# B.E. International Program

Faculty of Economics, Thammasat University

## TQF 3 Course Specification

### INTRODUCTORY ECONOMETRICS (EE325)

**Semester**: 2/2015 (January- May 2016)


**Instructors:** ***Phongthorn Wrasai, Ph.D.*** (Section 046401)

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Office Hours: TTR 8:10-9:00 and by appointment


**Lecture Time**: Tuesdays & Thursdays, 09:30-11:00

**Lecture Venues**: Room 302 (Section 046401)

Room 303 (Section 046402)

Room 304 (Section 046403)

**Course Description:** Application of statistical and economic theories in analyzing economic data, with emphases on parameter estimation techniques and applications of simple and multiple regression models to economic analyses. Use of computer application in practice is also covered.

**Prerequisites:** EE211, EE212, MA216 (or MA211), and ST216 (or ST211).
(Credits will not be awarded to students who are taking or have completed EE 425)

**Aims and Objectives:** This course provides an introduction to basic results and techniques of econometric theory. The emphasis will be on principles of econometrics and the application of econometric techniques rather than the derivation of theoretical statements. It is expected that at the completion of the course, students will be able to employ econometric investigation in their preparation for writing a seminar paper and to read critically empirical literature.

**Instructor's Note:** This is an introductory course for econometric analysis. To understand and be able to apply it effectively, you need to learn some basic theories and the reasoning underlying an estimated equation. Some applied examples will be discussed in class but exercises in homework will provide various examples of econometric application for students. Students are expected to use an econometrics computer package to do the homework. We will primarily use Stata statistical and econometrics software package for computer work in this course. There will be three Stata workshops in the student computer lab. Each of these workshops will last 1.5 hours. The dates and times will be announced in class accordingly.

Homework will be assigned on a regular schedule. An assortment of assignments based on theory and some computer applications that involve programming. Homework assignments are expected to be handed on time. Late submission will be graded on the basis of 50% of the total scores of that assignment. More-than two-day late homework will not be accepted. There will be occasional, possibly unannounced, quizzes during the semester. Missed quizzes may not be made up (unless this is the result of an officially excused absence)

**Assessment:**

| | |
|---|---|
| Homework Assignments and Quizzes | 20 points |
| Midterm Exam | 35 points |
| Final Exam | 45 points |

**Academic Honesty**

You are expected to be honest in all of your academic work. Copying is plagiarism and will be treated as an honor code violation. Potential sanctions include failure in the course and suspension from the university.

## Conduct and Manner

Ethics is all above everything, far more valuable than merely subject knowledge. Accordingly, plagiarism and cheating, including any possible plagiarism and cheating, will be subject to penalties as stated in the University Regulations. More importantly, to achieve overall objectives of learning, it is strongly advised that all students of EE325 classes behave in proper manner with socially acceptable and right conduct.

Below is advised code of conduct to be performed in EE325 class. Achieving and maintaining the code of conduct throughout the course will surely be awarded.

1. No mobile phones used. This includes silent mode, message sending, LINE, and all social network communication that would interfere teaching and learning. Should any mobile phone ring, a pop-up closed-book quiz will be given to all students in the group. Score earned from the quiz will be counted toward the course evaluation.

2. Be punctual. Class starts at 09:30 am. Yet it is understood that students may have continuing classes that cause delay. It is acceptable if it is a few minutes late. But unnecessary delay should be avoided. Even if students are on time, they are advised not to leave the room without unnecessary purposes.

3. Behave. Everyone is expected to behave with basic politeness, civility, and respect for others. In particular, talking in class is allowed if it's part of a class discussion. Private communications are not, especially during quizzes. Neither are reading extraneous materials, using electronic equipment/s or sleeping. Other socially acceptable manner should be practiced here. For example, this is a classroom whereby food and drink is not allowed. This is the university whereby students wear proper dress.

## Required Textbooks:

*Gujarati, Damodar. N. and Porter, Down C. (2009) **Basic Econometrics**. 5th ed. Singapore, McGraw-Hill/Irwin. (HB139 .G8 2009a) [Hereafter, **GP**]

Wooldridge, Jeffrey M. (2009) ***Introductory Econometrics: A Modern Approach.*** 4th ed. Mason, Ohio : South-Western Cengage Learning. (HB139 .W66 2009) [Hereafter, **W**]

*Main Text

## Recommended Texts for Further Study


Jame H. Stock and Mark W. Watson, ***Introduction to Econometrics***, 2nd Edition, Boston: Pearson Addison Wesley (2007)

William E. Griffiths, R. Carter Hill and George G. Judge, ***Learning and Practicing Econometrics***, John Willey & Sons (1993 or latest edition)

Jeffrey M. Wooldridge, ***Econometric Analysis of Cross Section and Panel Data***, MIT Press; 1 edition (October 1, 2001) ISBN-10: 0262232197 ISBN-13: 978-0262232197

Joshua D. Angrist and Jörn-Steffen Pischke, ***Mostly Harmless Econometrics: An Empiricist's Companion***, Princton University Press (2009) ISBN-13: 978-0-691-12035-5

Marno Verbeek, ***A Guide to Modern Econometrics***, Wiley (May 27, 2008) ISBN-10: 0470517697 ISBN-13: 978-0470517697

Studenmund, A. H. ***Using Econometrics: A Practical Guide***, Harper Collins Publishers (2006 or Latest Edition)

Wooldridge, Jeffrey M. (2009) ***Introductory Econometrics: A Modern Approach.***

4th ed. Mason, Ohio : South-Western Cengage Learning. (HB139 .W66 2009)


## Important Dates

| | |
|---|---|
| Class Begins | January 18, 2016 |
| Adding and Dropping Course | January 18-February 1, 2016 |
| Midterm Exam Period | March 7-12, 2016 (No Lectures) |
| **Midterm Exam** | **Thursday, March 10, 2016; 9.30-11.30 hr.** |
| Course Withdrawal with "W" | March 23-28, 2016 |
| Last Day of Classes | May 14, 2016 |
| **Final Exam** | **Monday, May 16, 2016; 9.00-12.00 hr.** |

## Course Outline

### Part I Single-Equation Regression Models

### 1. Introduction and the Nature of Regression Analysis

1.1 What is Econometrics?

1.2 Methodology of Econometrics

1.3 Types of Econometrics

1.4 The Nature of Regression Analysis

**Read:** GP: Introduction, Ch. 1, and Appendix

### 2. Review of Some Statistical Concepts

2.1 Summation and Product Operators

2.2 Sample Space, Sample Points, and Events

2.3 Probability and Random Variables

2.4 Probability Density Function (PDF)

2.5 Characteristics of Probability Distributions

2.6 Some Important Theorectical Probability Distributions

2.7 Statistical Inference: Estimation

2.8 Statistical Inference: Hypothesis Testing

**Read:** GP: Appendix A;

W: Ch. 1 and Appendices A, B, C

### 3. Simple Linear Regression Model

**3.1 Two-variable Regression Analysis: Some Basic Idea**

3.1.1 The Concept of Population Regression Function (PRF)

3.1.2 The Meaning of the Term Linear

3.1.3 Stochastic Specification of PRF

3.1.4 The Significance of the Stochastic Disturbance Term

3.1.5 The Sample Regression Function (SRF)

**3.2 Two-Variable Regression Model: The Problem of Estimation**

3.2.1 The Method of Ordinary Least Squares

3.2.2 The Classical Linear Regression Model: The assumptions

3.2.3 Underlying the Method of Least Square

3.3.4 Precision of Standard Errors of Least-Squares Estimates

3.2.5 The Coefficient of Determination $r^2$: A Measure of "Goodness of Fit"

**3.3 Classical Normal Linear Regression Model (CNLRM)**

3.3.1 The Probability Distribution of Disturbances $u_i$

3.3.2 The Normality Assumption for $u_i$: Why the Normality Assumption?

3.3.3 Properties of OLS Estimators under the Normality Assumption

3.3.4 The Method of Maximum Likehilood (ML)

**3.4 Two-Variable Regression: Interval Estimation and Hypothesis Testing**

3.4.1 Statistical Prerequisites

3.4.2 Interval Estimation: Some Basic Ideas

3.4.3 Confidence Intervals for Regression Coefficients $\beta_1$ and $\beta_2$

3.4.4 Confidence Interval for $\sigma^2$

3.4.5 Hypothesis Testing: The Confidence Interval Approach

3.4.6 Hypothesis testing: The Test-of-Significance Approach

3.4.7 Hypothesis Testing: Some Practical Aspects

3.4.8 Regression Analysis and Analysis of Variance (ANOVA)

3.4.9 Application of Regression Analysis: The Problem of Prediction

**Read:** GP: Chs.2-6; W: Ch. 2

## 4. Extensions of the Two-Variable Linear Regression Model

4.1 Regression through the origin

4.2 Scaling and units of measurement

4.3 Functional forms of regression model

4.4 How to Measure Elasticity: The Log-Linear Model

4.5 Semilog Models: Log-Lin and Lin-Log Models

4.6 Reciprocal Models

4.7 Choice of Functional Form

**Read:** GP: Ch. 6

## 5. Multiple Regression Analysis: The Problem of Estimation

5.1 The Three-Variable Model: Notion and Assumptions

5.2 Interpretation of Multiple Regression Equation

5.3 The Meaning of Partial Regression Coefficients

5.4 OLS and ML Estimation of the Partial Regression Coefficients

5.5 The multiple coefficient of determination $R^2$ and Multiple Coefficient of Correlation

5.6 Simple Regression in the context of Multiple Regression: Introduction to Specification Bias

5.7 R2 and Adjusted R2

5.8 The Cobb-Douglas Production Function: More on Functional Form

5.9 Polynomial Regression Models: Marginal Cost Curves

**Read:** GP: Ch. 7; W: Ch. 3

## 6. Multiple Regression Analysis: The Problem of Inference

6.1 The Normality Assumption Once Again

6.2 Hypothesis Testing in Multiple Regression: General Comments

6.3 Hypothesis Testing about Individual Regression Coefficients

6.4 Testing the Overall Significance of the Sample Regression

6.5 Testing the Equality of Two Regression Coefficients

6.6 Restricted Least Squares: Testing Linear Equality Restrictions

6.7 The Chow Test

**Read:** Gujarati: Ch. 8; W: Chs. 4, 6

**==========MIDTERM EXAM: March 10, 2016, 09:30-11:30==========**

## 7. Dummy Variable Regression Models

7.1 The Nature of Dummy Variables

7.2 ANOVA Models

7.3 ANOVA Models with Two Qualitative Variables

7.4 ANOVA Models with a Mixture of Quantitative and Qualitative Regressors

7.5 Dummy Variable Alternative to Chow test

7.6 Interaction Effects Using Dummy Variables

7.7 Use of dummy variable in time series data

7.7.1 Effect on intercept and slope

7.7.2 Seasonal analysis

7.8 Piecewise linear regression

**Read:** GP: Ch. 9; W: Ch. 7

# Part II Relaxing the Assumptions of the Classical Linear Regression Model

## 8. Multicollinearity: What Happens if the Regressors Are Correlated?

8.1 The Nature of Multicollinearity

8.2 Estimation in the Presence of Perfect Multicollinearity

8.3 Estimation in the Presence of "High" but "Imperfect" Multicollinearity

8.4 Multicollinearity: Much Ado about Nothing?

8.5 Practical Consequences of Multicollinearity

8.6 Detection of Multicollinearity

8.7 Remedial Measures

8.8 Is Multicollinearity Necessarily Bad?

**Read:** GP: Ch. 10; W: Ch. 3

## 9. Heteroscedasticity: What Happens If the Error Variance Is Nonconstant?

9.1 The Nature of Heteroskedasticity

9.2 OLS Estimation in the Presence of Heteroskedasticity

9.3 The Method of Generalized Least Squares (GLS)

9.4 Consequences of Using OLS in the Presence of Heteroskedasticity

9.5 Detection of Heteroskedasticity

9.6 Remedial Measures

9.7 A Caution about Overreacting to Heteroskedasticity

**Read:** GP, Ch. 11 and Appendix 11A; W: Ch. 4

## 10. Autocorrelation: What Happens If the Error Terms Are Correlated?

10.1 The Nature of the Problem

10.2 OLS Estimation in the Presence of Autocorrelation

10.3 The BLUE Estimator in the Presence of Autocorrelation

10.4 Consequences of Using OLS in the Presence of Autocorrelation

10.5 Detecting Autocorrelation

10.6 Remedial Measures

10.7 Model Mis-Specification Versus Pure Autocorrelation

10.8 Correcting for (Pure) Autocorrelation: The Method of Generalized Least Squares (GLS)

10.9 The Newey-West Method of Correcting the OLS Standard Errors

**Read:** GP: Ch. 12; W: Ch. 8

## 11. Model Specification and Diagnostic Testing

11.1 Model Selection Criteria

11.2 Types of Specification Errors

11.3 Consequences of Modle Specification Errors

11.4 Test of Specification Errors

11.5 Errors of Measurement

**Read:** GP: Ch. 13; W: Ch. 12

## ==========FINAL EXAM: Monday, May 16, 2016, 9:00-12:00==========