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Renewal Theory, Markov and Hidden Markov Model, Change-Point Detection, Applications in Financial Studies

I. Renewal Theory

- Nonlinear renewal theory of one-dimensional Markov random walks.
- Nonlinear renewal theory of high-dimensional simple random walks
(especially in their relationship with the one-dimensional Markov renewal theory)
- Their applications in industrial statistics (ex. MCUSUM) and financial statistics (ex. credit rating).

II. Markov and Hidden Markov Chain

- Using marginal likelihood to estimate the number of states of hidden Markov chain.

III. Change-Point Detection

- Using marginal likelihood to estimate unknown number of change-points for stepwise signal.

IV. Applications in Finance

- Credit risk, credit rating, and correlated defaults.