:

3, 5, 7, 10, 15, 20, 27.5, or 39 years.

- Each asset class has a **fixed depreciation schedule** determined by a combination of an accelerated depreciation method (DDB or 150%DB) and the straight-line depreciation method.

MACRS Half-Year Convention

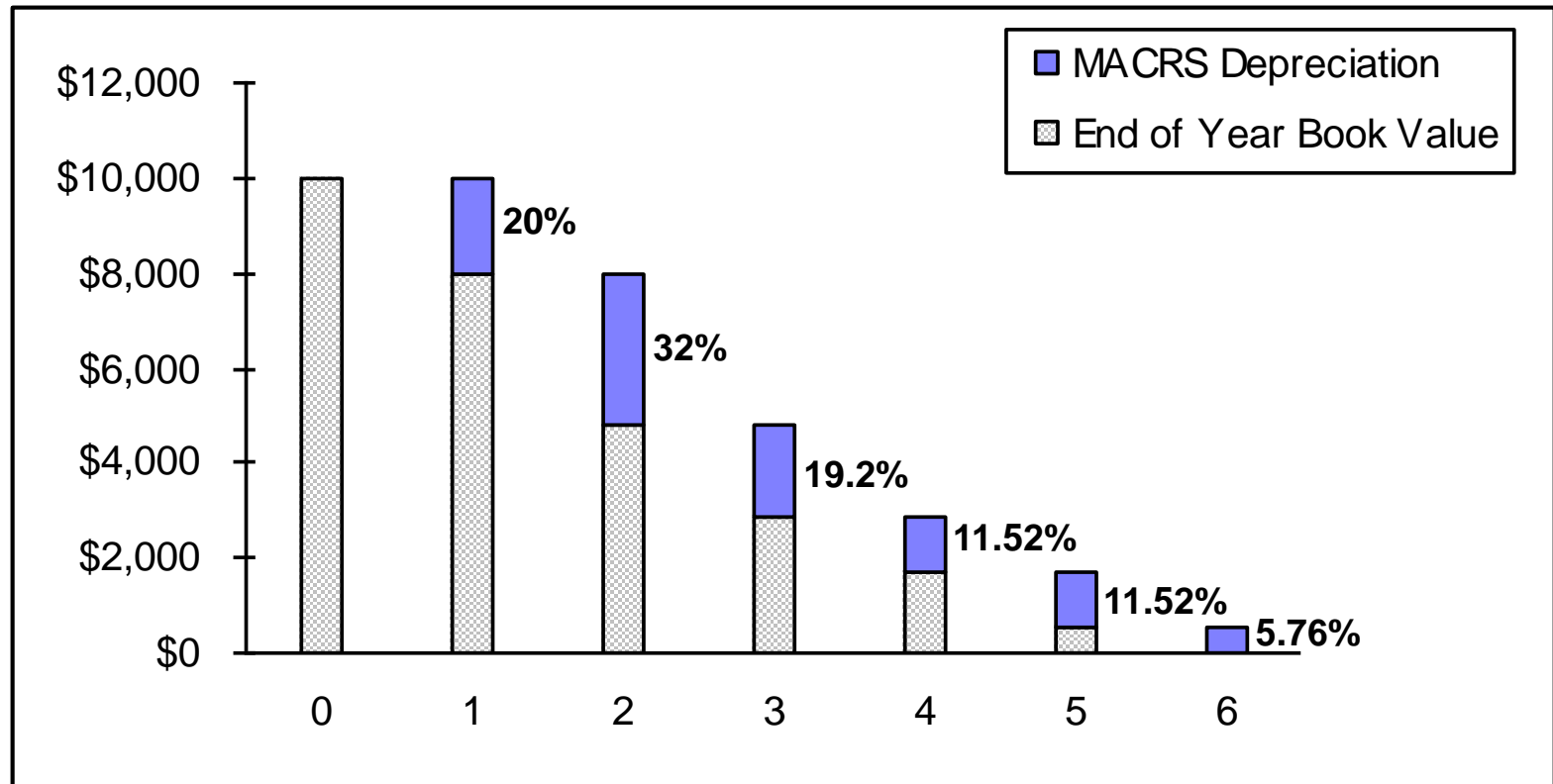
Applicable Depreciation Percentage

Recovery Year	3-Year Property	5-Year Property	7-Year Property
1	33.33	20	14.29
2	44.45	32	24.49
3	14.81	19.2	17.49
4	7.41	11.52	12.49
5		11.52	8.93
6		5.76	8.92
7			8.93
8			4.46

- The MACRS schedule assumes that depreciable assets in the N -year class are put into service at mid-year and retired at mid-year N years later.
- Thus, assets in the N -year class are depreciated over an $(N + 1)$ -year period: half a year in year 1, a full year in years 2 through N , and a half year in year $N+1$.

MACRS Depreciation Example

- Suppose a \$10,000 capital asset falls into the 5-year MACRS class:



Project Cash Flow Analysis: Key Ideas

- **NPW Criterion**: Given a set of *mutually exclusive* project alternatives, choose the alternative that yields the **highest NPW** with respect to the MARR over the evaluation period.
- Analysis should focus on **incremental cash flows** that result directly from the project alternatives.
- Remember to factor in elements that may substantially affect cash flows, such as **taxes**, **depreciation**, etc.
- (Next week) One or more **risk analysis methods** can help identify the magnitude and likelihood of potential loss associated with various decision alternatives.