INFLATION AND DISCOUNTING

An inherent problem in any kind of evaluation or decision analysis is the difficulty of making value comparisons among projects that are not measured in equal units. Even when values are stated in monetary units such as dollars, the values still may not be comparable, for at least two reasons:

• Inflation: Expenditures typically occur at various points in the past or future and are therefore measured in different value units because of changes in price (e.g., a 1980 dollar would, in general, have purchased more real goods and services in 1980 than would a 2002 dollar in 2002). A general trend toward higher prices over time, as measured in dollars, is called inflation. A general trend toward lower prices is called deflation. Dollars that include the effects of inflation or deflation over time are known as nominal, current, or data year dollars. Dollars that do not include an inflation or deflation component (i.e., their purchasing power remains unchanged) are called constant or base year dollars.

• Discounting: Costs or benefits (in constant dollars) occurring at different points in time—past, present, and future—cannot be compared without allowing for the opportunity value of time. The opportunity value of time as it applies to current versus future funds can be understood in terms of the economic return that could be earned on funds in their next best alternative use (e.g., the funds could be earning interest) or the compensation that must be paid to induce people to defer an additional amount of current year consumption until a later year. Adjusting for the opportunity value of time is known as discounting.

Analytically, adjusting for inflation and discounting are entirely separate concerns, and they should not be confused by attempting to calculate both at once. Instead, future costs and benefits of a project should be expressed in constant dollars and then discounted to the present at a discount rate that reflects only the opportunity value of time (known as a real discount rate). If future costs and benefits of a project are provided in nominal dollars, conversion of these nominal dollars to constant dollars can be accomplished through the use of applicable indexes as follows:

\[
\text{Dollars}_{\text{base year}} = \text{Dollars}_{\text{data year}} \times \frac{\text{Price Index}_{\text{base year}}}{\text{Price Index}_{\text{data year}}}
\]

Inflation indexes are available for every possible product and service. The choice among indexes from broad (e.g., Gross Domestic Product chain deflator) to intermediate (e.g., a consumption index such as the Consumer Price Index) to narrow sector or commodity depends upon how the results are to be interpreted.

Real discount rates used in life-cycle cost analysis typically range from 3 to 5 percent, representing the prevailing rate of interest on borrowed funds, less inflation. Because there is always an opportunity value of time, real discount rates will always exceed zero.

The formula to discount future constant value costs to present value is

\[
\text{Present Value} = \text{Future Value} \times \frac{1}{(1+r)^n}
\]

Where \( r = \) real discount rate, \( n = \) number of years in the future when the cost will be incurred.

The term \( 1/(1+r)^n \) is known as the discount factor and is always less than or equal to one. Using this formula, a $1,000 cost incurred in year 30, discounted to the present (year zero) at a 4 percent real discount rate would have a present value of $308.

It should be noted that the term “net present value” (NPV) is sometimes used when referring to the present value of life-cycle costs.

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