Implementation of Novel Sector Weight and Google Trends Data Objectives Using MOEA-D Curtails Systematic Risk for Quintessential Investors

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The Markowitz Mean-Variance model provides a computational framework for developing optimized portfolios but fails to account for the risk associated with human behavior. This study proposes an extension of the model by incorporating sector-weights and Google Trends data as objectives to bolster the model's applicability to retail investors. As the complexity of the problem renders an exact solution unattainable, a multi-objective evolutionary algorithm based on decomposition (MOEA-D) was implemented for its efficacy in creating a diverse population of solutions in a single run. The purpose of this work is two-fold: (1) the implementation of MOEA-D was optimized through parameter fine-tuning with 36 combinations of parameters and (2) the efficacy of the supplementary objectives was tested discretely through two experimental groups and one control group: Google Trends, sector-weights, and a standard bi-objective model, respectively. These simulations suggest that the following parameters were effective for the specificities of the problem: population = 230, mutation rate = 0.03, crossover rate =0.6, and number of iterations = 120,000. The behavioral objective showed promise in developing portfolios that minimized losses during the depth of the financial crisis with an out-of-sample loss of -0.00043 as opposed to the losses of -0.00051 for the bi-objective model, while the model with sector-weights exhibited the lowest variance of 0.000502675 in the out-of-sample data set. While frequent rebalancing would be necessary to ensure favorable results due to greater variance over the out-of-sample data set, Google Trends data exhibits great promise as a supplementary objective for portfolio optimization, warranting further analysis.

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