

**Trading in Risk Dimensions (TRD)**  
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**Abstract**

Previous work, mostly published, developed two-shell recursive trading systems. An inner-shell of Canonical Momenta Indicators (CMI) is adaptively fit to incoming market data. A parameterized trading-rule outer-shell uses the global optimization code Adaptive Simulated Annealing (ASA) to fit the trading system to historical data. A simple fitting algorithm, usually not requiring ASA, is used for the inner-shell fit. An additional risk-management middle-shell has been added to create a three-shell recursive optimization/sampling/fitting algorithm. Portfolio-level distributions of copula-transformed multivariate distributions (with constituent markets possessing different marginal distributions in returns space) are generated by Monte Carlo samplings. ASA is used to importance-sample weightings of these markets.

The core code, Trading in Risk Dimensions (TRD), processes Training and Testing trading systems on historical data, and consistently interacts with RealTime trading platforms at minute resolutions, but this scale can be modified. This approach transforms constituent probability distributions into a common space where it makes sense to develop correlations to further develop probability distributions and risk/uncertainty analyses of the full portfolio. ASA is used for importance-sampling these distributions and for optimizing system parameters.