

R.A. Al-Jarallah · A.R. Soltani · N.A. Al-Kandari

On continuity of the Pearson statistic and sample quantiles

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Abstract Convergence with probability one (in probability) of sequences of the sample quantiles and the Pearson statistic that are formed by columns of $N \times n$ arrays of random variables and bivariate random vectors, respectively, is established, $n \rightarrow \infty$. Two applications for the continuity of the Pearson statistics, when sampling is only possible along a sequence converging to an inaccessible targeting value, are presented.

Keywords Pearson statistic · Sample q -quantiles · Contingency tables · Array continuity · ARMA models · Stable random vectors

1 Introduction

In this work we consider with probability one or in probability convergence of sequences of the statistics sample q -quantiles and the Pearson statistics formed by the columns of sequences of arrays of random variables $\mathbf{X}_n = \{X_{n,i}; i = 1, \dots, N\}$, and bivariate random vectors, $(\mathbf{X}, \mathbf{Y})_n = \{(X_{n,i}, Y_{n,i}); i = 1, \dots, N\}$ $n = 0, 1, 2, \dots$ respectively. In sampling, for each n , the array \mathbf{X}_n can be considered as a sample of size N from the random variable X_n , while, for each i , $\{X_{n,i}; n = 1, 2, \dots\}$ is a trajectory of the sequence $\{X_n\}_{n \geq 1}$. Thus, a sequence of

R.A. Al-Jarallah · A.R. Soltani (✉) · N.A. Al-Kandari
Department of Statistics and Operations Research,
Faculty of Science, Kuwait University,
P.O. Box 5969 Safat-13060, Kuwait
E-mail: reema@kuc01.kuniv.edu.kw
E-mail: soltani@kuc01.kuniv.edu.kw
E-mail: noriah@kuc01.kuniv.edu.kw

A.R. Soltani
Department of Statistics, College of Science,
Shiraz University, Shiraz 71454, Iran