Approaches to the capital budgeting problem can roughly be classified as being concerned with:

- The selection of technically and economically independent or interrelated projects
- Decisions under certainty or decisions under uncertainty
- The development of valuation criteria (economics-finance approach) or efficient solution techniques (engineering-management science approach)\(^1\)

This paper deals with the accept-reject decision for a *single* project under *uncertainty* from the engineering-management science point of view. The approach used differs from the well-known methods of evaluating risky single-investment projects in the assumptions concerning the available information about future uncertain data.

The known procedures to analyze single investment projects with uncertain
data can be divided into two main groups: the structure-oriented and the decision-oriented methods.  

Structure-Oriented Methods

The immediate goal in applying a structure-oriented method is to find out how the evaluation criterion (e.g., the internal rate of return) depends on the uncertain data. The analysis results, therefore, not in a recommendation to accept or reject a certain project, but in a better insight into the structure of the problem, which possibly improves the final decision. Within the group of structure-oriented methods, one may differentiate between two principal types of approach depending on the information available about uncertain data.

An application of an approach of the first type requires the knowledge of the distribution functions of the uncertain data. Based on these distribution functions, it is possible, at least in principle, to calculate the distribution function of such evaluation criteria as the present value [2, 16, 35, 41, 43, p. 24, 44, 45, 66, 67, 68, 94], the internal rate of return [20, 39, 42, 70], or the payback period [62]. Analytical and simulation techniques have been proposed for computing the distribution function of the evaluation criterion. It should be noted, however, that both techniques have their specific deficiencies: Analytical methods are applicable only under very restrictive assumptions regarding the stochastic dependencies or the types of distribution functions of the random data; an application of the central limit theorem is problematic because of the discounting procedure [28, 43, p. 26], and the simulation procedure converges rather slowly if the random data are correlated.

If it is not possible to specify the distribution functions of the uncertain data, then valuable insights into the stability of a capital budgeting decision can be gained if the sensitivity of the corresponding evaluation criterion relative to changes of the uncertain data could be determined. The study of the effect of variations in uncertain data without knowing their distribution functions represents the goal of approaches of the second type. The methods proposed include local sensitivity analysis [10, 48, 95] based on differential calculus and global sensitivity analysis including break-even analysis [34, p. 97].

Decision-Oriented Methods

The application of a decision-oriented method provides the basis for either accepting or rejecting a risky investment project. Most of these methods require a knowledge of the distribution functions of the uncertain data. They differ