

## Stability testing for a special Pickard model

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### Abstract

We investigate the least squares estimator of the stability parameter  $\varrho := |\alpha| + |\beta|$  for a spatial unilateral autoregressive process

$$X_{k,\ell} = \alpha X_{k-1,\ell} + \beta X_{k,\ell-1} + \varepsilon_{k,\ell},$$

where the independent innovations  $\varepsilon_{k,\ell}$  have zero mean and unit variance. In the unstable case  $\varrho = 1$  [see, [1]] we show the asymptotic normality of the estimator with a scaling factor  $n^{5/4}$ , in contrast to the classical AR(p) model, where the least squares estimator of the appropriate stability parameter is not asymptotically normal. The limiting distribution of the stability parameter can be applied for building unit root tests for the above spatial process. In the unstable case we also obtain the limiting distribution of the least squares estimator of the parameters  $(\alpha, \beta)$  and give an essentially simpler proof of the corresponding results of [2].

**Keywords:** unstable spatial unilateral autoregressive process, unit root tests.

**AMS subject classifications:** primary 62M10; secondary 62F12

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