New Economic School

APPLIED TIME SERIES ECONOMETRICS

Module 2, 2006–2007

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The course is devoted to the modern applied time series analysis. First we will discuss principles of time series modeling and review various model selection procedures. After that we will study popular models of conditional mean dynamics such as linear ARs and VARs as well as nonlinear structures like threshold, transition and regime switching models. We will also explore such issues as stationarity, integratedness, unit roots and cointegration, and get acquainted with the notion of Brownian motion. Then we will turn to modeling conditional variance and, more generally, volatility, primarily using ARCH models. Finally, we will study methods of dealing with structural instability, as well as models for irregularly spaced financial data.

ORGANIZATION

The course presumes the use of publications in applied time series and computer work. The home assignment, or "mini-project" (50% of the grade) is an empirical analysis of a time series of own choice (with instructor's approval). The exam (50% of the grade) will contain questions on a published applied time series paper handed out in advance.

LITERATURE

There is a "Reader" available at the NES library which contains illustrative applied papers for reading and discussion in sections, about 2 per week. These papers primarily teach the methodology of research. Other, more technical, recommended literature is:

- «Эконометрический ликбез: прогнозирование временных рядов», *Квантиль*, №1, сентябрь 2006 г., стр. 3-62. Доступно на http://quantile.ru/
- Hamilton, J. *Time Series Analysis*, Princeton, 1994
- Franses, P. and D. van Dijk. *Nonlinear Time Series Models in Empirical Finance*, Cambridge, 2000
- Hayashi, F. *Econometrics*, Princeton University Press, 2000
- Enders, W. *Applied Econometric Time Series*, John Wiley, 1995

SYLLABUS

I. Modeling methodology and model selection

- Structural and non-structural time series modeling.
- Modeling the mean and modeling the variance.
- Model selection: diagnostic testing, information criteria and prediction criteria.
- General-to-specific and specific-to-general methodologies. Data mining.

II. Univariate time series: modeling the mean

- Stationary AR models: properties, estimation, inference, forecasting.
- Stochastic and deterministic trends, unit root testing. Brownian motion and FCLT.
- Nonlinear time series modeling of the mean: threshold and smooth transition autoregressions. Markov switching models.

III. Multivariate time series: modeling the mean

- Stationary VAR models: properties, estimation, analysis and forecasting.
- VAR models with elements of nonlinearity.
- Spurious regression and cointegration.

IV. Modeling the variance

- The class of ARCH models: properties, estimation, inference and forecasting.
- Extensions: IGARCH, ARCH-t, ARCD.
- Multivariate GARCH.
- Time-varying risk and ARCH-in-mean.
- Other measures of financial volatility.

V. Other topics in applied time series analysis

- Identification, estimation and testing for structural breaks.
- Retrospection and monitoring for structural stability.
- High frequency data models: ACD, UHF–GARCH.