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# Arbitrage-free Scenario Trees for Financial Optimization

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**Abstract.** This paper presents a method which is designed to generate arbitrage-free scenario trees representing multivariate return distributions. Our approach is embedded in the setting of Arbitrage Pricing Theory (APT), and asset returns are assumed to be driven by orthogonal factors. In a complete market setting we derive no-arbitrage bounds for expected excess returns using the least possible number of scenarios (i.e. the smallest dimension of the discrete state space) necessary to match the first two moments and to exclude arbitrage at the outset. This not only safeguards against the curse of dimensionality: Numerical results from solving two-stage asset allocation problems show that highly accurate results can be obtained with the smallest possible scenario tree.

## Keywords

NO-ARBITRAGE BOUNDS, SCENARIO GENERATION, FINANCIAL OPTIMIZATION