ECON751 Topics in Financial Econometrics

Jun Yu

Purpose

The aim of this course is to enhance the understanding of some of econometric methods and models used in financial econometrics. The courses is en extension to the discrete time series methods and models covered in Econometrics II (623). Students who wish to take this course must have taken Econ623.

Content Outline

Topic 1: Ordinary differential equations: theory

Topic 2: Ordinary differential equations: numerical issues

Topic 3: Brownian processes and stochastic differential equations

Topic 4: Levy processes

Topic 5: Continous time models in economics and finance

Topic 6: Econometric analysis of continous time models in economics and finance

Topic 7: Unit root in continuous time models

Topic 8: Discrete time fractional models: Estimation Methods and Standard Asymptotic Theory

Topic 9: Continuous time fractional models: Estimation Methods and Standard Asymptotic Theory

Topic 10: Weak Identification and Robust Confidence Sets

Instructor:

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Assessment:

50% of the final grade will be assessed on assignments.

The remaining 50% of the final grade will be assessed on the take-home exam.

Learning Resources: Books

Arnold, V.I., 1973, Ordinary different equations, MIT

Beran, J., 1994. Statistics for Long-Memory Processes, Volume 61. CRC Press

Bergstrom, AR, 1984, Continuous time stochastic models and issues of aggregation over time. In Z. Griliches and M.D. Intriligator, editors, Handbook of Econometrics. Vol. II (Elsevier Science, Amsterdam).

Giraitis, L., Koul, H. L., Surgailis, D, 2012, Large Sample Inference for Long Memory Processes IMPERIAL COLLEGE PRESS.

Learning Resources: Research Papers

Aït-Sahalia, Y., 2002, Maximum likelihood estimation of discretely sampled di¤usion: A closed-form approximation approach. Econometrica, 70, 223-262.

Aït-Sahalia, Y., 2008, Closed-Form Likelihood Expansions for Multivariate Di¤usions. Annals of Statistics, 36, 906-937.

Aït-Sahalia, Y. and J. Yu, 2006, Saddlepoint approximation for continuous-time Markov Processes. Journal of Econometrics,134, 507-551

Andersen, T. G., T. Bollerslev, F. X. Diebold, and P. Labys, 2001 The distribution of realized exchange rate volatility. Journal of the American Statistical Association 96, 42–55.

Andersen, T. G., T. Bollerslev, F. X. Diebold, and P. Labys, 2003 Modeling and forecasting realized volatility. Econometrica 71, 579–625

Balduzzi, P., S. Das, and S. Foresi , 1998, The Central Tendency: A Second Factor in Bond Yields, Review of Economics and Statistics, 80, 62-72.

Bandi, F. M. and B. Perron, 2006 Long memory and the relation between implied and realized volatility. Journal of Financial Econometrics 4, 636–670

Barndorff-Nielsen, O. and N. Shephard, 2002, Econometric analysis of realized volatility and its use in estimating stochastic volatility models. Journal of the Royal Statistical Society, Series B, 64, 253-280.

Billingsley, P., 1968 Convergence of probability measures. Wiley.

Bolko, A. E., K. Christensen, M. S. Pakkanen, and B. Veliyev, 2023 A GMM approach to estimate the roughness of stochastic volatility. Journal of Econometrics, forthcoming

Brockwell, P, Davis, R., 1987 Time Series: Theory and Methods. Springer

Cheridito, P., Kawaguchi, H., Maejima, M., 2003 Fractional Ornstein–Uhlenbeck processes. Electronical Journal Probability 8, 1-14

Corsi, F., 2009 A simple approximate long-memory model of realized volatility. Journal of Financial Econometrics 7, 174–196

Cox, J., Ingersoll, J., and S. Ross, 1985, A Theory of the Term Structure of Interest Rates,.Econometrica, 53, 385-407.

Dai, Q., and K. J. Singleton, 2000, Specification Analysis of Affine Term Structure Models, Journal of Finance, 55, 1943-78.

Davydov, Y. A., 1970 The Invariance Principle for Stationary Processes, Theory of Probability and Its Applications 15, 487-489.

Ding, Z., C. W. Granger, and R. F. Engle, 1993 A long memory property of stock market returns and a new model. Journal of Empirical Finance 1, 83–106.

Duffie, D., J. Pan, and K. J. Singleton, 2000, Transform Analysis and Asset Pricing for Affine Jump-diffusions, Econometrica, 68, 1343-1376.

Durham, G., and A. R. Gallant, 2002, Numerical Techniques for Maximum Likelihood Estimation of Continuous-time Diffusion Processes, Journal of Business and Economic Statistics, 20, 297-316.

Escanciano, J. C. and I. N. Lobato, 2009 An automatic portmanteau test for serial correlation. Journal of Econometrics 151, 140–149

Fink, H., Kl¨uppelberg, C., Z¨ahle, M., 2013 Conditional Distributions of Processes Related to Fractional Brownian Motion. Journal of Applied Probability 50, 166–183

Fox, R. and M. S. Taqqu, 1986 Large-sample properties of parameter estimates for strongly dependent stationary gaussian time series. The Annals of Statistics 14, 517–532.

Fukasawa, M., T. Takabatake, and R. Westphal, 2022 Consistent estimation for fractional stochastic volatility model under high-frequency asymptotics. Mathematical Finance

Gatheral, J., T. Jaisson, and M. Rosenbaum, 2018 Volatility is rough. Quantitative Finance 18, 933–949

Geweke, J. and S. Porter-Hudak, 1983 The estimation and application of long memory time series models. Journal of Time Series Analysis 4, 221–238.

Granger, C. W. J., R. Joyeux, 1980 An introduction to long-memory time series models and fractional differencing. Journal of Time Series Analysis 1, 15–29.

Gouriéroux, C., A. Monfort, and E. Renault, 1993, Indirect Inference, Journal of Applied Econometrics, 8, S85-S118.

Heston, S.L. 1993, A closed-form solution for options with stochastic volatility, with application to bond and currency options, Review of Financial Studies 6, 327-343.

Hosking, J. R., 1981 Fractional differencing. Biometrika 68, 165–176.

Hu, Y., Nualart, D.,, 2010 Parameter estimation for fractional Ornstein–Uhlenbeck processes. Statistics and Probability Letter 80, 1030–1038

Kunsch, H., 1987 Statistical aspects of self-similar processes. In Proceedings of the First Congress of the Bernoulli Society

Lang, G., Roueff, F., 2001 Semi-parametric estimation of the Holder exponent of a stationary Gaussian process with minimax rates. Statistical Inference for Stochastic Processes 4, 283–306.

Li, J., Phillips, P.C.B., Shi, S., Yu, J., 2022 Weak identification in long memory with Implications on volatility modelling. Working Paper, SMU

Mandelbrot, B., van Ness, J.W., 1968 Fractional Brownian motions, fractional noises and applications, SIAM Review, 10, 422–437.

Nowman, K. B., 1997, Gaussian Estimation of Single-factor Continuous Time Models of the Term Structure of Interest Rates, Journal of Finance, 52, 1695-1703.

Nuzman, C.J. and Poor, V.H., 2000 Linear estimation of self-similar processes via Lamperti's transformation. J. Appl. Probab. 37, 429–452

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Phillips, P.C.B. and J. Yu, 2005, Jackknifing bond option prices. Review of Financial Studies, 18, 707-742.

Phillips, P.C.B. and J. Yu, 2009a, A Two-Stage Realized Volatility Approach to Estimation of Di¤usion Processes with Discrete Data. Journal of Econometrics, 150, 139-150.

Phillips, P.C.B. and J. Yu, 2009b, Simulation-based Estimation of Contingent-claims Prices. Review of Financial Studies, 22, 3669-3705.

Phillips, P.C.B., and J. Yu., 2009c, Maximum likelihood and Gaussian estimation of continuous time models in finance. Handbook of Financial Time Series, 497-530.

Robinson, P. M., 1995a Gaussian semiparametric estimation of long range dependence. Annals of Statistics 23, 1630–1661.

Robinson, P. M., 1995b Log-periodogram regression of time series with long range dependence. Annals of Statistics 23, 1048–1072.

Shi, S. and J. Yu, 2022 Volatility puzzle: Long memory or anti-persistency. Management

Science, forthcoming

Shi, S., J. Yu,, C. Zhang, 2023, Fractional Gaussian Noise: Spectral Density and Estimation Methods, SMU, Working paper.

Shi, S., J. Yu,, C. Zhang, 2023, On the Spectral Density of Fractional Ornstein-Uhlenbeck Process: Approximation, Estimation, and Model Comparison, SMU, Working paper.

Sowell, F., 1990 The Fractional Unit Root Distribution, Econometrica 58, 495-505.

Sundaresan, S. M., 2000, Continuous-time Methods in Finance: A Review and an Assessment, Journal of Finance, 55, 1569-1622.

Tang, C.Y., and S.X. Chen., 2009. Parameter estimation and bias correction for di¤usion processes. Journal of Econometrics. 149, 65-81

Taqqu, M. S.,, 1975 Weak convergence to fractional Brownian motion and to the Rosenblatt process. Zeitschrift fur Wahrscheinlichkeitstheorie und verwandte Gebiete.

Wang, X., Phillips, P.C.B., Yu, J., 2011 Bias in Estimating Multivariate and Univariate Diffusions, Journal of Econometrics. 161, 228-245

Wang, X., W. Xiao, and J. Yu (2023) Modeling and forecasting realized volatility with the fractional Ornstein-Uhlenbeck process. Journal of Econometrics

Wang, X., Yu, J., 2023 Latent local-to-unity models, Econometric Reviews, 232, 389-415

Wang, X., Yu, J., 2023 On the Optimal Forecast with the Fractional Brownian Motion , SMU, Working paper.

Whittle, P., 1953 Estimation and information in stationary time series. Arkiv for matematik 2, 423–434.

Vasicek, O., 1977, An Equilibrium Characterization of the Term Structure,. Journal of Financial Economics, 5, 177-186.

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Yu, J., 2012, Bias in the Estimation of Mean Reversion Parameter in a Continuous Time Model, Journal of Econometrics, 169, 114-122.

Yu, J., 2011, Simulation-based Estimation Methods for Financial Time Series Models, Handbook of Computational Finance, Chapter 15, Page 427-465.

Zhou, Q. and Yu, J., 2015, Asymptotic Distributions of the Least Squares Estimator for Diffusion Processes**,** Economic Letters, 128, 1-5.