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# Uncertain Portfolio Selection with Mental Accounts and Realistic Constraints

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## Abstract

Since the security market is too complex, there are situations where the future security returns cannot be reflected by historical data and have to be given by experts' estimations according to their knowledge and judgements. This paper discusses a portfolio selection problem in such an uncertain environment. In the paper, in order to reflect different attitudes towards risk that vary by goal in one portfolio investment, we apply mental accounts to the investment. Uncertain variables are introduced to describe the securities' return, and a new uncertain portfolio selection model is developed when return risk control and liquidity risk control are considered. In addition, other important limitations, i.e., transaction cost, minimum transaction lot, bounds of holding, security diversification and sector diversification are also considered. In real life, investors face background risk which may affect their portfolio selection decisions. Thus, background risk is also considered. To solve the proposed problem, the equivalents of the model are proposed. Finally, a numerical example is given as an illustration.

**Keywords:** Portfolio selection; uncertain variable; mental accounts; realistic constraints

## 1. Introduction

Portfolio selection is concerned with optimal allocation of one's capital to different securities in order to maximize the expected return of the portfolio with risk control. Since the mean-variance theory (MVT) was proposed by Markowitz [1], scholars have begun to apply quantitative method to study the portfolio selection problem. In the classic studies, scholars mainly studied the problem in two directions. In the first direction, they used volatility as the portfolio risk measurement and

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