Instructor
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Times
Spring 2016
Class: T,TH 11:00-12:20
Office Hours: Tuesday 1:30-2:30, Thursday 12:30-1:30

Teaching Assistant
Luoxi Zhang
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Course Description
This course covers the basics of forecasting and time series analysis as used in finance, economics and business. Time series topics will include linear regression, ARIMA models, trend modeling, seasonal adjustments and volatility modeling.

Learning Goals

• Basic problems, issues and limitations in forecasting
• Basic forecasting and filtering tools
• Analysis of time varying volatility
• Formulating a well defined forecasting process in example applications
• Understand out of sample limitations in most forecasting solutions
• Utilize several different locations for retrieving time series information
• Be able to apply Stata in time series/forecasting situations
• Understand the impact of heteroscedasticity on efficiency

Prerequisites
ECON 210F and 211F, and FIN 201A. (ECON 210F/211F is equivalent to an undergraduate course in econometrics such as ECON 184.) The course also assumes basic calculus equivalent of about 1 semester of calculus at the undergraduate level. Finally, a basic understanding of matrix algebra will be extremely useful.

This course is designed for IBS masters students (MA, MSF, MBA). PhD students may also find some of the content useful as well.

Required Reading

• Becketti, Introduction to Time Series Using Stata, Stata Press, 2013
Recommended Reading


Other Useful but NOT Required Readings

- Diebold, *Elements of Forecasting*, 4th edition. (this book is available online for free download)
- Hyndman and Athanasopoulos, *Forecasting Principles and Practice*, (online)

Required Software

Stata will be required for all students. It is available on all machines at IBS and we have a site license for running it on your own machine. Depending on student demand, we may do some programming in R (which is open source).

Grading

Grades will be based on problem sets (15%), a midterm exam (35%), a final exam (35%), and a group project (15%).

Academic Honesty

You are expected to be honest in all of your academic work. Please consult Brandeis University Rights and Responsibilities (see http://www.brandeis.edu/studentlife/srcs/rr/) for all policies and procedures related to academic integrity. Students may be required to submit work to TurnItIn.com software to verify originality. Allegations of alleged academic dishonesty will be forwarded to the Director of Academic Integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university. Citation and research assistance can be found at LTS - Library guides (see http://guides.library.brandeis.edu/citations).

Disability Statement

IF YOU ARE A STUDENT WITH A DOCUMENTED DISABILITY ON RECORD AT BRANDEIS UNIVERSITY AND YOU WISH TO HAVE A REASONABLE ACCOMMODATION MADE FOR YOU IN THIS CLASS, PLEASE SEE ME IMMEDIATELY. PLEASE KEEP IN MIND THAT REASONABLE ACCOMMODATIONS ARE NOT PROVIDED RETROACTIVELY.

Course Outline

- Introduction
- Basic Tools
  - Stata: Beckett (1)
    * Interface
    * Core Commands
    * Basic Data Sets
– Statistics Basics and Review: Becketti (2)
  * Random Variables (2.1)
  * Hypothesis Tests (2.2)
  * Regression (2.3.1 only, OLS part)
  * Time Series Info (2.5)
• Basic Time Series Components and Filters: Becketti (3)
  – Time Series Questions (3.1)
  – Trends, Cycles and Seasonality (3.2)
  – Fitting a Trend (3.3.1)
  – Adding Seasonality (Lecture Only)
  – Simple Forecasting Filters (3.4)
• Forecasting with Filters and Trends: Becketti (4.1, 4.2 (skip 4.2.2))
• Regression with Autocorrelated Disturbances: Becketti (5; pages 167-182 only)
  – Violating Classical Assumptions
  – Testing for Autocorrelation (Durbin)
  – Robust Standard Errors
  – Overlapping forecast errors
• Standard Univariate Models: AR, MA, ARMA (Becketti 6)
  – Lag Notation
  – AR, MA, ARMA
  – Stationarity / Dynamics
• Forecasting Process
  – Integrated Processes and ARIMA (Becketti 10)
    * Unit Roots (Random Walk)
    * Dickey/Fuller Tests
  – Forecasting Applications: Becketti (7)
    * US GDP
      · Unit Roots
      · Time Trends
      · Other Information: ARMAX
Mixed Frequency Forecasts: MIDAS
  * US Unemployment
  * Housing Starts
  * Filters vs. ARMA

Volatility: Becketti (8)
  – Basic Features of Stock Returns
  – MA and Exponential Filters (Riskmetrics)
  – ARCH/GARCH models
  – Realized Volatility

Financial Time Series: Basic Features and Predictability
  – Dividend/Price Ratio
  – Technical Analysis and Momentum
  – Uncovered Interest Parity and the Carry Trade

Vector Autoregression (VAR): Becketti (9.1-9.3)
  – Housing Starts and Completions
  – Stock Returns and Trading Volume
  – A VERY Small Macro Model

Nonstationary Time Series and Multivariate Models: Becketti (10.3-10.4)
  – Spurious Regressions
  – Cointegration
  – Error Correction Models

Student Presentations