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ASSET ALLOCATION WITH ASSET-CLASS-BASED AND FACTOR-BASED RISK PARITY APPROACHES

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The asset allocation strategy is important to manage assets effectively. In recent years, the risk parity strategy has become attractive to academics and practitioners. The risk parity strategy determines the allocation for asset classes in order to equalize their contributions to overall portfolio risk. Roncalli and Weisang（2016）propose the use of “risk factors” instead of asset classes. This approach achieves the portfolio diversification based on the decomposition of portfolio risk into risk factor contribution. The factor-based risk parity approach can diversify across the true sources of risk whereas the asset-class-based approach may lead to solutions with hidden risk concentration. However, it has some shortcomings. In our paper, we propose a methodology of constructing the well-balanced portfolio by the mixture of asset-class-based and factor-based risk parity approaches. We also propose the method of determining the weight of two approaches using the diversification index. We can construct the portfolio dynamically controlled with the weight which is adjusted in response to market environment. We examine the characteristics of the model through the numerical tests with seven global financial indices and three factors. We find it gives the well-balanced portfolio between asset and factor diversifications. We also implement the backtest from 2005 to 2018, and the performances are measured on a USD basis. We find our method decreases standard deviation of return and downside risk, and it has a higher Sharpe ratio than other portfolio strategies. These results show our new method has practical advantages.

LIMIT OPERATION IN PROJECTIVE SPACE FOR CONSTRUCTING NECESSARY OPTIMALITY CONDITION OF POLYNOMIAL OPTIMIZATION PROBLEM

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This paper proposes a necessary optimality condition derived by a limit operation in projective space for optimization problems of polynomial functions with constraints given as polynomial equations. The proposed condition is more general than the Karush-Kuhn-Tucker（KKT）conditions in the sense that no constraint qualification is required, which means the condition can be viewed as a necessary optimality condition for every minimizer. First, a sequential optimality condition for every minimizer is introduced on the basis of the quadratic penalty function method. To perform a limit operation in the sequential optimality condition, we next introduce the concept of projective space, which can be regarded as a union of Euclidian space and its points at infinity. Through the projective space, the limit operation can be reduced to computing a point of the tangent cone at the origin. Mathematical tools from algebraic geometry were used to compute the set of equations satisfied by all points in the tangent cone, and thus by all minimizers. Examples are provided to clarify the methodology and to demonstrate cases where some local minimizers do not satisfy the KKT conditions.