

Operations Research Techniques for Capital Investment by F. Hanssmann.
New York: Wiley and Sons, 1968.

Even yet I suppose many economists are taught how to discuss problems rather than how to solve them. It is not surprising, therefore, that even in the analyses of investment projects, where the economist might have been thought to be the expert, mathematicians, scientists and statisticians have often been able to make a much more constructive and profitable contribution than the economist. 'Operations Research' is the mixture of mathematics, quantitative insight, and common sense that is coming to be used to solve many of the more complex problems of industry and government. Professor Hanssmann sets out to explain, without too much mathematics and with plenty of illustrative case studies, how these methods can be applied to investment decisions.

Since mathematical problems are not solved in the book, most of it is concerned to explain what the operations researcher should try to do, and how he sets about formulating the problems in a computable way. The careful reader should certainly acquire many useful hints and principles; but he will not be taken to the point where he could tackle such a problem himself. Before he could do that, he would have to know much more about mathematics, statistics, and computing than he can acquire here. This is primarily a book to show what operations research is and what it can do. As such, it should be extremely useful to the economist. The only prerequisite is that he should have no trouble in understanding equations. He should also be tolerant of the approximations and guesswork that are necessary when answers and action, not understanding, are required.

An economist is bound to be struck, on the one hand, by the ingenuity and power of the treatment of particular investment problems and, on the other hand, by the unsophisticated definition of the investment criteria. To some extent this lack of sophistication is deliberate. Rather than talk of, say, the businessman's indifference map for profits in different periods, or his utility

index for choices under uncertainty, Professor Hanssmann wants to present the consequences of different policies and then let the managers themselves decide. He recognizes that the operations research team is bound to exercise some discrimination in choosing which alternatives to present. But he takes it that their job is done best when several relatively crude measures of different aspects of the project's costs and benefits are reported to management. At no point is it suggested that management might require expert advice on that final choice. If the procedure sounds a bit arbitrary, the various case studies—expanded in admirable detail—demonstrate how imaginatively this method of assessment can be applied.

But the economist is bound to be able to offer constructive criticism of criteria. This is the area where he should be most expert; whereas the operations researcher is expert at formulating specified problems computationally and bringing quantitative evidence to bear, even in apparently improving aspects of the problem such as the chances of finding oil in unexplored areas. I found myself questioning seriously the treatment of uncertainty, and the application of these methods to public investment decisions. The assumption that the managers of corporate enterprises know what they think about risky prospects, and require no advice and instruction in choosing amongst them, is surely absurd. To expect that people who, sometimes, know nothing about probabilities, can nevertheless decide reasonably and sensibly when presented with, say, means and variances of profits for alternative projects, is very odd. They can decide certainly: that is what they are good at. But reasonably and sensibly? I doubt it.

Indeed, I doubt whether Professor Hanssmann has thought as hard about these problems as he has about the details of the project analysis. At one point, he takes it for granted that the mean value of the internal rate of return of a project is more interesting than the internal rate of return of the mean values of its costs and benefits. I cannot think of any reason why this should be true. There are many other instances of superficial and misleading remarks about uncertainty. Again, in dealing with public-sector decisions, it seems that rates of interest are adopted without question and substantial risk-aversion assumed. In the case study of oil exploration in the Sahara (due originally to a most distinguished economist, Professor Allais, in fact), the assumption that the risk of loss should be a very important consideration is accepted without question or discussion. This seems to me a grave mistake. At any rate, so important a matter requires hard thought.

All this is only to say that the economics of investment decisions is as important as the techniques of operational mathematics required to apply investment criteria. Most of us ought to know about both of them. Professor

Hanssmann's book is a valuable introduction to these operational aspects, for which economists should be very grateful.

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