Dynamic Asset Allocation under Controlled Downside Risk

Abstract

This paper provides an analytical framework for dynamic portfolio strategies that are mean-variance efficient and subjected to a principal-guaranteed rate. Specifying a numeraire known as growth-optimal portfolio, we apply martingale method instead of dynamic programming approach to solve the optimal problem. Under the general assumptions of the price dynamics being a semi-martingale with finite expectation and variance, the efficient strategies are identified as a combination of put options on minimum norm portfolio and zero coupon bonds with the maturity of investment horizon. In the case of a single factor interest rate model, we derive the closed-form formula for optimal weights on securities. We conduct numerical simulations to illustrate the performance of the optimal strategies in the case of an economy comprising a stock index fund, a bond index fund and a money market account. In addition, for different investors with various interests like principal guaranteed rate and investment horizon, we also show how investors ought to allocate their funds.