Chihwa KAO

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Education

Ph. D. (1983), Economics, SUNY at Stony Brook
M.S. (1982), Applied Mathematics and Statistics, SUNY at Stony Brook
B.A. (1974), Economics, Fu-Jen University, Taiwan

Academic Positions

Professor of Economics, University of Connecticut, 2016-
Department Head, Department of Economics, University of Connecticut, 2016-2023
Professor of Economics/Senior Research Associate, Syracuse University, 2000-2016
Department Chair, Department of Economics, Syracuse University, 2010-2013
Associate Professor of Economics/Senior Research Associate, Syracuse University, 1991-1999
Assistant Professor of Economics, Syracuse University, 1985-1991
Visiting Assistant Professor of Applied Mathematics and Statistics, SUNY at Stony Brook, Spring, 1985
Associate Research Fellow, Chung-Hua Institute for Economic Research, 1983-1984

Professional Experience

President, Chinese Economic Association in North America, 2003
Vice President, Chinese Economic Association in North America, 1996, 1998

Honors and Awards

Named #91 in the worldwide rankings of authors in econometrics by RePEc's April 2024 Rankings (http://ideas.repec.org/top/top.ecm.html)

Award for Excellence in Graduate Teaching, Department of Economics, Syracuse University, 1999

Award for Senior Scholar Research Grant, Chiang Ching-kuo Foundation for International Scholarly Exchange, Spring 2000

Google Scholar Citations
http://scholar.google.com/citations?user=j21_t_0AAAAJ&hl=en&oi=ao

Complete Publications in Research Papers in Economics (Repec)
http://ideas.repec.org/f/pka371.html

Selected Refereed Publications

Zhang, Z., Jing, H., and Kao, C. (2023), "High-dimensional Distributionally Robust Mean-variance Efficient Portfolio Selection," *Mathematics*, 11, 1272.

Li, X., and Kao, C., (2022), "Spatial Analysis and Modeling of the Housing Value Changes in the U.S. during the COVID-19 Pandemic," *Journal of Risk and Financial Management,* 15, 139.

Kao, C., and Liu, L., and Sun, R. (2021), "A Bias-Corrected Estimators in the Dynamic Panel Data Model," *Empirical Economics*, 60, 205-225.

Baltagi, B., Kao, C., and Wang, F. (2021), "Estimating and Testing High Dimensional Factor Models with Multiple Structural Changes," *Journal of Econometrics*, 220, 349-365.

Baltagi, B., Kao, C., and Liu, L. (2020), "Testing for Shifts in a Time Trend Panel Data Model with Serially Correlated Error Component Disturbance," *Econometric Reviews*, 39, 745-762.

Kao, C., Kim, M. S., and Zhang, Z. (2020), "Mahalanobis Metric Based Clustering for Fixed Effects Model," *Sankhya*, Series B.

Baltagi, B., Feng, Q., and Kao, C., (2019), "Structural Changes in Heterogeneous Panels with Endogenous Regressors," *Journal of Applied Econometrics*, 34, 883-892.

Alvarez-Ayuso, I., Kao, C., Romero-Jordan, D., (2018), "Long Run Effect of Public Grants and Tax Credits on R&D Investment: A Non-stationary Panel Data Approach," *Economic Modelling*, 75, 93–104

Kao, C., Trapani, L., and Urga, G. (2018), "Testing for Instability in Covariance Structures," *Bernoulli*, 24, 740-771.

Baltagi, B., Kao, C., and Wang, F. (2017), "Asymptotic Power of The Sphericity Test Under Weak and Strong Factors in a Fixed Effects Panel Data Model," *Econometric Reviews,* 36, 853-882.

Baltagi, B., Kao, C., and Wang, F. (2017), "Identification and Estimation of a Large Factor Model with Structural Instability," *Journal of Econometrics,* 197, 87-100.

Baltagi, B., Kao, C., and Liu, L. (2017), "Estimation and Identification of Change Points in Panel Models with Nonstationary or Stationary Regressors and Error Term," *Econometric Reviews*, 36, 85-102.

Baltagi, B., Feng, Q., and Kao, C. (2016), "Estimation of Heterogeneous Panels with Structural Breaks," *Journal of Econometrics,* 191, 176-195.

Baltagi, B., Kao, C., and Peng, B. (2015), "On Testing for Sphericity with Non-normality in a Fixed Effects Panel Data Model," *Statistics and Probability Letters*, 98, 123-130.

Baltagi, B., Kao, C., and Liu, L. (2014), "Test of Hypotheses in a Time Trend Panel Data Model with Serially Correlated Error Component Disturbances," *Advances in Econometrics,* 33.

Baltagi, B., Kao, C., and Na, S. (2013), "Testing Cross-sectional Dependence in Panel Factor Model Using the Wild Bootstrap F-test," *Statistical Papers,* 54, 1067-1094.

Baltagi, B., Kao, C., and Liu, L. (2013), "The Estimation and Testing of a Linear Regression with Near Unit Root in the Spatial Autoregressive Error Term," *Spatial Economic Analysis*, 8, 1742-1772.

Baltagi, B., Kao, C., and Liu, L. (2012), "On the Estimation and Testing of Fixed Effects Panel Data Models with Weak Instruments," *Advances in Econometrics*, 30, 199-235.

Baltagi, B., Feng, Q., and Kao, C.(2012), "Lagrange Multiplier Test for Cross-sectional Dependence in Fixed Effects," *Journal of Econometrics,* 170, 164-177.

Kao, C., Trapani, L., and Urga, G., (2012), "The Asymptotics for Panel Models with Common Shock," *Econometric Reviews*, 31, 390-439.

Baltagi, B., Kao, C., and Na, S., (2011), "Test of Hypotheses in Panel Data Models When the Regressor and Disturbances are Possibly Nonstationary,'' *Advances in Statistical Analysis,* 95, 329-350.

Baltagi, B., Feng, Q., and Kao, C., and (2011), "Testing for Sphericity in a Fixed Effects Panel Data Model," *Econometrics Journal*, 14, 25-47.

Bai, J., Kao, C., and Ng, S. (2009), "Panel Cointegration with Global Stochastic Trends," *Journal of Econometrics,* 149, 82-99.

Baltagi, B., Kao, C., and Liu, L. (2008), "Asymptotic Properties of Estimators for the Linear Panel Regression Model with Individual Effects and Serially Correlated Errors: The Case of

Stationary and Non-Stationary Regressors and Residuals," *Econometrics Journal*, 11, 554-572.

Huang, H. M., Kao, C., and Urga, G. (2008), "Copula-Based Tests for Cross-Sectional Independence in Panel Models," *Economics Letters*, 100, 224-228.

Bai, J., and Kao, C. (2006), "On the Estimation and Inference of a Panel Cointegration Model with Cross-Sectional Dependence," in *Panel Data Econometrics: Theoretical Contributions and Empirical Applications,* Edited by Badi Baltagi.

Hong, Y., and Kao, C. (2004), "Wavelet-Based Testing for Serial Correlation of Unknown Form in Panel Models," *Econometrica,* 72, 1519-1564.

Kao, C., Lee, L.-F., and Pitt, M., (2001), "Simulated Maximum Likelihood Estimation of the Linear Expenditure System with Binding Non-negativity Constraints," *Annals of Economics and Finance*, 2, 215-255.

Baltagi, B. H., and Kao, C. (2000), "Nonstationary Panels, Cointegration in Panels and Dynamic Panels: A Survey," *Advances in Econometrics*, 15, 7-51.

Kao, C., and Chiang, M-H. (2000), "On the Estimation and Inference of a Cointegrated Regression in Panel Data," *Advances in Econometrics*, 15, 179-222.

Kao, C., Chiang, M-H., and Chen, B. (1999), "International R&D Spillovers: An Application of Estimation and Inference in Panel Cointegration," *Oxford Bulletin of Economics and Statistics,* 61, 691-709.

McCoskey, S., and Kao, C. (1999), "Testing the Stability of a Production Function with Urbanization as a Shift Factor," *Oxford Bulletin of Economics and Statistics*, 61, 671-690.

Kao, C. (1999), "Spurious Regression and Residual-Based Tests for Cointegration in Panel Data," *Journal of Econometrics,* 90, 1-44.

McCoskey, S., and Kao, C. (1998), "A Residual-Based Test of the Null of Cointegration in Panel Data," *Econometric Reviews*, 17, 57-84.

Kao, C., and Ross, S. (1995), "A CUSUM Test in the Linear Regression Model with Serially Correlated Disturbances," *Econometric Reviews*, 14, 331-346.

Kao, C., and Wu, C. (1994), "Rational Expectations, Information Signaling and Dividend Adjustment to Permanent Earnings," *Review of Economics and Statistics,* 76, 490-502.

Kao, C., and Wu, C. (1994), "Tests of Dividend Signaling Using A Generalized Tobit Friction Model," *Journal of Business,* 67, 45-68.

Kao, C., and Wu, C. (1990), "A Two-Step Estimation of Linear Models with Ordinary Unobserved Variables: The Case of Corporate Bonds," *Journal of Business and Economic Statistics,* 8, 317-325.

Kao, C., and Dutkowsky, D. (1989), "An Application of Nonlinear Bounded Influence Estimation to Aggregate Bank Borrowing from the Federal Reserve," *Journal of the American Statistical Association,* 84, 700-709.

Book Chapter

Kao, C., and Wang, F. (2019), "Fixed Effects Likelihood Approach for Large Panels," *Panel Data Econometrics*, Chapter 7, 175-196.

Books

Kao, C., and Liu, L. (2019), *High Dimensional Econometrics and Identification*, World Scientific Publishing.

Feng, Q. and Kao, C. (2021), *Large Dimensional Panel Data Econometrics*, World Scientific Publishing.

Kao, C., and Kim, M., *Large Dimensional Panel Econometrics with Cross-sectional and Time Dependence*, in progress.

Selected Working Papers

Hounyo, U., Kao, C. and Kim, M. S. (2024), "A Free Probability Theory based LM Test for Cross-sectional Dependence in Large Panel Data Models with Serial Correlation," manuscript.

Hounyo, U., Kao, C. and Kim, M. S. (2024), "Serial Dependence Robust Bootstrap Test for Cross-Sectional Correlation in Large Panel Models," submitted to *Review of Economics and Statistics*.

Kao, C., Liu, L., and Sun, R. (2024), "A Bias-Corrected Fixed Effects Estimator in the Dynamic Panel Data Model with Exogenous Variables," submitted to *Econometrics Journal*.

Zhang, Z., and Kao, C. (2022), "Wasserstein Worst-Case Scenarios and Asset Price," manuscript.

Baltagi, B., Kao, C., and Wang, F. (2015), "Change Point Estimation in Large Heterogeneous Panels," manuscript.

Kao, C., and Liu, L. (2016), "F-tests of Homogeneity in a Panel Factor Model," manuscript.

Kao, C., Trapani, L., and Urga, G. (2015), "Testing for Breaks in Cointegrated Panels," manuscript.

Kao, C., and Oh, J. (2015), "On the Over-detection Probability of the Number of Factors," manuscript.

Kao, C., and Oh, J. (2016), "Misspecified Recovery or Recovery of the Long-term Risk: Evidence from the Gaussian Affine Term Structure," manscript.

Kao, C., and Oh, J. (2016), "On the Misdetection Probability of the Number of Factors and the Optimal Selection Rule in Finite Sample," mascsript.

Kao, C., and Shen, S. (2015), "Diffusion Index Forecasts and Factor-Augmented Regressions in Nonstationary Time Series," manscript.

Selected Scholarly Papers and Addresses

"On the Existence and Uniqueness of the Maximum Likelihood Estimates for the Heteroscedastic Regression Models with the Data are Right-Censored," presented at the winter meetings of the Econometric Society, Dallas, TX, December 1984.

"Censored Regression Diagnostics," presented at the Econometric Society Meetings of Fifth World Congress, Cambridge, MA, August 1985.

"The Influence Function for the Switching Regression Model," presented at the summer meeting of the Econometric Society, Durham, NC, June 1986.

"Bounded Influence Estimation for the Poisson-Jump Diffusion Process with Foreign Exchange Rates," presented at the American Statistical Association Winter Conference, San Diego, January 1989.

"The Impact of Credit Ratings and Economic Factors on State Bond Yields," presented at the summer meetings of the Econometric Society, Ann Arbor, Michigan, June 1989.

"The Estimation and Tests of a Partial Adjustment Model of Dividends with Rational Expectations," presented at the summer meetings of the Econometric Society, Ann Arbor, Michigan, June 1989.

"Tests of Dividend Signaling Using A Generalized Tobit Friction Model," presented at the American Finance Association, Washington, D. C., December 1990.

"Rational Expectations, Information Signaling and Corporate Dividend Behavior: An Empirical Investigation," presented at Western Finance Association meetings, Jackson Lake Lodge of the Grand Teton National Park, Wyoming, June, 1991.

"Robust Estimation in Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of Foreign Exchange Rates," presented at the summer meetings of the Econometric Society, University of Pennsylvania, June, 1991.

"A CUSUM Test in the Linear Regression Model with Serially Correlated Disturbances," presented at the summer meetings of the Econometric Society, University of Washington, Seattle, June, 1992.

"A GARCH with a Generalized Tobit of Exchange Rates in Taiwan," presented at ASSA/CEANA, Anaheim, California, January, 1993.

"Some New Approaches to Formulate and Estimate Taiwan's Exchange Rates: Friction-Bernoulli Jump Diffusion and Friction-GARCH," presented at Far Eastern Meeting of the Econometric Society, Taipei, Taiwan, June, 1993.

"How Important is the Errors-in-Variables in the Cointegrated Regression ?" presented at ASSA/CEANA, Washington DC, January, 1995.

"Maximum Simulated Likelihood Estimation of Consumer Demand Systems with Binding Non-Negativity Constraints," presented at the Econometric Society Meetings of the Seventh World Congress, Tokyo, Japan, August 1995.

"International R&D Spillovers Revisited," presented at ASSA/CEANA Meetings, San Francisco, January 1996.

"Residual-Based Tests of the Null of Cointegration in Panel Data," presented at ASSA/CEANA Meetings, New Orleans, January 1997.

"On the Estimation and Inference of a Cointegrated Regression in Panel Data," presented at the winter meetings of the Econometric Society, Chicago, January 1998.

"International R&D Spillovers: An Application of Estimation and Inference in Panel Cointegration," presented at ASSA/CEANA Meetings, Chicago, January 1998.

"A Monte Carlo Comparison of Tests for Cointegration in Panel Data," presented at the Eighth International Conference on Panel Data, Göteborg, June 1998.

"Testing the Stability of a Production Function with Urbanization as a Shift Factor: An Application of Non-Stationary Panel Data Techniques," presented at the Eighth International Conference on Panel Data, Göteborg, June 1998.

"Spurious Regression and Residual-Based Tests for Cointegration in Panel Data," presented at the summer meetings of the Econometric Society, Montreal, June, 1998.

"Testing the Stability of a Production Function with Urbanization as a Shift Factor: An Application of on-Stationary Panel Data Techniques," presented at ASSA/CEANA Meetings, New York, January 1999.

"On the Estimation of a Linear Time Trend Regression with a One-Way Error Component Model in the Presence of Serially Correlated Errors," presented at Far Eastern Meeting of the Econometric Society, Singapore, July, 1999.

"Testing for Structural Change of a Time Trend Regression in Panel Data," presented at the winter meetings of the Econometric Society, Boston, January 2000.

"Testing for Structural Change of a Cointegrated Regression in Panel Data," presented at the 9th International Conference on Panel Data, Geneva, June 2000.

"Wavelet-Based Testing for Serial Correlation of Unknown Form in Panel Models," presented at the summer meetings of the Econometric Society, College Park, University of Maryland, June, 2001.

"Wavelet-Based Testing for Serial Correlation of Unknown Form in Panel Models," presented at Far Eastern Meeting of the Econometric Society, Kobe, July, 2001.

"Wavelet-Based Testing for Serial Correlation of Unknown Form in Panel Models," presented at The Fifth ICSA International Conference, Hong Kong, August, 2001.

"Time Series Properties in Panel Data," presented (a keynote speaker) at the 10th International Conference on Panel Data, Berlin, July 2002.

"On the Estimation and Inference of a Panel Cointegration Model with Cross-Sectional Dependence," presented at European Meeting of the Econometric Society, Madrid, August, 2004.

"The Asymptotics for Panel Models with Common Shock," presented at the Econometric Society Meetings of the World Congress, London, 2005.

"Panel Cointegration with Global Stochastic Trends," presented at the AEA/CEANA Meetings, Chicago, January, 2007.

"Asymptotic Properties of Estimators for the Linear Panel Regression Model with Individual Effects and Serially Correlated Errors: The Case of Stationary and Non-Stationary Regressors and Residuals," presented at the Midwest Econometrics Group, St. Louis, October, 2007.

"Testing for Sphericity in a Fixed Effects Panel Data Model," presented at the Far Eastern Meeting of the Econometric Society, Tokyo, August, 2009.

"Lagrange Multiplier Test for Cross-sectional Dependence in Fixed Effects," presented at the 17th International Conference on Panel Data, Montreal, July 2011.

"Testing Cross-sectional Dependence in Panel Factor Model Using the Wild Bootstrap F-test," presented at the 18th International Conference on Panel Data, Paris, July 2012.

"Estimation and Identification of Change Points in Panel Models with Nonstationary or Stationary Regressors and Error Term," presented at the 19th International Conference on Panel Data, London, July 2013.

"Asymptotic Power of Sphericity Test in Fixed Effects Panel Data Mode," presented at the Far Eastern Meeting of the Econometric Society, Taipei, June, 2014.

"Change Point Estimation in Large Heterogeneous Panels," presented at the 21st International Conference on Panel Data, Budapest, June 2015.

"Large Dimensional Econometrics and Identification," presented at the 31st New England Statistics Symposium, University of Connecticut, April 2017.

"Tests for Cross-sectional Dependence in Large Panel Data Models with Serial Correlation," presented (a keynote speaker) at the 27th International Conference on Panel Data, Bertinoro, Italy, June 2022.

"A robust approach for estimating the grouped patterns of heterogeneity in panel data," presented at the 28th International Conference on Panel Data, Amsterdam, July 2023.

"A Free Probability Theory based LM Test for Cross-sectional Dependence in Large Panel Data Models with Serial Correlation,"to be presented at the 29th International Conference on Panel Data, Orleans, July 2024.

Courses Taught

Undergraduate
Syracuse
      Intermediate Microeconomics
      Microeconomics with Calculus
      Probability and Statistics
      Econometrics
      Economic Forecasting
      Mathematical Economics
      Mathematical Finance
      Finaicial Econometrics
UConn

Empirical Methods in Economics I
Financial Econometrics/ Mathematical Finance

Master
Syracuse
Mathematical Economics
Probability and Statistics
Econometrics
Financial Econometrics/Mathematical Finance
UConn
Financial Econometrics/Mathematical Finance
Machine Learning and Causal Inference

Ph.D.
At Syracuse
Probability and Statistics
Mathematics for Economics
Advanced Mathematical Economics
Mathematical Finance
Stochastic Calculus
Stochastic Differential Equations
Asymptotic Theory
Time Series Econometrics
Financial Econometrics
Panel Data Econometrics
Spatial Econometrics
Nonparametric Econometrics
Limited Dependent Variable Models
At UConn
Machine Learning and Causal Inference
Large Panel Models
Large Dimensional Econometrics
Stochastic Calculus
Financial Econometrics
Mathematical Finance
Random Matrix Theory

Completed Ph.D. Dissertations Supervised and Initial Placement
Syracuse
Suzanne McCoskey (1997), "Three Essays on Cointegration in Panel Data," United States Naval Academy.

Bangtian Chen (1997), "Cointegration in Panel Data," Security First Technologies.

Jamie Emerson (2001), "Essays on Estimation and Testing in Nonstationary Panel Data," Indiana University of Pennsylvania.

Qu Feng (2009), "Essays on Tests for Cross-sectional Dependence & Estimation of Change Points in Panel Data Models," Nanyang Technological University, Singapore.

SangGon Na (2011), "Essays on Testing Hypotheses When Non-stationarity Exists in Panel Data Models," Ministry of Strategy and Finance, Republic of Korea.

Fa Wang (2016), "Essays on Structural Changes in High Dimensional Econometric Models," Shanghai University of Finance and Economics.

Bin Peng (2016), "Three Essays on Testing for Cross-Sectional Dependence and Specification in Large Panel Data Models," Huazhong University of Science & Technology.

Jaewoo Oh (2017), "Essays On Misspecification in High Dimensional Econometrics and Asset Pricing," Ministry of Strategy and Finance, Republic of Korea.

UConn
Zhonghui Zhang (2020), "Three Essays on Econometrics," Nanjing Audit University.

Rui Sun (2021), "Three Essays on Selection on Unobservables and Bias-Corrected Fixed Effects Estimators in Dynamic Panel Data Models," Mercer University.

Huarui Jing (2021), "Three Essays on Financial Econometrics," Sewanee, the University of the South.

Dingxian Cao (2022), "Inference on Panel AR Model with Possible Unit-roots," PNC bank.

Xuejian Gong (2023), "Application of Distributionally Robust Optimization in Economic and Financial Models," Citi Institutional Clients Group.

Ziyun Wu (2023), "Three Essays on Machine Learning in Asset Pricing," Hartford Steam Boiler.

Professional Activity:
Referee for:
Journal of Econometrics, Econometric Reviews, Econometrics Journal, Econometric Theory, Review of Economics and Statistics, Review of Economic Studies, Journal of Business and Economic Statistics, Journal of Applied Econometrics, Statistics and Probability Letters, Journal of Public Economics, Journal of Urban Economics, European Economic Review, Journal of Business, National Tax Journal, Taiwan Economic Review, Academia Economic Papers, Review of Quantitative Finance and Accounting, Southern Economic Journal, Empirical Economics, Spatial Economic Analysis, Sociological Methodology, Urban Studies, Journal of Financial Studies, Journal of Statistical Computation and Simulation,

Communications in Statistics – Theory and Methods, International Review of Economics and Finance, Social Sciences and Humanities Research Council of Canada, Research Grants Council of Hong Kong, National Science Foundation, National School of Development at Peking University.