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THE DISCOUNT RATE: A REVIEW OF OPPOSING VIEWPOINTS*

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Introduction

The discount rate as an imposed or calculated rate of future returns to capital investment is a critical factor in the economic evaluation of proposed public as well as private investment projects. For example, a government project that promises substantial net benefits when evaluated at a rate of 5 percent may well appear wasteful if the rate is even marginally greater, say 5 1/8 percent. At stake in determining the appropriate discount rate is the efficient allocation of resources between private and public sectors of the economy. The discount rate suggests which projects should be undertaken, and thus the proportion of the economy's activity that should be undertaken by public agencies as opposed to the proportion that should remain in the private sector. So it is vital to understand what determines an 'appropriate' discount rate.

Table 1 provides an example of how different discount rates influence benefit-cost ratios as well as net benefits. This simple example shows that the discount rate is of crucial importance. The higher this rate, the lower the B/C or benefit/cost ratio, so it is more difficult to generate a 'favorable' benefit/cost ratio (B/C >1) for projects whose benefits will occur in the future. Keeping this fundamental theme in mind, it is useful to review various viewpoints on the criteria that most appropriately govern the selection of the discount rate to be used. The viewpoints can conveniently be discussed with respect to several common criteria, including Opportunity Costs, Social Time Preference,

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TABLE 1

The effect of discounting on the evaluation of a typical investment, using discount rates of 0, 3, 5 and 10 percent; after Haveman (1970).

Item	Unit	Discount rate (percent)			
		0	3	5	10
Present value of total benefits	$1,000	15,000	10,448	8,448	5,442
Present value of total costs	Do.	7,500	6,741	6,409	5,906
Benefit/Cost ratios	---	2:00	1:45	1:32	0:92
Net benefits	$1,000	7,500	3,707	2,047	-468

and Marginal Equalization.

The Opportunity-Cost Criterion

Baumol (1968), Harberger, Stockfish and other followers of the opportunity-cost school have argued that the appropriate discount rate is represented by the opportunity cost of capital in the private sector; that is, by the private market rate. Suppose one considers government construction of a dam, which will employ X number of workers, use Y tons of steel, and produce Z kilowatt-hours of electricity. In an economy with full employment, resources made available for the project must be transferred from other activities. If these resources yield an r rate of return in the private sector, however calculated, the resources should be transferred to the public sector if that project yields a similarly calculated rate of return exceeding r. If the potential earning rate in the project is below r, the resource allocation question should be left in private hands. Because the resources used by the government could alternatively be used in the private sector, the government must look to private interests and project rates to determine the appropriate public interest rate for discounting. This same principle was reflected in a report of the Joint Economic Committee of the U.S. Congress. As the Committee report indicates:

> Private citizens should not, in general, be forced to give up a portion of their incomes in the form of higher taxes to support public undertakings, which are of less social value than the uses to which their funds would otherwise be put. The way for the Federal Government to assure this result is to adopt in

public investment appraisal an interest rate policy which reflects the private sector opportunities foregone.

The opportunity-cost or private sector interest rate for the United States was around 8-10 percent during the period 1960-1970, although lower rates were considered justified by the Joint Economic Committee, in view of developing resources for future generations. But Baumol (1969) has suggested that future generations will probably be much richer than previous generations (as the past trends have shown), so the investments at low discount rates are a sort of subsidy to support and benefit future generations, at the cost of the relatively poor present generation. Only where there is a serious stagnation would Baumol subsidize investments for future generations, and only then if this policy were needed to revive the economy.

By contrast, Marglin, following a Pigouvian welfare path, pleads the case of future generations. To Marglin, future generations are as important as the present generation... "The present generation's preferences should not be allowed full sway in determining the overall rate of investment." "The individual may (will) die," goes the refrain, "but the Nation lives on."

In questioning this view Baumol (1969) states that, as far as posterity is concerned, there is no basis for presuming that a transfer of resources from the private to the public sector will necessarily produce a net increase in the amount of investment undertaken by the economy. The increase in the amount of government capital construction would very likely be offset, at least in part, by a decline in private investments in plant and equipment. He believes that if the Nation's

investments for the future are considered inadequate, there should be simultaneous inducements for both private and public capital formation.

The Social Time Preference Criterion

As we have seen, Baumol, Harberger and Stockfish advocate discount rates based on comparative returns to capital in the private and public sectors of the economy. However, Eckstein (1961a) would place more stress on the factor of social time preference. In his view, the private rate of time preference may be "too high", because private individuals tend to think and invest from a short-term viewpoint. Government takes a longer view, reflecting an obligation to promote the welfare of unborn generations. On this reasoning, the appropriate social rate of time preference should be lower than the private rate. Eckstein's view thus tends to lie between those of Baumol (1969) and Marglin.

Next comes Arrow, who suggests that the opportunity costs of capital and the rate of interest to the consumer are identical, as they must be for full optimality. The present value of any proposed new investment project accordingly must be computed using discount rates derived from the present and future value of a short-term rate of interest on consumer loans. To me this seems correct only if the private capital market were perfect, and if there were no divergences between social and private benefit. Only then would the discount rate on public investments be the same as that in the private market.

In examining a paper by Feldstein, another significant idea seems to emerge--the idea of public goods. Feldstein would invoke the political process, believing that since the market cannot express the collective

demand for investments to benefit future generations, political decisions must come into the picture. This buttresses Marglin and others in their suggestion that individuals, in their public role as citizens, may be willing to save for future generations--if others are also willing to do so. Public investment and consumption by future generations can in effect be treated as public goods to be 'consumed' by every member of the community. Feldstein employed an indifference curves analysis to arrive at his appropriate rate of social time preferencee.

The theory suggested by Feldstein has also been followed by Steiner. As shown in table 2, suppose the government plans to spend $100 on either project A or B. Each project serves some common underlying objectives, but generates a different time-stream of benefits. Project A produces 30 units of physically defined output after a year, and none thereafter. Project B produces zero units in year 1, 33 units at the end of 2 years, and none thereafter. One can see in table 2 that the present value of A in physical terms is $30/(1+r)$, and the value of B is $33/(1+r)^2$.

Harberger criticizes the social time preference criterion and considers the arguments of Eckstein (1961a), Marglin, and Steiner to be subject to a decisive criticism. He says they may lead to results in which the rate of return to investments in the public sector lies below that which could be obtained by placing the same funds at the disposal of the private sector, or by investing directly in private-type activities.

But Steiner and Feldstein have another significant idea in their work. To them, high and low discount rates represent different things. One is collective social preference, in which people, not dollars, vote

TABLE 2

Hypothetical example comparing opportunity costs of time preference of two projects serving the same objectives; after Steiner (1969).

Characteristic	Project A	Project B
Cost of project (dollars)	100	100
Physical output:		
1 unit = $3.80		
Year 1st	30	0
Year 2nd	0	33
Value of output (dollars)		
1 unit = $3.80		
Year 1st	114.00	0
Year 2nd	0	125.40
Present value, computed at		
6 percent	107.50	112.50
10 percent	103.60	103.60
11 percent	102.70	101.60
15 percent	99.10	94.80

or reveal their preferences. The other contrast is a concept of effective demand for capital. Steiner believes the real issue is whether public policies should serve to equalize the two. Harberger would use public policy to expand private investment and equalize private and public rates.

Hirshleifer, De Haven, and Milliman have still another approach to this issue. They say that the government could make sufficient funds available on the loan market to drive the interest rate down to the desired level, while holding down the inflationary potential--by imposing a sufficiently high level of consumption taxes. The net effect would be to restrict present consumption for the benefit of investment (future consumption), without creating inefficient disparities between the advantages of investment in the private and public spheres.

The Marginal Equalization Criterion

In a fashion similar to Hirshleifer, Stockfish argues, in connection with this criterion, that if we wish to attain a maximum rate of growth, resources should be invested where the return is highest. If we want to change the composition of private goods, whether produced by government or private firms, the most efficient investment should be encouraged by excise taxes and subsidies. If we want a given amount of government goods that meet 'collective' wants, the investment policy that generates the highest GNP is the best means to achieve it. In other words, if there is more productive power, rather than less, the burden of taxation or the inflationary incidence of deficit spending decreases. The government could, in this type of situation, divert more resources from the private sector to attain 'collective' goals than it could by causing resources to be invested in less productive channels.

Stockfish's line of reasoning seems to be criticized by Eckstein (1961b), on two grounds:

1. Stockfish assumes that an expansion of public investment leads to contraction of private investment in equal amount, or that a contraction of public investment would result in an equal expansion in the private sector. In fact, since public investment is financed primarily out of taxation, much of which is paid by households, its expansion would at least in part be at the expense of consumption.
2. Insofar as investment is affected, it need not be the best investment but only marginal undertakings in enterprises whose growth is particularly constrained by business taxes. Thus, the rate of return on good private investments also holds little normative significance for government projects.

A Final Commentary

In this brief review, I have tried to summarize several viewpoints on the complex questions that arise in selecting the discount rate most appropriate for analyzing the economics of public investment projects.

A general conclusion is that strong arguments exist for adopting any of the criteria described. Thus, the question is not whether one criterion is necessarily superior to another in theory or as a general policy standard, but whether the particular rate actually used in analyzing a given project is appropriate to the institutional circumstances and the policy setting within which the project has been proposed. This is a responsibility best shared by policy makers and economic analysts, so that the assumptions and results of project

evaluations are well understood by both and can be freely presented in project reports, and are thus made understandable to all factions interested in the project.

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