Instruction:
Lectures: Monday 9:00AM – 10:20AM (5306)

Instructor:
Sofya Budanova
Office: 3433
E-mail: sbudanova@hse.ru
Office Hours: Monday 16:00-17:00 or by appointment

Class Teachers:
Sofya Budanova, Igor Goncharenko.

Course Description
Time Series and Panel Data Analysis (intermediate level) is a one-semester course designed for fourth year ICEF students. The main objectives of the course are to introduce the students to the methods of time series and panel data analysis and prepare them for individual work, in particular on their bachelor’s thesis. The course is divided into two parts. The first part covers time series theory and methods, while the second part goes over panel data analysis. Students will learn basic theoretical results and how to estimate time series and panel data in practice with the help of computational software. The prerequisites for the course are Statistics and Econometrics. Knowledge of economic theory is useful as well. The course is taught in English.

Teaching Methods
The class consists of lectures (2 hours per week), practical sessions in the computer lab (2 hours per week), self-study in the computer lab, and self-study with literature.
Grading

The course grade consists of 3 problem sets (2 on Time Series and 1 on Panel Data), a midterm test, an essay and a final exam. The weighting scheme for the final grade will be as follows:

- Problem sets: 15%
- Midterm test: 35%
- Essay: 15%
- Final exam (on Panel Data only): 35%

Topics

Time Series Analysis

1. **Time series: basic concepts** Definition of time series. Introduction of main characteristics of time series (stationarity, ergodicity, autocovariance function, correlogram). Lag operator.


3. **Nonstationary time series** Deviations from stationarity: unit roots, deterministic trends, structural breaks. Tests of stationarity.

4. **Multivariate time series** VAR models: properties and characteristics. Granger causality.


6. **Conditional heteroskedasticity** ARCH and GARCH models: introduction, properties, estimation.

Panel Data Analysis

1. **Panel data: Introduction**

2. **Linear Panel Data Models** Fixed effects and random effects. Between, within, and pooled estimators. Estimation and hypothesis testing.

4. **Nonlinear panel models** Binary response models with panel data. Logit and probit models with panel data.

### Distribution of Hours

<table>
<thead>
<tr>
<th>#</th>
<th>Topic</th>
<th>Total</th>
<th>Lectures</th>
<th>Classes</th>
<th>Self-study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Time series: introduction</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>ARMA models</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Nonstationary time series</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Multivariate time series</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>Estimation and forecasting</td>
<td>20</td>
<td>4</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>Conditional heteroskedasticity models</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>Introduction to panel data</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Linear panel data models</td>
<td>32</td>
<td>6</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>Dynamic Panel Data Models</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>Nonlinear Panel Data Models</td>
<td>28</td>
<td>6</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>152</td>
<td>30</td>
<td>30</td>
<td>92</td>
</tr>
</tbody>
</table>

### Readings

#### Time Series


#### Panel Data


• Colin Cameron and Pravin Trivedi, *Microeconometrics: methods and applications*, Cambridge University Press, 2005

• Colin Cameron and Pravin Trivedi, *Microeconometrics using Stata*, Stata Press, 2010

**Additional Readings**

• Francis Diebold, *Econometrics and Predictive Modeling*, 2017

• Helmut Lütkepohl, *New Introduction to Multiple Time Series Analysis*, Springer, 2005