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On Pre-Commitment Aspects of a Time-Consistent Strategy for a Mean-Variance Investor

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Abstract

In this paper, a link between a time-consistent and a pre-commitment investment strategy is established. We define an implied investment target, which is implicitly contained in a time-consistent strategy at a given time step and wealth level. By imposing the implied investment target at the initial time step on a time-consistent strategy, we form a hybrid strategy which may generate better mean-variance efficient frontiers than the time-consistent strategy. We extend the numerical algorithm proposed in [Cong, F. and Oosterlee, C. W. (2016), *Journal of Economic Dynamics and Control*, 64(1):23–38] to solve constrained time-consistent mean-variance optimization problems. Since the time-consistent and the pre-commitment strategies generate different terminal wealth distributions, time-consistency is not always inferior to pre-commitment.

Keywords: Finance · Investment analysis · Decision analysis · Simulation · Time-consistency

1 Introduction

Since Markowitz's pioneering work (Markowitz, 1952) on a single-period investment model, the mean-variance portfolio optimization problem has become a very attractive topic in academic and industrial research and development. One way to extend Markowitz's work is to consider multi-period mean-variance optimization.

Dynamic mean-variance optimization is not a trivial task, as in general the Bellman dynamic programming principle (Bellman, 1957) should be applied to this kind of path-dependent optimization problem. Due to the nonlinearity of the variance operator, however, the mean-variance problem cannot be solved in this manner.

In Zhou and Li (2000) and Li and Ng (2000), the authors introduced an embedding technique, by which the original mean-variance problem was formulated as a tractable linear-quadratic (LQ) problem. Instead of pursuing an optimal balance between profit and risk, an investor then designs an investment strategy to minimize the difference between

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