Estimation for Double-Nonlinear Cointegration

Qiwei Yao

London School of Economics
E-mail: q.yao@lse.ac.uk

Abstract: In recent years statistical inference for nonlinear cointegration has attracted attention from both academics and practitioners. This paper proposes a new type of cointegration in the sense that two univariate time series y(t) and x(t) are cointegrated via two (unknown) smooth nonlinear transformations. More precisely, it holds that G(y(t), b) =g(x(t))+u(t), where $G(., beta)$ is strictly increasing and known upto an unknown parameter b, $g(.)$ is unknown and smooth, x(t) is I(1), and $u(t)$ is the stationary disturbance. This setting nests the nonlinear cointegration model of Wang and Phillips (2009) as a special case with G(y, b)=y. It extends the model of Lindon et al (2008) to the cases with a unit-root nonstationary regressor. Sieve approximations to the smooth nonparametric function g are applied, leading to an extremum estimator for b and a plugging-in estimator for g(.). Asymptotic properties of the estimators are established, revealing that both the convergence rates and the limiting distributions depend intimately on the properties of the two nonlinear transformation functions. Simulation studies demonstrate that the estimators perform well even with small samples. A real data example on the environmental Kuznets curve portraying the nonlinear impact of per-capita GDP on air-pollution illustrates the practical relevance of the proposed double-nonlinear cointegration.

(Joint work with Yingqian Lin and Yundong Tu.)