

THE INTEREST RATE IN COST-BENEFIT ANALYSIS

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It would be hard to overstate the importance of the interest rate used in the discounting of benefits and costs to judge the worthwhileness of proposed long-term Federal investments. Suppose a project were expected to yield benefits of \$1 million a year beginning 5 years from the initiation of construction and extending indefinitely into the future. Using an interest rate of $2\frac{1}{2}$ percent, we would evaluate this stream of expected benefits at \$35.36 million as of the date of initiation of the project. But if we were to use a 6-percent rate, our evaluation would be no more than \$12.45 million. The choice of interest rate becomes more critical, the longer the duration of the project in question, and the longer the lag between the beginning of construction and the time when benefits begin to accrue. Clearly major mistakes can be made if the wrong interest rate is used in evaluation. If the cost of the above project were \$20 million, it would be a fine investment if $2\frac{1}{2}$ percent were the right rate and a terrible mistake if 6 percent were the right rate. I propose to argue in this paper that a rate of 6 percent or better is the proper rate to use in evaluating Federal projects. This compares with a rate of $2\frac{1}{2}$ percent most commonly used by the Government agencies which undertake cost-benefit analyses.

The justification most commonly given for the use of the $2\frac{1}{2}$ percent rate is that that is the rate at which the Government can borrow. This, of course, is no longer true; perhaps a $3\frac{1}{2}$ percent rate would accord better with the present state of the money market. Be that as it may, my argument for a rate of 6 percent or better does not depend critically on the state of the money market. It holds equally well for the easy-money days immediately following the second World War and for the hard-money period through which we are now passing.

The essence of my argument is that there exist and have existed ever since the war widespread opportunities for investments yielding 6 and 8 percent and higher. So long as such opportunities are available, our society does itself a disservice by investing at yields of merely $2\frac{1}{2}$ or $3\frac{1}{2}$ percent. The opportunities I speak of are those at the margins of industrial and agricultural investment, and I suspect it is also true that investment in residential construction might yield close to 6 percent.

Let us consider a typical industrial investment. Let it be financed half out of equity (or retained earnings) and half out of borrowings. What must it yield in order that it be a successful investment in the market sense? Presumably, the total yield should be sufficient to pay the interest on the borrowings and provide a rate of return on the newly invested equity equal to the market rate of return on equity. Taking figures which are reasonably representative of the period since

the war, let us assume the interest charge on borrowings to be 4 percent, and the earnings yield of equities to be 10 percent. This earnings yield is, of course, after taxes; the before-tax yield of equity capital has typically been in the order of 20 percent. Thus our typical successful investment yields 4 percent on half the invested funds and 20 percent on the other half, making the rate of return on the whole equal to 12 percent. It may be objected that the 10 percent figure for earnings yield, while representative of the whole postwar period, has been rendered obsolete by the great rise in stock prices that has occurred. For recent years a figure of 7 percent might be better for the after-tax yield of equities. This means 14 percent before tax, and together with a 4 percent borrowing rate applied to half the total capital implies an overall yield on capital of 9 percent, rather than the 12-percent figure obtained earlier.

Another approach to estimating the rate of return on capital in the United States is to compare total income received on account of capital with the total value of the capital itself. Neither of these components is easy to estimate, but much work has been done in recent years to improve our knowledge of both.¹ In spite of the lack of absolute precision in the presently available estimates, one may feel quite confident that the stock of capital in the United States is somewhere between 3 and 4 times the national income, and that the income accruing to capital amounts to somewhere between one-third and one-fourth of the national income. Our estimate of the rate of return on capital in the overall economy lies, then, in the range between 6¼ percent (income of one-fourth divided by capital of 4) and 11.1 percent (income of one-third divided by capital of 3), and probably closer to the middle than to the extremes of the range.

In the case of agriculture we have a reasonably good measure of the return on capital in the ratio of the gross rent paid to the value of rented farms. For 12 Corn Belt States this rent/value ratio ranged from an average of 5½ percent in Ohio to an average of 8½ percent in Wisconsin, with most States averaging between 6 and 7 percent. The figures are for 1954-57, and apply to farms rented wholly for cash.²

It is clear that there do exist many alternative investments yielding 6 percent and more per year. One might ask, however, whether these differ substantially from typical government projects in their degree of riskiness, so as to warrant a substantially different rate of return. I cannot help but feel that Federal projects are highly similar in their degree of riskiness to many private projects. Both power and irrigation facilities are provided by the private market side by side with Federal installations, as are, from time to time, river and harbor improvements, flood-control facilities, etc. These rank, to the best of my judgment, neither as especially safe nor especially risky investments. It therefore seems reasonable to expect that Federal investments in these activities should pay off at least at 6 percent, which, as we have seen, appears to be somewhat below the aver-

¹ Cf. Raymond Goldsmith, *A Study of Saving in the United States*. (Princeton: 1956.) Moses Abramovitz, *Resource and Output Trends in the United States Since 1870*, *American Economic Review*, May 1956, pp. 5-23, and the sources cited therein.

² U. S. Department of Agriculture, *The Farm Cost Situation*, May 1957, p. 19, table 8.

age return on investments in the private sector of the economy. The purpose of Federal investment is, I believe, to improve our level of living and that of our children; the measure of this improvement is provided in dollar terms through the estimation of benefits. There seems little or no justification for the Government's withdrawing resources from the private sector unless these will yield as much improvement in levels of living as ordinary private investments.

My recommending the use of a substantially higher interest rate in cost-benefit analysis does not imply any prejudgment that serious mistakes were made because a lower rate was used. If estimated benefits were 5 times costs using a 2½ percent rate, they would likely turn out to exceed costs, though by a smaller margin, when a 6 or 8 percent rate was used. It is the projects which are marginal in the first place that look bad when a higher rate is used. It is accordingly of interest to inquire whether projects actually undertaken could pass the test of a higher interest rate. A group of investigators at the University of Chicago have looked into this question, using the same benefit and cost estimates as were presented by the agency in question, but simply applying different interest rates for time discounting.

Out of 24 Bureau of Reclamation projects which were in fact undertaken, only 8 would have been judged acceptable at a 5-percent rate, only 2 at a 7½-percent rate, and only 1 at a 10-percent rate, if only primary benefits are taken into consideration. Counting secondary as well as primary benefits, 16 projects would pass the test at the 5-percent rate, 9 at the 7½-percent rate, and 4 at the 10-percent rate. Similar results emerged from a study of 29 Corps of Engineers projects. However, in the case of 27 Department of Agriculture watershed programs, practically all of the projects would stand up under a 5-percent rate, and two-thirds would be acceptable at a 10-percent rate, though one must add that the estimates of benefits, which are the raw material of benefit-cost analysis, appear to be subject to substantial possible error in these cases.³

Thus it appears that the use of a higher rate would have precluded some, but by no means all of the projects actually undertaken. I strongly recommend and urge that future Federal investments receive scrutiny in terms of a rate of interest comparable to the return to capital in the private sector. This will lead to a better use of our resources, and in the bargain may provide some possibilities for budget limitation.

³ University of Chicago Office of Agricultural Economics Research. Paper No. 5612, July 18, 1956, pp. 4-5.