Econometric theory - Spring 2016

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Course Program (Updated 3/2/16)

1. Probability background

WMS *ch. 1, parts of ch. 2 (2.1, 2.2, 2.3 (read), 2.4, 2.5, 2.6, 2.7, 2.8, 2.10)*
Scopes of statistics. Population and sample. Learning from the data: graphically and analytically (mean, variance). Basics of probability (properties, conditional probabilities, Bayes theorem, independence).

2. Univariate random variables

WMS *ch. 3.1-3.4 (until example 3.8), 3.8, ch. 4.1-4.5, 6.4*
Definition and examples. Discrete and continuous random variables. Expectation and variance of univariate random variables. Functions of random variables.

3. Multivariate random variables

WMS *ch. 5.1-5.8*
Bivariate discrete r.v., marginals and conditional distributions. Continuous bivariate r.v., marginals and conditional distributions. Correlation and covariance.

4. Conditional Moments

WMS *ch. 5.10, 5.11*
Conditional expectation and variance. Law of iterated expectations and variance decomposition formula. Bivariate normal.

5. Sampling and estimation

WMS *ch. 7.1,7.2 (until th. 7.2 excluded), 7.3, 7.6. 8.1, 8.2, 8.5, 8.6, 9.3*
Goldberger *ch. 8.1-8.3, 9.1-9.3, 11.1, 11.3-11.5*
Random sampling. Density of a sample. The sample mean theorem. Unbiased estimators, MSE. CLT. Confidence intervals. Consistent estimators and LLN.

6. The linear regression model 1

SW *ch. 4 (inc. appendix 4.2 and 4.3), 5.1-5.4; read: 17.3, 17.4*
The linear regression model with one regressor, interpretation. Least squares estimation. Marginal effects and their interpretation. Fit (R^2). The least squares assumptions, small and large sample distribution. Standard errors, confidence intervals and hypothesis testing. Special cases (dummy variables, heteroskedasticity).

7. The linear regression model 2

SW *ch. 6.1-6.4 (until the adjusted R^2, excluded), 6.5-6.8. 7.1-7.2 (until the homoskedasticity-only F-stat. excluded), 7.3, read: 7.5 and 7.6.*

Omitted variable bias. The multivariate regression model and testing on single and multiple parameters.

8. Nonlinear regression
***SW** ch. 8.1-8.3; read: 8.4, 8.5*
Polynomial and logarithmic regression. Interpretation of the parameters. Interactions.

9. Maximum likelihood estimation
***SW** ch. 11.1, 11.2; read: 11.3*
Linear probability model, problems. Probit and Logit. Estimation by ML.

Bibliography

1. **WMS**: **Dennis Wackerly, William Mendenhall, and Richard L. Scheaffer**, *Mathematical Statistics with Applications*, 7th edition (2008)
2. **Goldberger** (optional): **Arthur S. Goldberger**, *A course in Econometrics*, (Harvard University Press, 1991)
3. **SW**: **James Stock and Mark W. Watson**, *Introduction to Econometrics*, 3rd edition (2010)