Independent vs. Mutually Exclusive Investment Projects

- A company could have many other investment opportunities available.
- These can each be analyzed and decided upon independently, regardless of whether or not another option is chosen or not chosen.
- These projects are called “independent.”
- Most likely, a company needs to choose which projects to pursue because of limited resources.
- Other situations are alternatives – you only choose one because they all are options to solve the same problem or meet the same need.
- If the acceptance of one automatically entails the rejection of all the others, we say the projects are “mutually exclusive.”

Initial Screening Method

- An easy *first-pass* (not final) way to determine whether to invest capital in a project is the “payback” method.
- The payback period is the length of time required to recover the cost of an investment.

Payback Methods

- Conventional payback method: ignores the time-value of money.
- The cumulative cash flow equals zero at the point where cash inflows exactly match (pay back) the cash outflows.
- If the cumulative cash flows are greater than zero, then the project is generating a profit, thus surpassing the payback point.
- If the inflows are constant every year, then the payback point may be calculated for the example: 2,000,000/520,000 = 3.8 years.
- Otherwise, consider year-by-year. You may need to assume continuous cash flow throughout the year.
- Benefits: Simple
- Flaws: doesn’t consider all the information
- Also: time-value of money

- Discounted payback method: considers the time-value of money.
- **Discounted payback period**: the length of time required to recover the cost of an investment base on discounted cash flows

When is “payback method” helpful?

- a company needs a measure of the speed of cash recovery
- company has a cash flow problem
- product is built to last only for a short time
- the machine the company is considering has a short market life

Net Present Worth

- We can estimate the worth of a project in terms of today’s cash value.
- Most companies of a required rate of return of a minimum attractive rate of return (MARR) that indicates the interest rate they expect their money to grow with.
- Use MARR in calculating present worth.

If $PW(i) > 0$, accept the investment.

If $PW(i) = 0$, remain indifferent.

If $PW(i) < 0$, reject the investment.

Break-even interest rate

- aka "internal rate of return"
- The project will have a positive NPW if the interest rate (MARR) is below the break-even interest rate.

Meaning of NPW

- For present-worth analysis, we assume that all the firm's funds can be put in investments that yield a return equal to MARR.
- called: "investment pool"
- If no funds are available for investment, we assume that the firm can borrow them at the MARR

Basis for Selecting the MARR

- Cost of Capital: the required return necessary to make an investment project worthwhile
  - includes cost of debt (interest rate associated with borrowing)
  - and cost of equity (return that stockholders require for a company)
  - These things reflect the presence of inflation in the economy.
- Consider any additional risk associated with the project
  - additional risk may be added onto the cost of capital
- summary: the MARR to use for project evaluation would be equivalent to the firm's cost of capital for a project of normal risk

Variations on PWA

- Future Worth Analysis (net future worth = NFW)
  - measures surplus at a time other than 0.
  - For long projects, NFW (time of commercialization) might be more helpful
- Capitalized Equivalent Method
  - when the life of a proposed project is **perpetual** or the planning horizon is extremely long (> 40 years)
  - Examine the "capitalized equivalent" (CE(i)) method
- Perpetual Service Life
  - **Capitalized cost** is the amount of money that must be invested today to yield a certain return A at the end of each and every period forever, assuming an interest rate of i.
- What constant income stream could be generated by PW(i) SAR today in perpetuity (forever)
- With an investment, there are two possible situations:
  - replacing an existing asset/system
  - new asset/system

Service vs. Revenue

- Services projects: revenues do not depend on the choice of project; rather, such projects must produce the same amount of output (revenue)
- Revenue projects: revenues depend on the choice of alternative

Analysis Period

- Analysis period: time span over which economic effects of an investment will be evaluated
    - aka: study period, planning horizon
- Can be determined in serval ways
    - a predetermined amount of time set by company policy
    - implied or explicit in the need
- We consider the analysis period to be the “required service period”
- Comparing projects with different “useful lives” requires comparing over an equal time span.