

CURRICULUM VITAE

Aris Spanos

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PERSONAL

Place of birth: Cyprus

Nationality: Greek Cypriot

Citizenship: United Kingdom/Cyprus

Residence status: United States

EDUCATION

- 1973-76 **B.Sc. Econ** (Mathematical Economics and Econometrics) - 1st Class Honors, London School of Economics (LSE)
- 1976-77 **M.Sc. Econometrics and Mathematical Economics**, London School of Economics (LSE)
- 1977-82 (1977-79 Full-time, 1979-81 Part-time) **Ph.D. Econometrics**, London School of Economics (LSE),
Dissertation: "Latent Variables in Dynamic Econometric Models",
Advisor, Professor David F. Hendry (University of Oxford)

EMPLOYMENT

- August 1999 - present, Professor, Department of Economics, Virginia Tech.
- July 1992 - December 2000, Professor of Economics, Department of Economics, University of Cyprus.
- January 1995 - August 1995, Professor, Department of Economics, Virginia Tech.
- August 1988 - December 1994, Associate Professor, Department of Economics, Virginia Tech.
- January 1980 - June 1987, Part-time Lecturer, Cambridge University.
- September 1979 - June 1987, Lecturer in Economics, Department of Economics, Birkbeck College, London University.

VISITING APPOINTMENTS

- January 1997 - June 1997, Department of Economics, Virginia Tech.
- July 1987 - June 1988, University of California, Santa Barbara.

ADMINISTRATION

Virginia Tech:

- Jan. 2001 – August 2006 Chair, Department of Economics

University of Cyprus:

- July 1992 - November 1992, Acting Head, Department of Economics, University of Cyprus.
- November 1992 - October 1994, Acting Dean of the School of Economics and Management, University of Cyprus.
- December 1992 - October 1994, Acting Rector, University of Cyprus.
- January 1995 - December 1997, Member of the Senate, University of Cyprus.
- January 1995 - April 1999, Member of the University Council, University of Cyprus.

Honors and distinctions

- Ranked number **20** in a worldwide ranking of econometricians, *Econometric Theory*, 1998, pp. 1-43. The ranking was based on the number of (weighted) pages of publications in the top 15 econometrics journals.
- Awarded the **Wilson Schmidt chair in Economics** (2001) at Virginia Tech.
- Re-appointed as **Wilson Schmidt Professor of Economics** (2011) at Virginia Tech

PROFESSIONAL ACTIVITIES AND ASSOCIATIONS

Membership. Econometric Society, The Royal Economic Society, American Economic Association, American Statistical Association, Institute of Mathematical Statistics.

Refereeing

Econometrica, Journal of Econometrics, Econometric Theory, Econometric Reviews, Economic Journal, Review of Economics and Statistics, Review of Economic Studies, Journal of Applied Econometrics, Journal of Economic Dynamics and Control, *Economica*, Oxford Economic Papers, Scottish Journal of Political Economy, Cambridge Journal of Economics, Applied Economics, Journal of Forecasting, Journal of the Royal Statistical Society, IEEE Transactions in Automatic Control, Journal of Financial Econometrics, Journal of Economic Methodology, British Journal for the Philosophy of Science, Communications in Statistics: Theory and Methods, Philosophy of Science, Statistical Science, American Statistician, Synthese, Journal of Statistical Theory and Practice, Journal of the American Statistical Association, Synthese.

Journal Editing

2001- 2005 Associate Editor, **Econometric Reviews**,
1992-2000 Editorial Board, **The Journal of Economic Methodology**,

1999- Editorial Committee, **Momento Economico** (Mexico)

2007 - Advisory Board, **Nefsis** (History and Philosophy of Science)

Book Editing

2005 – 2011 Co-editor of the “**Advanced Studies in Theoretical and Applied Econometrics (ASTA) series**” for Springer-Verlag.

TEACHING

M.Sc Economics, Birkbeck College (LONDON UNIVERSITY)

1. Econometrics (Quantitative Methods),
2. Advanced Econometrics,
3. Statistical Inference for Econometrics,
4. Mathematical Methods for Economic Theory,
5. Economic Theory: (i) Microeconomics, (ii) Classical economics, (iii) Monetary economics,
6. Supervisor for M.Sc. econometric thesis (the main supervisor for around 45 students yearly).

Ph.D. Economics, Birkbeck College (London University)

1. Empirical Econometric Modelling, 2. Supervisor for Ph.D dissertations

M.Phil. Economics, Cambridge University, Faculty of Economics and Politics

1. Advanced econometric theory

B.A. Economics, Cambridge University, Faculty of Economics and Politics

1. Econometric theory and applications

B.A. Economics, University of California, Santa Barbara

1. Introduction to Econometrics

M.A. Economics, University of California, Santa Barbara

1. Probability and Statistics,
2. Econometric Theory
3. Mathematical Economics: Dynamic Models in Macroeconomics

Virginia Tech, undergraduate

1. Principles of Economics: Macro,
2. Economic Forecasting, 3. Econometrics

Virginia Tech, graduate

1. Econometrics (Quantitative Methods),
2. Advanced Econometrics
3. Philosophy of Econometrics
4. Foundational Problems in Statistical Modeling and Inference

5. Supervisor for Ph.D dissertations

University of Cyprus, undergraduate

1. Principles of Economics: Microeconomics
2. Principles of Economics: Macroeconomics
3. Quantitative Methods for Economists: Probability theory and Linear Algebra
4. Introduction to Econometrics: Probability, Statistical Inference and Linear Regression
5. Econometrics,
6. Statistics and Econometrics I,
7. Statistics and Econometrics II
8. Macroeconometrics Workshop

External Examiner

1983-87, University of Cambridge, M.Phil
1986, Ph.D, Oxford University

Ph.D Supervision

Virginia Tech

John Robertson (1992). Thesis title: *Misspecification testing in systems of equations*.

Sharmistha Koya (1993). Thesis title: *Terms of Trade on PPP and Incomes of Primary-Commodity Exporting Countries*.

Lisa Rosenberry (1994). Thesis title: *On Growth theory: Stylized facts revisited*.

Maria Heracleous (2003). Thesis title: *Volatility Modeling Using the Student's t Distribution*.

Jason Bergtold (2004). Thesis title: *Binary Discrete Choice Models and Artificial Neural Networks*.

Ebere Akobundu (2004). Thesis title: *Heterogeneity and Dependence in Surface Temperature Data: Can the Normal Linear Regression Model Detect Global Warming?*

Andreas Koutris (2006). Thesis title: *Testing for Structural Change: Evaluation of the Current Methodologies, a Misspecification Testing Perspective and Applications*

Alfredo A. Romero (2010). Thesis title: *Statistical Adequacy and Reliability of Inference in Regression-like Models*

Niraj Poudyal (2013). Thesis title: *Confronting Theory with Data: the Case of DSGE Modeling*

University of Cyprus

Elena Andreou (1998). Thesis title: *Essays in Modelling Speculative Prices: Non-linear Dependence, Distributional and Heterogeneity Aspects*.

Christina Christou (2002). Thesis title: *Three Essays on the Performance of Single Equation Cointegration Estimators in Finite Samples*

INSTRUCTIONAL EXPERTISE

Undergraduate Level

Freshman-Sophomore Level Junior-Senior Level:

Principles of Economics (Micro, Macro),

Introduction to Econometrics,

Introductory Statistics,

Intermediate Econometrics,

Introductory Mathematics,

Forecasting.

Graduate Level

Econometrics at all levels,

Time Series modeling,

Cross-Section and Panel data modeling,

Applied Econometrics,

Advanced Statistics,

Advanced Macro-Economics,

Philosophy of Science and Economics,

Mathematical Methods for Economists,

Foundational Issues in Frequentist Inference

Frequentist vs. Bayesian Inference

INSTRUCTIONAL “PHILOSOPHY”

1. Demand and receive 100% from the students
2. Make the course challenging but enjoyable
3. Help the students develop their critical thinking
5. The exams are dominated by material, and practical skills that
I expect students to be able to apply many years after the exam.

PUBLICATIONS

Books and monographs

1. *Statistical Foundations of Econometric Modelling*, (1986), Cambridge University Press, Cambridge, (708 pages).
2. *The Vector Autoregressive Approach for Macroeconomic Modelling*, (with Andreou E. and G. Syrichas), *Central Bank of Cyprus Research Publication*, Vol. I. ISBN 9963421032, (1977) (136 pages).
3. *Probability Theory and Statistical Inference: Econometric Modeling with Observational Data*, (1999), Cambridge University Press, Cambridge, (817 pages).
4. *Error and Inference: Recent Exchanges on Experimental Reasoning, Reliability, and the Objectivity and Rationality of Science* (2010) [with D. G. Mayo], Cambridge University Press, Cambridge.

Papers

5. "Liquidity as a Latent Variable - an Application of the MIMIC Model", *Oxford Bulletin of Economics and Statistics*, pp. 125-243, **46**, 1984.
6. "The Monetary Approach to the Balance of Payments: a Critical Appraisal of some Empirical Evidence", *Oxford Bulletin of Economics and Statistics*, pp. 329-340, **46**, 1984, (with M. Taylor).
7. "Towards a Unifying Methodological Framework for Econometric Modelling", *Economic Notes*, 1988, pp. 107-34.
 - Reprinted in *Modelling Economic Series: Readings on the Methodology of Econometric Modeling*, pp. 335-64, edited by C.W.J. Granger, Oxford University Press, Oxford, 1990.
 - Reprinted in, ed. D. J. Poirier, *The Methodology of Econometrics* (The international Library of Critical Writings in Econometrics, No 6), Edward Elgar, 1994.
8. "Early Empirical Findings on the Consumption Function, Stylized Facts or Fiction: a Retrospective View," *Oxford Economic Papers*, 1989, **41**, pp. 150-169.
 - Re-printed (pp. 150-169) in the *History and Methodology of Econometric Modelling*, edited by C., L. Gilbert, N., De Marchi, Oxford University Press, Oxford, 1989.
9. "Error-Autocorrelation Revisited: the AR(1) case", *Econometric Reviews*, 1988, **7**, pp. 285-94.
10. "On Re-reading Haavelmo: a Retrospective View of Econometric Modeling," *Econometric Theory* 1989, **5**, pp. 405-429.
 - Reprinted in *General to Specific Modelling*, edited by Campos, J., N. R. Ericsson and D. F. Hendry, An Elgar Reference Collection, Edward Elgar, UK

11. "The Simultaneous Equations Model Revisited: Statistical Adequacy and Identification," *Journal of Econometrics*, 1990, **44**, pp. 87-105.
12. "Unit Roots and their Dependence on the Implicit Conditioning Information Set," *Advances in Econometrics*, 1990, **8**, pp. 271-292.
13. "Modeling Exchange Rate Dynamics: Thick-tails and Non-linear Dependence," (with A. McGuirk and J. Robertson), *Econometric Reviews*, 1993, **12**, pp. 33-63.
14. "On Modeling Heteroskedasticity: the Student's t and Elliptical Linear Regression Models," *Econometric Theory*, **10**, pp. 286-315, 1994.
15. "On Theory Testing in Econometrics: Modeling with Non-experimental Data," *Journal of Econometrics*, **67**, pp. 189-226, 1995.
16. "On Normality and the Linear Regression Model", *Econometric Reviews*, 1995, **14**(2), pp. 195-203.
17. "Econometric Testing", pp. 116-130, in *The Handbook of Economic Methodology*, edited by J. B. Davis, D. W. Hands and U. Maki, 1998, Edward Elgar.
18. "Revisiting Data Mining: 'Hunting' with or without a License," *Journal of Economic Methodology*, **7**, pp. 231-264, 2000.
19. "A Post-data Interpretation of Neyman-Pearson Methods Based on a Conception of Severe Testing", (with Deborah Mayo). *Measurements in Physics and Economics Discussion Paper Series, History and Methodology of Economics Group*. The London School of Economics and Political Science, August, 2000. London: Tymes Court.
20. "Time Series and Dynamic Models," chapter 28, pp. 585-609, *A Companion to Theoretical Econometrics*, edited by B. Baltagi, Blackwell Publishers, Oxford, 2001.
21. "On Modeling Speculative Prices: the Empirical Literature", (with Elena Andreou and Nikitas Pittis), *Journal of Economic Surveys*, **15**, 187-220, 2001.
22. "The Model Specification Problem from a Probabilistic Reduction Perspective," (with Anya McGuirk), *Journal of the American Agricultural Association*, 2001, **83**(5), pp. 1168-1176.
23. "The Problem of Near-Multicollinearity Revisited: Erratic vs. Systematic Volatility", (with Anya McGuirk), *The Journal of Econometrics*, **108**, pp. 365-393, 2002.
24. "Parametric versus Non-parametric Inference: Statistical Models and Simplicity," ch. 11, pp. 181-206 in *Simplicity, Inference and Modelling: Keeping it Sophisticatedly Simple*, edited by A. Zellner, H. A. Keuzenkamp and M. McAleer, Cambridge University Press, 2002.
25. "Statistical Adequacy and the Testing of Trend versus Difference Stationarity," (with Elena Andreou), *Econometric Reviews*, **22**, 217-237, leading paper with discussion, 2003.
26. "Methodology in Practice: Statistical Misspecification Testing" (with D. G. Mayo),

- Philosophy of Science*, **71**, 1007-1025, 2004.
27. "When Can Risk-Factor Epidemiology Provide Reliable Tests?" (with D. G. Mayo), Commentary: *Epidemiology*, **15**, 2004: 527-528, 2004.
 28. "Structural Equation Modeling, Causal Inference and Statistical Adequacy," pp. 639-661, *Logic, Methodology and Philosophy of Science*, Editors, P. Hajek, L. Valdes-Villanueva and D. Westerstahl, King's College, London, 2005.
 29. "Revisiting Structural Change: A Misspecification Perspective", (with A. Koutris and M. Heracleous), pp. 4081-4088, *Proceedings of the American Statistical Association*.
 30. "The Student's t Dynamic Linear Regression: Re-examining Volatility Modeling," (with M. Heracleous), *Advances in Econometrics*, **20**, 289-319, 2006.
 31. "Econometrics in Retrospect and Prospect," pp. 3-58 in Mills, T.C. and K. Patterson, *New Palgrave Handbook of Econometrics*, vol. 1, MacMillan, London, 2006.
 32. "Where Do Statistical Models Come From? Revisiting the Problem of Specification," pp. 98-119 *The Second Erich L. Lehmann Symposium*, Lecture Notes-Monograph Series, vol. 49, Institute of Mathematical Statistics, 2006.
 33. "Revisiting the Omitted Variables Argument: Substantive vs. Statistical Adequacy," *Journal of Economic Methodology*, **13**: 179-218, 2006
 34. "Severe Testing as a Basic Concept in a Neyman-Pearson Philosophy of Induction," [with D. G. Mayo] *The British Journal of the Philosophy of Science*, **57**: 323-357, 2006.
 35. "The Instrumental Variables Method revisited: On the Nature and Choice of Optimal Instruments," pp. 34-59 in *Refinement of Econometric Estimation and Test Procedures*, ed. by G. D. A. Phillips and E. Tzavalis, Cambridge University Press, Cambridge, 2007.
 36. "Philosophical Scrutiny of Evidence of Risks: From Bioethics to Bioevidence," [with D. G. Mayo] *Philosophy of Science*, 73(5), 803–816, December 2006.
 37. "Curve-Fitting, the Reliability of Inductive Inference and the Error-Statistical Approach," *Philosophy of Science*, 74(5), 357-381, 2007.
 38. "Linear vs. Log-Linear Unit-Root Specification: An Application of Misspecification Encompassing," [with D. F. Hendry and J. J. Reade], *Oxford Bulletin of Economics and Statistics*, 70, pp. 829-847, 2008.
 39. "Risks to Health and Risks to Science: the Need for a Responsible "Bioevidential" Scrutiny," [with D. G. Mayo], *Human & Experimental Toxicology*, 27, pp. 794-799, 2008.
 40. Risks to Health and Risks to Science: The Need for a Responsible "Bioevidential" Scrutiny," [with D. G. Mayo], *Biological Effects of Low Level Exposures*, Newsletter, 14 (3), 18-22, Jan. 2008.
 41. "Testing for Non-Stationarity using Maximum Entropy Resampling: a Misspecification Testing Perspective," (with A. Koutris and M. Heracleous),

- Econometric Reviews*, Volume 27, pp. 363-384, 2008.
42. "Statistics and Economics," pp. 1057-1097 in *The New Palgrave Dictionary of Economics*. Second Edition. Eds. Steven N. Durlauf and Lawrence E. Blume. Palgrave Macmillan, 2008. Online. Palgrave Macmillan:
<http://www.dictionaryofeconomics.com/article?id=pde2008_S000502>
doi:10.1057/9780230226203.1613
 43. "Revisiting Error-Autocorrelation Correction: Common Factor Restrictions and Granger Non-Causality," [with A. McGuirk], *Oxford Bulletin of Economics and Statistics*, 71, pp. 273-294, 2009.
 44. "The Pre-Eminence of Theory versus the European CVAR Perspective in Macroeconometric Modeling," *Economics: The Open-Access, Open-Assessment E-Journal*, Vol. 3, 2009-10. <http://www.economics-ejournal.org/economics/journalarticles/2009-10>. Special issue on "Using Econometrics for Assessing Economic Models"
 45. "Statistical Misspecification and the Reliability of Inference: the simple t-test in the presence of Markov dependence," *The Korean Economic Review*, 2009, **25**, 165-213.
 46. "Akaike-type Information Criteria and the Reliability of Inference: Statistical Model Specification vs. Model Selection," *Journal of Econometrics*, **158**, 204-220, 2010.
 47. "Theory Testing in Economics and the Error Statistical Perspective", pp. 202-246 in *Error and Inference: Recent Exchanges on Experimental Reasoning, Reliability, and the Objectivity and Rationality of Science*, edited by D. G. Mayo and A. Spanos, Cambridge University Press, Cambridge, 2010.
 48. "On a New Philosophy of Frequentist Inference," pp. 314-330 in *Error and Inference*, eds. D. G. Mayo and A. Spanos, 2010.
 49. Graphical Causal Modeling and Error Statistics, pp. 364-375 in *Error and Inference*, eds. D. G. Mayo and A. Spanos, 2010.
 50. Bernoulli Regression Models: Revisiting the Specification of Statistical Models with Binary Dependent Variables, [with J. Bergtold and E. Onukwugha], *Journal of Choice Modelling*, **3**, 1-28, 2010.
 51. The Discovery of Argon: A Case for Learning from Data? *Philosophy of Science*, **77**: 359-380, 2010.
 52. Is Frequentist Testing Vulnerable to the Base-Rate Fallacy? *Philosophy of Science*, **77**, 565-583, 2010.
 53. "Statistical Adequacy and the Trustworthiness of Empirical Evidence: Statistical vs. Substantive Information," *Economic Modelling*, **27**, 1436-1452, 2010.
 54. "Statistical Inference -Overview," pp. 1433-1439 in the *International Encyclopedia of Statistical Science*, Lovric, Miodrag (Editor), Springer, NY, 2010.
 55. "Macroeconomic Linkages in Mexico," [with J. Lopez and A. Sanchez] *Metroeconomica*, **62**, 356-385, 2011.

56. "Error Statistics," [with D. G. Mayo], pp. 173-208 in the *Handbook of Philosophy of Science*, vol. 7: *Philosophy of Statistics*, D. Gabbay, P. Thagard, and J. Woods (editors), Elsevier, 2011.
57. "Revisiting the Welch Uniform Model: A case for Conditional Inference?" *Advances and Applications in Statistical Science*, **5**, 33-52, 2011.
58. "Misplaced Criticisms of Neyman-Pearson (N-P) Testing in the Case of Two Simple Hypotheses," *Advances and Applications in Statistical Science*, **6**: 229-242, 2011.
59. "Foundational Issues in Statistical Modeling: Statistical Model Specification and Validation," *Rationality, Markets and Morals*, 2011, **2**, 146–178, [Special Topic: Statistical Science and Philosophy of Science](#).
60. "Revisiting the Berger location model: Fallacious Confidence Interval or a Rigged Example?" *Statistical Methodology*, **9**, 555-561, 2012.
61. "Philosophy of Econometrics," pp. 329-393 in the *Handbook of Philosophy of Science*, vol. **12: Philosophy of Economics**, Volume editor: Uskali Maki, General Editors: D. M. Gabbay, P. Thagard, and J. Woods, Elsevier, North-Holland, Amsterdam, 2012.
62. "A Frequentist Interpretation of Probability for Model-Based Inductive Inference," *Synthese*, **190**, 1555–1585, 2013.
63. "Revisiting the Likelihoodist Evidential Account," *Journal of Statistical Theory and Practice*, **7**, 187-195, 2013.
64. "Who Should Be Afraid of the Jeffreys-Lindley Paradox?" *Philosophy of Science*, **80**, 73-93, 2013.
65. "The 'Mixed Experiment' Example Revisited: Fallacious Frequentist Inference or an Improper Statistical Model?" *Advances and Applications in Statistical Sciences*, **8**, 29-47, 2013.
66. "Recurring Controversies about P values and Confidence Intervals Revisited," *Ecology*, 95(3), 2014, pp. 645—651.
67. "Learning from Data: the Role of Error in Statistical Modeling and Inference," pp. 177-207 in *Error and Uncertainty in Scientific Practice*, edited by Marcel Boumans, Giora Hon, Arthur Petersen, published by Pickering & Chatto, London, 2014.
68. "Revisiting Haavelmo's Structural Econometrics: Bridging the Gap between Theory and Data," forthcoming in *Journal of Economic Methodology*, 2014.
69. "Reflections on the LSE Tradition in Econometrics: a Student's Perspective," forthcoming in *Oeconomia*, 2014.
70. "Methodology and Ontology in Statistical Modeling and Inference: the Error Statistical Perspective," (with D.G. Mayo), forthcoming in *Synthese*, 2014.

Academic Interviews

71. "An Interview with Phoebus J. Dhrymes", *Econometric Theory*, **18**, pp. 1221-1272, 2002.

Book reviews

72. **Self-organizing methods in modelling** - GMDH type algorithms, ed. by S.J. Farlow, Marcel Dekker Inc. 1984, *The Economic Journal*, 1986, **96**, pp.279-80.
73. **The Cowles Commission in Chicago 1939-1955**, by C. Hildreth, Springer-Verlag, *The Economic Journal*, 1987, **97**, p. 802.
74. **Improved methods of inference in Econometrics**, by G.G. Judge and T.A. Yancey, North-Holland, *Economic Journal*, 1988, **98**, pp. 922-923.
75. **Towards a formal science of economics**, by Bernt P. Stigum, The MIT Press, *Journal of Economic Literature*, **XXX**, 1992, pp. 2140-2143.
76. "Let's be serious about methodology in econometrics: Review of '**The Limits of Econometrics**' by A.C. Darnell and J.L. Evans, Edward Elgar, 1990", *Methodus (Journal of Economic Methodology)*, 1991, **3** (2), pp. 137-147.
77. "When do empirical data provide reliable evidence for a hypothesis (theory)?" Review of the book **Error and the Growth of Experimental Knowledge**, by Deborah, G. Mayo, The University of Chicago Press, 1996, *Journal of Economic Methodology*, **8**(3), pp. 443-53, 2002.
78. **Probability, Econometrics and Truth: The Methodology of Econometrics**, Cambridge University Press, Cambridge, 2000, *The American Statistical Association*, **97**, pp. 921-923, 2002.
79. "Stephen Ziliak and Deirdre McCloskey's *The cult of statistical significance: how the standard error costs us jobs, justice, and lives*," *Erasmus Journal for Philosophy and Economics*, 1, pp. 154-164, 2008.
80. "**Error in Economics: Towards a more Evidence-Based Methodology**, by Julian Reiss," *Economics and Philosophy*, 2009, 25, 206-211.
81. "Review of "**Circular and Linear Regression: Fitting Circles and Lines by Least Squares**" by Nikolai Chernov, Chapman and Hall-CRC, London, 2011, *Journal of the American Statistical Association*, **107**, 1254-1255.

Non-refereed papers

82. "Modellizzazione e verifiche dei dati d'impresa con moderni methodi econometrici (Econometric Modelling with Panel data)," ch. 4, in *Analysis of the Company Growth*, (ed) G. Zannetti, 1989, Societa editrice il Mulino, Bologna.
83. "Statistical Adequacy and Panel Data Modelling," *Industria* (in Italian), 47, pp. 105-123, 1988.

84. "The Contributions to Econometrics in Trygve Haavelmo's Probability Approach in Econometrics," (with D.F. Hendry and N.R. Ericsson), *Socialøkonomen*, 1989, 11, pp. 12-17, invited contribution to special volume on Trygve Haavelmo, 1989 Nobel Laureate (Economics).
85. "Haavelmo, Trygve (1911--)" in *Business Cycles and Depressions: an Encyclopedia*, edited by David Glasner (1997), Garland Publishing, New York.
86. "Koopmans, Tjalling Charles (1910--1985)" in *Business Cycles and Depressions: an Encyclopedia*, edited by David Glasner (1997), Garland Publishing, New York.
87. "Specification," entry in the *International Encyclopedia of the Social Sciences*, 2nd edition, Editor in Chief: W. A. Darity, MacMillan, London, 2008.
88. "Specification Tests," entry in the *International Encyclopedia of the Social Sciences*, 2nd edition, Editor in Chief: W. A. Darity, MacMillan, London, 2008.