

Economic evaluation: Cost–benefit analysis

Cost–benefit analysis (CBA) is an economic model that purports to calculate the costs and benefits associated with a particular decision or series of decisions in purely monetary terms. It may involve using a range of different models to estimate values for the different costs and benefits, and usually uses calculations of **net present value** to express the monetary costs and benefits on a common time base.

The key stages of cost–benefit analysis are:

1 Identify a system of interest

As with all modelling techniques, it is first necessary to identify a system of interest, and to tabulate the variables that are important to the decision being made. These might be anything; numbers of an endangered species, journey times, passenger numbers, area of land in a particular use, noise levels etc.

2 Draw up table of costs

Costs may be:

- simple manufacturing/building/other physical process costs that can be predicted from comparable activities elsewhere, from known engineering, building or other experience or from standard tables.
- estimated financial costs of, for example, clean-up of pollution. To calculate these, it is necessary to be able to estimate (using some form of predictive model) the extent of pollution likely to be incurred and to estimate how much it will cost to deal with this. There is likely to be some uncertainty associated with such costs, since the models involved are more complex and more factors are unknown or only partially known, but in general they are not likely to be particularly contentious.
- estimated non-market costs of effects such as those on health, those due to loss of amenity etc. Again, it is necessary to estimate the extent of these effects, but it is also necessary to put a monetary value on these. There is a whole range of (very often disputed) techniques for assigning these costs such as contingent valuation, hedonic pricing, willingness to pay etc.

3 Draw up table of benefits

Once more, these may take various forms, some of which will be straightforward while others will involve many more assumptions. They might include:

- direct profits/income. Estimating these will involve models of the likely way that they will accrue as a result of the decision, so will be subject to risk and uncertainty, and there may also be questions as to whose profits or income should be included in the model.
- time savings are a frequent component of the benefits in cost benefit models, especially those concerned with transport. The likely savings can only be estimated from appropriate models, and these are bound to be subject to uncertainty. There is a whole range of further questions to be asked here, such as whose time-savings are to be taken into account, and how much such a saving is worth per hour. This may be relatively uncontroversial where an employee is concerned, since wage rates can be used to make the estimates, but how should savings in unwaged activities be costed?
- other benefits. These might include the numbers of an endangered or otherwise valued species, reduction of noise nuisance, changes in landscape etc. Estimating the physical extent of such changes is one modelling problem, and putting monetary values to them is another. As you may imagine, this is a very contentious area.

4 If appropriate, reduce all data to a common time base

Since costs and benefits are almost certain to occur at different times throughout the consequences of a decision, it is customary to use a technique such as **net present value** to express the outcomes on a common time base.

5 Present a single figure for each decision

Having done all the calculations for each potential decision, the results are then usually presented as a single figure that is supposed to encapsulate the 'value' of each course of action.

6 Questions about intangibles.

It should be obvious that this technique has to make some potentially heroic assumptions in order to present the final values. Some of these have already been mentioned, but fundamental to the whole technique is the extent to which the variables chosen represent the interests of different stakeholders. There are almost certain to be aspects of a system of interest that are controversial, aspects that are excluded as a result of lack of knowledge or because of power relationships and aspects that are intrinsically incapable of being given a monetary value. The way in which these are handled takes us beyond the technical aspects of cost–benefit analysis, but may be crucial to the decision-making process.