Appx 2
to the Order of March 23, 2023, № 244

NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

Department of Statistics and Economic Analysis

«CONFIRMED»
Dean of Faculty of Agricultural Management,
_____ **A. D. OSTAPCHUK**
"____" _____ 2023

«APPROVED»
at the meeting of the department
of Statistics and Economic Analysis
Record № 12 dated on " 28 " April 2023
Head of Department
_____ **I.D. LAZARUSHYNA**

«REWIEVED»
Program Coordinator
_____ **V.V. LUTSIAK**

PROGRAM OF THE COURSE

"Applied modeling"
Module: Econometrics

Specialty 073 "Management"
Educational program "Management"
Faculty of Agricultural Management
Developer **Olena BOHDANIUK**, Associate Professor of the Department of Statistics and Economic Analysis, PhD in Economics, Associate Professor

Kyiv – 2023

1. Description of the course
"Applied modeling"
Module: Econometrics

Field of knowledge, specialty, educational program, educational degree		
Educational degree	Bachelor	
Specialty	073 "Management""	
Educational program	"Management"	
Characteristics of the course		
Type	Compulsory	
Total number of hours	90	
Number of ECTS credits	3	
The number of structural modules	2	
Course project (work) (if applicable)		
Form of control	Exam	
Indicators of the course for full-time and part-time forms of study		
	Full-time form of study	Part-time form of study
Course (year of study)	2	
Semester	4	
Lecture classes	15 hours	
Practical, seminar classes	30 hours	
Laboratory classes	hours	
Self-study	45 hours	
Individual assignments	hours	
Number of weekly classroom hours for the full-time form of study	2.5 hours	

2. Purpose, tasks, and competencies of the course

The purpose is acquisition by the future specialist's knowledge of the methods of construction of economically mathematical models on macro and micro levels, abilities to utilize the proper mathematical vehicle in the decision of economic and administrative tasks and development of creative and analytical skills for economists and managers from a mathematical modeling, including usage of the personal computer for conducting of research.

Objectives:

- Current control of knowledge of students and mastering by them programmatic material a teacher which conducts employment from a course carries out. He is carried out in the process of conducting of practical and individual employments.

- During practical employments such controls are used: verbal questioning from Topics, certain plans practical employments, conducting of test control, by the evaluation of implementation of individual calculation tasks on the proper subject. Final control is carried out as examination (to the test) at the end of semester. At establishment of estimation effectiveness of current control, Master of Educational material is considered.

- The evaluation of results of capture of educational material a student takes a place considering the shown knowledge and carried out it is differentiated in accordance with the accepted Statute about the credit-module system of studies.

Competence acquisition:

Integrated competency (IC) Ability to solve complex specialized tasks and practical problems characterized by complexity and uncertainty of conditions, in the field of management or in the learning process, which involves the application of theories and methods of social and behavioral sciences.

General competencies (GC): **GC** 10 Ability to conduct research at the appropriate level.

Professional (special) competences (PC):

PC 3 The ability to determine the prospects for the organization's development.

Program learning outcomes (PLO):

PLO 6 Demonstrate the skills of searching, collecting, and analyzing information, calculating indicators to justify management decisions.

PLO 19 Demonstrate the ability to make independent decisions, develop enough alternative options, choose optimal solutions, and bear responsibility for their implementation.

PLO 20 The ability to solve complex, unpredictable tasks and problems in specialized areas of professional activity (agrarian sphere).

PLO 37 Ability to form budgets, forecasts and evaluate the management of internal and external logistics flows.

3.Structure of educational Discipline for:

– students of full-time education

Names of Modules and Topics	Number of hours												
	Full-time							Distance					
	W	Total	including					Total	including				
			L	Sem.	Pr.	Lab	Ind.w.		L	Sem.	Pr.	Lab	Ind.w.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Module 1 ***Methods of construction of general linear model***													
Topic 1. Subject, methods and objectives of discipline	1	1	1		-	-							
Topic 2. Methods of the general linear model	2-3	3	1		-	-	4						
Topic 3. Multicollinearity and its impact on the estimation of the model parameters	4-5	10	2	-	2	-	6						
Topic 4. Generalized least squares	6	7	1	-	2	-	4						
Topic 5. Econometric model of the dynamics	7	7	1		2		4						
Total for module 1		30	5		6	-	18						
Module 2 ***Empirical methods of quantitative analysis based on statistical equations***													
Topic 6. Empirical methods of quantitative analysis based on statistical equations	8-9	8	2	-	2		4						
Topic 7. Construction an econometric model with the autocollinearity remains	10-11	8	2	-	2		4						
Topic 8. Methods of instrumental variables	11-13	8	2	-	2		4						
Topic 9. Distributed lag models	14-15	6	1	-	1		4						
Total for module 2		30	10	-	14		6						
Total sum		90	15		30		60						

4. Topics of seminars

5. Topics of practical classes

№	Name of Topics	Number of hours
1	General view of a linear econometric model, its structure and stages of construction. Specification. Prerequisites for using the method of least squares (OLS 1). Properties of estimates, their characteristics.	2
2	The concept of the main principles of the classical correlation econometric analysis. The concept of multicollinearity, methods and characteristics of its identification.	2
3	The concept of heteroscedasticity and methods of its study. The impact of heteroscedasticity on the properties of parameter estimates. Generalized least squares method (Aitken method) estimates of the parameters of the linear econometric models with heteroscedastic residues.	2
4	Features of the econometric modelling based on time series. Trend model and methods to determine its parameters. The shape of the trend (linear, parabolic, hyperbolic, logical). Interpretation the parameters of the trend model. Graphic representation of the trend.	4
5	The advisability of the use in econometric calculations the statistical equations dependencies. The method of regression analysis and the method of statistical dependence equations. Comparison coefficients is the base of statistical equations dependencies.	2
6	The concept of autocorrelation. The nature and consequences of autocorrelation in econometric models. Check for autocorrelation. Durbin-Watson criterion.	2
7	Causes of correlation appearance between explanatory variables and residues. Estimation of model parameters using instrumental variables.	2
8	The concept of lag and lagged variables. Determination of the log coefficient. Building mutual correlation function and its graph. Building a distributed lag econometric models.	4
Total		30

6. Topics of lab classes

№	Name of Topics	Number of hours
1		-

7. Topics of self-study

№	Name of Topics	Number of hours
1	Methodological Principles of Statistics	2
2	Statistical observation	2
3	Summary and clustering statistics. Statistical tables	2
4	Generalizing statistical indicators	2
5	Analysis of series distribution	3
6	Concentration analysis, differentiation and similarity distributions	3
7	Sampling method	3

8	Statistical methods for measuring correlation	5
9	Analysis of the intensity dynamics	2
10	Time Series	2
11	Index method	2
12	Statistical Graphics	2
Total		**30**

8. Control questions, sets of tests for assessing the level of knowledge acquisition by students

Questions for writing control work and verbal questioning

1. **What the Econometrics is?** (is science which studies concrete quantitative conformities to the law and intercommunications of economic objects and processes by mathematical and statistical methods and models.)
2. **What the Economically-mathematical model is?** (is mathematical description of economic process or phenomenon with the purpose of its research and management. Among economically-mathematical models an important place is occupied by econometrical.)
3. **Which groups could be divided Econometrical methods?** (1) methods of evaluation of parameters of classic econometrical model using the method of the least squares (MLQ), their verification (checking of model for its accordance to that modeling process or object); 2) methods of evaluation of parameters of the generalized model, when some pre-conditions of the usage of method of MLQ are violated; 3) methods of evaluation of parameters of dynamic econometrical models, their verification; 4) methods of evaluation of parameters of econometrical models which are based on the basis of the system of simultaneous structural equalizations.)
4. **What is the main task of econometrical research?** (The main task of econometrical research is an evaluation of parameters and verification of meaningfulness of econometrical model which is carried out stage-by-stage)
5. **What stages of econometrical research you know?** (A specification of the model in a mathematical form. Estimation of model parameters. Checking of model for authenticity. Application of the developed models in prognostication)
6. **Describe the structure of Econometrics**. (econometrical methods; econometrical models of economic processes and phenomena)
7. **Tell us about elements of the mathematical model of object.** (description of the object which needs to be defined (unknown values) – vector $Y=(y_j)$; descriptions of external (concerning the modeled object) conditions which are changing – vector $X=(X_j)$; aggregate of object's internal parameters – A.)
8. **There are two groups of Mathematical models. What are they?** (structural; functional)
9. **To what models belong the Econometric model?** (functional models)
10. **Describe the main mandatory elements for the construction of econometric model**. (large enough aggregate of data observations; homogeneity of observations set; exactness of entrance information)
11. **The observation aggregate can be represented as a well-organized set (matrices) of data with the parameters *n, m, T.* What are they mean**? (*n* – number of aggregate units; *m* – number of signs which describe each unit; *T* – time interval during which the sign of certain supervision is studied)
12. **What are three methods of sample set forming ?**(temporal, when functioning of separate object is examined into the dynamics; - spatial, when the observation aggregate is studied in statics; - spatial-temporal, which is combination of spatial and temporal sample set)

13. **All errors are divided into two groups. What are they** (*systematic* and *random*)? **What is the difference between them** (The *systematic* errors have *permanent size, Random* errors are predetermined by influence of random factors during the indexes forming)?

NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENT SCIENCES OF UKRAINE			
"Bachelor"	Statistics and Economic Analysis department	**Ticket number 1** the discipline "Econometrics"	**Approved** Chief of Department of Statistics and Economic Analysis _____ (signature) prof. I.D.Lazarysnyna "____" 20

Examination task

I. Problem

If the coefficient of determination is evened 0,64, the coefficient of correlation is evened:

II. Theoretical question

Evaluation of model parameters with autocorrelation residues

III. Tests

1. Connection is substantial, if coefficient of correlation:

- (•) a. Greater 0,5
- ( ) b. Negative
- ( ) c. Positive

2. Autocorrelation of tailings - is

- ( ) a. The phenomenon is in econometrical research, when dispersion of rejections is different, and covariation of rejections is absent
- ( ) b. The phenomenon is in econometrical research, when dispersion of rejections is different, but observed covariation of rejections
- ( ) c. The phenomenon is in econometrical research, when dispersion of rejections permanent, and covariation of rejections is absent
- ( ) d. The phenomenon is in econometrical research, when dispersion of rejections is permanent, but observed covariation of rejections
- ( ) e. The phenomenon is in econometrical research, when dispersion of rejections is different, and here observed covariation of rejections

3. If the determinant of correlation equals to 1, it mean that:

- ( ) a. It is not possible to set
- ( ) b. there is complete multicollinearity
- ( ) c. multicollinearity is absent
- ( ) d. there is partial multicollinearity

4. In the presence of autocorrelation of the remains of estimation of model parameters can have the following results:

a. Estimates of the model parameters will be shifted, statistical criteria can not be used in the dispersion analysis, the ineffectiveness of the estimates of the parameters of the econometric model leads to ineffective predictions

b. Fade the accuracy of the estimation of parameters, the evaluation of the parameters become insignificant due to the presence of multicollinear explanatory variables, the estimation of parameters become sensitive to the volume of units of observation

c. Estimates of model parameters will be shifted, statistical criteria can not be used in the dispersion analysis.

5. Intercommunication of successive elements of sentinel or spatial data row is autocorrelation

Yes

No

6. Why is an accidental value introduced in an econometric model?

a. Because the investigated factors can not fully explain the change in the effective indicator

b. To apply statistical research methods

c. Because the random component has a quantitative dimension

7. At presence of heteroscedasticity in an econometric model, to estimate parameters a least-squares method, it is enough:

a. To change the specification of model

b. To convert information of entrances

c. To take deviation from middle

d. To standardize explanatory variables

8. The presence of heteroscedasticity is testified if:

a. If $R^* \neq F_{tabl}$

b. If $R^* < F_{tabl}$

c. If $R^* > F_{tabl}$

d. If $R^* = F_{tabl}$

9. The sum of tailings in correctly built model is evened:

a. It is not possible to define

b. 0

c. To any value from 0 to

d. 100%

e. To any value from -1 to 1

10. Criterion $\chi 2$ - Pearson can take value

a. Any positive numerical value

b. Any numerical value

c. Any negative numerical value

d. from -1 to +1

e. from 0 to

9. Teaching methods

Practical	Visual	Verbal	Working with book	Video- method
Experiments, exercises, training and productive work	Illustrations, demonstration, observation of students	Explanation, explanation, narration, conversation, instruction, lecture, discussion, debate	Reading	Viewing, Training, Exercises under the supervision of "electronic teacher" control

10. Forms of assessment

Control measures include current and final evaluation of student knowledge. Current control is carried out during practice and in the process of self-study in the following areas: rapid surveys, tests, tasks "right-wrong" problem.

11. Distribution of grades received by students

Evaluation of student knowledge is carried out on a 100-point scale and is converted to national grades according to Table 1 "Regulations and Examinations and Credits at NULES of Ukraine" (order on enactment of 26.04.2023, protocol No. 10)

Student rating, points	**National grade based on exam results**	
	Exams	**Credits**
90-100	**Excellent**	**Passed**
74-89	**Good**	
60-73	**Satisfactory**	
0-59	**Unsatisfactory**	**Not passed**

In order to determine the rating of a student (listener) in the discipline $\mathbf{R_{dis}}$ (up to 100 points), the rating from the exam $\mathbf{R_{ex}}$(up to 30 points) is added to the rating of a student's academic work $\mathbf{R_{aw}}$ (up to 70 points): $\mathbf{R_{dis} = R_{aw} + R_{ex}}$.

12. Educational and methodological support

1. Regulations.
2. Complex teaching of the discipline.
3. Methodological guidelines for independent study courses.
4. Methodological guidelines for writing a term paper.
5. Course: Econometrics ☑ (nubip.edu.ua)

13. Recommended literature

Main

1 . Наконечний С. І., Терещенко Т. О., Романюк Т. П. Економетрія: Підручник.2-е вид. доп. та перероб. К. : КНЕУ, 2020. 296 с.
2. Економетрика [Текст] : підруч. для студ. вищ. навч. закл.; [за ред. О. І. Черняка] ; Київ. нац. ун-т ім. Т. Шевченка. К. : ВПЦ "Київський університет", 2017. 359 с.
3. Економетрія (економетрика) [Текст] : навч. посіб. [для студ. заоч. форми навч. всіх екон. спец. ВНЗ] ; Терноп. нац. екон. ун-т. Т.: Підручники і посібники, 2018. 115 с.
4. Ілюстративний матеріал з навчальної дисципліни "Економетрика" для студентів галузі знань 0305 "Економіка і підприємництво" всіх форм навчання [Текст]. Харк. нац. екон. ун-т ; [уклад.: Прокопович С. В., Степуріна С. О., Чуйко І. М.]. Х. : Вид. ХНЕУ, 2017. 30 с.

Additional

6. Гур'янова Л. С. Моделювання збалансованого соціально-економічного розвитку регіонів : монографія. Харків. нац. екон. ун-т. - Бердянськ: Ткачук О.В., 2016. 405 с.
7. Лугінін О. Є. Економетрика : навч. посіб. Херсон : ОЛДІ-ПЛЮС, 2018. 319 с.
8. Козьменко О. В. Економіко-математичні методи та моделі (економетрика) : навч. посіб. AdditionalСергієнко, С. В. Прокопович; Харків. нац. екон. ун-т ім. С. Кузнеця. Харків : ХНЕУ ім. С. Кузнеця, 2015. 383 с.