

# Consistent Nonparametric Tests for Granger Causality

Yoshinori Kawasaki

Department of Statistical Modeling  
The Institute of Statistical Mathematics

Abstract:

Since the pioneering work by Granger (1969), many authors have proposed tests of causality between economic time series. Most of them are concerned only with “linear causality in mean”, but dependence between series may be nonlinear, and/or not only through the conditional mean. Indeed models with conditional heteroskedasticity are widely studied recently. The purpose of this paper is to propose nonparametric tests for possibly nonlinear causality based on conditional moments in a similar direction as in Robinson (1989) and Chen and Fan (1999). Desirable features of the tests are; (i) we relax the assumption of beta-mixing typically assumed in the literature to alpha mixing, (ii) the testing procedures have nontrivial power against square-root  $T$  local alternatives, and (iii) this class of test statistics includes many important special cases previously proposed. We also report some Monte Carlo results. [Authors are Yoshihiko Nishiyama (Kyoto University), Kohtaro Hitomi (Kyoto Institute of Technology), Yoshinori Kawasaki (Institute of Statistical Mathematics), and Kiho Jeong (Kyungpook National University).]