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Least Absolute Deviation Estimation for Fractionally Integrated Autoregressive Moving Average Time Series Models with Conditional Heteroscedasticity

Abstract: In order to model time series exhibiting the features of long memory, conditional heteroscedasticity and heavy tails, a least absolute deviation approach is considered to estimate fractionally autoregressive integrated moving average models with conditional heteroscedasticity. The time series generated by this model is short memory or long memory, stationary or nonstationary, depending on whether the fractional differencing parameter $d \in (-1/2, 0)$ or $(0, \infty)$, $(-1/2, 1/2)$ or $(1/2, \infty)$ respectively. Using a unified approach, the asymptotic properties of the least absolute deviation estimation are established. This article also derives the large sample distribution of residual autocorrelations and absolute residual autocorrelations and these results lead to two useful diagnostic tools for checking the adequacy of the fitted models. Some Monte Carlo experiments were conducted to examine the performance of the theoretical results in finite sample cases. As an illustration, the process of modeling the absolute return of the daily closing Dow Jones Industrial Average Index (1995-2004) is also reported.