

Course Outline
Department of Economics
Hong Kong University of Science and Technology

Econometrics
ECON5300

Spring Semester 2017

Contact Details

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| Instructor: | Prof. Jin Seo Cho |
| Office: | LSK 6052 |
| Phone: | 2358-7595 |
| Email: | jinseocho@ust.hk |
| Office Hours: | 16:00 to 17:00, Tue. |

Class Times and Classroom Numbers

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| Class Times: | 14:00 to 15:50, Tue. and Thur. |
| Classroom: | LSK1032 |

Course Objective

The goal of ECON5300 is twofold. First, we aim at obtaining the popular skills for writing empirical research papers. We attempt to achieve this by getting familiar with the well-known econometric analyses and linking this to the knowledge on the numerical outputs generated by standard statistical packages. Second, we aim to bridge the current course topics to the upper level econometrics courses, which are devoted to mainly the frontier econometrics researches.

In attaining these goals, our interests will be delimited to cross-sectional data. There are two reasons for this. First, analysis of cross-sectional data is a building bloc for the analysis of many other data sets. For example, stationary time-series data can be analyzed in parallel to the analyses for cross-sectional data. Thus, it becomes more efficient to understand cross-sectional data analyses before examining time-series data. Second, cross-sectional data are easier than analyzing other data sets as they do not involve too much difficulty for other types of data that are variations of cross-sectional data. Eventually, by these, studying cross-sectional data becomes a good starting point for achieving the specified objectives and also in terms of educational viewpoint.

After completing ECON5330, average students are expected to be able to conduct the following:

- Applying suitable and popular econometric analyses for cross-sectional data;
- Understanding the implicit assumptions behind data analysis carried for economic data;
- Interpreting the numerical outputs generated by standard statistical packages;
- Being curious on econometric analyses under the violations of the cross-sectional data assumption maintained in the course.

Course Plans

We have the following course plans for ECON5300:

- Classical Linear Models
 - ordinary least squares (OLS) estimation
 - best linear unbiased estimator (BLUE)
 - t -statistic
 - Wald statistic
- Tools for Asymptotic Analysis
 - law of large numbers (LLN)
 - central limit theorem (CLT)
- Standard Linear Models without Classical Linear Model Conditions
 - OLS estimation
 - consistence
 - asymptotic distribution
 - t -statistic
 - Wald statistic
- Linear Models with Conditional Heteroskedasticity
 - OLS estimation
 - consistence
 - asymptotic distribution
 - t -statistic
 - Wald statistic
 - generalized least squares (GLS) estimation
- Standard Nonlinear Model
 - nonlinear least squares (NLS) estimation
 - consistence
 - asymptotic distribution
 - t -statistic
 - Wald statistic
 - Lagrange multiplier (LM) statistic
 - quasi-likelihood ratio (QLR) statistic
- Nonlinear Models with Conditional Heteroskedasticity
 - NLS estimation
 - uniform law of large numbers (ULLN)
 - consistence
 - asymptotic distribution
 - t -statistic
 - Wald statistic
 - LM statistic
 - QLR statistic
- Correctly Specified Maximum Likelihood Estimation (MLE)
 - MLE estimation
 - consistence
 - asymptotic distribution
 - t -statistic
 - Wald statistic
 - LM statistic
 - likelihood ratio (LR) statistic

- Linear Models with Endogenous Errors
 - IV, TSLS, and GMM estimations
 - consistence
 - asymptotic distribution
 - t -statistic
 - Wald statistic

If time permits, we will further attempt to cover the following topics as well:

- Misspecified Maximum Likelihood Estimation
- Econometric Analyses for Time Series Data

Also, we demonstrate our data analyses by programming using statistical software GAUSS package whenever they are necessary for our better discussions.

Readings

There are a number of textbooks dealing with the course contents of ECON5300. For our course, we use the following textbook:

- Hayashi, F. (2000). *Econometrics*. Princeton University Press

As this book has too big volume for a one semester course, only selected chapters that are relevant to our course plans will be covered. Also, we do not follow the textbook line by line. The main purpose of having textbooks is in letting know student the progress of our course plans and preview the course materials before attending the lectures.

In addition, there are more recommended textbooks you can find out from the library or available on the course webpage:

- Green, W. (2008). *Econometric Analysis*. Prentice Hall
- Johnston, J. and DiNardo, J. (1997). *Econometric Methods*. McGraw Hill

These references cover similar topics given by Hayashi (2000) although they present them in different ways from topic to topic. In particular, Johnson and DiNadiro (1997) focus to econometric analyses based upon matrix algebra. Students can refer to these textbooks whenever they feel the methodologies covered in the references more appealing than others. Our lectures attempt to compromise the intuitive approaches and rigorous analysis of econometric models.

Finally, in terms of methodological issues associated with asymptotic analysis, we will refer to the following reference:

- White, H. (2001). *Asymptotic Theory for Econometricians*. Academic Press

Lecture Notes

In addition to the above readings, the course webpage will provide the lecture notes in PDF format for students' convenience. From the past experiences, students have tendencies to focus on the lecture notes for the course, but it has to be pointed out that

it can reduce the potential knowledge scope of students if they focus on only the lecture notes.

Assessment

The following formula will be applied to get your final grade of ECON5300:

$$\text{Final grade} = 0.2 \textit{Attn} + 0.35 \textit{Mid-Ex} + 0.45 \textit{Fin-Ex},$$

where *Attn* is Class participation; *Mid-Ex* is Midterm exam score; and *Fin-Ex* is Final exam score. Please, note that the attendance rate has relatively high portion for the final grade, which emphasizes that class attendance is very important for achieving the course objectives.