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Autoregressive approximation in nonstandard situations: the fractionally integrated and non-invertible cases

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Abstract Autoregressive models are commonly employed to analyze empirical time series. In practice, however, any autoregressive model will only be an approximation to reality and in order to achieve a reasonable approximation and allow for full generality the order of the autoregression, h say, must be allowed to go to infinity with T , the sample size. Although results are available on the estimation of autoregressive models when h increases indefinitely with T such results are usually predicated on assumptions that exclude (1) non-invertible processes and (2) fractionally integrated processes. In this paper we will investigate the consequences of fitting long autoregressions under regularity conditions that allow for these two situations and where an infinite autoregressive representation of the process need not exist. Uniform convergence rates for the sample autocovariances are derived and corresponding convergence rates for the estimates of $AR(h)$ approximations are established. A central limit theorem for the coefficient estimates is also obtained. An extension of a result on the predictive optimality of AIC to fractional and non-invertible processes is obtained.

Keywords Autoregression · Autoregressive approximation · Fractional process · Non-invertibility · Order selection · Asymptotic efficiency