Applied Forecasting Methods

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Office Hours: Tuesday 11:00am-12:00pm or by appointment
Tutorial Hours: TBA

Scheduled Class Time and Organizations: Class will meet once a week from 2:30pm to 5:15pm on Tuesdays for lecture in room 307, Esther Lee Building. Students are encouraged to ask questions and provide suggestions throughout the course.

Course Description and Objectives: This course is designed as a sequel to Introduction to Econometrics and focuses on forecasting. Forecasting is important, as forecasts are constantly made in business, economics, government, finance, and many other fields and much depends on them. This course will introduce you to econometric time-series models and methods that can be used to generate forecasts. A wide range of topics are going to be covered, including basic concepts of forecasting, forecasting trends and seasonality, ARIMA processes, combination of forecasts, evaluation of forecasts, and volatility forecasting. Upon successful completion of this course, the students are expect to master basic properties of modern forecasting models, and be able to skillfully select appropriate forecasting models to fit real data sets and generate their own forecasts.

Software: EVIEWS will be used for computer-based calculations. A student version of EVIEWS is available at *www.eviews.com*. However, the freedom is granted for you to chose any statistical software which you feel comfortable to use for assignments.

Course Web Page: Access through CUSIS.

Course Texts:

The required textbook is

- Diebold, Francis X. (2008): *"Elements of Forecasting,"* Fourth Edition, South Western College Publishing Co..

Good general econometrics textbooks are

- Stock, James and Mark Watson (2003): *"Introduction to Econometrics,"* Addison Wesley.

- Wooldridge, Jeffrey M.(2003): *"Introductory Econometrics: A Modern Approach,"* Fifth Edition, South Western College Publishing Co..

Advanced time series textbooks are

- Hamilton, James (1994): *"Time Series Analysis,"*, Princeton Univ. Press.

- Fuller, Wayne A. (1996): *"Introduction to Statistical Time Series,"* Second Edition, Wiley-Interscience.

- Tsay, Ruey S. (2005): *"Analysis of Financial Time Series,"* Second Edition, Wiley-Interscience.

- Granger, C.W., John and Newbold, Paul (1986): *"Forecasting Economic Time Series,"* Second Edition, New Milford, Connecticut, U.S.A..

Course Requirements:

- **Problem Sets [20%]:** There will be three to four problem sets, assigned during the semester. For each, students will have one week to complete. The problem sets are designed to give you the opportunity to review and enhance the material learned in class.

- **Midterm Exam [20%]:** It is scheduled at class time on Tuesday, Oct. 17.

- **Final Exam [60%]:** The final exam will be conducted centrally by the school Registration and Examination Section. All students are expected to take final examination at the same time. If you are sick or have other compelling reasons preventing you from taking the test, a certified medical note or proper documents from a dean or other authorities must be supplied. Then a make-up exam might be scheduled. Exchange students are reminded that early departure is not a valid reason for not taking the final exam.

Honesty in Academic Work: Please visit the following web-site for details of university policy on Honesty in Academic Work: http://www.cuhk.edu.hk/policy/academichonesty/.

Course Outline:

The sessions outlined below include topics which are going to be covered in this course. These are only approximate and more time will be spent on some topics than others.

1. **Introduction to Forecasting**

2. **Review of Probability, Statistics and Regression for Forecasting**

3. **Six Considerations Basic to Successful Forecasting**

   - The Decision Environment and Loss Function
   - The Forecast Object, Statement and Horizon
   - The Information Set
   - Methods and Complexity, the Parsimony Principle, and the Shrinkage Principle

4. **Statistical Graphics for Forecasting**

   - The Power of Statistical Graphics
   - Simple Graphical Techniques
   - Elements of Graphical Style
   - Application: Graphing Four Components of Real GDP

5. **Modeling and Forecasting Trend**

   - Modeling Trend
   - Estimating Trend Models
   - Forecasting Trend
   - Selecting Forecasting Models Using the Akaike and Schwarz Criteria
   - Applications: Forecasting Retail Sales

6. **Modeling and Forecasting Seasonality**

   - The Nature and Sources of Seasonality
   - Modeling Seasonality
   - Forecasting Seasonal Series
   - Applications: Forecasting Housing Starts

7. **Characterizing Cycles**

   - Covariance Stationary Time Series
   - White Noise
   - The Lag Operator
   - Wold's Theorem, the General Linear Process, and Rational Distributed Lags

- Estimation and Inference for the Mean, Autocorrelation, and Partial Autocorrelation Functions
- Application: Characterizing Canadian Employment Dynamics

8. **Modeling Cycles: MA, AR, and ARMA Models**

- Moving Average (MA) Models
- Autoregressive (AR) Models
- Autoregressive Moving Average (ARMA) Models
- Applications: Specifying and Estimating Models for Employment Forecasting

9. **Forecasting Cycles**

- Optimal Forecasts
- Forecasting Moving Average Processes
- Making the Forecasts Operational
- The Chain Rule of Forecasting
- Application: Forecasting Employment

10. **A Forecasting Model with Trend, Seasonal, and Cyclical Components**

- Assembling What We've Learned
- Application: Forecasting Liquor Sales
- Recursive Estimation Procedures for Diagnosing and Selecting Forecasting Models

11. **Forecasting with Regression Models**

- Conditional Forecasting Models and Scenario Analysis
- Accounting for Parameter Uncertainty in Confidence Intervals for Conditional Forecasts
- Unconditional Forecasting Models
- Distributed Lags, Polynomial Distributed Lags, and Rational Distributed Lags
- Regressions with Lagged Dependent Variables, Regressions with ARMA Disturbances, and Transfer Function Models
- Vector Autoregressions
- Predictive Causality
- impulse-Response Functions and Variance Decompositions
- Application: Housing Starts and Completions