Journal of Econometrics ▮ (▮▮▮▮) ▮▮▮–▮▮▮

Contents lists available at ScienceDirect

Journal of Econometrics

journal homepage: www.elsevier.com/locate/jeconom

Editorial

Frontiers in Time Series and Financial Econometrics: An overview☆

Shiqing Ling[a], Michael McAleer[b,c,d,e,*], Howell Tong[f]

[a] Department of Mathematics, Hong Kong University of Science and Technology, Hong Kong, China
[b] Department of Quantitative Finance, National Tsing Hua University, Taiwan
[c] Econometric Institute, Erasmus School of Economics, Erasmus University Rotterdam, The Netherlands
[d] Tinbergen Institute, The Netherlands
[e] Department of Quantitative Economics, Complutense University of Madrid, Spain
[f] Department of Statistics, London School of Economics, United Kingdom

ARTICLE INFO

Article history:
Available online xxxx

JEL classification:
C22
C32
C58
G17
G32

Keywords:
Time series
Financial econometrics
Threshold models
Conditional volatility
Stochastic volatility
Copulas
Conditional duration

ABSTRACT

Two of the fastest growing frontiers in econometrics and quantitative finance are time series and financial econometrics. Significant theoretical contributions to financial econometrics have been made by experts in statistics, econometrics, mathematics, and time series analysis. The purpose of this special issue of the journal on "Frontiers in Time Series and Financial Econometrics" is to highlight several areas of research by leading academics in which novel methods have contributed significantly to time series and financial econometrics, including forecasting co-volatilities via factor models with asymmetry and long memory in realized covariance, prediction of Lévy-driven CARMA processes, functional index coefficient models with variable selection, LASSO estimation of threshold autoregressive models, high dimensional stochastic regression with latent factors, endogeneity and nonlinearity, sign-based portmanteau test for ARCH-type models with heavy-tailed innovations, toward optimal model averaging in regression models with time series errors, high dimensional dynamic stochastic copula models, a misspecification test for multiplicative error models of non-negative time series processes, sample quantile analysis for long-memory stochastic volatility models, testing for independence between functional time series, statistical inference for panel dynamic simultaneous equations models, specification tests of calibrated option pricing models, asymptotic inference in multiple-threshold double autoregressive models, a new hyperbolic GARCH model, intraday value-at-risk: an asymmetric autoregressive conditional duration approach, refinements in maximum likelihood inference on spatial autocorrelation in panel data, statistical inference of conditional quantiles in nonlinear time series models, quasi-likelihood estimation of a threshold diffusion process, threshold models in time series analysis — some reflections, and generalized ARMA models with martingale difference errors.

1. Introduction

Statistics, econometrics and time series analysis have rich histories, with numerous accomplishments and associated journals and societies. Finance is a more recent discipline, as is financial econometrics. Two of the fastest growing frontiers in econometrics and quantitative finance are time series and financial econometrics. Significant theoretical contributions to financial econometrics have been made by experts in statistics, econometrics and time series analysis.

As a fairly recent discipline, it is easier to trace the origins of financial econometrics than of statistics and time series. The advent of threshold models, which are widely used in econometrics and financial econometrics, can be traced to Tong (1978) (for further details, as well as a number of new areas of exploration, see Tong, in press), while the econometric analysis of time-varying volatility modeling has its genesis in Engle (1982), which has led to a vast literature on dynamic volatility modeling and risk management, among others.

☆ The Guest Co-editors wish to thank the Editors of the Journal of Econometrics for their support and encouragement, and the referees for their timely and very helpful comments and suggestions on the papers comprising the special issue. For financial support, the second author wishes to thank the Australian Research Council and the National Science Council, Taiwan.

* Corresponding editor.
E-mail address: michael.mcaleer@gmail.com (M. McAleer).

http://dx.doi.org/10.1016/j.jeconom.2015.03.019
0304-4076/

The direct connection between modeling thresholds and time series is obvious, given the time-varying nature of the thresholds and data. Furthermore, the connection between conditional volatility and time series models is also obvious, given that conditional volatility may be expressed as an ARMA process of the squared shocks to financial returns. The imaginative ideas developed in the papers by Tong (1978) and Engle (1982) have contributed significantly to the explosive growth in financial econometrics and time series models over the last few decades.

An early, and possibly the first, international conference that was focused solely on financial econometrics, specifically the "International Conference on Modelling and Forecasting Financial Volatility", was held in Perth, Australia, in September 2001, with the keynote speakers being Clive Granger, Rob Engle and Neil Shephard. A special issue of the Journal of Applied Econometrics based on selected papers from the conference is overviewed in Franses and McAleer (2002), and a conference review is given in Oxley (2002). Such international conferences in financial econometrics are now widespread, especially with the establishment of the Journal of Financial Econometrics in 2003 and the Society for Financial Econometrics in 2007.

The special issue brings together the leading specialists in time series, financial econometrics, statistics and mathematics to present the latest theoretical developments in "Frontiers in Time Series and Financial Econometrics". The novel and significant contributions to the special issue present an extensive range of theoretical papers, all of which can be used in practical applications, by the leading scholars in statistics, time series analysis and financial econometrics.

The broad theme of the special issue covers several exciting topics in time series and financial econometrics, including estimation, specification testing and prediction, analysis of multiple-threshold models, adaptive compositional models, high-dimensional stochastic regression, latent factors, asymmetric conditional duration models, heavy tails, calibrated option pricing models, maximum likelihood inference on spatial autocorrelation, high-dimensional functional coefficient time series, tests of independence when the observations are curves, functional index coefficient models with variable selection, quantile analysis for long memory stochastic volatility models, quasi-likelihood estimation of a threshold diffusion process, statistical inference of conditional quantiles in nonlinear time series, hyperbolic memory, optimal model averaging, realized co-volatilities with asymmetry, leverage and long memory, statistical inference for panel dynamic simultaneous equations model for large N and large T, and stationary Lévy-driven CARMA processes.

The purpose of the special issue is to highlight a number of areas of research in which novel statistical, financial econometric and time series methods have contributed significantly to frontiers in time series and financial econometrics, specifically forecasting co-volatilities via factor models with asymmetry and long memory in realized covariance (Asai and McAleer, in press), prediction of Lévy-driven CARMA processes (Brockwell and Lindner, in press), functional index coefficient models with variable selection (Cai et al., in press), LASSO estimation of threshold autoregressive models (Chan et al., in press), high dimensional stochastic regression with latent factors, endogeneity and nonlinearity (Chang et al., in press), sign-based portmanteau test for ARCH-type models with heavy-tailed innovations (Chen and Zhu, in press), toward optimal model averaging in regression models with time series errors (Cheng et al., in press), high dimensional dynamic stochastic copula models (Creal and Tsay, in press), a misspecification test for multiplicative error models of non-negative time series processes (Gao et al., in press), sample quantile analysis for long-memory stochastic volatility models (Ho, in press), testing for independence between functional time series (Horvath and Rice, in press), statistical inference for panel dynamic simultaneous equations models (Hsiao and Zhou, in press), specification tests of calibrated option pricing models (Jarrow and Kwok, in press), asymptotic inference in multiple-threshold double autoregressive models (Li et al., in press-a), a new hyperbolic GARCH model (Li et al., in press-b), intraday value-at-risk: an asymmetric autoregressive conditional duration approach (Liu and Tse, in press), refinements in maximum likelihood inference on spatial autocorrelation in panel data (Robinson and Rossi, in press), statistical inference of conditional quantiles in nonlinear time series models (So and Chung, in press), quasi-likelihood estimation of a threshold diffusion process (Su and Chan, in press), threshold models in time series analysis — some reflections (Tong, in press), and generalized ARMA models with martingale difference errors (Zheng et al., in press).

The interesting, timely and novel contributions to this special issue should highlight and encourage innovative research in a variety of challenging areas associated with time series analysis and financial econometrics. It is exciting that many of the leading international scholars in statistics, mathematics, econometrics, time series analysis and financial econometrics have contributed to an innovative special issue on "Frontiers in Time Series and Financial Econometrics".

The plan of the remaining part of the paper is as follows. An overview of the 21 papers in the special issue is presented in Section 2. Some final remarks are given in Section 3.

2. Overview

The first paper is "Forecasting co-volatilities via factor models with asymmetry and long memory in realized covariance", by Manabu Asai (Faculty of Economics, Soka University, Japan) and Michael McAleer (Department of Quantitative Finance, National Tsing Hua University, Taiwan). Modeling covariance structures is known to suffer from the curse of dimensionality. In order to avoid this problem for forecasting, the authors propose a new factor multivariate stochastic volatility (fMSV) model for realized covariance measures that accommodates asymmetry and long memory. Using the basic structure of the fMSV model, the authors extend the dynamic correlation MSV model, the conditional and stochastic Wishart autoregressive models, the matrix-exponential MSV model, and the Cholesky MSV model. The empirical results for 7 financial asset returns for the US stock returns indicate that the new fMSV models outperform existing dynamic conditional correlation models for forecasting future covariances. Regarding the forecasting performance for one-day, five-day and ten-day horizons, the recommended specification among the new fMSV models is the stochastic Wishart autoregressive specification with asymmetric effects for the periods during and after the global financial crisis (GFC), while the Cholesky fMSV model with long memory and asymmetry displays the best performance for periods outside the GFC.

In the second paper, "Prediction of Lévy-driven CARMA processes", by Peter Brockwell (Department of Statistics, Colorado State University, USA) and Alexander Lindner (Institut für Mathematische Stochastik, TU Braunschweig, Germany), the authors consider the problem of determining the conditional expectations, $E(Y(h)|Y(u); u < 0)$ and $E(Y(h)|Y(u); -M < u < 0)$, where $h > 0$, $0 < M < \infty$, and $Y(t)$ is a strictly stationary continuous-time ARMA (CARMA) process driven by a Lévy process L. If the driving Lévy process satisfies $E(L(1)^2) < \infty$, then these are the minimum mean-squared error predictors of $Y(h)$ given $(Y(t))$, $t < 0$, and $(Y(t))$, $-M < t < 0$, respectively. Conditions are established under which the sample path of L can be recovered from that of Y, when Y is causal and strictly stationary and also without these assumptions when L is a pure jump Levy process. When

Please cite this article in press as: Ling, S., et al., Frontiers in Time Series and Financial Econometrics: An overview. Journal of Econometrics (2015), http://dx.doi.org/10.1016/j.jeconom.2015.03.019