

Enhancing Portfolio Optimization with a Fuzzy Behavioral Momentum Factor

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Abstract:

Classical Mean-Variance Optimization (MVO) remains a cornerstone of modern finance, yet its practical application is notoriously sensitive to input parameters, particularly expected asset returns. Traditional estimation methods, such as historical averages or the single-factor Capital Asset Pricing Model (CAPM), often fail to capture market complexities and can lead to unstable, highly concentrated portfolios. This paper addresses this challenge by proposing a novel, twofactor asset pricing model that incorporates market risk and a newly developed Fuzzy Behavioral Momentum (FBM) factor. The FBM factor is designed to move beyond simple price changes by using fuzzy logic to systematically evaluate the “quality” of an asset’s momentum, considering its underlying volatility and trading volume patterns. We define the mathematical construction of the FBM factor and its integration into an expected return model. An empirical study is conducted on a portfolio of technology stocks, comparing the optimal portfolio derived from our FBM-enhanced model against one derived from a baseline model using historical returns. The results demonstrate that the FBM-enhanced approach yields a significantly more diversified and structurally robust portfolio allocation, mitigating the corner-solution problem inherent in naive MVO implementations. This research contributes a practical methodology for integrating the imprecise nature of behavioral market dynamics into a quantitative portfolio optimization framework.

Keywords:

Fuzzy Logic, Portfolio Optimization, Mean-Variance Optimization, CAPM, Behavioral Finance, Momentum Factor.