

ECO2400F PART I

This is the first module of ECO2400 in fall 2019 semester. This half introduces basic concepts and methods of statistical decision theory, mainly focusing on hypothesis testing and inference.

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Office Hour: By appointment.

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Reference: We will cover [Gourieroux and Monfort \(1995, Chapter 1–2, 14–18, 20, and 22\)](#). Most of materials we will be discussing can also be found in [Greene \(2010\)](#) and [Casella and Berger \(2002\)](#).

Course work: There will be one simulation assignment and one exam.

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.