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Bounds on Choquet Integrals in Finite Product Spaces for Capacities with Given Marginals

We investigate the problem of finding upper and lower bounds for a Choquet risk measure of a nonlinear function of two risk factors, when the marginal distributions of the risk factors are ambiguous and represented by nonadditive measures on the marginal spaces, but the joint nonadditive distribution on the product space is unknown. We treat this problem as a generalization of the optimal transportation problem to the setting of nonadditive measures. We provide explicit characterizations of the optimal solutions for finite marginal spaces, and we investigate some of their properties. We further discuss the connections with linear programming, showing that the optimal transport problems for capacities are linear programs, and we also characterize their duals explicitly.