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Sequential optimization under uncertainty

Two kinds of problems are discussed to illustrate the use of statistics in finance and economics. For the optimal portfolio problem, the distribution of investment returns is assumed to be unknown and the Bayesian approach is applied. The sequential portfolio model under uncertainty is formulated as a Markov decision process and the optimal strategy is characterized. For the problem of dynamically pricing a product under uncertainty, we assume that the demand function is determined by a compound Poisson process with unknown parameters. The optimal pricing problem is formulated as a bandit model and the key issue is to compromise between information gathering (so as to reduce uncertainty and make better informed decisions in the future) and immediate payoff (so as to achieve a certain measure of economic revenues). The optimal strategy and its properties are addressed.