

ECO2400 FALL 2020 PART II

This is the second module of ECO2400 in fall 2020 semester. This half introduces basic concepts and methods of statistical decision theory, mainly focusing on hypothesis testing and inference. Some journal articles will be discussed as illustrations of the theory. The lectures will be delivered online asynchronously.

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Office Hour: By appointment on Zoom or Bb collaborate.

TA: Chris Dobronyi (christopher.dobronyi@mail.utoronto.ca).

Reference: We will cover [Gourieroux and Monfort \(1995\)](#), Chapter 1–2, 14–18, 20, and 22). This book is available online at University of Toronto library. Materials we will study can also be found in [Greene \(2010\)](#), [Casella and Berger \(2002\)](#), and [Lehmann and Romano \(2006\)](#) at different levels of depth.

Course work: There will be one simulation assignment and one exam. The exam will be held online with limited time. The (open book) exam and its submission link will be available online for two and a half hours. This includes the time that you write down your answers, scan (or taking photos of) it, and upload the files.

Targeted course content:

- (1) Introduction (and review) of statistical decision theory
 - (a) Statistical decision.
 - (b) Hypotheses
 - (c) Tests

- (d) Types and risks of errors.
- (e) Neyman tests and uniformly most power tests.
- (f) UMP tests for simple hypotheses, monotone likelihood ratio family and UMP tests for one sided hypotheses.
- (g) Unbiasedness and Uniformly Most Power Unbiased Tests.
- (h) Exponential family and UMPU tests for two sided hypotheses.
- (i) Exponential family and UMPU tests for hypotheses with nuisance parameters.

Reference: [Gourieroux and Monfort \(1995, Chapter 1,2, 14,15,16.1\)](#) and [Casella and Berger \(2002, Chapter 8\)](#).

(2) Confidence regions

- (a) Pivotal functions.
- (b) Inverting a test.
- (c) Uniformly Most Precise and Uniformly Most Precise Unbiased confidence sets.

References: [Gourieroux and Monfort \(1995, Chapter 20\)](#) and [Casella and Berger \(2002, Chapter 9\)](#)

(3) Likelihood based tests

- (a) Wald, Score and Likelihood Ratio tests
- (b) Examples: tests in linear model with Gaussian errors, discrete choice models, limited dependent models, likelihood based Hausman tests in linear models.

Reference: [Gourieroux and Monfort \(1995, Chapter 17\)](#), [Greene \(2010, Chapter 14.1–14.6\)](#).

(4) Extremum-estimation based tests

- (a) Review of basic asymptotic theory: weak and strong convergence, convergence in distribution etc.
- (b) Tests based on Extremum Estimation.
- (c) Tests based on GMM: J-tests for over-identified restrictions (tests for instrument validity).
- (d) Hausman tests for exogenous regressors, Hausman tests in panel data models.

Reference: [Gourieroux and Monfort \(1995, Chapter 18\)](#), [Greene \(2010, Chapter 5.6, 5.7, 8.4, 11.4, 11.5, 13.5, 13.6\)](#).

- (5) Applied topics
 - (a) Multiple testing
 - (b) Robustness v.s. biases of heteroskedasticity robust variance estimators.
 - (c) Clustering
 - (d) Inference when instruments are weak
 - (e) Nonparametric tests

REFERENCES

- CASELLA, G., AND R. BERGER (2002): *Statistical Inference*. Duxbury.
- GOURIEROUX, C., AND A. MONFORT (1995): *Statistics and Econometric Models*. Cambridge University Express.
- GREENE, W. (2010): *Econometric Analysis*. Prentice.
- LEHMANN, E. L., AND J. P. ROMANO (2006): *Testing statistical hypotheses*. Springer Science & Business Media.