БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ /
BELARUSIAN STATE UNIVERSITY

УТВЕРЖДАЮ / APPROVED

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государственного университета/
Rector of Belarusian State University

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27.06.2025

Регистрационный/Registration №3166/m.

СТАТИСТИЧЕСКОЕ МОДЕЛИРОВАНИЕ И АНАЛИЗ ДАННЫХ В ЭКОНОМИКЕ И ФИНАНСАХ/

STATISTICAL MODELING AND ANALYSIS OF DATA IN ECONOMICS AND FINANCE

Учебная программа учреждения образования по учебной дисциплине для специальности:

The programof the educational institution of the discipline for the speciality:

Специальность / Speciality:

7-06-0533-05 Прикладная математика и информатика /

7-06-0533-05 Applied Mathematics and Computer Science

Профилизация / Profilization:

Компьютерный анализ данных / Computer Data Analysis

2025

Учебная программа составлена на основе ОСВО 7-06-0533-05-2023 и учебного плана № М53а-5.3-115/уч. от 11.04.2023.

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ПОЯСНИТЕЛЬНАЯ ЗАПИСКА

Статистические модели экономических и финансовых процессов называются эконометрическими моделями, а методы анализа экономических и финансовых процессов – эконометрическими методами. Эконометрические модели и методы используются для решения таких актуальных задач, как: причинно-следственный анализ, прогнозирование и оптимизация принятия решений в экономике и финансах. Это определяет необходимость их изучения и практического освоения специалистами в области компьютерного анализа данных в рамках дисциплины «Статистическое моделирование и анализ данных в экономике и финансах».

Цель и задачи учебной дисциплины

Цельдисциплины «Статистическое моделирование и анализ данных в экономике и финансах» – изучение методов и программных средств эконометрического анализа, моделирования и прогнозированияреальных процессов на основе экономических и финансовых данных.

Задачи дисциплины:

1) изучение теоретических основ эконометрического моделирования, анализа и прогнозирования экономических и финансовых процессов;

2) освоение навыков построения типовых эконометрических моделей с использованием модельных данных и современных эконометрических программ;

3) приобретение навыков построения эконометрических моделей реальных экономических и финансовых процессов, а также их использование для анализа причинно-следственных связей между экономическими переменными, прогнозирования и оптимизации экономических решений.

Место учебной дисциплины в системе подготовки специалиста с высшим образованием.

Учебная дисциплина относится к дисциплинам по выборумодуля «Математические методы для анализа данных»компонента учреждения образования.

Учебная программа составлена с учетом междисциплинарных связей и программ по дисциплинам: «Многомерный статистический анализ», «Математическое и компьютерное прогнозирование».

Требования к компетенциям

Освоение учебной дисциплины «Статистическое моделирование и анализ данных в экономике и финансах» должно обеспечить формирование следующих компетенций:

Специализированныекомпетенций:

Применять известные модели данных, модифицировать их, а также методы в экономике и финансах.

В результате изучения дисциплины студент должен:

знать:

– методы оценки и проверки адекватности регрессионных моделей при выполнении и нарушении традиционных модельных предположений;

– методы построения и тестирования моделей стационарных экономических временных рядов ARMA;

– методы построения моделей временных рядов с детерминированными и стохастическими трендами, а также структурными и сезонными изменениями;

– методы сезонной корректировки экономических временных рядов, а также методы разложения временного ряда на трендовую, сезонную и циклическую составляющие;

– методы построения моделей ARIMA и SARIMA нестационарных временных рядов со стохастическими трендами и сезонными изменениями и их применение для прогнозирования макроэкономических показателей;

– методы построения моделей финансовых временных рядов с условной гетероскедастичностью ARCH, GARCH, ARIMA-GARCH и их применение для прогнозирования доходности и риска на финансовых рынках;

– методы проверки коинтеграции экономических временных рядов и построения моделей коррекции ошибок для макроэкономических показателей;

– методы прогнозирования и оценки точности прогнозов на основе эконометрических моделей;

уметь:

– строить основные типы эконометрических моделей экономических и финансовых процессов;

– анализировать адекватность построенных эконометрических моделей;

– применять эконометрические модели для анализа причинно-следственных связей между экономическими переменными;

– прогнозировать значения экономических переменных и выбирать варианты экономических решений на основе экспериментов с моделью;

иметь навыки:

–эконометрического анализа, моделирования и прогнозирования;

– построенияи применения эконометрических моделей с использованием статистического и эконометрического программного обеспечения;

– экономического анализа на основе результатов эконометрического моделирования.

Структура учебной дисциплины

Дисциплина изучается в 3-м семестре. В соответствии с учебным планом на изучение учебной дисциплины «Статистическое моделирование и анализ данных в экономике и финансах» для очной формы обучения отведено – 198 часов, в том числе 66 аудиторных часов, из них: лекции – 22 часа, практические занятия – 22 часа, семинарские занятия – 22 часа.

Трудоемкость учебной дисциплины составляет 6 зачётных единиц.

Форма промежуточной аттестации – экзамен.

EXPLANATORYNOTE

Statistical models of economic and financial processes are called econometric models, and methods of analysis of economic and financial processes are called econometric methods. Econometric models and methods are used to solve such topical problems as: cause-and-effect analysis, forecasting and optimization of decision-making in economics and finance. This determines the need for their study and practical mastery for specialists in the field of computer data analysiswithin the frame of the discipline«Statistical Modeling and Analysis of Data in Economics and Finance».

Aim and tasks of the discipline

Aimof the discipline«Statistical Modeling and Analysis of Data in Economics and Finance»–study the methods and software tools of econometric analysis, modeling and forecasting of realprocesses based on economic and financial data.

Tasks of the discipline:

1) study of the theoretical foundations of econometric modeling, analysis and forecasting of economic and financial processes;

2) mastering the skills of constructing typical econometric models using model data and modern econometric software;

3) acquisition of skills of constructing econometric models of real economic and financial processes, as well as the use of models for the analysis of cause-and-effect relationships between economic variables, forecasting and optimization of economic decisions.

The place of the academic discipline in the system of training a specialist with higher education.

The academic discipline belongs to the "Elective courses" of the module "Mathematical methods for data analysis"of the educational institution component

The curriculum is compiled taking into account interdisciplinary connections and programs in the disciplines: "Multivariate statistical analysis", "Mathematical and computer forecasting".

Requirements for competencies

Mastering the academic discipline "Statistical Modeling and Analysis of Data in Economics and Finance" should ensure the formation of the following competencies:

Specialcompetencies:

To apply known data models, and to modify them as well as methods in economics and finance.

As a result of studying the discipline, the student should:

know:

– methods of estimation and testing the adequacy of regression models when traditional model assumptions are met and violated;

– methods of constructing and testing models of stationary economic time series ARMA;

– methods of constructing models of time series with deterministic and stochastic trends, as well as structural and seasonal changes;

– methods of seasonal adjustment of economic time series, as well as methods of decomposing a time series into trend, seasonal and cyclical components;

– methods of constructing ARIMA and SARIMA models of nonstationary time series with stochastic trends and seasonal changes and their application to forecasting macroeconomic indicators;

– methods of constructing models of financial time series with conditional heteroscedasticity ARCH, GARCH, ARIMA-GARCH and their application to forecasting the rate of return and risk in financial markets;

– methods for testing cointegration of economic time series and constructing error correction models;

– methods for forecasting and evaluation the accuracy of forecasts based on econometric models;

be able to:

– construct the main types of econometric models of economic and financial processes;

– analyze the adequacy of the constructed econometric models;

– apply econometric models to analyze cause-and-effect relationships between economic variables;

– forecast the values of economic variables; construct and select options for
economic decision based on experiments with the model;

have skills in:

– econometric analysis, modeling and forecasting;

– constructing and application econometric models using econometric software;

– economic analysis based on the results of econometric modeling.

Structure of the academic discipline

The discipline is studied in the 3rd semester. In accordance with the curriculum, a total of 198 hours are allocated for studying the academic discipline "Statistical Modeling and Analysis of Data in Economics and Finance" for full-time higher education, including 66 classroom hours, of which: lectures – 22 hours, practical classes – 22 hours, seminars – 22 hours.

The labor intensity of the discipline is6 credit units.

Form of certification – exam.

CONTENTOFTHESTUDYMATERIAL

Section 1 Statistical approach in economic and finance data analysis.

Topic 1.1.Introduction to statistical analysis and modeling of economic and financial data.

Principles and general scheme of statistical analysis and modeling of economic and financial data. Data types.Cross-sectional data. Time series. Panel data. Classification of tasks and methods of data analysis.

Topic 1.2. Econometricmodeling approach.

Concepts of econometrics and econometric model. General scheme of econometric modeling.Economic theory and econometric models. Classification of econometric models. Statistical and econometric software.

Section 2.Probabilistic models of economic data and their preliminary analysis

Topic 2.1.Basic probability distributions in economic researches.

Probability distributions of the economic variables. Distributions of test statistics.

Topic 2.2.Preliminary statistical analysis of data distributions.

Descriptive statistical analysis.Preliminary graphical analysis.

Section 3.Statistical estimation and testing hypothesis.

Topic 3.1. Statistical parameter estimates and their properties.

Statistical estimation methods. Estimation of numerical and functional characteristics.

Topic 3.2. Statistical testing hypothesis.

Principles of statistical hypothesis testing. General forms of statistical criteria. Testing distribution of random sample.

Section 4.Regression analysis of economic and financial data.

Topic 4.1. General Linear Statistical Model (GLSM) and its special cases.

Simple and Multiple linear regression model. Dynamic linear regression model.

Topic 4.2. Least Square Method of estimation (LS) in traditional assumptions.

Deterministic assumptions. Stochastic assumptions.TheLS-estimates for regression coefficients and for variance of residuals. Statistical properties of LS-estimates.

Topic 4.3. Testing the adequacy of regression models.

Test statistics R^2,*RSS*, *SER*. Testing the statistical significance for a single regressor using *t* and *F*-statistics.

Topic 4.4. Analysis of the model's residuals.

Autocorrelation analysis using Durbin – Watson (*DW*) statistic. Normal distribution analysis for residuals.

Topic 4.5. Choosing the best model using information statistics.

Parsimony principal. Using *AIC, SIC, HQ* statistics.

Topic 4.6. Regression forecasting

The predictive form of the regression models. Static and dynamic forecasts. Forecast accuracy characteristics *RMSE, MAD, MAPE,* Theil Coefficient and their analysis.

Section 5.Economic time series models: classificationand typical features.

Topic 5.1. Classification of economic time series models.

Stationary and nonstationary time series.Trend stationary time series (TS-models). Difference stationary time series (DS-models).

Topic 5.2. Typical structure of economic time series models.

Deterministic and stochastic trends. Seasonal and cycle changes. Structural breaks and outliers. Residual stochastic component.

Topic 5.3. Seasonal adjusted and decomposition of economic time series.

Seasonal adjusted method TRAMO/SEATS.Cycle extractionHodrick – Prescott method.

Section 6.Stationary time series analysis, modeling and forecasting.

Topic 6.1. Stationary time series and their characteristics.

Mean, varianceand autocorrelation function of stationary time series. The*ACF* and*PCF*statistics. Correlograms analysis.

Topic 6.2. Main types of stationary time series models.

Autoregressive models AR(*p*). Moving average models MA(*q*). Autoregressivemoving average model ARMA(*p*,*q*). Stationary and Invertible properties.

Topic 6.3. Estimation and testing the adequacy of TS-models.

Using LS and Nonlinear LS methods. Testing parameters for statistical significance. Analysis of residuals. Testing for autocorrelation, heteroscedasticity and normal distribution of residuals. TS-models with seasonal changes and structural breaks. Dummies variables. Bai – Perron estimation method.

Section 7.Autoregressive integrated moving average model ARIMA. Box–Jenkins approach.

Topic 7.1.DS-models and integrated time series. ARIMA-model.

Simple differences. Difference stationary model (DS-model). Integrated time series and ARIMA(*p,d q*) model.

Topic 7.2. Box–Jenkins approach.

Unit root tests. ADF-rest. BPUR-test. DS-models with structural changes.

Topic 7.3. Seasonal ARIMA models SARIMA.Box – Jenkins approach.

Seasonal differences. Additive and multiplicative seasonality. Using log transformation. Seasonal AR and MA components. Estimation and testing of the SARIMA(*p,d q; P,D,Q*) model. Forecasting based on the SARIMA model.

Section 8. Time series models with heterogenous volatility.

Topic 8.1. Models with unconditional heteroscedasticity.

The concept of unconditional heteroscedasticity. Causes and types of unconditional heteroscedasticity. Methods for constructing time series models with unconditional heteroscedasticity.

Topic 8.2. Autoregressive conditional heteroscedasticitymodel ARCH. Effects of conditional heteroscedasticity. ARCH and GARCH models. Methods for testing conditional heteroscedasticity. Constructing ARCH, GARCH models.

Topic 8.3. Forecasting of financial marketsbased on ARIMA-GARCH model.

Modeling and analysis of financial markets based on ARIMA-GARCH model. Forecasting of financial markets returns and volatility using ARMA-GARCH models.

Section 9. Cointegrated time series and error correction model.

Topic 9.1. Cointegration and error correction mechanism.

Spurious regression and cointegration. Cointegrated time series and error correction mechanism.

Topic 9.2. Error correction model and Engle – Granger approach.

Error correction model. Long-term dependence. Short-term dependence. The case of a single cointegration equation. Methods for estimating the cointegration

equation.Engle – Granger approach. Cointegration tests. Forecasting based on the error correction model.

TEACHING AND METHODOLOGICAL MAP OF THE DISCIPLINE

Full-time form of higher education with the use of distance learning technologies (DLT)

Title of section, topic	Title of section, topic	In-class hours					Independent work	Form of control
		Lectures	Workshops	Seminar classes	Laboratory classes	Other		
1	2	3	4	5	6	7	8	9
1	**Statistical approach in economic and finance data analysis**	**2**						
1.1	Introduction to statistical analysis and modeling of economic and financial data.	1						Interview.
1.2	Econometric modeling approach.	1						Interview.
2	**Probabilistic models of economic data and their preliminary analysis**	**2**	**1**					
2.1	Basic probability distributions in economic researches.	1						Interview.
2.2	Preliminary analysis of data distributions in economic researches.	1	1					Interview.
3	**Statistical estimation and testing hypothesis**	**2**						
3.1	Statistical parameter estimates and their properties	1						Interview.
3.2	Statistical testing hypothesis.	1						Interview.
4	**Regression analysis of economic and financial data**	**4**	**3**	**4**				

4.1	General Linear Statistical Model (GLSM) and its special cases.	1		1				Interview.
4.2	Least Square Method of estimation (LS) in traditional assumptions	1		1				Interview.
4.3	Testing the adequacy of regression models.	1	1					Oral survey.
4.4	Analysis of the model's residuals.	1	1					Report on the work-shop task.
4.5	Choosing the best model using information statistics.			2				Interview.
4.6	Regression forecasting.		1					Oral survey.
5	**Economic time series models: classification and typical features**	**2**	**4**	**4**				
5.1	Classification of economic time series models.	1						Oral survey.
5.2	Typical structure of economic time series models.	1	2					Individual tasks.
5.3	Seasonal adjusted and decomposition of economic time series.		2	4				Report on the work-shop task.
6	**Stationary time series analysis, modeling and forecasting**	**2**	**4**	**2**				
6.1	Stationary time series and their characteristics.	1						Individual tasks.
6.2	Main types of stationary time series models.	1	2	2				Oral survey.

6.3	Estimation and testing the adequacy of TS-models		2					Report on the workshop task.
7	**Autoregressive integrated moving average model ARIMA. Box – Jenkins approach**	**2**	**4**	**4**				
7.1	DS-models and integrated time series. ARIMA-model.	1						Individual tasks
7.2	Box–Jenkins approach.	1	2	2				Report on the work-shop task.
7.3	Seasonal ARIMA models SARIMA. Box – Jenkins approach.		2	2				Report on the workshop task.
8	**Time series models with heterogenous volatility**	**2**	**4**	**4**				
8.1	Models with unconditional heteroscedasticity.			2				Review
8.2	Autoregressive conditional heteroscedasticity model ARCH	2	2					Individual tasks
8.3	Forecasting of financial markets based on ARIMA-GARCH model.		2	2				Report on the workshop task
9	**Cointegrated time series and error correction model**	**4**	**2**	**4**				
9.1	Cointegration and error correction mechanism.	2	1	2				Individual tasks
9.2	Error correction model and Engle – Granger approach.	2	1	2				Report on the workshop task
TOTAL		**22**	**22**	**22**				

INFORMATION AND METHODOLOGICAL PART

List of basic literature

1. Consoli, S. Data Science for Economics and Finance. Methodologies and Applications / S. Consoli, D. Reforgiato Recupero, M. Saisana // Springer, 2021. –355 p. –[Электронный ресурс]. – Режим доступа: https://link.springer.com/book/10.1007/978-3-030-66891-4.
2. Greene, W. Econometric Analysis. 8th Edition / W. Greene // Pearson Education Limited, London, 2018. – 1126 p. – [Электронныйресурс]. – Режимдоступа: https://api.pageplace.de/preview/DT0400.9781292231150_A39514649/preview-9781292231150_A39514649.pdf
3. Stock, J.H. IntroductiontoEconometrics /J.H.Stoc, M.W.Watson // Global-EditionPearsonEducationLimited. 2020. – 779 p. – [Электронный ресурс]. – Режим доступа:https://www.sea-stat.com/wp-content/uploads/2020/08/James-H.-Stock-Mark-W.-Watson-Introduction-to-Econometrics-Global-Edition-Pearson-Education-Limited-2020.pdf
4. Tsay, R.S. Analysis of Financial Time Series, Third Edition/ R.S. Tsay // Wiley-Interscience, 2010, 683 p. – [Электронныйресурс]. – Режимдоступа: https://cpb-us-w2.wpmucdn.com/blog.nus.edu.sg/dist/0/6796/files/2017/03/analysis-of-financial-time-series-copy-2ffgm3v.pdf
5. Магнус, Я. Р. Эконометрика. Начальный курс : [учебник] / Я. Р. Магнус, П. К. Катышев, А. А. Пересецкий. - 9-е изд., испр. - Москва : Издательский Дом "Дело" РАНХиГС, 2021. - 503 с.

List of additional literature

1. EViews Tutorials. Электронный ресурс:https://www.eviews.com/Learning/index.html
2. EViews 11Getting Started, Электронныйресурс: https://www.eviews.com/download/EViews%2011%20Getting%20Started.pdf
3. Malugin, V.I. The Securities Market: Quantitative Methods of Analysis. Moscow: Delo, 2003, 320 p. (in Russian)
4. Malugin, V.I. Methods of Analysis of Multivariate Econometric Models with Heterogeneous Structure. Minsk: BSU, 2014, 351 p. (in Russian)
5. Kharin, Yu.S. Econometric Modeling / Yu.S. Kharin, V.I. Malugin, A.Yu. Kharin – Minsk: BSU, 2003, 318 p. (in Russian)

List of recommended diagnostic tools and methodology for final mark formation

The object of diagnostics of students' competences is the knowledge and skills acquired as a result of studying the academic discipline. Identification of studentslearning achievements is carried out by means of current and interim certification.

The following means of current certification can be used to diagnose competences:

- Interview,
- Oral survey,
- Individual task,
- Report on the workshop (practical classes) task.

The form of interim certification in the discipline "Statistical Modeling and Analysis of Data in Economics and Finance" in accordance with the curriculum is an exam.

A rating system of the student knowledge is used for the final mark formation, which makes it possible to trace and evaluate the dynamics within the process of achieving learning objectives. The rating system stipulates the use of weighting coefficients for current and interim certification of students in the academic discipline.

The final mark formation in the course of control measures for current certification (approximate weighting coefficients determining the contribution of current certification to the mark for passing interim certification) includes:

– performance of interview – 20 %;

– performance of oral survey– 20 %;

– performance of individual tasks – 20 %;

– report on the workshop task – 40 %.

The final mark for the discipline is calculated on the basis of the mark of current certification (rating system of knowledge) –60 % and end-of-term exam mark –40 %.

Approximate list of practical(workshop) classes

Class № 1. Preliminary analysis of data distributions in economic researches.

Class № 2. Testing the adequacy of regression models and analysis of the model's residuals.

Class № 4. Regression forecasting and choosing the best model using information statistics.

Class № 5. Seasonal adjusted and decomposition of economic time series.

Class № 6. Estimation and testing the adequacy of TS-models with structural breaks and seasonal changes.

Class № 7. Construction of the DS-models with structural changes.

Class № 8. Construction of the SARIMA model using the Box-Jenkins approach.

Class № 9. Forecasting of financial markets based on ARIMA-GARCH model.

Class № 10. Testing spurious regression and cointegration.

Class № 11. Construction of the error correction model using Engle – Granger approach.

Approximate topics of seminar classes

Class № 1.Basic probability distributions in economic researches.

Class №2. Statistical methods for parameter estimation and hypothesis testing.

Class №3. Least Square Method of OLSM estimation in traditional assumptions.

Class № 4. Choosing the best model, using information statistics.

Class № 5. Seasonal adjusted and decomposition of economic time series.

Class № 6.Main types of stationary time series models: AR, MA, ARMA.

Class № 7. Unit root tests. ADF-test. BPUR-test.

Class № 8. Construction of the TS-model with multiple structural breaks using Bai – Peron approach.

Class № 9. Forecasting of stock markets based on ARIMA-GARCH models.

Class 10. Analysis of business cycles using TRAMO/SEATS and Hodrick – Prescott methods.

Class № 11. Construction of the error correction model in macroeconomic researches.

Description of innovative approaches and methods for teaching the discipline

When organizing the educational process, a practice-based approach is used,which entails the following:

– mastering the educational content through solving practical tasks;

– acquiring skills for effective performance in various types of professional activities;

– orientation towards idea generation, implementation of students' group projects, development of business culture;

– use of evaluation procedures, assessment methods, indicating the formation of professional competences.

Methodological recommendations for the organization of independent work

Independent work for the purpose of studying the material of the academic discipline involves working with recommended educational literature and Internet resources. Theoretical information is consolidated by completing laboratory assignments, during which one should be guided by the methodological developments posted in the electronic library of the university and on the educational portal. Additional assignments (tests, assignments for independent completion) may also be offered for self-assessment and deeper assimilation.

Approximate list of questions for the exam

1. General characteristics of statistical analysis and modeling problems in economic and finance.
2. General form of econometric models and main stages of their building.
3. The main purposes and tasks of econometric modeling.
4. Typical structure of economic and financial time series model.
5. Decomposition of economic time series model.
6. Stationary time series models and their properties.
7. Autocorrelation analysis of time series based on the of autocorrelation (AC) and partial autocorrelation (PAC) functions.
8. Autoregressive models AR(p): properties and stationarity condition.
9. Moving average models MA(q): properties and invertibility condition.
10. ARMA(p,q) models and their properties.
11. Identification of ARMA model based on AC and PAC functions and correlograms.
12. Regression models and traditional model assumptions.
13. OLS estimates of regression and autoregressive models.
14. The problem of the statistical and economic adequacy of econometric models.
15. Determination coefficient and its properties. Adjusted determination coefficient.
16. Durbin – Watson statistic and its application.
17. Information statistical criteria AIC, SC, HQC and their application.
18. Analysis of statistically significant of the parameter's estimates based on t-criterion.
19. Analysis of the model adequacy based on F-criterion.
20. The form of statistical criteria based on P-value.
21. Autocorrelation analysis of the model residuals based on correlograms and Q-statistic.
22. Analysis of residual heteroscedasticity using the White test.
23. Analysis of the random values distribution based on goodness-of-fit tests.
24. Analysis of the normality of the residual's distribution based on Jarcques – Bera test.
25. Time series models with deterministic trends and methods for their construction.TS-models
26. Seasonal smoothing methods of economic and financial time series.
27. Use of the Hodrick-Prescott statistical filter to extract the economic cycle.
28. Structural changes in econometric models. Examples of linear trend models with structural changes.

29. Using dummy variables in time series with deterministic trend and structural changes.
30. Using seasonal dummy variables in time series with deterministic trend and seasonal changes.
31. Nonstationary time series models with stochastic trends. DS-models.
32. Simple and seasonal differencing operators and their application.
33. Building DS-models with structural changes.
34. Integrated time series models. Definition and properties of the ARIMA model.
35. Building ARIMA models based on the Box – Jenkins approach. Testing the adequacy of the ARIMA model.
36. Building seasonal ARIMA models.
37. Unit root ADF-test and BPUR-test.
38. Conditional heteroscedasticities effects in financial time series.
39. Conditional heteroscedastic models ARCH and GARCH and there building.
40. ARCH LM heteroscedastic test.
41. Spurious regression and cointegration.
42. Error correction mechanism. Long-run and Short-runrelationships.
43. Engle – Granger Cointegration test
44. Construction of an Error Correction Model using the Engle – Granger approach.

ПРОТОКОЛ СОГЛАСОВАНИЯ УЧЕБНОЙ ПРОГРАММЫ УО

Название учебной дисциплины, с которой требуется согласование	Название кафедры	Предложения об изменениях в содержании учебной программы учреждения высшего образования по учебной дисциплине	Решение, принятое кафедрой, разработавшей учебную программу (с указанием даты и номера протокола)
Учебная дисциплина не требует согласования			

Заведующий кафедрой математического моделирования и анализа данных, доктор эконом. наук, профессор _____ В.И.Малюгин

26 мая 2025 г.

ДОПОЛНЕНИЯ И ИЗМЕНЕНИЯ К УЧЕБНОЙ ПРОГРАММЕ УО

на _____/_____ учебный год

№ п/п	Дополнения и изменения	Основание

Учебная программа пересмотрена и одобрена на заседании кафедры
_____ (протокол № ____ от _____ 202_ г.)

Заведующий кафедрой
_____ _____

УТВЕРЖДАЮ
Декан факультета
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