Testing for a Unit Root in Noncausal Autoregressive Models

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This work develops likelihood-based unit root tests in the noncausal autoregressive (NCAR) model formulated by Lanne and Saikkonen (2011, *Journal of Time Series Econometrics* 3, Iss. 3, Article 2). The possible unit root is assumed to appear in the causal autoregressive polynomial and for reasons of identification the error term of the model is supposed to be non-Gaussian. In order to derive the tests, asymptotic properties of the maximum likelihood estimators are established under the unit root hypothesis. The limiting distributions of the proposed tests depend on a nuisance parameter determined by the distribution of the error term of the model. A simple procedure to handle this nuisance parameter dependence in applications is proposed. Finite sample properties of the tests are examined by means of Monte Carlo simulations. The results show that the size properties of the tests are satisfactory and the power against stationary NCAR alternatives is significantly higher than the power of conventional Dickey Fuller tests and the M-tests of Lucas (1995, *Econometric Theory* 11, 331-346). In an empirical application to a Finnish interest rate series evidence in favour of a stationary NCAR model with leptokurtic errors is found.

Keywords: Maximum likelihood estimation, Noncausal autoregressive model, Non-Gaussian time series, Unit root.