FORUM

ON THE FUTILITY OF UTILITY

In recent contributions to this *Review*[1] and elsewhere,[2] Professor Dillon has espoused the virtue of the principle of maximizing expected utility when a decision maker is faced with risky choice. However, there is some evidence to suggest that the estimation and use of utility functions is not as straightforward as Professor Dillon would have us believe. In this note, comment is made on three aspects of the procedure: (i) improvement in utility function estimation procedures; (ii) relevance to decision making behaviour; (iii) the possibility of different functions for different decisions.

(i) The most common procedure used has been the modified von Neumann-Morgenstern method, where the certainty equivalent ($z) of a 50 : 50 chance of $x or $y is found.[3] Typically, the first question spans the monetary interval of interest (say $0 to $40,000) and subsequent questions specify intermediate points. An unpublished empirical test of this procedure with graziers in the Clarence region revealed considerable inaccuracies in the answers to the first question, compared with subsequent "check" questions[4]. The consistency of the inaccuracies suggested that graziers were having difficulty in reconciling such widely separated money amounts.

Accordingly, a modified questioning format is proposed. Instead of fixing $x and $y, and varying $z until the certainty equivalent is found, $x and $z are predetermined and $y varies. Since $x < $z <$y, this generates the utility curve outwards from the origin. The money amounts involved in a question, being closer together, should not pose as great a problem to decision makers.

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[1] J. L. Dillon, "An Expository Review of Bernoullian Decision Theory in Agriculture", this *Review*, Vol. 39, No. 1 (March, 1971), pp. 3–80.

[2] J. L. Dillon, "Interpreting Systems Simulation Output for Managerial Decision Making", in J. B. Dent and J. R. Anderson (*eds.*) *Systems Analysis in Agricultural Management*, (Sydney: John Wiley, 1971).

[3] J. P. Makeham, A. N. Halter and J. L. Dillon, *Best Bet Farm Decisions*, (Armidale: University of New England, Professional Farm Management Guidebook, No. 6, 1968).

[4] *ibid.*

(ii) If a utility function underlying a grazier's decision making behaviour exists, it is questionable whether it can be elicited by a few naive questions involving gambles of 50 : 50 prospects. There is, for example, a conflict between out of context questions to avoid bias and "real world example" type questions so that the decision maker employs his "real world" utility function to answer them.

It is obvious that utility functions must be estimated in relation to the relevant experience of the decision maker. Despite the fact that amounts up to $40,000 would be experienced by most graziers, the chances of an equally likely $0 or $40,000 result are remote in the extreme. Typically, there will be several possible outcomes which will lie closer together. One should not expect questions which relate to situations completely beyond the experience of a decision maker to be a realistic basis for estimating the utility function of the decision maker.

(iii) Although utility theory allows biases and hunches to be reflected in subjective probabilities, an estimated function would be a simplification of the true decision environment if, as seems quite conceivable, attitudes differed for two decisions. For example, a loss of $2,000 from fire damage to fences is unlikely to concern some graziers as much as $2,000 lost by sheep deaths arising from drought starvation. The possibility of different utility functions for different decisions suggests that proxy decision making (e.g. by a consultant) could be very dangerous if based on a utility function alone.

In conclusion it should be pointed out that the tenor of this note is not counter to the basic principles of Bernoullian Decision Theory. The certainty equivalent concept is an unquestionably beneficial aid in reducing the complexity of a decision problem where outcomes are known only in probabilistic terms. However, it is felt that the derivation and use of utility functions to facilitate decision making (proxy or otherwise) is not the rosy concept it has sometimes been painted. Rather, there are severe operational shortcomings which have often been glossed over in an endeavour to highlight theoretical niceties.

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COMMENT ON TREBECK

As Mr Trebeck notes it may sometimes be difficult, even impossible, to plot a utility curve $U = U(\$x)$ for some people. For this there may be a variety of reasons related to: (a) non-acceptance of the relevant axioms; (b) the existence of non-substitutable goals so that utility is lexiographic; (c) difficulty in handling hypothetical questions; or (d) inefficient questioning procedures. These difficulties did not go unrecognized in my review[1] though it would be fair to say, I think, that Mr Trebeck sees them as occurring more frequently than I do. So long as their possible existence is recognized and due care exercised, I believe the operational impact of these difficulties can be adequately controlled.

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[1] Dillon, J. L., "An Expository Review of Bernoullian Decision Theory in Agriculture", this *Review*, Vol. 39, No. 1 (March, 1971), pp. 3–80.