TIME SERIES ANALYSIS: BACHELOR COURSE

Instructor: *Dean FANTAZZINI*

- **Course Objectives**: The goal of this course is to introduce basic time series models and to provide basic tools for empirical work with economic and financial time series data. It starts by introducing univariate stationary ARMA models, progresses to non-stationary models, and ends by discussing some special cases such as ADL models. Applied aspect of time series analysis is emphasized in the course.

- **Prerequisites**: Students should be familiar with basic concepts of econometrics including probability theory, linear algebra, OLS, GLS and maximum likelihood. Students need to have a knowledge of a statistical software (e.g. Eviews). We will use Eviews throughout the lectures as it is one of the most commonly used econometric software.

- **Textbooks**:
  - James D. Hamilton (1994), *Time Series Analysis*, Princeton University Press
  - Fumio Hayashi, (2000), *Econometrics*, Princeton University Press
  - Сергей Айвазян (2001), *Основы эконометрики*, Юнити, Том 2
  - Ruey Tsay (2002), *Analysis of Financial Time Series*, Wiley
  - P. Franses and R. Paap (2004), *Periodic Time Series Models*, Oxford University Press

- **Method of Grading**: Each student should take a final exam which considers both theoretical and applied aspects.

Course Outline

1. Stochastic Processes [8 hours+8 seminars]

1.1 Introductory Tools
1.2 Stationarity and Ergodicity
1.3 Random Walk, White Noise and Martingale
1.4 First-order and p-th order Difference Equations
1.5 Wold's Decomposition

2. Stationary processes [8 hours+8 seminars]

2.1 Moving Average process
2.2 Auto-Regressive processes
2.3 ARMA processes
2.4 Estimation of ARMA processes

3. Non-stationary processes [8 hours+8 seminars]

3.1 Trend Stationary processes
3.2 Integrated processes
3.3 Forecasting
3.4 Unit-Root Testing
3.5 Box & Jenkins Methodology

4. Univariate Modelling: Some Extensions [8 hours+8 seminars]

4.1 Models for Conditional Heterosckedasticity: GARCH models
4.2 Periodic Models

References

1. Stochastic Processes

- Айвазян[2], paragraph 3.1
- Hamilton, chapters 1-2, 3.1-3.2, 4
- Hayashi, paragraph 2.2
- Tsay, chapters 1-2

2. Stationary processes: Review of ARMA Processes

- Айвазян[2], paragraphs 3.2-3.3, 3.4.1-3.4.3
- Hamilton, chapters 3, 5
- Hayashi, chapter 6
- Tsay, chapter 2

3. Non-stationary processes

- Айвазян[2], paragraphs 3.5.1
- Hamilton, chapters 15-17
- Hayashi, chapter 9
- Tsay, chapter 2

4. Some Extensions

- Tsay, chapter 3
- Franses and Paap, chapters 1-3