

Course ID Number: ADC 6565

**Course Title: Econometric Modeling and Forecasting
with Time Series Analysis**

No. of Credits: 2

Graduate School of International Relations
International University of Japan

Term: Spring 2012
Timetable: 4th and 5th period on Mon.

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Course Introduction

Econometric modeling and forecasting have become one of the most important tools for policy makers of the day in quantifying the impacts of various policies on their economies. To tackle practical problems policy makers and business managers need to build empirical models. In developing countries, however, when applying those models for various analyses they have to overcome various problems that do not exist in developed economies. One of the frequently observed problems is the lack of data. This fact not only restricts the scope of econometric analysis but also requires highly developed skills for extracting meaningful quantitative information from the limited available data. The objectives of the course are to explore various econometric methods to overcome the above-mentioned problems and construct various econometric models for students' own economies. These models will be useful for policy makers in their deliberation to achieve high standards of living for their citizens.

International University of Japan

The Course Syllabus for Econometric Modelling and Forecasting with Time Series Data

Title of the course:	ADC 6565 Econometric Modelling and Forecasting with Time Series Data
Course instructor:	N. S. Cooray Office Room 332, Office Tel: 428 and Email: cooray@iuj.ac.jp
Class schedule:	Monday 14:40-16:10 and 16:20-17:50
Term:	Spring 2012
Credit:	2 Credits (Classes are in PC Room 120)

1. Course description and objectives:

Econometric modelling and forecasting have become one of the most important tools for policy makers of the day in quantifying the impacts of various policies on their economies. To tackle practical problems policy makers and business managers need to build empirical models. In developing countries, however, when applying those models for various analyses they have to overcome various problems that do not exist in developed economies. One of the frequently observed problems is the lack of data. This fact not only restricts the scope of econometric analysis but also requires highly developed skills for extracting meaningful quantitative information from the limited available data. The objectives of the course are to explore various econometric methods to overcome the above-mentioned problems and construct various econometric models for students' own economies. These models will be useful for policy makers in their deliberation to achieve high standards of living for their citizens.

This course is also designed to provide the practical illustration of techniques used in applied macroeconometric and a clear understanding of the salient features, challenges and opportunities of the participants' own economies. This course is highly recommended for students who intend to do quantitative analysis (using time series data in particular) in their thesis writing.

2. Learning outcomes for participants:

At the end or during the course participants will be able:

- (a) To conceptualise the vital concepts and issues of econometric analysis and modelling;
- (b) To apply the econometric concepts and tools to understand and analyse their countries' economic behaviour;
- (c) To understand the complex nature and inter-linkages among sectors and markets of their economies;
- (d) To acquire skills and knowledge of econometric modelling for strategic thinking and understanding;
- (e) To acquire methodological foundation necessary for future studies; and

(f) To synthesis of ideas, views and evidence.

3. Career relevance:

The knowledge and skills obtained from the course will be useful for business managers and development practitioners in analysing and maximising the effectiveness of policies and business decision. Awareness of econometric tools are necessary for effective decision making in business and policy administration/management.

4. Course context and rationalisation:

This course is quite similar to Business Forecasting. Those who have taken Macroeconomics, Applied Econometrics, and Statistics for Business and Economics will find it easy to follow the course. MBA students who are interested in business forecasting may wish to register this course.

5. Pedagogical techniques:

- (a) Class room lectures;
- (b) Computer workshops and in class discussion;
- (c) Reading assignments from Internet, books and journals; and
- (d) Homework assignments and group discussion.

6. Assessment:

Assessment will depend on the performance of the followings:

- | | | |
|-----|---|-----|
| (a) | Class participation/commitment/ contribution etc. | 10% |
| (b) | Homework assignments (3-5) | 20% |
| (c) | Mid-term paper | 30% |
| (d) | Final paper | 40% |

The term paper should be an econometric model using student's own country data. Some home assignments are given in such a way that they can be linked to the term paper. (Details of term paper will be given in the class).

7. References placed on reserve

Stephen G. Hall (2007) Applied Econometrics: A Modern Approach Using EViews and Microfit.

Enders, W. (2010). Applied Econometric Time Series (3 ed.). Danvers: Wiley.

EViews 6 Command and Programming Reference and User's Guide

Griffiths' William E; R. Carter Hill, and Guay C. Lim (2008), Using EViews for Principles of Econometrics

Gujarati, D. (2011). Econometrics by Example. Hampshire: Palgrave Macmillan.

Gujarati, Damodar N. (2003), Basic Econometrics, (4th edition), McGraw-Hill: Boston.

Hill, R. Carter; William E. Griffiths and Guay C. Lim (2008), Principles of Econometrics, Third Edition, John Wiley and Sons, Inc.

Jha, Raghbendra (2003), Macroeconomics for Developing Countries, Routledge: London.

Klein, Lawrence R. et al. (1999), *Principles of Macroeconometric Modeling*, ELSEVIER, The Netherlands.

Pindyck, Robert S. and Daniel L. Rubinfeld (1998), *Econometric Models & Economic Forecasts*, Fourth Edition, McGraw-Hill, Singapore.

Studenmund, A. H. (2011). *Using Econometrics: A Practical Guide* (6 ed.). Boston: Pearson.

8. Hours of consultation: Wednesday from 14:30-16:30

All learning partners are encouraged to share their opinion, suggestion and difficulties in a relaxed atmosphere with course facilitator. Arrangements can also be made to consult on an individual or group basis as needs arise.

9. Detailed course contents and required readings:

Required readings are marked with a star (*), recommended readings are not starred. A course folder has been created on the public folder (Cooray's course) for recommended readings and for readings that are available online. Other materials are reserved and can be obtained from the MLIC counter.

1. First week: Course Introduction and Time Series Analysis

(a) Course introduction

(b) Types of data

(c) Smoothing and Extrapolation (Seasonality, Decomposition Models, Irregularity of data, trends)

(c) Understanding of an economy

Required readings

EViews6. (2007). Seasonal Adjustment. In *User's Guide* (pp. 339-354). Quantitative Micro Software.

Pindyck, R., & Rubinfeld, D. L. (1998). Smoothing and Extrapolation of Time Series. In 4 (Ed.), *Econometric Models and Economic Forecasts* (pp. 463-520). McGraw-Hill International Editions.

White, H., & Granger, C. W. (2011). Consideration of Trends in Time Series. *Journal of Time Series Econometrics*, 3 (1), 1-40.

Granger, C. W. J. and P. Newbold (1974), Spurious Regressions in Econometrics, *Journal of Econometrics*, 2, 121-141

Recommended readings

Australian Bureau of Statistics (2008), *Time Series Analysis: Basic*
<http://www.abs.gov.au/websitedbs/d3310114.nsf/4a256353001af3ed4b2562bb00121564/b81ecff00cd36415ca256ce10017de2f!OpenDocument>, Accessed on 13 April 2008. Available on the course folder

2. Second week: Time Series Econometrics: Stationarity and Unit Roots

(a) Estimation of simple models

(b) Stationarity and Unit Roots

Required readings

EViews6. (2007). Seasonal Adjustment. In *User's Guide* (pp. 339-354). Quantitative Micro Software.

Gujarati, Damodar N. (2003), Basic Econometrics, Fourth Edition, McGraw-Hill International Edition, Boston, Chapter 21, pp. 792-834.

Eviews 6 User's Guide 11, Chapter 26, pp. 88-92 for details on Unit Root Tests.

Recommended readings

Brooks, Chris (2002), Introductory Econometrics for Finance, Cambridge University Press: Cambridge, Chapter 7, pp. 367-436.

Greene, William H. (2003), Econometric Analysis (5th edition), Ch 20.3, 20.4

Kawakatsu, Hiroyuki (1998), A Computer Handbook Using Eviews to accompany Econometric Models & Economic Forecasts, by Pindyck, Robert S. and Daniel L. Rubinfeld (1998), Chapter 16, pp. 198-217.

Maddala, G. S. and In-Moo Kim (2002), Unit Roots, Cointegration, and Structural Change, Cambridge University Press: Cambridge, UK.

Pindyck, Robert S. and Daniel L. Rubinfeld (1998), Econometric Models & Economic Forecasts, Fourth Edition, McGraw-Hill, Singapore, Chapter 16, pp. 489-520.

Wooldridge, Jefferey M. (2003), Introductory Econometrics (2nd edition), Chapter 10 and 11

3. Third week: Time Series Econometrics: Cointegration and Error Correction Mechanism

(a) Cointegration

(b) Error Correction Mechanism (use data in CD for Gujarati chapter 21)

(c) Discussion on the application of cointegration and error correction models in inflation analysis

Required readings

Bandra, A. (n.d.). Short-Run Dynamics of Inflation: Do monetary and Exchange Rate Policies Matter?-An Emperical Investigation for Sri Lanka. *Staff Studies of the Central Bank of Sri Lanka*, 73-93.

Engle, R. F., & Granger, C. W. (1987). Co-integration and Error-Coorection: Representation, Estimation, and testing. *Econometrica* , 55, 251-276.

EViews6. (2007). Cointegration Testing. In *User's Guide* (pp. 363-382). Quantitative Micro Software.

Gujarati, D. N. (2003). Cointegration. In *Basic Econometrics* (4 International Edition ed., pp. 822-830). Boston: McGraw-Hill.

Pindyck, R., & Rubinfeld, D. L. (1998). Smoothing and Extrapolation of Time Series. In 4 (Ed.), *Econometric Models and Economic Forecasts* (pp. 463-520). McGraw-Hill International Editions.

Recommended readings

Brooks, C. (2002). Modelling long-run relationships in finance. In *Introductory Econometrics for Finance* (pp. 367-436). Cambridge: Cambridge University Press.

Greene, W. H. (2003). Time Series Models. In *Econometric Analysis* (5 International Edition ed., pp. 608-662). Prentice Hall.

Maddala, G. S., & Kim, I.-M. (2002). Unit roots and cointegration. In *Unit Roots, Cointegration, and Structural Change* (pp. 45-97). Cambridge: Cambridge University Press.

4. Fourth week: Some Essentials Topics in Econometrics

- (a) Distributed lag and autoregressive models
- (b) Causality in economics
- (c) Dealing with missing data
- (d) Impulse Response Analysis
- (e) Dummy Variable Model

Required readings

- Gujarati, D. N. (2003). Cointegration. In *Basic Econometrics* (4 International Edition ed., pp. 822-830). Boston: McGraw-Hill.
- Pindyck, R., & Rubinfeld, D. L. (1998). Consumption Function. In 4 (Ed.), *Econometric Models and Economic Forecasts* (pp. 94-95). McGraw-Hill International Editions.
- Pindyck, R., & Rubinfeld, D. L. (1998). Missing Observation. In 4 (Ed.), *Econometric Models and Economic Forecasts* (pp. 246-250). McGraw-Hill International Editions.
- Pindyck, R., & Rubinfeld, D. L. (1998). Polynomial Distributed Lag. In 4 (Ed.), *Econometric Models and Economic Forecasts* (pp. 236-242). McGraw-Hill International Editions.
- Pindyck, R., & Rubinfeld, D. L. (1998). Testing for Serial Correlation When There Is a Lagged Dependent Variable. In 4 (Ed.), *Econometric Models and Economic Forecasts* (pp. 169-70). McGraw-Hill International Editions.
- Pindyck, R., & Rubinfeld, D. L. (1998). Tests for Causality. In 4 (Ed.), *Econometric Models and Economic Forecasts* (pp. 242-245). McGraw-Hill International Editions.

Recommended readings

- Durbin, J. (1970). Testing for Serial Correlation in Least-Squares Regression When Some of the Regressors Are Lagged Dependent Variables. *Econometrica*, 38, 410-421.
- Granger, C. (1969). Investigating Causal Relations by Econometric Methods and Cross-Spectral Methods. *Econometrica*, 34, 424-438.
- Sims, C. (1972). Money, Income and Causality. *American Economic Review*, 62, 540-552.

5. Sixth week: Dynamic Simulation of Simultaneous-Equation Models

Up to now we have worked with single equation and from now on we move multi-equations system. Having estimated simultaneous system we then move on to simulation for policy analysis and forecasting. Simulation is simply the mathematical solution of a simultaneous set of difference equations. We discuss ex post simulation or historical simulation and test the reliability of the model before it will be utilised for forecasting and policy analysis. Using data (see file entitled "macro.wf1" in the data folder)

given in section 13.3 of Pindyck and Rubinfeld (1998, p. 390), we demonstrate how to estimate and test simultaneous model in EViews.

- (a) System estimation methods
- (b) Model simulation
- (c) Validation of model or model testing
- (d) Forecasting

Required readings

- Gujarati, D. N. (2003). Simultaneous-Equation Methods. In *Basic Econometrics* (4 International Edition ed., pp. 762-791). Boston: McGraw-Hill.
- Pindyck, R., & Rubinfeld, D. L. (1998). Simultaneous-Equation Estimation. In 4 (Ed.), *Econometric Models and Economic Forecasts* (pp. 337-378). Singapore: McGraw-Hill International Editions.
- Pindyck, R., & Rubinfeld, D. L. (1998). Introduction to Simulation Models. In 4 (Ed.), *Econometric Models and Economic Forecasts* (pp. 379-412). Singapore: McGraw-Hill International Editions.
- EViews6. (2007). System Estimation. In *User's Guide II* (pp. 307-344). Quantitative Micro Software.
- EViews6. (2007). Models. In *User's Guide II* (pp. 407-458). Quantitative Micro Software.

Recommended readings

- Griffiths, W. E., Hill, R. C., & Lim, G. C. (2008). Simultaneous Equations Models. In *Using EViews for Principles of Econometrics* (pp. 211-218).
- Hill, R. C., Griffiths, W. E., & Lim, G. C. (2008). Simultaneous Equations Models. In *Principles of Econometrics* (3 ed., pp. 303-324). John Wiley and Sons, Inc.
- Klein, L. R., Welfe, A., & Welfe, W. (1999). Simulation. In *Principles of Macroeconometric Modeling* (pp. 153-187). North-Holland: ELSEVIER.

6. Seventh week: Introduction to macroeconomic modelling

Econometric models have been used by the private sector, academicians and government sector policy makers to analysis the economy and to evaluate economic policies and also to forecast the future behaviour of the economy. This session will give a brief history of modelling activities and an overview of models of developing countries.

We also introduce other macroeconomic models developed for fiscal and monetary policy analysis. International Monetary Fund (IMF) has been using its own proto-type econometric model constructed and estimated for 31 developing countries. Since this model has wide and almost universal applicability students are encourage to estimate IMF-type model using their own country's data and use it for policy analysis. Having completed estimations of equation we then move to create a system estimation (or simultaneous equations system) in the EViews.

- (a) Introduction to macroeconomic modelling and its evolution
- (b) Understanding the links among markets and sectors of an economy

- (c) New Approach to macroeconomic Modelling
- (d) Discussion on IMF-type model
- (e) Discussion on IS-LM model

Required readings

- Jha, R. (2003). IMF-type macro models for developing countries. In *Macroeconomics for Developing Countries* (pp. 177-192). Routledge: London.
- Pindyck, R., & Rubinfeld, D. L. (1998). Appendix 14.1 A Small Macroeconomic Model. In 4 (Ed.), *Econometric Models and Economic Forecasts* (pp. 442-462). Singapore: McGraw-Hill International Editions.
- Klein, L. R., Welfe, A., & Welfe, W. (1999). A Macroeconomic Model-A New Approach. In *Principles of Macroeconomic Modeling* (pp. 2-24). North-Holland: ELSEVIER.

Recommended readings

- Bodkin, R. G., Klein, L. R., & Marwah, K. (1991). *A History of Macroeconomic Model-Building*. England (pp. 3-33). Edward Elgar Publishing Limited.
- Granger, C. W. (2002). *Empirical Modeling in Economics: Specification and Evaluation*. Cambridge: Cambridge University Press.

7. Eighth week: Policy Analysis and Forecasting with Models (Multiplier or Scenario Analysis)

Having estimated different models in previous sessions, here we will intend to do testing of models and to use those models for forecasting and policy analysis. Policy analysis or multiplier analysis will include: fiscal policy, monetary policy, pricing policy, and exchange rate policy

- (a) Multiplier analysis or policy analysis with models
- (b) Autoregressive Integrated Moving Average (ARIMA) or Box-Jenkins methodology
- (c) Vector Autoregressive Model (Var Model)

8. Ninth week: Modelling and Forecasting of Risk and Volatility in Macroeconomics and Finance

- (c) We discuss volatility of financial assets, inflation, and exchange rate using ARCH and GARCH Estimation.

Discussion of ODA paper

Reference:

- Gujarati, Damodar N. (2003), Chapter 22
EViews 6 Chapter 29
Koop, Gary (2003), Analysis of Economic Data, Chapter 11 on “Applications of time series methods in macroeconomics and finance” , pp. 167-198.

9. Tenth week: Global Level Commodity and Other Econometric Models

Significant improvements in global commodity modelling took place during the 1980s and since then the expansion of global level commodity models has been evidenced. Econometric modelling of commodity markets can be used "as an effective new approach" in this area. Nevertheless, the knowledge of determination of demand, supply and price is inadequate and the problem of falling price of primary commodity is unsolved. Thus, quantitative models of commodity markets can help provide a clear understanding of the nature of the problems. In this session, we use some estimated commodity models for agricultural policy analysis in developing countries.

Global level econometric model provides a consistent framework for undertaking quantitative studies of the international economic transmission mechanisms. These models will also be useful in quantifying the effects of international and national policies on the outlook for the world economy.

- (a) Impact analysis of commodity prices using commodity models
- (b) Agricultural policy analysis using econometric model
- (c) Discussion on global level modelling
- (d) Discussion on forecasting and policy analysis using global models

Reference:

- Adam, F. G. and J. Vial (1988), "Explaining Recent Metals Price Swings-Exchange Rate and Structural Considerations" *Resource Policy*, Vol. 14, pp. 85-97.
- Adam, F. G. and V. G. Duggal (1999), "The Implications of Rapid Economic Development in Asia for Cereal and Meat Demand: An Investigation of Food Demand Relationships with Application to China" *Journal of Econometric Studies of Northeast Asia* Vol. 1, No. 2, pp. 21-36.
- Adams, Gerard F. (2004), *Commodity Prices: Current Perfective*, Paper presented at the Spring Meeting of Project Link, New York.
- Klein, Lawrence R. and Fu-chen Lo, Eds. (1995), *Modeling Global Change*, United Nations University, Tokyo (Chapters 2, 4, 5, 10 and 11).
- Klein, Lawrence R. et al. (1999), *Principles of Macroeconometric Modeling*, ELSEVIER, The Netherlands. (Chapters 4, pp. 127-146)
- Lo, Fu-chen, Hiroyasu Tokuda and N. S. Cooray, Eds. (2000), *The Sustainable Future of the Global System III*, The United Nations University/Institute of Advanced Studies, Tokyo.
- Van Groendaal, W. J. H., and J. W. Vingerhoets (1995) "Can International Commodity Agreement Work?" *Journal of Policy Modeling* 17 (3): 257-277.

See <http://www.chass.utoronto.ca/link/> for more details on Project LINK