Abstract

Due to its great flexibility of adjusting dependence strength, the extended negatively dependent structure is wildly used in high-dimensional statistical applications and risk management applications. Since many mathematicians and statisticians pay special attention to dependent random variables, the aim of this study is to systematically explore the fundamental probability property and investigate the various limiting theorems for extended negatively random variables.

We establish the Borel-Cantelli lemma and several different probability inequalities and moment inequalities for extended negatively dependent random variables. The probability inequalities include Bernstein type inequality and Hoeffding type inequality, and the moment inequalities contain exponential type inequality and Rosenthal type inequality. We also construct a fundamental maximal inequality for extended negatively random variables, and through this theorem we obtain Hàjek-Rényi type inequality and Kolmogorov type inequality.

The Kolmogorov type three-series theorem is generalized to extended negatively random variables. The Kolmogorov-Chung type and the Marcinkiewicz-Zygumund type strong law of large numbers is obtained for extended negatively dependent random variables. Based on the Borel-Cantelli lemma and the Rosenthal type inequality for extended negatively dependent random variables, we use the method of subsequence to provide the necessary and sufficient condition for the strong law of large numbers.

Using the probability inequality and moment inequality for extended negatively dependent random variables, we present the complete convergence and complete moment convergence theorems for array of rowwise extended negatively dependent random variables. Furthermore, we estimate the precise asymptotic in complete convergence and complete moment convergence for extended negatively dependent and identical distributed random variables.