

Benefit & Cost Ratio



Lecture 8
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Cost-benefit analysis is a set of practical procedures for guiding public expenditure decisions.



A benefit-cost ratio (BCR) is an indicator, used in the formal discipline of cost-benefit analysis, that attempts to summarize the overall value for money of a project or proposal.



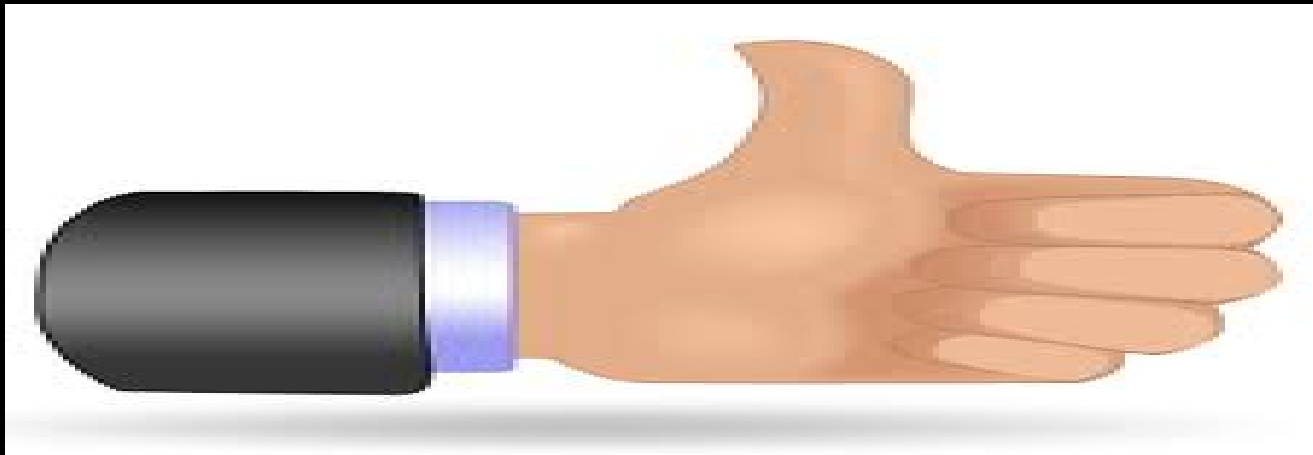
A BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. All benefits and costs should be expressed in discounted present values.



Benefit cost ratio (BCR) takes into account the amount of monetary gain realized by performing a project versus the amount it costs to execute the project. The higher the BCR the better the investment.



General rule of thumb is that if the benefit is higher than the cost the project is a good investment.



The Benefit-cost analysis is commonly used to evaluate public projects.



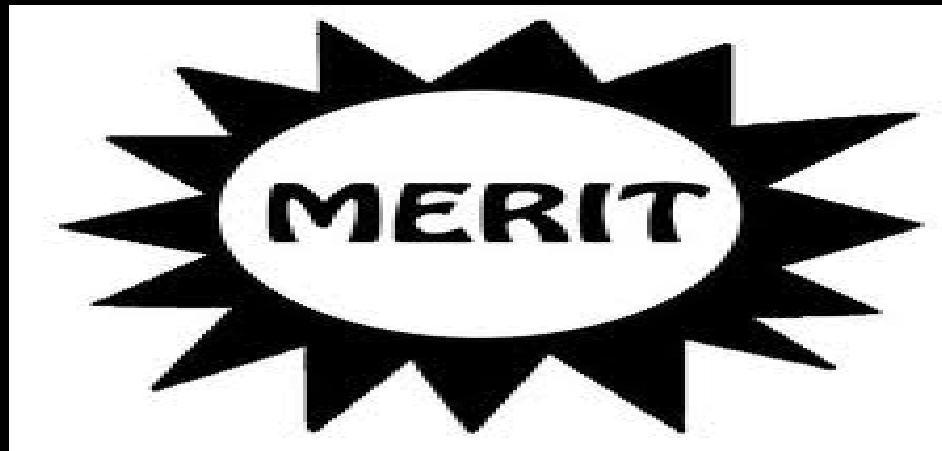
Benefit-cost analysis (BCA) is a technique for evaluating a project or investment by comparing the economic benefits with the economic costs of the activity.



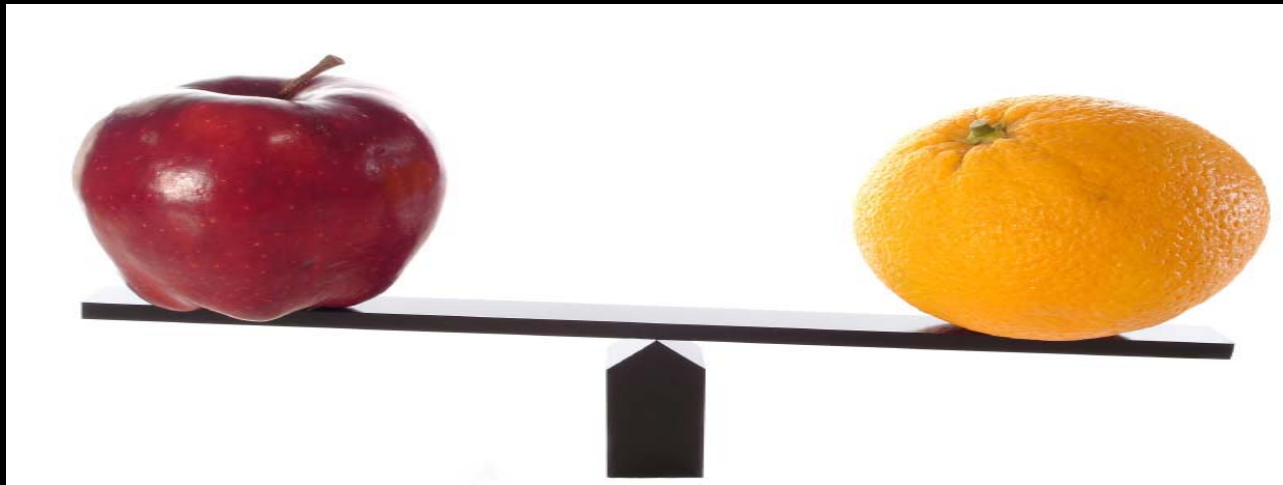
Benefit-cost analysis has several objectives.



First, BCA can be used to evaluate the economic merit of a project.



Second the results from a series of benefit-cost analyses can be used to compare competing projects.



BCA can be used to assess business decisions, to examine the worth of public investments, or to assess the wisdom of using natural resources or altering environmental conditions.

Ultimately, BCA aims to examine potential actions with the objective of increasing social welfare.



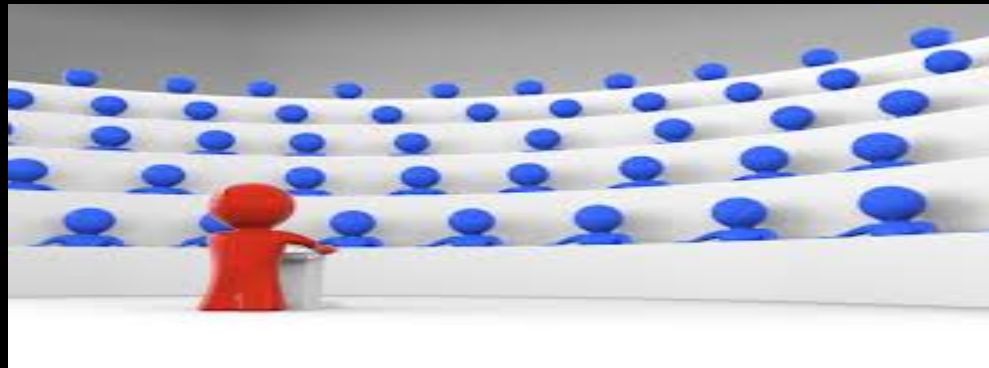
Regardless of the aim, all benefit-cost analyses have several properties in common. A BCA begins with a problem to be solved.

For example, a community may have the goal of alleviating congestion on roads in an area. Various projects that might solve the particular problem are then identified. As an example, alternative projects to alleviate road congestion in an area might include a new highway, a public bus system, or a light rail system.



The costs and benefits of these projects would be identified, calculated, and compared.

Decisions are typically not made solely on the basis of BCA, but BCA is useful and sometimes required by law. Without a doubt, results from a BCA can be used to raise the level of public debate surrounding a project.



Explicitly, nearly every public and private decision involves some comparison of benefits and costs. Although a formal BCA is not used for all decision making, the principles are applied in many settings. Here are a few brief examples.



Example 1:

You must decide whether to go out with your friends to a “picnic party” on a Thursday night.

Going out will have associated benefits and costs. The benefits include spending time with your friends and receiving Good Entertainment. The costs of the night include (at minimum) a cab ride home, missing class the next day (and possibly missing a surprise quiz), and waking up with a nasty hangover. Costs could run higher.



Example 2:

Society must decide whether to open-up an old-growth forest for logging. Logging would provide a variety of benefits, but will also entail costs. The products and employment generated by logging are benefits.

Some of the costs of cutting the old-growth forest include the cost of cutting, the loss of wildlife habitat, damages to local streams due to runoff, and the loss of an opportunity to cut the forest sometime in the future.



Example 3:

An agency must decide whether to impose regulations to conserve a biologically important wetland. Conserving the wetland has environmental benefits. The wetland provides habitat for a variety of animals, including waterfowl. The wetland ultimately provides benefits to hunters and bird-watchers. The wetland also provides benefits because it helps to maintain water quality and reduces flooding in neighboring areas. However, land that would be conserved could be used in a different way, say for agriculture or a shopping mall. This loss in use is an opportunity cost. Landowners may also incur some direct costs in protecting wetlands on their property or some opportunity costs associated with not using these areas in another way. BCA can be used to compare the benefits and costs of imposing the regulation.



The Benefit-Cost Ratio (BCR) directly compares benefits and costs. To calculate the BCR, divide total discounted benefits by total discounted costs.

For example, a program that costs \$3 million and accrues \$8 million in benefits has a BCR of 2.67 (\$8 million divided by \$3 million). A benefit-cost ratio of 2.67 means policymakers can expect \$2.67 in benefits.

A BCR greater than 1 means the benefits outweigh the costs and the investment should be considered. If the ratio is less than 1, the costs outweigh the benefits. If the BCR is equal to 1, the benefits equal the costs.

The Return on Investment (ROI) is similar to BCR, but compares the net benefit (total discounted benefits minus total discounted costs) to costs.

To calculate the ROI for the previous example, first calculate the net benefits (\$8 million minus \$3 million equals \$5 million). Then divide the net benefits by the total costs (\$5 million divided by \$3 million). The result—1.67—is the ROI, which is typically expressed as a percentage (167 percent). Thus, the investment (i.e., the cost) will generate a return (i.e., net benefit) that amounts to 167 percent of the cost of the investment.

The ROI indicates how much of the investment policymakers can expect to receive as a benefit. If the ROI is positive, the benefits exceed the costs and the investment should be considered. A negative ROI means that the costs outweigh the benefits. An ROI of 0 means the benefits equal the costs.

The Net Present Value (NPV) reflects the net benefits of a project in dollar terms.

To calculate NPV, subtract the total discounted costs from the total discounted benefits. The NPV for the previous example is \$5 million (\$8 million minus \$3 million).

A positive NPV means that benefits outweigh costs and the investment should be considered. A negative NPV means that the costs outweigh the benefits. An NPV of 0 means the benefits are equal to the costs.

All three metrics can be used to report results for a cost-benefit analysis. Each one emphasizes a different aspect of the relationship between benefits and costs.

- The BCR is commonly used to demonstrate an investment by showing the relationship between total benefits and total costs. The BCR is thus a *relative* measurement of the investment's benefits and costs.
- The ROI is frequently used in financial settings and reports the gain from the investment. It is also a relative measurement.
- The NPV reports the total difference between benefits and costs in dollar terms. It is an absolute measurement of a program's net benefit or cost.

CBA can also be used to compare health-related interventions to those in other economic sectors.

For example, when deciding how to allocate the limited funding approved by a state or local legislature, policy makers might have to choose between implementing a statewide, school-based screening program for tuberculosis infection or a job-training program for the unemployed.

For each of these competing programs, CBA enables policy makers to determine whether the value of its positive consequences exceeds the value of societal resources required to implement the program. This will help policy makers choose the program that provides the best return on investing societal resources.

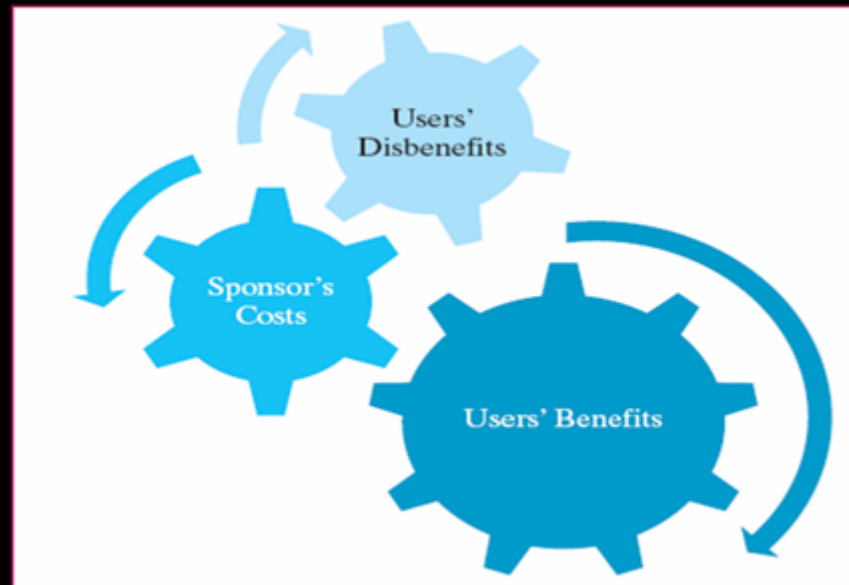
Framework of Benefit-Cost Analysis

Step 1: Identifying all the users and sponsors of the project.

Step 2: Identifying all the benefits and disbenefits of the project.

Step 3: Quantifying all benefits and disbenefits in dollars or some other unit of measure.

Step 4: Selecting an appropriate interest rate at which to discount benefits and costs in future to a present value.



Private Sector Project Evaluation

Admissible: Are the benefits greater than the costs.

Preferable: Are the net benefits the highest. Most projects involve a stream of benefits and costs over time.



Private Sector Project Evaluation

The **present value criteria** for project evaluation are that:

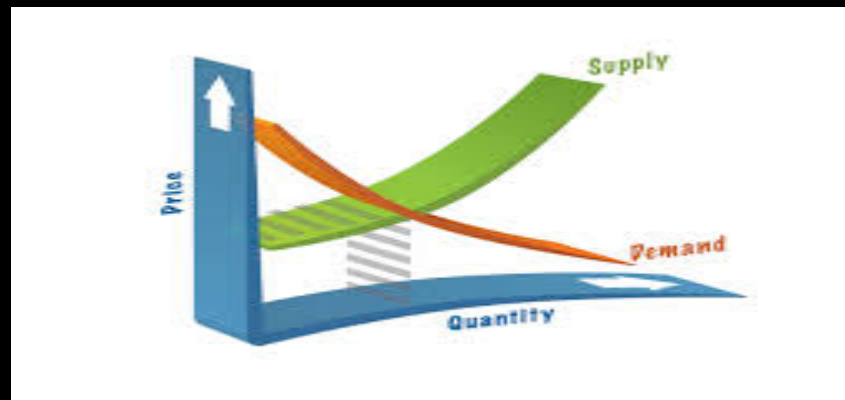
- ✓ A project is admissible only if its present value is positive.
- ✓ When two projects are mutually exclusive, the preferred project is the one with the highest present value.

- **Cost-benefit analysis** is a term that refers both to:
 - ✓ helping to appraise, or assess, the case for a project or proposal, which itself is a process known as project appraisal.
 - ✓ An informal approach to making decisions of any kind.
- Under both definitions the process involves, whether explicitly or implicitly, weighing the total expected costs against the total expected benefits of one or more actions in order to choose the best or most profitable option.
- The formal process is often referred to as either CBA (Cost-Benefit Analysis) or BCA (Benefit-Cost Analysis).

The cost-benefit analysis is explicitly designed to inform the practical decision-making of enterprise managers and investors focusing on optimizing their social and environmental impacts.



Supply, Demand, and Government Policies



Price controls

Price ceiling: A legal maximum on the price of a good or service Example: rent control

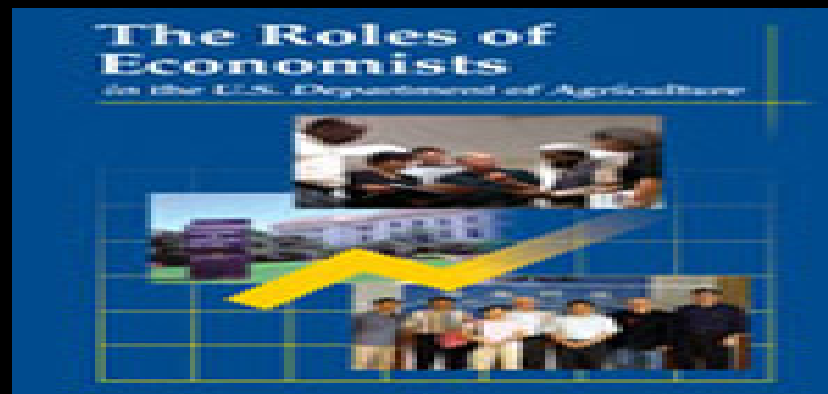
Price floor: A legal minimum on the price of a good or service Example: minimum wage

Taxes: The govt can make buyers or sellers pay a specific amount on each unit bought/sold.



Supply, Demand, and Government Policies

- In a free, unregulated market system, market forces establish equilibrium prices and exchange quantities.
- While equilibrium conditions may be efficient, it may be true that not everyone is satisfied.
- One of the roles of economists is to use their theories to assist in the development of policies.



CONTROLS ON PRICES

- Are usually enacted when policymakers believe the market price is unfair to buyers or sellers.
- Result in government-created price ceilings and floors.



CASE STUDY: Rent Control in the Short Run and Long Run

- Rent controls are ceilings placed on the rents that landlords may charge their tenants.
- The goal of rent control policy is to help the poor by making housing more affordable.
- One economist called rent control “the best way to destroy a city, other than bombing.”

Example:

- In the central California, a large canal was being investigated. Its cost was estimated at \$5,600,000. Annual maintenance costs were projected to be \$100,000. Annual benefits in irrigation for agriculture were \$360,000. No salvage value at the end of the economic life of the canal was considered. A time horizon of 50 years was adopted for the study. All sums were expressed in constant dollars as of the project year zero, thus accounting for possible inflation or deflation over the years. A 7 percent discount rate suggested by the federal water resources council was stipulated. Compute the B/C ratio by netting out the cash flow. Will the project be accepted?**