

to the original paper, Bierens (1997), for more details on the test statistic and its null distribution. Here we only mention that we have implemented two versions of Bierens test. The first variant of the test (using $F_k(x) = \cos(2k\pi x)$) only provides the correct limiting distribution in case the assumption $\mu = \alpha\mu_0$ in Theorem 1 is satisfied. The second variant of the test uses $F_k(x) = \cos(2k\pi[Tx - \frac{1}{2}]/T)$, and is correct even if this assumption fails to hold, e.g., in case there are deterministic trends in the data.

4 Monte-Carlo set-up and results

Following the simulation experiment in Boswijk and Lucas (1997), we consider the following bivariate ($k = 2$) data generating process (DGP):

$$\Delta \begin{pmatrix} y_{1t} \\ y_{2t} \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & -c/T \end{pmatrix} \begin{pmatrix} y_{1,t-1} \\ y_{2,t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}. \quad (22)$$

More complicated DGP's involving genuine cointegrating relations and/or endogeneity of regressors can also be used without altering the results of the present paper. Of course, such alterations will affect the absolute rejection frequencies of our test procedures, but they will not affect the *ordering* of the different testing principles in terms of power performance, see also Lucas (1998). Dividing c in (22) by the sample size T follows the local alternatives formulation of Phillips (1988), see also Johansen (1991b). It allows us to investigate the effect of the sample size on the performance of the tests in an elegant way.

We consider 4 values for c , namely $c = 0, 5, 10, 20$, and two sample sizes, namely $T = 100, 1000$. To limit the (heavy) computational burden of the simulations, we conduct 2000 and 1200 Monte-Carlo simulations for sample sizes $T = 100$ and $T = 1000$, respectively. Note that within each Monte-Carlo simulation, we need an additional simulation in order to determine the critical values or pvalues of the test, see the end of Section 2. We use 500 simulations to estimate the asymptotic pvalues. In our experience, this is sufficient from a practical point of view. We test the null of no cointegration against the alternative of at least one cointegrating relation. We use a 5% significance level. We set $\bar{n} = 3$ as the upper bound on the order of the SNP polynomial used in the simulations. This is done in order to limit the computational burden.

In order to investigate the performance of the tests under alternative conditions, we use several distributions for the innovations ε_t . Following Boswijk and Lucas (1997), we use:

- the standard bivariate normal distribution;