

Chapter 3

Decision theory

3.1 INTRODUCTION

Decision theory deals with methods for determining the optimal course of action when a number of alternatives are available and their consequences cannot be forecast with certainty.

It is difficult to imagine a situation which does *not* involve such decision problems, but we shall restrict ourselves primarily to problems occurring in business, with consequences that can be described in dollars of profit or revenue, cost or loss. For these problems, it may be reasonable to consider as the best alternative that which results in the highest profit or revenue, or lowest cost or loss, on the average, in the long run. This criterion of optimality is not without shortcomings, but it should serve as a useful guide to action in repetitive situations where the consequences are not critical. (Another criterion of optimality, the maximization of expected “utility,” provides a more personal and subjective guide to action for a consistent decision-maker.)

The simplest decision problems can be resolved by listing the possible monetary consequences and the associated probabilities for each alternative, calculating the expected monetary values of all alternatives, and selecting the alternative with the highest expected monetary value. The determination of the optimal alternative becomes a little more complicated when the alternatives involve sequences of decisions.

In another class of problems, it is possible to acquire—often at a certain cost—additional information about an uncertain variable. This additional information is rarely entirely accurate. Its value—hence, also the maximum amount one would be willing to pay to acquire it—should depend on the difference between the best one expects to do with the help of this information and the best one expects to do without it.

These are, then, the types of problems which we shall now begin to examine in more detail.