Project Appraisal In Developing Countries

Kamal Raj Dhungel*

INTRODUCTION

The origin of the cost-benifit can be traced back to the welfare economics of 19th century. It's first practical application began in United States of America in order to analyse the net benifit of water sources in 1930s. The concept of cost benifit now-a-days has become popular in analysing the acceptance or rejection of a particular project with respect to social cost-benifit analysis. There are two methods of social cost benifit analysis which are popularly known as the Little/Mirrlees and UNIDO methods. The major differences between these two approaches to social cost-benifit analysis can be visualised in selecting the numeraire to be used. The former method is based on the border price and accounting rate of interest based on public saving as numeraire while the latter is based on the donestic currencies and consumption rate of interest as numeraire. However, both the appraches have seversl evidence that the social cost benifit of a particular project gives similar results. This article aims to analyse the major components of the cost benifit analysis particularly on the basis of aforesaid two approaches.

IDENTIFYING COSTS AND BENIFITS

The identification of flow involved in project investmetnt appraisal should be made as; initial period investment cost; operating cost; the value of output; and the life of the project.

The value of the flow must then be discounted to obtain their present value as everythings has an opportunity cost. Once the identification of net flow has been determined, the net present value (NPU) can be obtained through the discounted rate. This is termed as the first profitability of the particular project. For social project appraisal, costs include all payments that reduce the availability of real resources to other users and benifit occurs when the project supplies the additional good or service or reduce the cost of a good previously available [Roemer 1975].

---

* Mr. Dhungel is Lecturer, Central Department of Economics, T.U. Kirtipur.

Net Present Value (NPV)

The net present value criterion is based on the difference between benitfits and costs, both discounted at th appropriate discount rates. In order to arrive at the NPV one should take four basic steps prior to calculate the NPV. These four basic steps are; the project costs and the benifits must be properly identified; once identified, the costs and benifits must be given a value reflecting market prices to asses private investors prospects and social prices to help to determine a government decision; costs and benifits must be compiled over time; and once the effects of time have been incorporated benifits must be related to costs for each projects so that projects can be compared to each other.

Once the above conditions are fulfilled, NPV can be measured as the present value of benifits [PVB) less the present value of costs [PVC) which benifits and costs are discounted at minimum return requirement [MRR] or the opportunity costs rate of return of the resources employed in the project. In order to compute present value an appropriate discount rate is required. The rate to be used is the MRR, that a public investment is required to earn if it is to be worthwhile. Unless the project is capable of earning, this rate of return or something being discounted at this discount rate, the resources it uses should be better employed as an alternative use. If all future benifits and costs have been expressed in terms of present values with an appropriate discount rate, they can be added to find the NPV of the project. Three important points should be kept in mind when dealing with the NPV. Firstly, the present value is always less than the nominal value that occurs in the future. Secondly, the longer the delay in realising some nominal value, the less is its present value and lastly, the higher the interest rate the lower the present value. As stated above, the first acceptability condition of the project is NPV. Acceptability requires that NPV >0. (Annex 1).

Benifit Cost Ratio

The benifit cost ratio was for a time the most popular decision rule used in social project appraisal. The B/C ratio is measured as PVB/PVC again discounting at the MRR. In other words, it is calculated by dividing the sum of a projects' discounted benifit by the sum of its discounted loss. It is the second criterion to accept or reject the project under consideration. The acceptability requires if the ratio is above 1. It means B/C > 1.

Internal Rate Of Return (IRR)

It is that rate of discount applied to benifit and cost streams which sets PVB=PVC or NPV=O. The NPV and IRR both should be taken together when projects are being considred one at a time. These two methods are closely related. In calculating the NPV one can independently choose a discount rate based on the cost of capital and then found the difference between discounted benifits and costs. On the other the calculation of IRR reverses the procedure. Instead of selecting the discount rate one can set the NPV at zero and try to solve for discount rate. The process of finding the IRR is trial and error. (Roemer 1975). If the result is positive a higher rate is used, if negative a lower rate is used and the process is repeated until the NPV is reduced to zero. Thus, the discount rate that yields a zero net present value is the internal rate of return (IRR). If the discount rate used in NPV is less than the social discount rate i.e. the value of IRR, the project under consideration is worthwhile. (Pearce 1971). If there are many projects having the same NPV, it will create a simple problem, i. e. which project should be selected. In such a situation, the B/C ratio should be marked which gives the reasonable answer to choose a single project among the various projects.

The Social Rate Of Discount

The choice of social rate of discount depends on the numeraire taken. The discount rate on the UNIDO method is consumption rate of interest (CRI). Emperical study for CRI has some complications. The UNIDO approach is based on the bottom up on the basis of switchig values. In this method one should convert the value of all inputs and outputs into their consumption equivalents. Switching value is the value at which a project becomes acceptable. The switching value of the project is the value of CRI that leaves a zero NPV for the project. It is the discount rate at which the NPV switches from positive to negative. Therefore, switching value can also be regarded as the IRR of the project. When more than one project is being considered, the switching value of the CRI is the discount rate at which one alternative comes to have a higher NPV than the other.

Similarly, the choice of numeraire in Little/Mirrlees system is the public saving for the reason that the appropriate discount rate is the rate which the marginal utility of public saving falls. This rate is termed as the accounting rate of interest (ARI) (Thirlwall 1994). If the too low ARI is

chosen there will be excessive investment, a balance of payment deficit and underuse of resources (Baldwin 1972). The ARI should be kept as high as possible consistent with their being as much investment as saving permits. (Little/Mirrlees1974). They suggested that most developing countries ought to use the rate around 10 percent in real terms. They also seuggest three rates for ARI: high, low and medium.

Shadow Prices

In order to compare the social costs and benifits of a project it is necessary to value both the resources, factors of production used and the goods and services produced. The prices actually observed in the economy may not measure social value correctly. Whenever there are controls, monopoly power, administered or legislative prices, external econimies and other market distortions, market prices will diverge from social opportunity costs and cannot be used in social project appraisal. Also, taxes and subsidies will introduce a spread between the prices consumers pay and those producers receive. In all these situations observed market prices must be adjusted or the correct market prices should be selected to reflect social values. These adjustd or selected prices are called shadow or social prices.

Theoritically, all shadow prices should be derived from a comprehensive mathematical model of the economy. In practice, however, shadow prices should be done selectively in terms of two criteria: firstly, the resources which figure most prominantly in benifits and costs in market prices and secondly, all resources invalued in the porject for which market prices are farthest out of reach compared to their respective shadow prices. Both of these criteria must be applied simultaneously for determining the shadow prices. Having these two conditions in mind one can assess the basis of shadow prices which are: main outputs; importable material inputs; major non-importable material inputs, and unskilled labour.

Once the bases of the shadow pricing are incorporated in the model, the fundamentals of shadow pricing should be evaluated. The most commonly used fundamentals of shadow prices are: the concept of tradability; the sources of shadow prices; the treatment of taxes; the choice of numeraire, and the use of adjustment factor.

Determination Of Shadow Prices

the UNIDO method clearly guides to determine the shadow price of the resources used by the projects. In a perfect market the shadow price would be the market price. But in the real world, the marginal cost of production will not be equal to the marginal price that consumers will be willing to pay for one more unit. It happens to the reason of the market inperfections, as tariffs, quotas and monopolies create distortions on demand and supply. There is little chance that market price reflect the true economic value and costs of inputs and outputs. For tradable resources the domestic market price is likely to be higher than the border price. Similarly, because of market distortions, marginal social cost as seen from the supply side for non-traded goods will also probably not be equal. Therefore, it is necessary to decide whether the project inpacts were in demand and supply to determing shadow prices.

Realising the above facts, project evaluater has to assess the impacts whether they are in demand or supply or both. The UNIDO method clearly recommonds three sources of shadow prices depending on the project inpact in national economy. These are:

- A project through its use and production of resources may for any given input or output affect the; supply available to the rest of the economy; level of its production to the rest of the economy; level of its imports or exports.

- In terms of production of an output the project may; increase total consumption in the economy; decrease production in other parts of the economy; decrease imports or increase exports.

- The corollary inpacts of the projects consumption may be; to decrease consumption of the rest of the economy; to increase production within the economy; to increase imports or decrease exports.

Therefore, while determining the shadow prices of resources, the sources of shadow pricing must be assessed by taking the impacts on the whole economy after which the project is to be acceptable.

The Unique Feature Of Developing Countries And Shadow Exchange Rate

Most of underdeveloped countries are typical. Industries have not developed the capacity to supply most of the capital and intermediate

goods required for continued development. So, most of the developing countries like Nepal will critically depend on imports. The capapacity to earn or save foreign exchange will, therefore, remain a critical concern of development plans and policies. Having this environment, foreign exchange becomes a factor of production because it represents ability to purchase capital equipment, industrial or agriculture inputs and consumer necessities. Realising the above facts, the currencies of developing countries are drastically overvalued. The official rate is undervalued to that of market exchange rate. In other words, the official rate of foreign exchange is likely to remain below the market rate of exchange. Therefore, shadow price for foreign exchange should be considered when the appraisals of projects are to be undertaken.

Shadow Wage Rate

Most of the labour used in any sector comes from a labour surplus rural sector and its departure involves a little or no loss of agricultural production, i.e. the opportunity cost equal to its marginal productivity is typically very low. (Baldwin 1972). However, the wages of labour used in the other sector of an economy rather than in the agricultural sector, will be determined above the wage rate of agricultural sector due to the pressure of trade unions. Therefore, in such circumtances, the actual wage rate lies between the actual market wage rate and an agricultural subsistance wage rate which is known as the shadow wage rate of the labour. There are other impacts such as in distribution and income, the evaluation of such inpacts are beyond the scope of this article.

Adjustment Or Conversion Factors

The financial values found in the financial tables must be transfromed into economic values, which indicate the premium, and that must be added or the discount that must be subtracted to reflect the difference between financial and ecomomic values.

The adjustment factors used in the UNIDO analysis are closely related to well known conversion factors or accounting ratios in the Little/Mirrlees analysis. According to them the actual prices paid cover the cost of inported inputs including import duties, the market cost of various other inputs, the cost of labour at the ruling wage rates, profit and tax payments. To get the accounting price of the inputs, of the ruling wage rates, it would like to subtract import duties and other indirect taxes, the excess of profits over that required to cover the ARI and to add on some allowence for the

consumption out of profits by those involved in providing the services. This is hard work, so, instead project evaluator can take some average of the ratios of accounting prices to market prices. These ratios are called conversion factors . The adjustment factor in UNIDO analysis is equal to the conversion factor minus unity.

CONCLUSION

Most of the developing countries are handicaped by the proper investment decision guidences. The investment decisions should be guided by above discussed cost and benifit measurements. These measuring instruments for social cost benifit analysis is used in public as well as private investment decisions in order to rationalise the guidelines for investment in which specific use of imputs with alternative uses should be determined to the optimum possible scale. To obtain this goal of investments, the task that confronts us is to develop a consistent and generally acceptable set of weights that will select just those projects that will yield the maximum benifits for a given expenditure of public funds. For this reason, project appraisal is a tehnique that permits us to derive such a set of weights or prices.

ANNEX 1

Once all future benifits and costs have been expressed in terms of present values, they can be added to find the net present value (NPV) of the project. Thus,

$$NPV = \frac{B_0 - C_0}{(1+i)^t} + \frac{B_1 - C_1}{(1+i)} + \frac{B_2 - C_2}{(1+i)^2} + \cdots + \frac{B_t - C_t}{(1+i)^t} \cdots + \frac{B_n - C_n}{(1+i)^n}$$

Where, B_t = total benifits in year t.

       C_t = total costs in year t.

       $B_t - C_t$ = net benifit in year t.

       i = discount interest rate.

       n = number of years, duration of the project.

Note that NPV may be positive or negative.

Similarly, we can obtain the basic equation for the calculation of IRR as,

$$O = \frac{B_0 - C_0}{(1+i)^0} + \frac{B_1 - C_1}{(1+i)} + \frac{B_2 + C_2}{(1+i)^2} + \cdots + \frac{B_n - C_n}{(1+i)^n}$$

Where the symbols have the same meaning as above.

As stated in the main parts of the article, the procedure for obtaining the IRR is iterative. Then, the simple iterative method of obtaining IRR is given by,

IRR = lower discount rate - difference between the highest and . lower discount rates × $\dfrac{\text{NPV at lower discount rate}}{\substack{\text{the difference of NPV at} \\ \text{lower and higher discount rate}}}$

For the regection/acceptance of the particular project the IRR does not provide the criterion for selection of projects. Thus, IRR should be compared with market rate of interest or social rate of interest. The procedure of comparisions is as follows:

If IRR is greater than the market interest rate or social rate of interest, then select the project under consideration. Now, taking the hypothetical example to find the NPV and IRR:

Years	Total Cost	Total Benifits	Net Cash Flow	DF at 10 Percent	NPV	DF at 25 Percent	NPV
1	100	-	- 100	0.909	-90.9	0.800	-80.00
2	100	-	-100	0.826	-82.6	0.640	64.00
3	-	90	90	0.751	67.59	0.512	46.08
4	-	100	100	0.683	83.30	0.410	41.00
5	-	150	150	0.621	93.15	0.328	49.20
Total	200	340	140		70.54		-7.72

Here, NPV at 10 percent is 70.54 > , thus the project is worthwhile. But the NPV at 25 percent is -7.72 so, project in not worthwhile. This example provides the basis for obtaining IRR,

$$\text{IRR} = 10 + 15 \left[\frac{70.54}{70.54 + 7.72} \right] = 23 \text{ percent.}$$

similarly, the discount factor $(DF) = \dfrac{1}{(1 + i)^i}$

SELECTED REFERENCES

Baldwin, G.B. (1972) "A Layman Guides to Little/Mirrless" *Finance and Development* Vol. 9, No. 1.

Hansen, J. (1978) *Guidelines to Practical Project Appraisal: Social Benifit Cost Analysis in Developing Countries*, Oxford and IBH Publishing Company, New Delhi.

Layard, R. (1975) (ed.) *Cost Benifit Analysis*, Penguin Books Ltd., England.

Little,I.M.D, Mirrlees, J.A. (1974) *Project Appraisal and Planning for Developing Countries*, Oxford and IBH Company, New Delhi.

Mishan,E.J. (1975) *Cost Benifit Analysis*, George Allen and Unwin

Roy P. (1973). *Appraisal and Control of Projects Costss*, Macgraw Hill, London.

Pearce, D.W. (1971) *Cost Benifit Analysis in Urban and Regional Planning*, Unwin Hyman, London.

Roemer, M, Stern J.J. (1975) *The Appraisal of Development Projects*, Praeger Publishers, New York.

Thirlwall, A.P. (1994) *Growth and Development*, Macmillan, Hongkong.

UNO (1978) *A Guide to Practical Project Appraisal*, Project, Formulation and Evaluation, Series No. 3, UNO, New York.

Weiss, D. (1976) *Economic Evaluation of Projects*, German Development Institute, Berline.