Australian Government
Department of Finance and Deregulation
Office of Best Practice Regulation

Best Practice Regulation Guidance Note

Decision rules in regulatory cost-benefit analysis

Key Points:

- For a Regulation Impact Statement to be adequate, it should demonstrate that the proposal has a positive net social benefit that is higher than the alternative options.
- The two main methods of assessing a proposal's net social benefit are the *net present value* and the *benefit-cost ratio*.
- Net present value is the appropriate decision criterion to use in regulatory cost-benefit analysis.
  - The benefit-cost ratio is of limited use in regulatory cost-benefit analysis.

The OBPR recommends using the net present value decision for cost-benefit analysis in Regulation Impact Statements. This note provides guidance on alternative decision rules that can be applied in cost-benefit analysis, and explains why the OBPR considers net present value to be a superior measure of whether a proposed regulation has a net social benefit.

Background

Ideally, all government policies would improve the welfare of society. A policy that made at least some people better-off, while making nobody worse-off, would unambiguously improve social welfare; in economic theory such a policy is termed *Pareto efficient*. However, in reality such policies rarely exist, and a requirement for Pareto efficiency would result in policy inertia. A more practical requirement is that a policy should only be implemented when those who gain from the policy could compensate those who lose, and still be better off. Such a policy is said to offer a *potential* Pareto improvement.

The aim of cost-benefit analysis (CBA) is to provide a framework for assessing the ability of a project or regulation to offer a potential Pareto improvement. In undertaking a CBA, the analyst estimates all of the costs and benefits of a policy proposal in monetary terms for ease of comparison. If the benefits are greater than the costs — if there is a *net social benefit* — then in theory the gainers from the proposal would be able to compensate the losers and still be better-off, and the policy represents a potential Pareto improvement.

The Australian Government's requirements reflect the need for policies to result in a net social benefit[1]. For a Regulation Impact Statement (RIS) to be assessed as adequate, it should demonstrate that:

- the benefits of the proposal to the community outweigh the costs; and
- the preferred option has the greatest net benefit for the community, taking into account all the impacts (Australian Government 2007)

[1] Similarly, the Council of Australian Governments' principles of best practice regulation include "adopting the option that generates the greatest net benefit to the community" (COAG 2007, p. 4).

Alternative decision criteria

A policy has a net social benefit, and should be recommended, if the present value[2] of the benefits exceeds the present value of the costs. However, if there are two alternative policies that both have a net social benefit, then a decision rule is required in order to select the one with the greatest benefit. The net benefit can be measured in absolute terms by the *net present value*, or in relative terms by the *benefit-cost ratio* or the *internal rate of return* (Sinden and Thampapillai 1995).

Net Present Value

The net present value (NPV) of a project or regulation is the present value of estimated benefits minus costs. In mathematical terms, it is expressed as:

$$NPV = \sum_{t=1}^{n} \frac{(B_t - C_t)}{(1+r)^t}$$

Where B_t is the benefit in year t, C_t is the cost in year t, and r is the discount rate. In general, the decision rule when using NPV is:

- accept a policy only if NPV>0; and
- in deciding between alternative policies, select the one with the highest NPV

Benefit-cost ratio

The benefit-cost ratio (BCR) of a project or regulation is the present value of the estimated benefits divided by the present value of the estimated costs. In mathematical terms, it is expressed as:

$$BCR = \sum_{t=1}^{n} B_t / (1+r)^t \Big/ \sum_{t=1}^{n} C_t / (1+r)^t$$

The decision rule when using BCR is:

- accept a policy only if BCR>1; and
- in deciding between alternative policies, select the one with the highest BCR

Internal rate of return

The internal rate of return describes the discount rate at which the present value of costs equals the present value of benefits. There are difficulties in calculating the IRR for negative cash flows, and it has limited usefulness in regulatory CBA (as opposed to the CBA of investment projects); for these reasons it is not discussed in this note.

Which decision criterion: NPV or BCR?

NPV gives an estimate of the absolute size of the net social benefit (and hence the potential Pareto improvement) of a proposal and is the theoretically correct measure to use. If, in practice, the NPV and BCR were equally easy to compute, and were consistent in terms of recommending one option over another, then it would not matter which criterion were used. However, because BCR summarises the *relative* size of the costs and benefits of a proposal, not the *absolute* size, this is not the case.

[2] For a discussion on present values and discounting, see *Australian Government (2007), p. 119.*

The relative size of a proposal's costs and benefits, and hence the BCR, depend on how the impacts are treated — are they added to costs or subtracted from benefits? For example, a proposed new road would divert traffic from existing roads, and thereby reduce accidents on these roads. But there would be accidents on the new road. The accidents on the new road could be counted as costs of the proposal, or they could be subtracted from the benefits of the proposal. Their classification would make no difference to the estimate of NPV, but would make a difference to the estimated BCR[3].

Additionally, the NPV and BCR can give conflicting results when used to rank alternative projects. This is illustrated in table 1: under the NPV criterion, project B is preferred to A, while under the BCR criterion project A is preferred. However, because project B represents the option with the largest net social gain, it should be chosen.

Table 1: **NPV versus BCR**

Project	***Discounted Costs***	***Discounted Benefits***	***NPV***	***BCR***
	($m)	($m)	($m)	
A	10	20	10	2.0
B	95	120	25	1.3

BCR is only preferred to NPV in situations where capital projects need to be funded from a limited pool of funds. In this case, it can be shown that allocating funds by way of the BCR criterion results in a higher net social benefit than by using NPV. However, regulatory CBA rarely deals with making capital investments from fixed funding pools; costs are generally dispersed among various stakeholder groups, and may occur through the life of a regulation. As such, NPV is generally the correct decision criterion to use in regulatory CBA.

Summary

For regulatory CBA, NPV is the correct criterion (Boardman et al 2006; Sinden and Thampapillai 1995). Estimates of BCR are sensitive to how the impacts of a proposal are categorised, and can give conflicting results to NPV. As such, NPV should be used in the CBA of proposed regulations, and to avoid confusion BCR should not be reported.

References

Australian Government 2007, *Best Practice Regulation Handbook*, Canberra.

Boardman, A., Greenberg, D., Vining, A. and Weimer, D. 2006, *Cost-Benefit Analysis: Concepts and Practice*, Third Edition, Pearson Prentice Hall, New Jersey.

COAG (Council of Australian Governments) 2007, *Best Practice Regulation: a guide for Ministerial Councils and National Standard Setting Bodies*, October.

Sinden, J. and Thampapillai, D. 1995, *Introduction to Benefit-Cost Analysis*, Longman Australia, Melbourne.

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[3] Alternatively, consider a proposed immunisation program which would reduce the number of deaths from a disease, but would have a small number of deaths associated with the immunisation. The BCR would vary depending on whether the deaths caused by the immunisation were subtracted from the lives saved, or considered as separate costs.