MGIMO University
School of Government and International Affairs

Syllabus approved
Dean, The MGIMO School of Government and International Affairs
Mikhail Troitskiy
« » 2018

Applied Statistics and Introduction to Econometrics
Undergraduate Course Syllabus

Instructor
Evgeny R. Nadorshin

This syllabus is designed in accordance with the MGIMO Educational Standard for the Bachelor Program in International Affairs.

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**PART 1:
INSTRUCTOR INFORMATION, COURSE DESCRIPTION
AND TEACHING METHODS**

1.1 General information

Template
- Full course title: Applied Statistics and Introduction to Econometrics
    - Type of course: Compulsory
    - Level of course: B.A.
    - Year of study: 2nd
    - Number of ECTS credits allocated: 3
    - Name of lecturer(s) and office hours:
    Evgeny Nadorshin, economist
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1.2. Course aims, thematic structure and learning outcomes

Aims

The idea of the course is to help students with non-mathematical background understand the idea of math statistics and econometrics and familiarize them with the core instruments. As a result listeners should be able to understand

Learning outcomes

By the end of the course listeners should be able to
Understand the value of math statistics and econometrics
Recognize methods used in mathematical statistics and econometrics
Apply these methods in a number of simple but still probable real world cases
Read and comment the results of the applications of the instruments in questions

1.3. Course requirements and grading plan

Requirements

It is expected that students attend classes and read the literature from the list of reading material (below) they should be also prepared to participate in class discussions and behave themselves well. Students will also be required to hand on time required works.

Grading plan

The final grade will be calculated on the basis in-class tests and exercises of mid-term (30%), lecture attendance (20%), final exam (50%).

Assessment	Format	Weight in %
Attendance	In class, individual	20
|In-class tests and exercises, mid-term	Written, in class, individual	30
Final exam	Written, in class, individual	50

PART 2: COURSE CONTENT

Main reading material

Newbold P. Statistics for Business and Economics. Prentice-Hall, (N). 6th edition, 2007;

Gujarati D. N. Basic Econometrics McGraw-Hill, 3d edition, 1995.

Additional reading material

Айвазян С. А., Мхитарян В. С. Теория вероятностей и прикладная статистика. ЮНИТИ. Москва, 2001;

Dougherty C. Introduction to econometrics, Oxford University Press, 3d edition, 2005;

Шведов А. С. (2005). Теория вероятности и математическая статистика, 2-е издание, ВШЭ.

Internet Resources

https://en.wikipedia.org/wiki/Descriptive_statistics;

http://www2.gsu.edu/%7Edscbms/ibs/qcontent.html;

http://www.math.uah.edu/stat/.

WEEKLY SCHEDULE & READINGS

2.1 Types of work

Types of work	Academic hours
Total	**108**
Total for lectures, seminars and written exam	*34*
Lectures	16
Seminars	18
Written tests and/or final exam	
Homework	*74*

2.2. Course content and readings by topic

SCHEDULE OF CLASSES AND READINGS

1. *Why statistical methods are a must for everyone? What is econometrics? Uncertainty. Properties of random variables. Population and samples. Observations. Central tendency and dispersion. Descriptive statistics. Mode, mean, median. Variance, standard deviation, range. Grouped data and histograms. Quartiles, interquartile range.*

The lecture is mostly a reminder to the students of the knowledge received during the course of Statistics, namely the topic 1, lectures 1.1, 1.2, 1.3. The seminar should train and update the relevant skills.

Reading: Newbold ch.1-2

2. *Probability. Random experiments. Events. Random events. Conditional probability. Bayes theorem. Discrete random variables and probability distributions. Binomial. Multinomial, Poisson distributions. Expectation of discrete random variable. Variance of discrete random variable. Joint distribution of discrete random variable. Independence of random variables. Covariance, correlation.*

The lecture is a reminder to the students of the knowledge received during the course of Quantitative Methods, namely the topic 5, lectures 5.1, 5.2, 5.3, 5.4. The seminar should train and update the relevant skills.

Reading: Newbold ch.3-4

3. *Continuous random variables and probability distributions. Expectation and variance. Universal and normal distributions. Central limit theorem. Normal distribution as approximation of binomial and Poisson distribution. Student's t distribution, $\square^2$ distribution, F distribution.*

The aim of the lecture is to make students familiar with the concept of continuous random variable which is very important for further analysis especially within the block of econometrics but it is not commonly presented in the surrounding world and is mostly understood through a good level of abstraction. The central limit theorem is the core to many science disciplines even humanitarian when field research results are being analysed and presented. The task of the seminar to help develop very basic skill needed to operate and understand the results of someone's operations with continuous random variables.

Reading: Newbold ch.5.

4. *Sampling distribution. Distribution of a mean and sample variance. Point estimation. Unbiasness of an estimator. Minimum variance unbiased estimators. Interval estimation.*

This lecture touches two very important topics: sampling which is one of the the core methods to collect and consequently analyse the information around us, and point estimation. We produce estimates every day in our life and it is also one of the core products of a proper science which serves as the basis for hypothesis testing (later in the course). The seminar should let students sense the idea of sampling estimation and understand the properties of the estimations made.

Reading: Newbold ch.6-7

5. *Interval estimation. Confidence intervals for mean with known and unknown variance. Confidence intervals for population proportion, mean differences.*

Point estimation is not the only way to produce an estimate in a world with uncertainty – in many cases interval is a lot more important. The concept of confidence intervals is crucial for understanding the level of reliability of point estimations. The term will be defined and its application shown during the lecture, the seminar will help train the skill of combining point and interval estimation on known examples from newspapers in particular.

Reading: Newbold ch.8

6. *Hypothesis testing. Null and alternative hypothesis. One-sided and two-sided alternative hypothesis. One- and two-tailed tests. Type I and Type II errors.*

This lecture will explain the central concept of statistical analysis – how to formulate and test a hypothesis. Most of the meaningful scientific conclusions in very different fields of science are made or verified with the help of the instrument. The seminar will train the relevant skills.

Reading: Newbold ch.9

7. *Nature of regression analysis. Two-variable regression model. Regression, correlation and causality.*

This part is more about words than formulas. It will explain the links between mathematical statistics and regression analysis; this bridge is important for proper implementation of the knowledge and skills received during previous lectures and seminars in the last two topics of the course.

Reading: Gujarati ch1-2

8. *Ordinary least squares in case of two-variable regression. Gauss-Markov theorem. Properties of the OLS estimators. R^2 – goodness of fit. Normality assumption. Hypothesis testing.*

The lecture will formally present OLS method and derive the appropriate estimators and their properties under Gauss-Markov theorem assumption. The meaning and value of goodness of fit measure. The seminar will train the capability to understand the results received and presented by others more than the application of the techniques by the students themselves.

Reading: Newbold ch.12. Gujarati ch.3-5

9. *Multiple regression analysis. The problem of estimation and interpretation. Hypothesis testing.*

This extension of the previous topic is vital for understanding research results and applying the method in a real world situation as two-variable regression is rarely used in studies. The seminar will concentrate on the capacity to properly read and understand the results/output of a software package.

Reading: Newbold ch.13. Gujarati ch.7