

**Econ 615 Applied Econometrics**

**Course Requirement: A Term Paper**

**Basic Texts:**

C. Hsiao (2022), *Analysis of Panel Data*, 4<sup>th</sup> Edition. Cambridge, University Press.

AC. Cameron and P.K. Trivedi (2005), *Microeconometrics*, Cambridge University Press.

**Recommended Texts:**

T. Amemiya (1985), *Advanced Econometrics*, Harvard University Press.

M. Intrilligator, R. Bodkin and C. Hsiao (1996), *Econometric Models, Techniques and Applications*, 2<sup>nd</sup> ed., Prentice Hall.

Q. Li and J. S. Racine (2007), *Nonparametric Econometrics*, Princeton: Princeton University Press.

A.C. Cameron and P.K. Trivedi (2020), *Microeconometrics Using Stata*.

1. Machine Learning (ML) and Econometrics – Data Driven vs. Structural Modeling, Fundamental ML Algorithms, Supervised vs. Unsupervised Learning, Single Equation vs. System of Equations. Identification, Moments Estimator vs. Likelihood Estimator, Full Information vs. Limited Information Estimator, Regression Estimator vs. Instrumental Variable Estimator

*Recommended Readings:*

Hsiao, C. (2024), “Machine Learning and Econometrics”, *Singapore Economic Review*, 69, 1601-1616.

Taddy, M. (2019), *Business Data Sciences: Combining Machine Learning and Economics to Optimize, Automate and Accelerated Business Decisions*, Mc Graw Hill.

Hood, W.C. and T.C Koopmans, eds. (1953), *Studies in Econometric Method*, Cowles Commission Monograph 14, Wiley.

Anderson, T.W. and H. Rubin (1949), “Estimation of the Parameters of a Single Equation in a Complete System of Stochastic Equations”, *Annals of Mathematical Statistics*, 20.

Athey, S. (2019), “The Impact of Machine Learning on Economics”, in *The Economics of Artificial Intelligence*, ed. By A. Agrawal, University of Chicago Press.

Intriligator, Bodkin and Hsiao (1996), Ch. 9, 10 and 13.

Amemiya (1985), Chapter 7

L. Hansen (1982), “Large Sample Properties of Generalized Method of Moments Estimator”, *Econometrica*, 50, 1029-1054.

Newey, W. and D. McFadden (1994), “Large Sample Estimation and Hypothesis Testing” *Handbook of Econometrics*, vol. 4, Elsevier.

C. Hsiao (1982), “Identification”, *Handbook of Econometrics*, vol. 1, 223-283.

2. Qualitative Choice Models-Linear Probability; Probit; Logit; Single Index Model; Multinomial Probit; Conditional Logit; Nested Logit; Ordered and Sequential Outcomes; MLE; Semiparametric Estimation; Maximum Score; Smoothed Maximum Score; Average Derivative; Specification Tests; Choice based sample, etc.

*Basic Reading:*

Cameron and Trivedi (2005), ch. 14 and 15.

*Recommended Readings:*

Amemiya (1985), ch. 9.

Hsiao (2022), ch. 6.

Hauseman, J.A. (1978). “Specification Tests in Econometrics”, *Econometrica*, 46, 1251-71

Manski, C.F. (1975), “Maximum Score Estimation of the Stochastic Utility Model of Choice”, *Journal of Econometrics*, 3, 205-228.

Horowitz, J.L. (1992), “A Smoothed Maximum Score Estimator for the Binary Response Model”, *Econometrica* 60, 505-531.

Hsiao, C. and B.H. Sun (1999), “Modeling Survey Response Bias — With an Application to the Demand for an Advanced Electronic Device”, *Journal of Econometrics* 189, 15-39.

Horowitz, J.L. (1993), “Semiparametric and Nonparametric Estimation of Quantal Response Models”, in *Handbook of Statistics*, vol. 11, ed. by G.S. Maddala, C.R. Rao and H.D. Vinod, Amsterdam: Elsevier.

Powell, J.L., J. Stock, and T. Stoker (1989), “Semiparametric Estimation of Index Coefficients” *Econometrica*, 54, 1435-60.

3. Limited Dependent Models and Sample selection Models – truncated and censored data; MLE; Heckman two-stage estimator; symmetrically trimmed least squares estimator; least absolute deviation estimators; quantile regression; semi-parametric estimation; sample selection

models; partial linear regression models; pairwise difference estimator; specification analysis; simultaneous equation models; coherency condition, etc.

*Basic Readings:*

Cameron and Trivedi (2005), ch. 16.

Hsiao (2022), ch. 7.1.

*Recommended Readings:*

T. Amemiya (1985, ch. 10).

Nelson, F.D. (1977), "Censored Regressions with Unobserved Stochastic Censoring Thresholds", *Journal of Econometrics*, 6, 309-327.

Ahn, H. and Powell, J.L. (1993), "Semiparametric Estimation of Censored Selection Models with a Nonparametric Selection Mechanism", *Journal of Econometrics*, 58, 3-29.

Robinson, P.M. (1982), "On the Asymptotic Properties of Estimators of Models Containing Limited Dependent Variables", *Econometrica*, 50, 27-41.

Hsiao, C. and C. Kim (1990), "A Statistical Perspective on Insurance Rate-Making", *Journal of Econometrics*, 44, 5-24.

Andrews, D.W.K. and M.M.A. Schafagans (1998), "Semiparametric Estimation of the Intercept of a Sample Selection Model", *Review of Economic Studies*, 65, 497-517.

Chen, S. (1999), "Distribution-Free Estimation of the Random Coefficient Dummy Endogenous Variable Model", *Journal of Econometrics*, 91, 171-199.

Hsiao, C., Y. Shen, B. Wang and G. Weeks (2007), "Evaluating the Impacts of Washington State Repeated Job Search Services on the Earnings of Prim-Age TANF Recipients", *Journal of Applied Econometrics*, 22, 453-475.

Liu, E., C. Hsiao, T. Matsumoto and S. Chou (2009), "Maternal Full-Time Employment and Overweight Children: Parametric, Semi-parametric and Non-parametric Assessment", *Journal of Econometrics*, 152, 61-69.

4. Nonparametric and Semiparametric Methods-Kernel Density Estimation, Conditional Density Estimation, Regression, Sieve Estimation, Single Index Models, Partial Linear Models, Consistent Model Specification Tests.

*Basic Readings:*

Cameron and Trivedi (2005), ch. 9.

Li and Racine (2007), ch. 1, ch. 5.1, ch. 5.2, ch. 2, ch. 12.1. Ch. 15.

*Recommended Readings:*

Chen, X. (2007), "Large Sample Sieve Estimation of Semi-nonparametric Models", *Handbook of Econometrics*, vol 6B, Elsevier.

Bierens, J.J. (1990), "A Consistent Conditional Moment Test of Functional Form", *Econometrica*, 58, 1143-1458.

Hong, Y.M. and H.L. White (1995), "Consistent Specification Testing via Nonparametric Series Regression", *Econometrica*, 63, 1133-1159.

5. Program Evaluation- Selection on observables and unobservables; Propensity Score Matching; Difference-in-difference estimator; regression discontinuity; local instrumental variable estimator, panel data approach; synthetic control method; etc.

*Basic Readings:*

Cameron and Trivedi (2005), ch. 25.

*Recommended Readings:*

Rosenbaum, P. and D.B. Rubin (1983), "The Central Role of Propensity Score in Observational Studies for Causal Effects".

Imbens, G.W. and T. Lemieux (2008), "Regression Discontinuity Designs: A Guide to Practice", *Journal of Econometrics*, 142, 615-635.

Hsiao, C. (2022), Ch. 12.

Angrist, J.D., G.W. Imbens, and D.B. Rubin (1996), "Identification of Causal Effects Using Instrumental Variables", *Journal of the American Statistical Association*, 91, 444-455.

Dehejia, R.H. and S. Wahba (1999), "Re-evaluating the Evaluation of Training Programs", *Journal of the American Statistical Association*, 94, 1053-1062.

Heckman, J.J. and E.J. Vytalacil (2001), "Local Instrumental Variables", in *Nonlinear Statistical Modeling*, ed. by C. Hsiao, K. Morimune, and J.L. Powell, Cambridge, U.K.: Cambridge University Press.

Hahn, J. (1998), "On the Role of Propensity Score in Efficient Semiparametric Estimation Average Treatment Effects", *Econometrica*, 66, 315-331.

Hsiao, C., Y. Shen, B. Wang and G. Wang (2008), "Evaluating the Effectiveness of Washington State Repeated Job Search Services on the Employment Rate of Prime-Age Female Welfare Recipients", *Journal of Econometrics*, 145, 98-108.

Damronplait, K., C. Hsiao and X. Zhao (2009), "Decriminalization and Marijuana Smoking Prevalence: Evidence from Australia", *Journal of Business and Economic Statistics*.

Abadie A., Diamond A., and Hainmueller J. (2010). "Synthetic Control Method for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program", *Journal of the American Statistical Association*, 105, 493-505.

Abadie A., and Gardeazabal, J. (2003). "The Economic Costs of Conflict: A Case Study of the Basque Country", *American Economic Review*, 93, 113-132.

Hsiao C., Ching S., and Wan S.K. (2012). "A Panel Data Approach for Program Evaluation: Measuring the Benefits of Political and Economic Integration on Hong Kong with Mainland China", *Journal of Applied Econometrics*, 27(5), 705-740.

Gardeazabal J., and Vega-Bayo, A. (2016). "An Empirical Comparison Between the Synthetic Control Method and Hsiao *et al.*'s Panel Data Approach to Program Evaluation", *Journal of Applied Econometrics*, DOI: 10.1002/jae.2557.

Wan, S., Xie, Y. and Hsiao, C. (2018), "Comment on Gardeazabal and Vega-Bayo", *Economic Letters*,

Hsiao, C. and Zhou, Q.K. (2019), "Panel Parametric, Semi-parametric and Nonparametric Construction of Counterfactuals", *Journal of Applied Econometrics*.

Wan, S., Xie, Y. and Hsiao, C. (2018), "Comment on Gardeazabal and Vega-Bayo", *Economic Letters*,

Hsiao, C. and Zhou, Q.K. (2019), "Panel Parametric, Semi-parametric and Nonparametric Construction of Counterfactuals", *Journal of Applied Econometrics*.

Ke,X. and C. Hsiao (2023), "Data Subject to Multiple Treatment Effects - Disentangle the Impact of Global Pandemic and the Impact of Specific Disease Control Policy", *Singapore Economic Review*, 68, (2023), 1507-1527.

6. Duration Analysis and Count Data Models- Proportional Hazard, Duration Regression Model; Accelerated Failure Time Model; Left Censoring, Right Censoring likelihood function; Markov Chain Models, Count Data Models-Poisson and Negative Binomial Models; Excess Zeros.

Cameron and Trivedi (2005), ch. 17, ch. 20.

*Basic Readings:*

Amemiya (1985), ch. 11.

Chen, S.N. (2019), "Quantile Regression for Duration Models with Time-Varying Regressors", *Journal of Econometrics*, 209-1-17.

7. Challenges of Big Data and Artificial Intelligence

---finite dimensions vs. high dimension modeling, sparsity, random forest, LASSO, Machine Learning, double debiased estimator

Athey, S. (2017), "Beyond Prediction: Using Data for Policy Problems", *Sciences*, 355, 483-485.

Varian, H. (2014), "Big Data: New Tricks for Econometrics", *Journal of Economic Perspective*, 28, 3-28.

Belloni, A., V. Chernozhukov and C. Hansen (2014), "High-Dimensional methods and inference on structural and treatment effects", *Journal of Economic Perspectives*, 28, 29-50.

Tibshirani, R. (1996), "Regression shrinkage and selection via lasso", *Journal of the Royal Statistical Society*, series B, 58, 267-288.

Hsiao, C. and Q.K. Zhou (2023), "Statistical Inference for low dimensional parameters in the presence of high dimensional covariates", mimeo.

Leeb and Potscher (2005), “Model Selection and Inference: Facts and Fiction”, *Econometric Theory*.

Syrngkanis, V. and M. Zampetakis (2021), “Estimation and Inference with Trees and Forests in High Dimensions”, <https://arxiv.org/pdf/2007.03210.pdf>.

## 8. Panel Data Analysis

### (a) Introduction – Advantages and Challenges

Hsiao, C. (2007), “Panel Data Analysis – Advantages and Challenges”, *Test*, 16, 1-22.

Hsiao (2022), ch. 1.

Hsiao, C. (2001), “Panel Data Models”, in *Comparison of Econometrics*, edited by B. Baltagi, Oxford: Blackwell, 349-365.

Hsiao, C. (2002), “Economics Panel Data”, in *International Encyclopedia of the Social and Behavioral Sciences- Statistics Section*, edited by J. Kadane and S. Fienberg, Oxford: Elsevier.

### (b) Static Variable Intercept Models-Least Squares Dummy Variable Estimation, Error Components Models, Fixed versus Random Effects Specification Analysis.

Hsiao (2022), ch. 2.

Cameron and Trivedi (2005), ch. 21.

### (c) Dynamic Models with Variable Intercept – Random Effects Models, Fixed Effects Model, Maximum Likelihood and Transformed Maximum Likelihood Estimators, Generalized Method of Moments Estimators (GMM) Initial Values and Sample Size.

Hsiao (2022), ch. 3.

- Ahn, S.C. and P. Schmidt (1995), "Efficient Estimation of Models for Dynamic Panel Data", *Journal of Econometrics*, 68, 5-27.
- Arellano, M. and O. Bover (1995), "Another Look at the Instrumental Variable Estimation of Error-Components Models", *Journal of Econometrics*, 68, 29-51.
- Binder, M., C. Hsiao and M.H. Pesaran (2005), "Estimation and Inference in Short Panel Vector Autoregressions with Unit Roots and Cointegration", *Econometric Theory*, 21, 795-837.
- Hsiao, C., M.H. Pesaran and A.K. Tahmiscioglu (2002), "Maximum Likelihood Estimation of Fixed Effects Dynamic Panel Data Models Covering Short Time Periods", *Journal of Econometrics*, 107-150.
- Hsiao, C. and A.K. Tahmiscioglu (2008), "Estimation of Dynamic Panel Data Models with Both Individual- and Time-Specific Effects", *Statistical Planning and Inference*, 138, 2698-2721.
- Hsiao, C. and J. Zhang (2015), "IV, GMM or QMLE to Estimate Dynamic Panel Data Models", *Journal of Econometrics*, 187,312-322.
- Alvarez, J. and M. Arellano (2003), "The Time Series and Cross-Sectional Asymptotics of Dynamic Panel Data Estimators", *Econometrica*, 71, 1121-1159.

Hsiao, C. and Zhou, Q.K. (2018), "Incidental Parameters, Initial Conditions and Sample Size in Statistical Inference for Dynamic Panel Data Models", *Journal of Econometrics*, 207,114-128.

#### (d) Panel Interactive Effects Models

- Bai, J (2003), Inferential theory for factor models of large dimensions, *Econometrica*, 71(1):135-171.
- Bai, J., 2009, Panel Data Models with Interactive Fixed Effects, *Econometrica*,77, 1229-1279.
- Bai, J. and Ng, S. (2002), Determining the Number of Factors in Approximate Factor Models, *Econometrica*, 70, 191-221.
- Pesaran, M.H. (2006), Estimation and Inference in Large Heterogeneous Panels with Cross Section Dependence, *Econometrica*, 74, 967-1012.
- Hsiao, C. Shi, Z. and Zhou, Q., (2022), Transformed Estimation for Panel Interactive Effects Models, *Journal of Business and Economics Statistics*, 40, 1831-1848.

(e) Qualitative Choice Models – Incidental Parameters Issues Conditional Maximum Likelihood Estimator, Maximum Score Estimator, Bias Adjusted Estimator, Approximate Models, Dynamic Models, True State Dependence vs. Spurious State Dependence.

#### *Required Reading:*

Hsiao (2022), ch. 6.

#### *Recommended Readings:*

Ahn, S.C., Y.H. Lee and P. Schmidt (2013), "Panel Data Models with Multiple Time-Varying Individual Effects", *Journal of Econometrics*, 174.1-14.

Bartolucci, F., and V. Nigro (2010), "A Dynamic Model for Binary Panel Data with Unobserved Heterogeneity Admitting a Root-n Consistent Conditional Estimation", *Econometrica*, 78, 719-733.

Bartolucci, F., and V. Nigro (2012), "Pseudo Conditional Maximum Likelihood Estimation of the Dynamic Logit Model for Binary Panel Data", *Journal of Econometrics*, 170, 120-116.

Carro, J.M., (2007). "Estimating Dynamic Panel Data Discrete Choice Models with Fixed Effects", *Journal of Econometrics*, 140, 503-528.

Honoré, B.E., and E. Kyriazidou (2000), "Panel Discrete Choice Models with Lagged Dependent Variables", *Econometrica*, 68, 839-874.

Honore, B.E. and E. Kyriazidou (2000), Panel Data Discrete Choice Models with Lagged Dependent Variables", *Econometrica*, 68, 839-74.

Damrongplasit, K., Hsiao, C. Zhao, X. (2019), "Health Status and Labor Market Outcome", *Pacific Economic Review*, 24, 269-292.

Damrongplasit, K. and Hsiao, C. (2022), "Heterogeneity and Lucas Critique in Light of Panel Data Analysis", *Advances in Econometrics*, vol. 43B, 61-80, Emerald Publishing.

(e) Limited Dependent Variable and Sample Selection Models-Powell Symmetrically Trimmed Estimator, Honoré Trimmed Least Squares Estimator, etc.

*Required Reading:*

Hsiao (2022), ch. 7.

*Recommended Readings:*

Honoré, B.E. (1992). "Trimmed LAD and Least Squares Estimation of Truncated and Censored Regression Models with Fixed Effects", *Econometrica*, 60, 533-567.

Honoré, B.E., and J.L. Powell (1994), "Pairwise Difference Estimators of Censored and Truncated Regression Models", *Journal of Econometrics*, 64, 241-278.

Honore, B.E. and E. Kyriazidou (2000), "Estimation of Tobit-Type Models with Individual Specific Effects", *Econometrics Review*, 19.

(f) Cross-Sectionally Dependent Panel Data- Spatial Approach Factor, Cross-Sectionally Mean Augmented Approach, Test of Cross-Sectional Independence, Program Evaluation, etc.

*Recommended Readings:*

Anselin, L., J. Le Gallo and H. Jayet (2008), "Spatial Panel Econometrics", in the *Econometrics of Panel Data*, 3<sup>rd</sup> ed., by L. Matyas and P. Sevestre, Berlin: Springer-Verlag, 625-660.



- Bai, J., (2009), "Panel Data Models with Interactive Fixed Effects", *Econometrica*, 77, 1229-1279.
- Bai, J., and S. Ng (2002), "Determining the Number of Factors in Approximate Factor Models", *Econometrica*, 70, 191-221.
- Pesaran, M.H., (2006), "Estimation and Inference in Large Heterogeneous Panels with Cross-Section Dependence", *Econometrica*, 74, 967-1012.
- Hsiao, C., S. Ching and S. Wan (2012), "A Panel Data Approach for Program Evaluation - Measuring the Benefits of Political and Economic Integration of Hong Kong with Mainland China", *Journal of applied Econometrics*, 27, 705-740.
- Hsiao, C. (2018), "Panel Models with Interactive Effects", *Journal of Econometrics*, 206, 645-673.
- Hsiao, C., Shi, Z, and Zhou, Q. (2021), "Transformed Estimation for Panel Interactive Effects Models", *Journal of Business and Economics Statistics* (forthcoming).
- (g) Variable Coefficients Models- Fixed and Random Coefficients Models, Bayesian Approach  
Correlated Random Coefficients Models.

*Required Reading:*

Hsiao (2022), ch. 13.

*Recommended Readings:*

- Hsiao, C. and Tahmiscioglu, A. (1997), "A Panel Analysis of Liquidity Constraints and Firm Investment", *Journal of the American Statistical Association*, 92, 455-465.
- Hsiao and Pesaran (2008), "Random Coefficients Models", in *The Econometrics of Panel Data*, 3rd ed., by L. Matayas and P. Sevestre, Berlin: Springer, 187-216.
- Heckman, J.J. and E. Vytlacil (1998), "Instrumental Variables Methods for the Correlated Random Coefficient Model", *The Journal of Human Resources*, 33, 974-987.
- Card, D. (2001), "Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems", *Econometrica*, 69, 1127-1160.
- Florence, J.P., J.J. Heckman, C. Meghir and E. Vytlacil (2008), "Identification and Treatment Effects Using Control Functions in Models with Continuous Endogenous Treatment and Heterogeneous Effects", *Econometrica*, 76, 1191-1201.
- Wooldridge, J.M. (2007), "Instrumental Variable Estimation of the Average Treatment Effect in the Correlated Random Coefficient Model", *mimeo*.
- Sarafidis, V. and T. Wansbeek (2012), "Cross-Sectional Dependence in Panel Data Analysis", *Econometric Reviews*, 31, 483-531.
- Hsiao, C., Li, Q., Liang, Z., and Xie, W. (2019), "Panel Data Estimation for Correlated Random Coefficients Models", *Econometrics*, 7.