Peter J. Lenk

Professor of Technology and Operations and Marketing
Stephen M. Ross School of Business at the University of Michigan

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Contact

701 Tappan Street
University of Michigan
Ann Arbor, MI 48109-1234
Phone: 734-936-2619; FAX: 734-936-0274;
e-mail: plenk@umich.edu
URL http://webuser.bus.umich.edu/plenk/

Research Interests

- Application of Bayesian models to business and economics, including marketing research, information systems, and finance
- Bayesian theory, inference, and computations

Teaching Interests

- Management Decision Analysis
- Bayesian Inference and Decision Theory
- Forecasting
- Data Mining and Multivariate Analysis
- Regression Analysis

Education

- Ph.D. in Statistics from The University of Michigan, "Bayesian Nonparametric Predictive Distributions," chair: Bruce M. Hill, 1984
- M.A. in Statistics from The University of Michigan, 1981
- M.A. in Mathematics from Indiana University, 1979
- B.A. in Mathematics from Indiana University, 1977

Appointments

- Michael R. and Mary Kay Hallman Fellow 2011 to 2014
- Full Professor, Stephen M. Ross Business School at the University of Michigan, 2008 to present
- Associate Professor, Stephen M. Ross Business School at the University of Michigan, 1994-2008
- Assistant Professor, Stephen M. Ross Business School at the University of Michigan, 1989-1994
- Assistant Professor, New York University, Leonard Stern School of Business, 1984-1989

- Research Associate and Lecturer, The University of Michigan, 1979-1984
- Teaching Assistant, Indiana University, 1977-1979

Scholarly Honors and Awards
- Leonard J. Savage Thesis Award from the NBER-NSF Seminar on Bayesian Inference in Econometrics and Statistics, 1985
- Sanford R. Robertson Associate Professor of Business Administration, junior faculty research award, 1994
- One of four finalist for the John Little paper of the year for 1996 in *Marketing Science*
- 2004 ART Forum Award for Best Presentation
- American Statistical Association Fellow, 2011

Grants
- Rackham Fellowship, The University of Michigan, 1982
- Foundations and Applications of Bayesian Inference and Decision Theory, National Science Foundation, 1990
- Statistical and Stochastic Methods for Safety CAE, Ford Motor Corp, 1999
- "Dealer Econometrics at Individual Dealership Level and the Associated Optimal C&I Design," Ford-UM Alliance, $190,166.
- "Modeling Behavioral Interactions among AVs and Other Road Users with Game Theory and Inverse Reinforcement Learning," Ford-UM Alliance, $206,367

Professional Memberships
- American Marketing Association
- American Statistical Association
- INFORMS

Professional Service
- Associate Editor, Data Mining and Knowledge Discovery, 2009 to 2013
- Marketing Science Guess Editor for Special Issue on Big Data. 2014
- Program Chair, 2005 Advanced Research Techniques Forum, American Marketing Association
- Program Committee, 2003 and 2004 Advanced Research Techniques Forum, American Marketing Association
- Treasurer, Section on Business and Economic Statistics, American Statistical Association, 1998-99
- President, Section on Statistics in Marketing, American Statistical Association, 2000-01
- Associate Editor, *Journal of Business and Economic Statistics*, 1993-2003
- Editorial Board, *Marketing Science*, 2000 to present, and Area Editor.
- Ad Hoc Referee: *Annals of Statistics, Econometrica, Journal of Business and Economics Statistics, Journal of Marketing Research, Journal of the American*

Statistical Association, Journal of the Operational Research Society, Journal of the Royal Statistical Society, Management Science, Marketing Science, The National Science Foundation, and *Operations Research*

School Service
- President of Ross' chapter of Beta Gamma Sigma honor society 2014-22
- Research Policy Committee 2014 -18
  - Reviewed compliance procedures in animal laboratories 2016-2017
  - Reviewed Office of Technology Transfer 2014-15
- Community Values Committee 2014-17
- Provost's Advisory Committee on Budgetary Affairs 2012-14
- Executive Committee for Center for Statistical Consultation and Research 2000-15
- Faculty Senate 2008-11, 2016-17
- Community Values Committee 2007-08 and Chair 2010-2012
- Part Time Program Task Force 2004
- Curriculum Committee, 1990-92 and 2000-03
- Doctoral Committee, 1993-99
- Strategic Planning Committee 1997-99. Chair 1998/99
- Chair of Statistics and Management Science, 1997 and 1999-03

Special Programs and Workshops
- Tauber Manufacturing Internship 2012-2020
- Bayesian Models, 1 day workshop at Ford, 2016
- Faculty in Michigan's MAP program. Interdisciplinary, 7 week consulting projects, 1994-96, 1998-2003, 2005-06, 2008, 2016-17
- Global Blue program with the Daewoo Corporation in South Korea, 1995
- Bayesian Applications and Methods in Marketing, Special Interest Group, American Marketing Association, Three day workshop for industry and academic marketing researchers, 1999 - 2002
- Bayesian Models and Markov Chain Monte Carlo, Three day workshop to the Chicago Chapter of the American Statistical Association, 2000
- Bayesian Models, Methods and Applications, Workshops at the Advanced Research Techniques Forum, sponsored by the American Marketing Association, 2001-2006
- Sawtooth Software Conference, workshop on Hierarchical Bayes: Theory and Practice, with Bryan Orme, 2004
- IMSM GfK Conference keynote address and workshop on Variable Importance, 2005. GfK is a major marketing research firm headquartered in Durenburg, Germany.
- Workshop on Bayesian Models, Methods, and Marketing at GfK, 2005.

- Workshop on Bayesian Statistics and Marketing, study group at the University of Michigan, 2004-2006.
- Tutorial on Hierarchical Bayesian Models, Third Statistical Challenges in eCommerce Research Symposium - SCECR 07.

Ph.D. Students
- Wehyi Wu, Ph.D. 2019, "Econometrics Models for Dealer Incentives.'
- Masaru Hashimoto, Ph.D. 2007, "Bayesian Nonparametric Models for Micro-Data in Finance"
- Jun Qin, Ph.D. 2005, "Bayesian Semiparametric Regression Models with Mixture of Constrained Polya Trees"
- Ming Li, Ph.D. 2002, "International Inflation and Interest Rates"
- Elizabeth Pierce, Ph.D. 1996, "Stochastic Models for Data Quality"
- Shreevardhan Lele, Ph.D. 1996, "Steady State Analysis of Three Process Monitoring Procedures in Quality Control," co-chaired with Stephen Pollack, Department of Industrial Engineering, University of Michigan
- Marjorie Rosenberg, Ph.D. 1994, "A Hierarchical Bayesian Model of the Rate of Non-Acceptable In-Patient Hospital Utilization," winner of the 1995 Zellner Award for the most outstanding thesis in Business and Economics, co-chaired with Richard Andrews

Work in Progress

- "Hierarchical Bayesian Spectral Regression with Shape Constraints for Multi-Group Data," with Taeryon Choi and Jangwon Lee
- "Does a Marketing Founder for a Startup Affect the Likelihood of Investment," with Ofer Mintz and Yitong Wang.
- "Bayesian Smoothing of Stationary, Continuous Time, Discrete Space Models for High Frequency Financial Data" with Masaru Hashimoto

Publications

1) Lenk, P. (1983) "Mappings of Fields Based on Nominations,'' *Journal of the American Society for Information Science*, 34, 115-122.

2) Lenk P. (1984) "The Structure of a Random Relation with an Application to a Nomination
   Network," *Social Networks* 6, 1-30.

3) Lenk, P. (1987) "Spectral Representations for Random Densities," *Statistics & Probability Letters*, 5, 295-298.

4) Lenk, P. (1988) "The Logistic Normal Distribution for Bayesian, Nonparametric, Predictive Densities," *Journal of the American Statistical Association*, 83, 509-516.

5) Lenk, P. and Floyd, B. (1988) "Dynamically Updating Relevance Judgments in Probabilistic Information Systems via Users' Feedback," *Management Science*, 34, 1450-1459..

6) Lenk, P. and Rao, A. (1990) "New Models from Old: Forecasting Product Adoption by Hierarchical Bayes Procedures," with discussion, *Marketing Science*, 9, 42-53.

7) Lenk, P. (1990) "Bayesian Predictive Distributions under Multinomial Sampling*," Bayesian and Likelihood Methods in Statistics and Econometrics*, editors S. Geisser, J. Hodges, S. J. Press, and A. Zellner, (reviewed articles), North-Holland, Amsterdam, 357-370.

8) Lenk, P. and Tsai, C. L. (1990) "Transformations and Dynamic Linear Models," *Journal of Forecasting*, 9, 219-232.

9) Lenk, P. (1991) "Towards A Practicable Bayesian Nonparametric Density Estimator," *Biometrika*, 78, 531-43.

10) Gordon, M. and Lenk, P. (1991) "A Utility Theoretic Examination of the Probability Ranking Principle in Information Retrieval," *Journal of the American Society for Information Science*, 42, 703-714.

11) Gordon, M. and Lenk, P. (1992) "When is the Probability Ranking Principle Sub-Optimal?," *Journal of the American Society for Information Science*, 43, 1-14.

12) Lenk, P. and Rao, A. (1992) "Hierarchical Bayes Forecasts of Multinomial Dirichlet Data Applied to Coupon Redemptions," *Journal of Forecasting*, 11, 603-619.

13) Lenk, P. J., and Rao, A. G., and Tibrewala, V. (1993) "Nonstationary Conditional Trend Analysis: An Application to Scanner Panel Data," *Journal of Marketing Research*, (August), 30, 3, 228-304.

14) DeSarbo W., Ramaswamy, V. and Lenk, P. (1993) "A Latent Class Procedure for the Structural Analysis of Two-Way Compositional Data," *Journal of Classification*, 10(2), 159-193.

15) Lenk, P. (1993) "A Bayesian Nonparametric Density Estimator," *Journal of Nonparametric Statistics*, 3, 53-69.

16) Allenby, G. and Lenk, P. (1994) "Modeling Household Purchase Behavior with Logistic Normal Regression," *Journal of the American Statistical Association*, 83, 428, 1218-1231.

17) Allenby, G. and Lenk, P. (1995) "Reassessing Brand Loyalty, Price Sensitivity, and Merchandizing Effects on Consumer Brand Choice," *Journal of Business and Economic Statistics*, July, 13, 3, 281-290.

18) Lenk, P. and Rao, A. (1995) "Distributions Arising from Time Heterogeneous Poisson Processes," *Management Science*, Vol. 41, No 7 July, 1117-1129.

19) Lenk, P., DeSarbo, W., Green, P., and Young, M. (1996) "Hierarchical Bayes Conjoint Analysis: Recovery of Partworth Heterogeneity from Reduced Experimental Designs," *Marketing Science*, Vol. 15, No. 2, 173-191.

20) Young, M. and Lenk, P. (1998) "Hierarchical Bayes Methods for Multifactor Model Estimation and Portfolio Selection," *Management Science*, Vol 44, No. 11, S111-S124.

21) Rosenberg, M., Andrews, A., and Lenk P. (1999) "A Hierarchical Bayesian Model for Predicting the Rate of Non-Acceptable In-Patient Hospital Utilization," *Journal of Business and Economic Statistics*, Vol. 17, No. 1, 1-8.

22) Lenk, P. (1999) "Whose model is it? Bridging the gap between engineering and statistics," *Experimental Techniques*, 23, 1, 1999.

23) Moeller, M., Thomas, R., Chen, S. E., Chandra, N., and Lenk, P. (1999) "NVH CAE Quality Metrics," Society for Automotive Engineers.

24) Wedel, M. Kamakura, W., Arora, N., Bemmaor, A., Chiang, J., Elrod, T., Johnson, R., Lenk, P., Neslin, S., Polusen, P., (1999) "Discrete and Continuous

Representations of Unobserved Heterogeneity in Choice Modeling," *Marketing Letters*, Special Issue of the HEC Choice Symposium, 10, 3, 219-232.

25) Lenk, P. (1999) "Bayesian Inference of Semiparametric Regression," *Journal of the Royal Statistical Society, Series B*, 61, 863-879.

26) Lenk, P. and DeSarbo, W. (2000) "Bayesian Inference for Finite Mixtures of Generalized Linear Models with Random Effects," *Psychometrika*, 65: (1) 93-119.

27) Wedel, M. and Lenk, P. (2001) "Bayesian Econometrics: A Reaction to Geweke," *Journal of Econometrics*, 100/101, 79-80.

28) Wu, S. Gu, L., Zhang, X., and Lenk, P. (2001) "Step functions - a measure for frontal crash pulse and its applications," *International Journal of Vehicle Design*, Vol. 26, No. 4 (special issue on safety), 385-394.

29) Elrod, T. Russell, G. J., Shocker, A. D., Andrews, R. L., Bacon, L., Bayus, B. L., Carroll, J. D., Johnson, R. M., Kamakura, W. A., Lenk, P., Mazanec, J. A., Rao, V. R., Shankar, V. (2002) "Inferring Market Structure from Customer Response to Competing and Complementary Products," *Marketing Letters*, Special Issue of the Asilomar Choice Symposium, 12, 3, 221-232.

30) Lenk, P. (2003)"Bayesian Semiparametric Density Estimation and Model Verification using a Logistic-Gaussian Process," *Journal of Computational and Graphical Statistics*, Vol. 12, No. 3,548-565.

31) Bradlow, E., Allenby, G., Rossi, P., and Len, P. (2003) "When BDT in Marketing Meant Bayesian Decision Theory: The Influence of Paul Green's Research," *Marketing Research and Modeling: Progress and Prospects, A Tribute to Paul Green*.

32) Walker, S.,Damien, P., Lenk, P. (2004) "On Priors with the Kullback-Leibler Property," *Journal of the American Statistical Association*, 99, 466, 404-408.

33) Bacon, L, Durall, J, and Lenk, P. (2004) "Item Response theory (IRT) Models: Basics and Marketing Applications," *2004 Sawtooth Software Conference Proceedings*, 187-206.

34) Zeithammer, R., and Lenk, P. (2006) "Bayesian Estimation of Multivariate Normal Models when Dimensions are Absent," *Quantitative Marketing and Economics*, 4(3), 241-265.

35) Lenk, P., Wedel, M., and Bockenholt, U. (2006) "Bayesian Estimation of Circumplex Models subject to Prior Theory Constraints and Scale-Usage Bias,'' *Psychometrika*. 71 (1): 33-55.

36) Lenk, P. 2008 "Interpretations of Probability," *Encyclopedia of Quantitative Risk Analysis and Assessment*, Vol. 2, 943-951, editors Ed Melnick and Brian Everitt, John Wiley & Sons, New York, NY.

37) Bacon, L, Lenk, P., Seryakova, K., Veccia, El, (2007) "Making MaxDiff more Informative: Statistical Data Fusion by way of Latent Variable Modeling,' *Sawtooth Software Conference Proceedings* (reviewed articles).

38) Bacon, L. and Lenk, P. (2008)"Ipsativity Can Take a Big Bite Out of Your Discrete-Choice Utility," *Marketing Research*, reviewed article for trade journal.

39) Wedel, M., Naik, P., Bacon, L., Bodapati, A., Kreulen, J., Lenk, P., Madigan, D., Montgomery, A., (2008) "Challenges and Opportunities in High Dimensional Choice Data Analyses," *Marketing Letters*, 19, 3-4, 201-213.

40) Gilbride, T., Lenk, P., Brazell, J. (2008) "Market Share Constraints and the Loss Function in Choice-Based Conjoint Analysis," *Marketing Science*, 27, 6, 995-1011.

41) Kadam, A. and Lenk, P. (2008) "Bayesian Inference for Issuer Heterogeneity in Credit Ratings Migration," *Journal of Banking & Finance*. 32, 10, 2267-2274.

42) Lawrence, K. A., Lenk, P., Quinn, R. E. (2009) "Behavioral Complexity in Leadership: The Psychometric Properties of a New Instrument to Measure Behavioral Repertoire,"*The Leadership Quarterly*, 20, 87-102.

43) Zeithammer, R., and Lenk, P. (2009) "Statistical Benefits of Choices from Subsets," *Journal of Marketing Research*, 46, 6, 816-831.

44) Lenk, P. and Orme, B. (2009) "The Value of Informative Priors in Bayesian Inference with Sparse Data," *Journal of Marketing Research*, 46, 6, 832-845.

45) Lenk, P. (2009) "Simulation Pseudo-Bias Correction to the Harmonic Mean Estimator of Integrated Likelihoods," *Journal of Computational and Graphical Statistics*, 18, 4, 941–960.

46) Batra, R., Lenk, P., and Wedel, M. (2010) "Brand Extension Strategy Planning: Empirical Estimation of Brand-Category Personality Fit and Atypicality," *Journal of Marketing Research*, 47, 2, 335-347.

47) Lenk, P. (2010) "Marketing Research," in *The Handbook of Technology Management: Supply Chain Management, Marketing and Advertising, and Global Management*, Volume 2, editor Hossein Bidgoli, John Wiley & Sons, Hoboken, New Jersey, 367-380.

48) Gilbride, T. and Lenk, P. (2010) "Posterior Predictive Model Checking: An Application to Multivariate Normal Heterogeneity,"*Journal of Marketing Research*, 47, 5, 896–909

49) Lenk, P. (2011) "Discussion: A comparison of generalized multinomial logit (GMNL) and latent class approaches to studying consumer heterogeneity with some extensions of the GMNL," *Applied Stochastic Models in Business and Industry*. Reviewed comment.

50) Bacon, L., and Lenk, P. (2012) "Augmenting discrete-choice data to identify common preference scales for inter-subject analyses," *Quantitative Marketing and Economics*, 10, 4, 453-474.

51) Lenk, P. (2014) "Bayesian Estimation of Random Utility Models," *Handbook of Choice Modelling*, eds. Stephane Hess and Andrew Daly, Edward Elgar Publishing, Northampton, MA. 457-497.

52) McDonnel-Feit, E., Feinberg, F. Lenk, P. (2017) "Bayesian Analysis," *Advanced Methods for Modeling Markets*, editors Peter S. H. Leefang, Jaap E. Wieringa, Tammo H. A. Bijmolt and Koen H. Pauwels, Springer, 493-554.

53) Lenk, P. and Choi T. (2017) "Bayesian Analysis of Shape-Restricted Functions using Gaussian Process Priors," *Statistica Sinica*, 27, 43-69.

54) Kalyanam, K., Lenk, P. and Rhee, E. (2017) "Basket Composition and Choice Among Direct Channels: A Latent State Model of Shopping Costs," *Journal of Interactive Marketing*, 39, 69-88.

55) Dotson, J. P., Howell, J. R.; Brazell, J. D.; Otter, T., Lenk, P. J., MacEachern, S. and Allenby, G. (2018) "A Probit Model with Structured Covariance for Similarity Effects and Source of Volume Calculations," *Journal of Marketing Research*, February, 35-47.

56) Choi T., and Lenk, P. J. (2019), "Bayesian Spectral Analysis Regression," Flexible Bayesian Regression Modeling, editor Yanen Fan, Elsevier, 14-48 Invited and reviewed book chapter.

57) Mintz, Ofer., Gilbride, T., Currim, I., and Lenk, P. (2021), The Right Metrics for Marketing-Mix Decisions, *International Journal of Research in Marketing*, 38, 1, 32-49 .

58) Mintz, O., Bart, Y., Lenk, P., and Reibstein, D. (2022) "Hybrid BYO Conjoint with Boosting for Data Fusion: Estimating Context Effects for Marketing Dashboards," Revise and resubmit to *Marketing Science*.