

The foundations of expected utility. By PETER C. FISHBURN. Theory and Decision Library series, vol. 31. Boston, Dordrecht and London: Reidel; distributed in the U.S. and Canada by Kluwer Boston, Hingham, MA, 1982. Pp. xii, 176. \$39.50. ISBN 90-277-1420-7.

JEL 83-0592

Rationality in choice under uncertainty has come to be identified with expected utility maximization, experimental or conceptual objections notwithstanding; Fishburn develops the underlying axiomatization. The exposition follows the natural division into i) the derivation of an expected utility representation for a given, objective probability distribution over states of nature and ii) the simultaneous derivation of a subjective probability distribution over states of nature and an expected utility representation. The argument is meticulous, intuition is neglected, and the emphasis is on technical detail: finite vs countable additivity of probability measures, partially ordered preferences, or multilinear utility on products of mixture sets. The work is thus of interest as a reference rather than as a textbook. Its shortcoming lies in the omission of criticisms and extensions that have occupied the literature since the work of John von Neumann, Oscar Morgenstern, and Leonard Savage. I shall outline them.

In an expected utility representation, probabilities enter linearly and the cardinal utility index is, in the standard version at least, independent of the state of nature. The argument for linearity hinges on the sure thing principle:^{1,2} If conditional on an event B act f is preferred to act g while f and g coincide if B does not occur, then f is unconditionally preferred to g . The axiom, even though intuitively appealing, has been repeatedly reported to be the subject of experimental falsification. A possible yet partial defense is, as Mark Machina has suggested, to view linearity and hence expected utility as an approximation to more general preferences. That the state of nature does not affect the cardinal utility index

derives from the axiom which establishes preferences among consequences: If, unconditionally a consequence c is preferred or indifferent to a consequent c' , then for no event B is it the case that conditional on B the order of preference is strictly reversed. The axiom requires an appropriate interpretation of consequences vs states and acts. At the limit, however, the appropriate interpretation strains the limits of plausibility: A consequence c may be unavoidably incompatible with a state s and the individual asked to consider acts assigning c to s . The following remark by Savage exposes the difficulty:

To some—perhaps to you—it will seem grotesque if I say that I should not mind being hung so long as it be done without damage to my health or reputation, but I think it desirable to adopt such language so that the danger of being hung can be contemplated in the framework of f of s [From a letter to Robert Aumann dated 27 Jan. 1971].

Complementary to the development of the axioms underlying expected utility maximization should be the derivation of its observable implications. Failure to yield restrictions on the observable behavior of the individual would render the theory irrefutable. Furthermore, questions of prediction and welfare require the cardinal utility index as well as the subjective probabilistic beliefs to be recoverable from observable behavior. For the particular problem of portfolio selection, and if asset markets are possibly incomplete, as Philip Dybvig, Herakles Polemarchakis and others have argued, an affirmative resolution of these issues requires strong, additional assumptions.

Aggregate choice introduces additional considerations. Individual expected utility maximization may be compatible with totally arbitrary aggregate behavior, while excessively strong additional restrictions on individual characteristics and their distribution are required for aggregate behavior to be generated by expected utility maximization; the aggregation of probability distributions need not, furthermore, be independent of the aggregation of cardinal utility indices. A promising yet unexplored alternative is that of approximate aggregation: under milder restrictions, there may exist a cardinal utility index and a probability distribution such that maximization of

¹ I am following here the terminology of Savage with states (of the world), events (sets of states), acts, and consequences; acts map states to consequences. An event B occurs if the realized state s lies in B .

² The independence axiom of von Neumann-Morgenstern is analogous.

the associated expected utility approximates aggregate behavior. Rationality in aggregate behavior acquires an additional dimension once it is realized that, if individual agents receive differential information, they should revise their probabilistic beliefs to incorporate the information revealed by the (aggregate) behavior of others. Revision stops only when revealed information has become common knowledge; this may suffice to eliminate any relevant differences of opinion.

Intertemporal choice under uncertainty does not necessarily require a distinct argument. A formal treatment, however, may not be sufficiently sensitive to the particularities introduced by the temporal component, such as the possibility of dynamic inconsistency and the resulting divergence between the naive and the sophisticated formulation of the individual optimization problem.

In conclusion it should be mentioned that failure of the expected utility hypothesis may put into question the accepted Arrow-Debreu formulation of general equilibrium: If individual objective functions fail to be separable across states of nature and linear in probabilities, the resolution of uncertainty may necessitate the revision of individual plans even if markets in contingent commodities at the initial point in time are complete.

HERAKLES M. POLEMARCHAKIS

*Columbia University and
Université Catholique de Louvain, Belgium*

The economics of supply and demand. By LAWRENCE R. KLEIN. The Royer Lectures series. Baltimore: Johns Hopkins University Press; London: Blackwell, 1983. Pp. xii, 169. \$17.50. ISBN 0-8018-3095-8. JEL 84-0029

Based on the 1981 Royer Lectures delivered at the University of California, Berkeley and several other public lectures, this book is a collection of Nobel laureate Lawrence Klein's thoughts on current controversies in macroeconomics, a spirited defense of Keynesian economics, and suggestions on where macroeconomics should go from here. One should say at the outset that since it is a collection of public lectures, it is not, for the most part, written for the professional economist who will find some of the discussion a bit superficial.

As one of the foremost of the older genera-

tion of Keynesian economists, Professor Klein takes strong exception to the notion that Keynesian economics has failed, and should be replaced by Monetarism, Rational Expectations, or any of the other currently popular schools. Rather, he argues that the Keynesian analysis along with much of the rest of macroeconomics is incomplete because it is too exclusively concerned with problems of demand management. That may have been fine in the Great Depression when there was so much idle capacity that demand could be assumed to create its own supply, but it will not do now exactly because we have learned to manage demand well enough, thanks to Keynesian economics, that we really do have to worry about supply problems. Now what we need is not to abandon Keynesian analysis, but to supplement it with a far more detailed treatment of the supply side. That treatment should go beyond the aggregate labor market models and expectations formations that pass for the supply side in most current macroeconomic theories.

To do this, Professor Klein calls on macroeconomists to shift from their aggregate models to a much greater level of sectoral detail. He is convinced that supply-side difficulties are now our most pressing macroeconomic problem, and he makes a good case that they are sectoral and structural, that is to say, microeconomic in nature. They involve such factors as energy supply, pollution, the effect of regulation, productivity, and sectoral capacity constraints, none of which can usefully be modeled at the aggregate level. To remedy this, Professor Klein proposes that we integrate our demand-side models with a variable-coefficient Leontief input-output system to produce a general equilibrium multisector model with as many as 1000 equations. As he puts it,

... the back of the envelope approach to economic reasoning is *chose passe*. The kinds of problems that are being faced today, especially in the supply side components, require an analysis of interrelationships among age-specific distributions, industrial sectors, and commodity types. They are not micro in the true Walrasian sense, but they are an order of magnitude different from experience in macroeconomic analysis [p. 30].

Models of the sort he proposes would enable us to trace out the effects of supply shocks,