Econometrics 270, Part II: Department of Economics Fall 2007

stanford university

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OH: M 1:30-3:30PM (Econ 346)
Lectures: M, W 10 - 11:50 (Econ 140)
Section: F 9-10:50 (380-380W)
Objectives: We will use the same text book Casella and Berger (2001) (CB) as the first half of 270 and cover the material in Chapters 6-10 although at a level somewhat higher than presented in the text. There are several other books that discuss the material covered and which one is optimal for a student will depend on her/his background. Examples of such books are (in approximate order of difficulty) Hogg and Craig (1995), DeGroot and Schervish (2001), Bickel and Doksum (2000), Gallant (1997), Bierens (2004), Florens, Marimoutou, and Peguin-Feissolle (2007), Lehmann and Casella (2003), Rao (2002), Lehmann and Romano (2005) and Schervish (1996).
Problem Sets: The material covered in the course cannot be learned without solving a lot of problems and there will be 3-4 problem sets. The problem sets will be graded by the T.A. and discussed in Section.
Grading: Your grade in this part of the course will be based on your performance on a final exam (70%) and on the problem sets (30%). You are allowed to work together in groups for the problem sets, but each student must turn in an individual problem set with their own solutions. I cannot overemphasize the importance of working through the problem sets. There is a strong correlation between working hard on the problem sets and doing well on the course exam as well as the comprehensive examination.
Regrade Requests: There will be no regrading of problem sets. If there was an unambiguous mistake in the grading of the exam, you may request a regrade of the material. You should be aware that your grade may go up or down on the regrade request. Requests for regrades based on attempts to get more partial credit will be automatically denied. Requests for regrades based on a desire for a better grade and not based upon a grading mistake will be automatically denied. Requests for regrades based on interpreting what you write, what

you meant to say will be automatically denied. Requests for regrades which require a comparison with another student's grade must involve both students submitting for a regrade. All regrade requests should be in writing, stating exactly what was incorrectly grades and should be submitted to the instructor within one week of the date on which the material was returned to you. Any regrade requests submitted after one week of when the material was returned to you will be automatically denied.

STUDENTS WITH DOCUMENTED DISABILITIES: Students who has a physical or mental impairment that may necessitate an academic accommodation or the use of auxiliary aids and service in class must initiate the request with the Disability Resource Center (DRC). The DRC will evaluate the request along with the verified documentation, recommend appropriate accommodations, and prepare a verification letter dated in the current academic term in which the request is being made.

COURSE OUTLINE

1. Parametric Models, Parameter, Identification, Statistic, Sufficient Statistics, Likelihood Function, Ancillary Statistics, Complete Statistics, Basu's Theorem, Exponential Families (Ch. 6 of CB)

2. Point Estimation and Finite Sample Properties of Estimators: The Analogy Principle as a general strategy for formulating estimators. Three popular classes of estimators: (a) Maximum Likelihood (b) M-Estimators and (c) Minimum Distance Estimators (with (Generalized) Method of Moments as the leading example). Basic Decision Theory, Loss functions, Risk functions. Criteria for choosing amongst different estimation procedures: Unbiasedness, Minimum Mean Squared Error. Rao-Blackwell Theorem, Lehmann-Scheffe Theorem, Fisher Information, UMVUE, Variance Bounds for Unbiased Estimators (Cramer-Rao Bounds), Efficiency of Maximum Likelihood. Examples: Exponential Families, Gaussian Linear Regression, Multiple Equation Models (SUR, FIML), Binary Choice Models, Linear IV Models, (Non-Linear) Least Squares. (Ch. 7 of CB and Manski (1994)).

3. Large Sample Properties of Estimators: Consistency, Asymptotic Normality and Consistent variance estimation for Maximum Likelihood, M- and Minimum Distance estimators. Examples: (Heteroscedasticity Robust) Linear Regression, Non-Linear Least Squares, Binary Choice. Asymptotic Efficiency of MLE. (Ch.7 of CB, Chapter 7 of Hayashi (2000) and Newey and McFadden (1994) if you are interested in a more detailed treatment).

4. Hypothesis Testing: 0-1 Loss Function, Type I, II errors, Power, Size, Signifi-

cance Level, p-values, Critical Regions, Distance Function Principle, Neyman-Pearson Lemma, UMP and UMPU tests. T-tests, F-Tests, Chi-Squared Tests, Monotone Likelihood Ratio Families, Trinity of Tests (Likelihood Ratio, Wald, Lagrange Multiplier), Asymptotic equivalence of the Trinity, Hypothesis Testing in Large Samples, Consistency of Tests. (Ch.8 of CB and Ch.7 of Hayashi (2000)).

5. Constructing Confidence Regions: Confidence Region, Confidence Level, Confidence Coefficient, Duality between Confidence Regions and Hypothesis Tests, Pivotal and Asymptotically Pivotal Quantities, Uniformly Most Accurate (UMA) Confidence Regions and Uniformly Most Accurate Unbiased (UMAU) Confidence Regions, Asymptotically valid Confidence Regions. Pratt's Theorem.(Ch.9 of CB)

References

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Florens, J.-P., V. Marimoutou, and A. Peguin-Feissolle (2007): *Econometric Modeling and Inference*. Cambridge University Press.

Gallant, R. (1997): *An Introduction to Econometric Theory*. Princeton University Press.

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Manski, C. (1994): "Analog Estimation in Econometrics," in *Handbook of Econometrics*, ed. by R. Engle, and D. McFadden, vol. IV, chap. 43, pp. 2560–2581. Elsevier Science.

Newey, W., and D. McFadden (1994): "Large Sample Estimation and Hypothesis Testing," in *Handbook of Econometrics*, ed. by R. Engle, and D. McFadden, vol. IV, chap. 36, pp. 2111–2245. Elsevier Science.

Rao, C. (2002): *Linear Statistical Inference and its Applications*. Wiley-Interscience.

Schervish, M. (1996): *Theory of Statistics*. Springer.