Educational establishment
«Belarus State Economic University»

APPROVED
Rector of Educational establishment
«Belarus State Economic University»
_____ V.N. Shimov
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Registration No UD 3660-19 / st.

ECONOMETRICS (ADVANCED LEVEL)

Syllabus for Master's program
1-25 81 06 «Accounting, analysis and audit»

2019

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RECOMMENDED FOR APPROVAL BY:

Department of Economic Informatics of educational establishment «Belarus State Economic University»
(minutes № 7 on «22» 04 2019);

The scientific-methodical Council of the educational establishment «Belarus State Economic University»
(minutes № 3 on «20» 02 2019).

EXPLANATORY NOTE

Econometrics (Advanced Level) studies quantitative and qualitative relationships between objects, processes and phenomena of the economic sphere at micro- and macrolevels based on the methods of mathematical statistics.

The purpose of educational discipline «Econometrics (Advanced Level)» is studying methods for constructing and evaluating econometric models for their further practical application in the applied field.

Tasks of educational discipline «Econometrics (Advanced Level)»:

- to form an idea of the importance of econometric research at the enterprise level and for the economy as a whole;
- to master the theoretical prerequisites for econometric analysis and acquire practical skills in the construction and evaluation of econometric models;
- to familiarize with the basic approaches to forecasting on the basis of econometric models.

Master should have the following professional competencies, should be able to:

- PC-2. Search, analyze and evaluate the sources of information for conducting economic calculations.
- PC-3. Estimate the effectiveness of projects taking into account a random factor.
- PC-11. Prepare tasks and develop project solutions under a random factor.
- PC-13. Apply the latest software and technology tools to work with statistical information.
- PC-25. Apply methods of analysis and organization of innovation implementation.

As a result of studying «Econometrics (Advanced Level)» master student must

know:

- types of econometric models and methods of their construction;
- methodology of specification, identification and verification of econometric models;
- methods for estimating the model parameters;
- probabilistic and statistical methods for estimating the random component of the model;
- criteria for estimating regression parameters under violation of the basic assumptions of the Ordinary Least Squares;
- main problems of econometric modeling of economic objects, processes and phenomena;

be able to:

- justify the choice of econometric models of analysis and forecasting of economic processes and phenomena at macro, meso- and micro levels;
- build econometric models on the basis of time series, cross-sectional and space and space-time data;

- estimate the parameters of the model as a whole, interpret their economic meaning;
- identify and eliminate from the econometric models the distorting effects associated with the noisiness of empirical data, the multicollinearity of exogenous variables, the autocorrelation of the levels of indicators of dynamic series, the heteroscedasticity of random residuals;

have skills:

- of application of general purpose software;
- of performing calculations using special software.

The study of «Econometrics (Advanced Level)» assumes that students know the main concepts of mathematical statistics, elements of probability theory, the basic course of econometrics, economic theory, macroeconomic analysis and information technologies.

The knowledge control is carried out with practical tests and tests on personal computer.

In accordance with the curriculum of the specialty 1-25 81 06 «Accounting, analysis and audit» the course consist of 72 academic hours, including 36 classroom hours. Distribution by occupation is the following: lectures – 10 hours; practical classes – 16 hours; laboratory classes – 10 hours. Form of the current certification is a credit.

THE CONTENT OF EDUCATIONAL MATERIAL

Topic 1. Multiple linear regression

The concept of multiple linear regression. Selection of independent variables for building of multiple linear regression. Multicollinearity of explanatory variables and its elimination. Goodness-of-fit of the multiple linear regression model. Estimation of the parameters of the multiple linear regression model. Properties of the multiple linear regression estimates. The Gauss-Markov theorem for multiple linear regression. Economic interpretation of the significant parameters of the multiple linear regression. Applications of the multiple linear regression model.

Topic 2. Nonlinear regression

Classification of nonlinear regression models. Simple and multiple nonlinear regression models which can be reduced to linear ones. Estimation of the parameters of nonlinear regression models. Applications of nonlinear regression models.

Topic 3. Econometric analysis under violation of the assumptions for building a classical regression model

Heteroscedasticity: the causes and consequences. Methods to identify heteroscedasticity. Generalized least squares. Autocorrelation: definition, causes and consequences. Criteria for estimating autocorrelation. Generalized simple and multiple linear regression models autocorrelated residuals. Examples of solving the applied problems with generalized linear models.

Topic 4. Regression models with variable structure

Dummy variable. The application of the least squares method for estimating the parameters of a model with dummy variables. Applications of the regression model with dummy variables.

Topic 5. Systems of econometric equations

The concept and classification of systems of econometric equations. Structural and reduced forms of the model. Identification problem. Identifiable, non-identifiable, overidentified models. Estimation of the parameters of the structural model: indirect least squares, two-step least squares, three-step least squares, maximum likelihood method. Application of the principal component method for eliminating multicollinearity. Examples of practical application of the systems of econometric equations.

Topic 6. Stationary time series

Random processes, characteristics of random processes, stationarity of the time series in a broad and narrow sense. The concept of trend. Seasonal component. Cyclic component. Random component. Stationary time series. Examples of stationary time series. Autocorrelation and partial autocorrelation functions of a stationary time series, correlograms. Definition and properties of the autoregressive model AR (p). Definition and properties of moving average model MA (q). Application of the invertibility condition to MA (q). The mixed process ARMA (p,q): stationarity and reversibility properties. Methods for constructing and testing of ARMA (p,q) models. Applications of stationary time series.

Topic 7. Nonstationary time series

Nonstationary time series. Classification and general characteristics of nonstationary time series models. Models of time series with deterministic trend and methods of their construction. Definition and properties of the ARIMA model. Construction and testing of the ARIMA model based on the Box-Jenkins approach. Features of the construction of seasonal model ARIMA. Forecasting economic indicators based on the ARIMA model.

Topic 8. Method of singular spectral analysis of the processing of one-dimensional time series

Chaotic time series of economic indicators. Quasiperiodic time series. Methods for determining the hidden cycle. The method of singular spectral analysis and its algorithm.

EDUCATIONAL-METHODICAL DISCIPLINE MAP «ECONOMETRICS (ADVANCED LEVEL)»
FOR THE FULL-TIME FORM OF MASTER EDUCATION FOR MASTER'S PROGRAMS
1-25 81 06 «ACCOUNTING, ANALYSIS AND AUDIT»

Topic's number	Topic	The number of classroom hours						Other*	Form of the knowledge control
		Lectures	Practical lessons	Seminars	Laboratory lessons	The number of control independent work hours			
						Lectures	Seminars		
1	Multiple linear regression		2					[1-7, 9, 11-12]	Control practical task
2	Nonlinear regression	2			2			[1-7, 9, 11-12]	Control practical task
3	Econometric analysis under violation of the assumptions for building a classical regression model	2	2					[1-7, 9, 11-12]	Control practical task
4	Regression models with variable structure		2		2			[1-7, 9, 11-12]	Test
5	Systems of econometric equations	2	2		2			[2-5, 11-12]	Test
6	Stationary time series	2	2		2			[2-4, 7-8, 10]	Control practical task
7	Nonstationary time series	2	2		2			[2-4, 7-8, 10, 13]	Test
8	Method of singular spectral analysis of the processing of one-dimensional time series		4					[2-4, 7-8, 10]	Test
	Total hours	**10**	**16**		**10**				**Credit**

* section «Other» consists of references in square brackets.

INFORMATIONAL AND METHODOLOGICAL PART

Methodical recommendations on the organization of master students independent work in academic discipline «Econometrics (Advanced Level)»

An important stage of the studying of the educational discipline is independent work of master students. Budget of the time for independent work is recommended as, on average, 1,5-2 per 2-hours classroom lesson.

The main directions of the master student independent work are:

- Initially a detailed acquaintance with the program of the educational discipline;
- acquaintance with the list of recommended references on the educational discipline in general and its sections, the study of necessary literature on the topics of the syllabus, the selection of necessary information in additional literature;
- preparation for practical and laboratory classes;
- preparation for the implementation of diagnostic monitoring forms (control practical tasks, tests);
- preparation for credit or exam.

References

Basic:

1. Wooldridge, J.M. Introductory Econometrics: A Modern Approach / J.M. Wooldridge. – 6th Edition, 2016. – 912 p.
2. Verbeek, M. A Guide to Modern Econometrics / M. Verbeek. – 5th Edition, 2017. – 520 p.
3. Brooks, Ch. Introductory Econometrics For Finance / Ch. Brooks. – 2019. – 750 p.
4. Ruppert, D. Statistics and Data Analysis for Financial Engineering / D. Ruppert, D. S. Matteson. – 2nd Edition, 2015. – 719 p.

Additional:

5. Davidson, R. Econometrics Theory and Methods / R. Davidson, J.G. MacKinnon. – Oxford University Press, 2009. – 768 p.
6. Greene, W.H. Econometric Analysis / W.H. Greene. – 7th Edition. – Prentice Hall, 2011. – 1232 p.
7. Berndt, E.R. The Practice of Econometrics: Classic and Contemporary / E.R. Berndt. – Addison-Wesley Publishing Company, 1996. – 702 p.
8. Tsay, R.S. Analysis of Financial Time Series / R.S. Tsay. – 3d Edition, 2010 – 720 p.
9. Kennedy, P. A Guide to Econometrics / P. Kennedy. – 6th Edition. – Willey-Blackwell, 2008. – 600 p.

10. Enders, W. Applied econometrics time series / W. Enders. – 2nd Edition. – N.Y.: J. Wiley&Sons, 2004. – 472 p.
11. Ruud, P.A. An Introduction to Classical Econometric Theory / P.A. Ruud. – Oxford University Press, 2000. – 976 p.
12. Hayashi, F. Econometrics / F. Hayashi. – Princeton University Press, 2000. – 690 p.
13. Tsay, R.S. Multivariate Time Series Analysis: With R and Financial Applications / R.S. Tsay. Wiley, 2013 – 1789 p.

MINUTES OF SYLLABUS ENDORSEMENT

Title of the academic discipline with the current discipline should be endorse	Department	Suggestions of changes in the syllabus content	Decision of the department (with the number and date of the minutes)
Audit and related services	Department of Accounting, analysis and audit in the sectors of the national economy	No suggestions	Minutes №_____ «____»_____201__
Financial management	Department of Accounting, analysis and audit in the sectors of the national economy	No suggestions	Minutes №_____ «____»_____201__

SYLLABUS ADDITIONS AND CHANGES

in _____/_____ academic year

№	Additions and changes	Reasons

Syllabus is re-considered and approved on the meeting of the department of economic informatics (minutes № ____ on _____ 20___)

Head of the department
Ph.D. (Economics), Associate Professor _____ A.M. Zenevich

APPROVE
Director of the Institute
of Masters Programs
Ph.D. (Economics), Associate Professor _____ O.A. Morozevich