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Optimal Project Selection under Uncertainty *

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Abstract

The problem of selection of projects is a common one in private and public companies that are required to allocate scarce resources usually amongst alternatives that differ in technical, operational, and financial aspects, as well as in the level of risk. This paper presents an application of optimal selection of project portfolios under uncertainty and budget constraints. It addresses the problem by using the maximization of the expected net present value (E-NPV) of the portfolio as the objective function. In a subsequent section the objective function is changed and the maximization of the E-NPV for a certain confidence level is used. The model also incorporates total financial constraints , as well as upper and lower bounds on the allocation policies. An example, adapted from a real company, is presented to illustrate the proposed methodology. The results show the optimal allocation of financial resources to each project, taking into account the uncertainty associated with the different input variables.

Key words: Investment analysis, Project selection, Linear Programming, Monte Carlo simulation.

1 Introduction

The allocation of financial resources to portfolios of projects is a common problem. Managers have to choose wisely to fulfill their strategic objectives through the execution of these projects. Financial planners attempt to select an "optimal subset" of projects that increases the value of the company, while complying with the allocation and budget constraints specified and keeping a desired level of risk.

One of the most widely studied problems in Finance and Engineering Economics is project selection and configuration of investment portfolios [1]. This problem has been studied with traditional methodologies such as Net Present Value (NPV), Internal Rate of Return (IRR), Modified IRR and the Value of Future Cash Flows. All these techniques, if appropriately applied, lead to good decisions in terms of the projects to be selected. Also, some Operations Research models have been studied, using the maximization of profit or value as the objective function and subject to technical and budgetary constraints. The effectiveness of all these methods notwithstanding, it is relevant to consider methods that address the uncertainties that are synonymous to the real life of projects.

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