BUILDING ECONOMICS
ECONOMIC EVALUATION IN PRACTICE

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VIEWPOINT OF ECONOMIC EVALUATION

Economic evaluations are always carried out from a particular point of view.

- A financial analysis tries to chart all the money incomes and outgoings of a project as a budgeting exercise for cash flow.
- Benefit cost analysis includes social, rather than merely private objectives, criteria, and constraints. The national viewpoint looks towards the efficient use of resources (capital, labour, land, raw materials, energy and so on) to achieve social objectives.

PURPOSE OF ECONOMIC EVALUATION

- New or replacement investment projects: whether or not to undertake a project; whether to undertake it now, or later; whether to buy one piece or equipment or another, or from one supplier or another.
- The use or disposal of existing assets: whether to sell land or redevelop.
- Standards of design or provision: setting standards for insulation, lighting, or design of buildings; for environmental quality; for replacement of vehicles; for staffing levels.
- Current expenditure options: for example, the choice of maintenance schedules.

COMMON OBJECTIONS TO ECONOMIC EVALUATION

There are some stock objections to project evaluation. Each has an element of truth and offers useful lessons:

"Decisions are often political. Working out the economic benefits and costs in such cases is a waste of time".

- Political considerations often lead to "non-economic" decisions. The importance of a formal evaluation is that it makes evident to all concerned the cost of taking adverse economic decisions on political grounds.

"Formal evaluation rarely tells you anything that is not obvious. In any case there is often no sensible alternative to the action proposed".

- In practice, the "obvious best" option is often not the best option. Evaluation often generates better options. On the other hand, evaluation procedures can degenerate to a ritual to get "common sense" proposals through procedural hoops.

"It is impossible to appraise services such as health, education, and defence (and design) where outputs cannot be valued in money terms".

- Even when outputs cannot be satisfactorily valued, a description of the benefits of options, combined with an analysis of their costs, is still an important aid to decision making. The choice is often between different ways of producing the same or similar outputs.

"It is not realistic to develop and apply evaluation procedures without extra resources to do the extra work".

- The cost of an evaluation is generally very small compared with the savings that it achieves.

"Economic evaluation is pointless in an uncertain world: judgement by experienced professionals is better".

- Over precision can be unhelpful and misleading. In most respects, however, uncertainty increases rather than reduces the need for systematic evaluation.

PRECONDITIONS FOR EFFECTIVE EVALUATION

To be fully effective, economic evaluation should:

- Be the norm in all areas of expenditure approval or decision-making.
- Be carried out early in the approval process, before options are closed off, and be reviewed at later stages.
- Be carried out in sufficient detail and examine sufficient options for the nature and size of resources involved.
- Be given due weight in decision-making.

ISSUES ON WHICH TECHNICAL GUIDANCE IS MOST OFTEN REQUIRED

CONSIDERING TOO FEW OPTIONS

- Decisions where there are no realistic choices are rare. There is always a "do-nothing" option and there will usually be choices as to the size, scope, form, or timing of projects.

CONFUSING REAL AND NOMINAL VALUES

- It is the value of benefits and costs in real terms abstracting from changes in the general price level that matter in an evaluation.
- All benefits and costs in an evaluation should be converted to a common money value by removing general inflation.
- Changes in the price of particular goods and services relative to the general price level should be taken into account.

OVERLOOKING SOME COSTS

- In benefit cost analysis and cost-effectiveness evaluations, and to a more limited extent in commercial evaluations, costs should be taken into account even if they do not actually involve spending cash.
- In particular, the value of land and of existing buildings should be included: the only costs that can be ignored are those that have already been incurred (sunk costs) and which are for items with no alternative use (fully sunk), or those common to all options.

INCLUDING SUNK COSTS

- Sunk costs are irrelevant in investment decisions. Each investment project must be considered on its own merit. The fact that present decisions cannot change the decisions made in the past reflects the irreversibility of time.
- The only costs that should enter into a project evaluation are those those have yet to be incurred. Costs already committed for materials, land etc. that have no marketable value, i.e. no opportunity value in an alternative use, are defined as sunk costs and must be ignored in any project evaluation.

- When rankings of options alone are involved, only those costs subject to choice and control need be included.

COUNTING APPRECIATED VALUE OF LAND RELATIVE TO THE GENERAL PRICE LEVEL AS BENEFIT.

- Even if land is anticipated to increase in value relative to other prices, it is wrong to include the increase in relative value as a benefit without taking into account increases in opportunity costs associated with keeping the land in the project.

USING INAPPROPRIATE TIME HORIZONS.

- Time horizons need to be set in relation to the economic lives of assets. Residual values should be included in the evaluation for any assets that have some value beyond the period covered by the evaluation.

IGNORING UNCERTAINTY

- Events seldom turn out as expected and this often needs to be taken into account. There are formal techniques for allowing for risk and uncertainty. Evaluations should also specify when changing circumstances require a revaluation.

FAILING TO DISCOUNT FUTURE COSTS OR BENEFITS

- Cost and benefits occurring at different points in time are not equally valuable and should be discounted to a common base date. (Public sector discount rate is 10% per annum in real terms).

USING AVERAGE, INSTEAD OF MARGINAL BENEFITS AND COSTS

- Allocative efficiency requires the consideration of marginal, not average, benefits and costs.
- For example, in calculating the operating costs of a new highway, marginal operating costs saved on alternative routes due to reduced traffic should be subtracted. Since operating costs can be expected to rise less than proportionately with the flow of traffic per unit time, marginal operating costs will be lower than average operating costs.
- It is often the case that only average operating costs are recorded and the analyst adopts these averages for expediency. Be aware of the bias introduced — in the above example, the use of average operating costs will exaggerate the cost savings and therefore sensitivity analysis should be performed.

INCLUDING INTEREST PAYMENTS ON BORROWED CAPITAL AS COSTS

- Interest payments on borrowed capital, while being a financial outlay, have no significance as far as the economic costs of a project are concerned since the real resources used — labour, material, and equipment, etc. are the same regardless of the source of financing.
- When income tax is involved it is necessary to note that only the interest portion and not the principal repayment portion is claimable as a deduction to taxable income.
- If the initial capital cost of an investment is financed through borrowing, explicit account may need to be taken of the resultant interest payments on the borrowing. There is a danger of double counting because the process of discounting implicitly takes account of capital repayments.
- If the interest charge rate and the discount rate are one and the same then interest charges can be ignored in the life cycle of calculations (Flanagan et al., 1989).
- If the interest rate and discount rate are not identical then the life cycle implications of the capital plus interest charges can be calculated by:
  (1) Calculating the value of an annuity of $(i - r)C_0$ at interest rate r over N years. (i = interest rate on the borrowed capital, r = discount rate.)
  (2) Adding the result of (1) to the initial capital costs.
  If $i > r$, then interest charges increase life cycle costs. If $i < r$, then interest charges decrease life cycle costs.

INCLUDING DEPRECIATION IN OPERATING COSTS WHEN COST OF CAPITAL EQUIPMENT HAVE BEEN INCLUDED IN A LUMP-SUM FASHION AT THE BEGINNING OF THE PROJECT

- Depreciation is strictly a bookkeeping device. To include depreciation on top of lump sum capital costs will exaggerate real costs. (Depreciation expense allowances however are claimable as deductions for tax purposes).

CHOOSING AMONG PROJECTS ON THE BASIS OF MAXIMISING INTERNAL RATES OF RETURN OR BENEFIT-COST RATIOS

- The fundamental criterion for choosing among investment projects is the maximisation of net present value. Ranking projects based on either internal rates of return or benefit-cost ratios may lead to a sub-optimal choice.

OVERVIEW OF STEPS IN THE ECONOMIC EVALUATION PROCESS

IDENTIFY THE OBJECTIVES:

- Establish the objectives of the analysis at the outset to ensure the scope of the work is delineated to meet the objectives and no more, to assist in selecting a mode of evaluation, and to structure the problem for solution.
- Identify the constraints that may reduce the number of options to be considered. For example, a cost budget may be too low to allow the acquisition of a project even if the project is expected to be cost effective.
- Establish whether the project is technically sound before undertaking an economic evaluation.

DEVELOP DESIGN ALTERNATIVES:

- Develop several design options. Do not prematurely reject radical alternatives off hand, even if they initially appear to fall outside established energy, financial, or performance constraints.
- Define a baseline alternative against which all other alternative may be compared. Ensure this baseline meets minimum requirements as dictated by the building codes, environmental criteria, safety considerations, and performance requirements.

- Carry out a preliminary screening of options by estimating the significant effects that are expected to result from each alternative with the objective of eliminating those options which are impractical or which will obviously result in substantial higher life cycle costs than the baseline.

IDENTIFY COST FACTORS

- Costs will fall into one of the following categories:
- Capital costs. These are the costs associated with the development of a project, and include construction, interim financing, site acquisition, design and management.
- Owning and operating costs.
- Operating and maintenance costs:
- Cyclical renewal costs: Intermittent cyclical renewals of worn, deteriorated or outdated components, including decoration, minor repairs or replacement, alterations etc.
- Replacement and major repairs: Several major elements of a building will need to be replaced during its economic life, either due to deterioration, obsolescence, or changes in operating conditions.
- Revenues. If the outside wall dimensions of a building are fixed, an additional thickness of insulation will affect the net rentable floor areas and thus revenue. Likewise, the space occupied by a mechanical system also affects net rentable area and thus revenue.
- User costs. These costs are associated with the activities that take place within the building, the efficiency of which may be affected by the design of the building.
- Measuring the efficiency variations between alternative designs can be a difficult task. In practice, user costs are ignored unless these costs are major such as in the design of a hospital where the life cycle cost of user activities far exceed the building and operational costs.
- Residual values. The residual or salvage value should be established for any cost element at the end of the life cycle of the study or when it is being replaced during the life cycle including the cost of removal and disposal associated with replacement.
- When an element is expected to last for the normal economic life of a building, its terminal value in most cases can safely be assumed to be zero, because the calculated present value would normally be negligible.

SELECT TIME PERIODS:

- Determine the baseline year and the time period or life cycle for the analysis.
- Identify when components will need to be replaced (service life), when major overhauls needs to be performed and to generally assign a point in time for every cost admitted, including loans and mortgage repayments.
- For the purpose of analysis, the life cycle of a building is usually equated to its economic life. The physical life of a building normally exceeds its economic life.
- In accordance with well-accepted conventions simplify the models of cash flows by assuming that all capital investment costs occur in a lump sum at the beginning of the first year of the study period, and that all other costs occur in lump sums at the end of the respective years in which they occur.
- Set up a cash flow diagram to describe the timings of the various types of cash flows associated with a given project.

ESTABLISH ECONOMIC PARAMETERS

- Establish the cost of capital and other financial parameters at an early date with the investor.
- Establish applicable escalation rates based on best available information.

SELECT AN APPROPRIATE METHOD OF ECONOMIC ANALYSIS

The appropriate method of economic analysis may comprise one, or more, of the following approaches:

- Net Present Value.
- Annual Equivalent Value.
- Benefit-cost Ratio.
- Internal Rate of Return.
- Break Even Analysis.
- Payback.
- Accounting Returns.

CALCULATE MEASURES OF ECONOMIC PERFORMANCE

- Economic analysis can be easily carried out using a spreadsheet or specially designed software.

EVALUATE AND COMPARE ALTERNATIVES.

- The test of viability of a private investment is that it should yield at least the market rate of interest.
- In benefit cost analysis it is not sufficient to merely evaluate benefits and costs to identify the economic optimum. It is also necessary to identify who pays the costs and who reaps the benefits.

PERFORM A SENSITIVITY ANALYSIS.

- Whenever there is uncertainty about data and assumptions perform a sensitivity analysis by simply repeating an evaluation using different input values.
- Test the percentage change in the output measure to be specified, to identify those parameters that are likely to be most critical in determining the success of a project. This information can be useful in focusing further data gathering efforts.
- Calculate economic measures of performance based on upper and lower estimated values of input parameters, such as minimum and maximum estimated life to estimate a range within which the outcome is expected to fall. Expressing the project in terms of upper and lower boundaries than by a single point estimate can provide a clearer picture of the project's cost effectiveness.
- Anticipate "what if" questions by calculating measures of economic performance based on different scenarios to strengthen your report of evaluation results.

TAKE INTO ACCOUNT UNQUANTIFIED EFFECTS.

- Take into account unquantified effects, as well as quantified effects, in making a decision. The quantifiable measures of economic performance taken alone can be misleading when significant unquantifiable consequences cannot be adequately captured in the numerical evaluation.
- Impute the maximum or minimum value that could be assigned the unquantified effects without reversing the decision by using a break-even analysis approach. For example, the life cycle operating costs of a building may be reduced if the south wall is windowless. If a windowless wall eliminates a view, the maximum value that would be imputed for the view would be the net savings of the solid wall over the windowed wall, all other factors being equal.

ADVISE ON THE DECISION.

- The result of the economic evaluation should be an aid to improved decision-making, not a substitute for good judgement.
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