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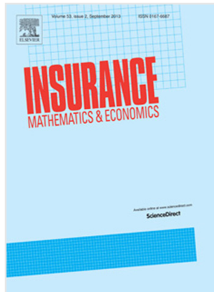

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Pre-commitment vs. time-consistent strategies for the generalized multi-period portfolio optimization with stochastic cash flows

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Abstract: In this paper, we propose a multi-period portfolio optimization model with stochastic cash flows. Under the mean-variance preference, we derive the pre-commitment and time-consistent investment strategies by applying the embedding scheme and backward induction approach, respectively. We show that the time-consistent strategy is identical to the optimal open-loop strategy. Also, under the exponential utility preference, we develop the optimal strategy for multi-period investment, which is time-consistent. We show that the above two time-consistent strategies are equivalent in some cases. We compare the pre-commitment and time-consistent strategies under different situations with some numerical simulations. The results indicate that the time-consistent strategy is more stable and secure than pre-commitment strategy under the generalized mean-variance criterion.

Keywords: Portfolio choice; Stochastic cash flows; Pre-commitment strategy; Time-consistent strategy; Exponential utility

1 Introduction

Portfolio optimization is one of the most important issues in asset management, which mainly focuses on how to allocate the investor's wealth among different assets by choosing a set of reasonable investment opportunities. In fact, the investment decisions are always influenced by the investor's preference, which is indicated by the optimization objective. The mean-variance and expected utility preferences are the most popular optimization objectives in portfolio optimization. The classical mean-variance portfolio optimization theory was first introduced by Markowitz (1952), which paved the foundation of modern financial theory. Ever since then, hundreds of thousands of extensions and applications are presented. Another important guideline follows the expected utility theory. In this framework, the investor aims to maximize the expected value of a utility function of the terminal wealth and formulate a series of optimal investment strategies.

Markowitz (1952) only discussed the single-period mean-variance portfolio optimization model. However, dynamic investment is the usual way adopted in real world. Naturally, the multi-period or dynamic portfolio optimization model is regarded as one of the most important extensions of the pioneering work by Markowitz (1952). Since the variance in the optimization objective is not separable, the multi-period mean-variance problem can not be solved directly by dynamic programming. This guideline has not made a great breakthrough until Li and Ng (2000), who derived the analytical optimal strategy and efficient frontier by using an embedding scheme. Subsequently, Zhou and Li (2000) solved the continuous-time mean-variance problem by using the same approach as Li and Ng (2000). In the past years, many researchers followed the work of Li and Ng (2000) and further studied the dynamic mean-variance portfolio optimization problem under different situations. Leippold et al. (2004) presented a geometric approach to solve the multi-period asset-liability management mean-variance portfolio optimization problem. Dai et al. (2010) discussed a continuous-time mean-variance portfolio optimization problem with proportional transaction costs. For more research regarding the multi-period mean-variance

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