Macroeconomic Dynamics, **14** (Supplement 1), 2010, 1–2. Printed in the United States of America.
doi:10.1017/S1365100509991131

INTRODUCTION TO THE SPECIAL ISSUE ON NONLINEAR TIME SERIES

MELVIN HINICH
The University of Texas at Austin

A nation's economy is a complex nonlinear dynamical system with links to other national economies. Classical macroeconomic models typically incorporate linear approximations to the nonlinear world and add simple dynamics to capture adjustments over time. Most of these simplifications offer little insight into the nonlinear structure of economic relationships that exist. Nor do they provide useful predictions beyond the short-term predictions of the autoregressive linear models from which they are derived.

This issue presents six papers that apply various statistical analyses of different types of nonlinearity in economic time series. I hope that the statistical evidence of complex nonlinearity in economic systems will motivate econometricians and statisticians to cooperate in the very difficult and challenging task of developing nonlinear mathematical models that have predictive power for real economic systems.

The paper by Lim and Brooks employs the Hinich bicorrelation statistic computed for rolling frames to measure the degree of stock price deviations from a random walk for the stock markets of 50 countries over the period 1995–2005. They find that stock markets in economies with low per capita GDP generally experience more persistent price deviations than those in the high-income group. This clustering effect is not due to market liquidity or other structural characteristics, but instead can be explained by cross-country variations in the degree of private property rights protection. They make the very important conjecture that weak protection deters the participation of informed arbitrageurs, leaving those markets dominated by sentiment-prone noise traders whose correlated trading cause stock prices in emerging markets to deviate from the random walk benchmarks for persistent periods of time. Because private property protection is a vital component of a stable democracy, their paper illuminates the connection between public policy on property rights and markets.

In their long memory paper Ashley and Patterson show that smooth time variation in the mean, either stochastic or deterministic, induces apparent long memory in a time series. Because the impact of such trending behavior is concentrated at very low frequencies, it and the consequent apparent long memory can be eliminated by either high-pass filtering or detrending. They demonstrate the effectiveness of nonlinear detrending via penalized-spline nonparametric regression. Because a time-varying mean can be of economic interest in its own right,

© 2010 Cambridge University Press 1365-1005/10

https://doi.org/10.1017/S1365100509991131 Published online by Cambridge University Press

examining a nonlinear trend and deviations from it is preferable as a modeling strategy to simply estimating a fractionally integrated model. They illustrate the superiority of this strategy using weekly stock return volatility data.

Romero-Meza, Bonilla, Hinich, and Bórquez employ a statistical test based on the signal coherence function to detect subtle periodicities in the Chilean exchange rate. They use a unique intraday data set that allows them to capture persistent cyclical movements during the day that challenge the random walk hypothesis. They present a microstructure explanation for the observed periodicity. They also look at the day-of-the-week effect for the Chilean peso and find that the different days of the week indeed have different behavior patterns. This is an important result for investment allocation and risk assessment.

Patterson and Sharma investigate the formation of informational cascades by traders in a random sample of 8,000 NYSE stock-days experiencing extreme price changes during 1998–2001. Their cascade measure is designed to detect informational cascades in high-frequency stock market prices. They find evidence of cascades on approximately 12% of the days when the NYSE experiences, on average, large price increases. This percentage increases to about 20% on days experiencing large price decreases, on average. They find evidence that the interarrival times of trades in stocks exhibiting significant informational cascades are generated by a nonlinear stochastic process. The process generating trade times is serially correlated and it exhibits nonlinear serial dependence. The occurrence of cascades correlates with the incorporation of fundamental information into security prices.

Wild, Foster, and Hinich presents evidence of episodic nonlinearity in the half-hour spot prices of the National Electricity Market of Australia by testing for episodic nonlinearity in the dynamics governing weekly cycles in spot-price time series data. They apply the Hinich portmanteau correlation, bicorrelation, and tri-correlation tests and the Engle ARCH LM test to the time series of half-hourly spot prices from 7 December 1998 to 29 February 2008. They use trimming to improve the finite sample performance of the various test statistics given the presence of significant skewness and leptokurtosis in the source data sets, which adversely affect the convergence properties of the test statistics. They find significant third- and fourth-order nonlinear serial dependence in the trimmed weekly spot-price data, pointing to the presence of "deep" nonlinear structure in these data.

Using a GARCH (1,1) model as an example, Ashley and Patterson apply their model evaluation technology to examine the ability of the estimated model to reproduce features of particular interest: various aspects of nonlinear serial dependence, in the present instance. Using daily returns to the CRSP equally weighted stock index, they find that the GARCH(1,1) specification cannot be rejected. Because the CRSP daily returns data only take the last trade of the day, the CRSP daily time series is badly aliased. Papers by Hinich and Patterson and Hinich using high-frequency stock returns data have shown that the ARCH and GARCH models are invalid.

https://doi.org/10.1017/S1365100509991131 Published online by Cambridge University Press