CHAPTER IX

COST-BENEFIT VERSUS EXPECTED UTILITY
ACCEPTANCE RULES

1. INTRODUCTION

In Chapter II it was noted that Carnap's Rule of Maximizing Estimated Utility may be used as a measure of acceptability in virtually any sense of this difficult term. By including different kinds of considerations with different amounts of importance in the determination of utility values, the scope of application of the rule tends to be exhaustive. As a matter of fact, which Carnap has himself emphasized, the rule he recommends as a normative principle is very old. It was invented by Daniel Bernoulli and modified by Thomas Bayes. Hence, it is sometimes referred to as Bernoulli's rule and sometimes as Bayes's rule, and, in the present case, as the Bernoulli-Bayes rule.

A number of influential philosophers besides Carnap have recommended the Bernoulli-Bayes rule or some variation of it as a first approximation or step in the right direction toward a solution of the problem of providing a criterion, principle or rule for determining the acceptability of scientific hypotheses. But, so far as I know, no one has suggested that some sort of benefits-less-costs rule might be more advantageous, and it is roughly this idea that I wish to explore and ultimately vindicate. More precisely, I shall attempt to prove the normative claim that a cost and benefit dominance principle of acceptance ought to be preferred to any sort of Bernoulli-Bayes principle because right now and for the foreseeable future the former performs better and cannot perform worse than the latter (in a sense of 'perform' that will be elucidated below).¹

¹ Less thorough comparisons of these and similar rules with respect to different applications may be found in K. R. MacCrimmon, Decisionmaking Among Multiple-Attribute Alternatives: A Survey and Consolidated Approach, Memorandum RM-4823-ARPA, The RAND Corporation, Santa Monica, 1968 and P. M. Pruzan, "Is cost-benefit analysis consistent with the maximization of expected utility?" Operational Research and the Social

A. C. Michalos, The Popper-Carnap Controversy
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Although most of the chapter consists of a detailed analysis and comparison of the two relevant principles, their requirements and applications, I shall begin with a brief outline of the basic elements of each in sections two and three in order to provide a general orientation and more or less common background for our discussion. In section four relevant senses of the terms 'preferable,' 'performs better,' 'effective,' 'efficiency,' and 'degree of sophistication of information' are explained. These are necessary for the comparison of the Bernouilli-Bayes rule with that of the variant of a benefits-less-costs rule in sections five through seven. Section six contains a detailed examination of William Harvey's implicit use of his own variant of a benefits-less-costs rule. In the eighth section strategies for increasing the effectiveness of the rule recommended here are presented and the final brief section suggests areas for future research.

2. MAXIMIZATION OF EXPECTED UTILITY

Proponents of the rule enjoining the maximization of expected utility, which we shall hereafter abbreviate as MEU, imagine a decision-maker confronted with a set of (practically speaking) mutually exclusive and exhaustive possible courses of action from which one that is optimal must be adopted. The decision-maker knows that the payoff or utility (in some sense of this word which will be explained later) that he obtains from his choice will be partially determined by events which are (practically speaking) mutually exclusive, exhaustive and beyond his control. If he has objective probability values (i.e., relative frequencies, propensities, physical range measures, etc.) for the occurrence of these events then he is operating under conditions of risk. If he does not have such values then he is in a situation of uncertainty, but he will transform it into a situation of risk by determining appropriate subjective probability values (i.e., betting quotients, degrees of belief, etc.) for the events. Given all this data he is ready to use MEU, which, as a normative principle, prescribes the acceptance of that course of action whose sum of probability-weighted utilities is larger than that of any of its alternatives. If $U_i$ and $p_i$