Investment appraisal

Finance, Investment

Cost benefit analysis in general aims at expressing the impact of a policy or project in monetary terms. Its two main tasks are to determine the efficiency and equity effects of a proposed course of action; in particular, the allocation of current resources, which have alternative uses to an activity whose benefits will accrue over time. The benefits are the increased production of some goods and services and the costs are the benefits that could have been obtained if the resources had been put to their best alternative use.

Cost benefit analysis is a procedure used to evaluate proposed investments in the hope of choosing those that improve social welfare. Social welfare can be considered to be the sum of individuals' welfare determined by their choices between alternative bundles of goods and shown in monetary terms by their willingness to pay, as measured by the area under the market demand curve. In figure 1 total benefits will be DOMR, whilst total costs, will be POMR. The net benefit from production and consumption of a this good will therefore be DPR.

The demand curve denotes WTP and consumers would be prepared to pay more than the going price P for all units of output up to the last, or marginal, unit when consumption is OM. The area DPR shows the extent to which they would be prepared to pay above market price. Thus all the net benefits of the commodity accrue to consumers and DPR is the consumers' surplus. Once the inputs and outputs of a project have been determined it is necessary to place an economic value on each one over the life cycle of the investment.

Where no price can be set by the market, for example, the cost of public goods and externalities such as environmental factors, estimated shadow prices can be used to replace inappropriate or missing market prices. As the investment takes place now in exchange for a stream of future benefits it is necessary to discount the cash flows in future years back to present day values to determine if the net benefit of the project is greater than the opportunity cost of using the investment funds for an alternative scheme.

In a commercial decision making scenario the rate of discount used can be that which corresponds to either the rate of interest at which they can borrow funds, or if they already have the funds, what is the best rate of interest they could get for approximately the same degree of risk. In comparing alternative schemes, the one producing the highest Net Present Value (NPV) represents the greatest return on the initial investment. In the public sector, where the cost and benefits are not necessarily purely financial a social discount rate can be applied which may be based on a low risk market rate of interest (e. g. government bonds) or a political judgement about the rights and responsibilities between present and future generations.

If the analysis shows net costs and benefits then the discount rate that brings the NPV to zero is called the Internal Rate of Return (IRR). The IRR shows the rate of interest the project could pay to its investment funders during its life and still break even. IRR's can be used to rank projects and will generally provide the same ordering as NPV's, where a high IRR means the

project could potentially pay a high rate of interest and is therefore highly desirable.

IRR's are independent of the scales of investment required for projects and can therefore indicate whether it would be better to undertake a number of small projects rather than one large project. In the public sector, an IRR approach frees the CBA analyst from choosing a social discount rate and the policy maker has only to decide whether the resultant IRR is acceptable on behalf of society and its future generations. As cost benefit analysis is the allocation of current resources in order to obtain future benefits, the predictions of future cash inflows and outflows cannot be calculated with absolute certainty.

Allowance has therefore to be made in the analysis for the risk of the forecasts being wrong and any uncertainty which mat arise through changes in consumer behaviour or technological change. For very risky projects a pre-defined cut off period could be chosen over which the initial costs must be re-couped. This policy may be valid where monopoly power is not likely to prevail or political uncertainty necessitates recouping the initial costs within a short time period. In calculating the NPV, a risk premium can be added to the discount rate used in the calculation.

The benefit of this is that it does penalise distant returns where uncertainty is greatest but has disadvantages in the risks are not constant from year to year, it penalises those projects where benefits are received late in the period and the size of the premium to impose is difficult to determine. If it is thought that particular risks may occur at certain times during the life cycle

of the project then percentage additions to costs or percentage reduction in benefits can be made.

In deciding on adjustments to make inrespectof risk, scientific techniques such as probability distribution can be used. The difficulties posed with these techniques are that whilst two distributions can have the same mean they may differ significantly in their dispersion. A sensitivity analysis or matrix can be developed, where the effect on the analysis can be calculated for any change in the input variables. By using computer analysis the optimum NPV can be determined for any particular combination of variables.

Whereas risk can be assessed mathematically as it represents estimated deviations from known values, uncertainty by its nature cannot be allowed for in the same way. Rules of choice can be formulated for different degrees of certainty and varied according to the optimism or other wise of the cost benefit analyst. The level of optimism or pessimism will vary from project to project depending on the particular financial circumstances of their organisation at the time of the analysis.

Adjusting the variables used in the analysis can generally make the allocation of risk through cost benefit analysis. In public sector schemes, these risks may be more difficult to assess due to externalities where benefits and costs are not easily quantifiable in monetary terms. If the social discount rate used is too low compared with that in the private sector resources may be diverted to the public sector at the expense of more efficient and equitable investment in the private sector.