Statistical Decision Theory

Who makes the decisions?

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Introduction

In all fields of Science, business, administration, management, medical practice and, in general, every day life, we have to make decisions under conditions of uncertainty. What more appealing than a scientific - a mathematical! - theory of decision making, a set of rules that tell us what is the right thing to do, or, at least, which is the combination of choices to avoid?

To a certain extent, this is what Decision Theory attempts to do. Its object is to identify a course of action that is logically consistent with the decision-maker's own preferences. To this effect the decision maker must express his/her preferences in terms of numerical utilities and his/her uncertainties in terms of probabilities and then must choose the decision which maximizes the expected utility. '(1)

Decision Theory has developed as a branch of Statistics over the past 25-30 years mainly in the States; the Decision Theory approach provides a model for most chapters of Statistics, like estimation, hypothesis testing etc.

It is my intention in this note to look at some applications of Decision Theory and outline very briefly a possible critique of this discipline.

Decisions and Designs Inc.

Decisions and designs Incorporated is a prominent U.S. company which has been functioning in the field of decision analysis since the early sixties with the collaboration of highly qualified scientists and under the sponsorship of Government agencies and business enterprises.

Their task is to apply the theory of optimal decisions to practical problems, that is to structure the reasoning and information behind the problem, quantify itscomponents and deduce the logical implications for action.

It is worth looking into some of their studies, taken among the few that are "unclassified" since this tip-of-the-iceberg may help understand the logic employed.

Dump Israel for Oil (2)

This is a research project investigating the choice between three alternative U.S. foreign policy options towards a hypothetical (?) Middle Eastern country. These differed from one another for the different degrees of political and economical concessions (dollar "absorption", political support, military security, cultural exchange etc.) granted by the U.S.A. to the country in return for improved prospects for supply of oil. To set up the

the model, the following had to be quantified: the impact of negotiating postures on oil supply, the balance of payments, Western Europe and Japan reactions, U.S. sentiment (ie. reaction of American Jews) and the effect in other oil producers. Thus even human factors were weighed in terms of billions of dollars and barrels of oil per day.

More examples

Other projects carried out by D.D.I. :

a) To what extent should the U.S. permit Communist countries to have access to high technology products? The model evaluated numerically the implications of various "easy access" policies for Communist bloc military capabilities, U.S. foreign trade, economic and political relations between the United States and its European and Asian allies, and U.S. technological superiority.

b) Is it better for a ship to shoot or not to shoot at an unidentified aircraft? The "shoot vs. no-shoot" decision was examined on the basis of values that might be assigned to the loss of human life, the cost of equipment, the effect on morale and the impact on political positions, to determine the critical probability that the incoming plane is an enemy at which the decision should change from "don't shoot" to "shoot".

c) At what point in time after the Warsaw Pact begins to mobilise would NATO go into a state of "reinforced alert" (meaning war)? A study was conducted to estimate the timeliness of NATO responses to an impending attack.

Besides these Dr Stangelove exercises (it is not difficult to imagine a study trying to put a value on the effect of dropping the atom bomb against American public image) other researches involve "intelligence" management and business.

The mystifying role of decision analysis

Thus decisions of a political nature are arrived at by "scientific" methods. But what are the assumptions on which the theory is based? First of all the probabilities and utilities which the calculations rest so heavily upon are personal ones, they are one particular individuals. This is never clearly stated in the projects and the subjective character of the conclusions is obscured by what looks like a deliberate attempt at presenting the findings as objective truths, through the usual impressive display of data, diagram s, graphs, percentages. The laymen will feel inclined to delegate their responsibility as decision makers to the "experts".

Coherence

Secondly, one of the principles of Optimal Decision Theory is coherence. Can we apply this mathematical category when considering human factors? It is well known that it does not describe human behaviour, if only because it fails to account for historical developments. Some statisticians argue that it is people's behaviour which ought to change. (3) Then it would fit in with our mathematical model and statistical decision theory would become a much more successful tool.' Even intelligent self-criticisms to be found in decision theory books (4) only view the effectiveness, practical applicability of the theory within the framework of the status quo: "If you do not formalize de decisions, what else can you do?"

Conclusions

It is the social responsibility of radical statisticians to draw attention to the misuses of decision theory and its unhuman features. Also, further investigation is needed: I suggest that this theory exists in a form that reflects the power and social control of the dominant capitalist class, as many of its characteristics imply - for instance it is not suitable for collective efforts (5) . A closer look at its historical developments would probably justify this claim.

(1) N Raiffa and R Schlaifer (Applied Statistical Decision Theory) Graduate School of Business Administration, Harvard University ; Boston(1961)
The research carried out for this book was supported by a grant from the Ford Foundation.

(2) Technical Report DT/TR 75-76 "An analysis of Alternative Mid Eastern Agreement" By R Brown, C R Peterson, J W Ulvila. Contracts N00014-75-C-0426
N00014-73-C-0149 (1974)

(3) D V Lindley "The future of statistics - a Bayesian 21st century", Supp. Adv. Appl. Prob. 7 (1975)

(4) H Raiffa "Decision Analysis" (1968) Addison and Wesley

(5) T S Ferguson "Development of the Decision Model" On the history of Statistics and probability, Marcel Dokker, Inc. (1976)