

# A sharp analysis on the asymptotic behavior of the Durbin-Watson statistic for the first-order autoregressive process

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The purpose of this paper is to provide a sharp analysis on the asymptotic behavior of the Durbin-Watson statistic. We focus our attention on the first-order autoregressive process where the driven noise is also given by a first-order autoregressive process. We establish the almost sure convergence and the asymptotic normality for both the least squares estimator of the unknown parameter of the autoregressive process as well as for the serial correlation estimator associated to the driven noise. In addition, the almost sure rates of convergence of our estimates are also provided. It allows us to establish the almost sure convergence and the asymptotic normality for the Durbin-Watson statistic. Finally, we propose a new bilateral statistical test for residual autocorrelation.

Subjects: **Statistics Theory (math.ST)**; Probability (math.PR); Statistical Finance (q-fin.ST)

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