

Name of the entrance exam
Quantitative Finance
Field/fields of study
38.04.01 Economics
Educational program/programs
38.04.01_27 Quantitative Finance
Abstract
<p>The program includes a list of topics (questions) on subjects of the basic part of the professional block in the field of 38.03.00 Economics and Management, which are included in the content of the admission exam for the master program.</p> <p>The admission exam is evaluated on a 100-point scale and consists of an interdisciplinary exam in the scope of the requirements imposed by the state educational standards of higher education for the bachelor's degree level in the field corresponding to the master's degree, conducted in person in writing or remotely (the maximum score is 100). The minimum number of points confirming its successful completion is set by the Admission Rules approved for the current academic year.</p> <p>It is allowed to use writing materials, a draft, and a calculator during the entrance test.</p> <p>The test duration is 60 minutes.</p>
Disciplines included in the program of entrance examinations for the Master's degree program
<p>Financial statement analysis</p> <p>Financial management</p> <p>Probability theory and mathematical statistics</p>
Content of academic disciplines
<p>Financial statement analysis</p> <ol style="list-style-type: none"> 1. The financial statements (the balance sheet, the income statement, the statement of cash flows) 2. Assets 3. Liabilities and Equity 4. EBITDA, EBIAT, EBIT, EBT, Net Income 5. Cash Flow from Operations 6. Cash Flow from Investments 7. Cash Flow from Financing Activities 8. Goals of Financial Analysis 9. Cross-sectional analysis 10. Vertical analysis 11. Horizontal analysis 12. Profitability ratios (Return on Equity, Return on Assets, Return on Investment, Gross Profit Margin, Operating Profit Margin, Net Profit Margin) 13. Liquidity ratios (Net Working Capital Ratio, Current Ratio, Quick Ratio) 14. Activity ratios (Inventory Turnover, Accounts Receivables Turnover, Total Asset Turnover, Average Collection Period) 15. Financing ratios (Debt Ratio, Debt-Equity Ratio, Times Interest Earned Ratio) 16. Market ratios (Earnings per Share, Price Earnings, Market to Book) 17. Dividend ratios (Dividend Yield, Dividend Payout Ratio) 18. Cash flow vs. Profit 19. Du Pont Ratio Analysis 20. Accounting Profit vs. Economic Profit 21. The contents of an annual report <p>Study Literature:</p> <ol style="list-style-type: none"> 1. Thomas, R. R., van Greuning, H., Henry, E., & Michael, A. B. (2009). International financial statement analysis. John Wiley & Sons. 2. Fridson, M. S., & Alvarez, F. (2022). Financial statement analysis: a practitioner's guide. John Wiley & Sons. <p>Financial management</p> <ol style="list-style-type: none"> 1. The four types of firms (sole proprietorships, partnerships, limited liability companies, corporations) 2. Ownership versus control of corporations 3. The stock market (primary and secondary stock markets) 4. The time value of money (three rules of time travel, valuing a stream of cash flows, perpetuities and annuities, non-annual cash flows) 5. Interest rates (interest rate quotes and adjustments, the determinants of interest rates, the opportunity cost of capital) 6. Valuing bonds (bond cash flows, prices and yields) 7. Investment decision rules (NPV, IRR, PB, PI) 8. Valuing stocks (dividend-discount model, share repurchases and total payout model, discounted free cash flow model) 9. Risk and return (common measures of risk and return, trade-off between risk and return, diversification in stock portfolios)

10. Arbitrage pricing theory
11. Capital asset pricing model
12. Estimating the cost of capital (the equity cost of capital, the debt cost of capital)
13. Capital structure in a perfect market (equity versus debt financing, Modigliani-Miller theory)
14. Financial distress costs, taxes and firm value
15. Trade-off theory (optimal capital structure)
16. Pecking Order of Financing Alternatives
17. Leverage
18. Weighted average cost of capital
19. Valuing companies (income approach, market approach, cost approach)
20. Payout policy (distributions to shareholders, tax disadvantage of dividends, signaling)
21. Corporate governance (agency costs, monitoring by the board directors and others, compensation policies, managing agency conflict, regulation)

Study Literature:

1. Berk, J., DeMarzo, P. (2014). Corporate Finance. 3rd Edition. Pearson Education. – 1141 p.
2. Brealy, R., Myers, S., Allen, F. (2014). Principles of Corporate Finance. Eleventh Global Edition. – 1005 p.
3. Damodaran, A. (2010). Applied corporate finance. John Wiley & Sons.

Probability theory and mathematical statistics

1. Elements of combinatorics. The principle of multiplication and the principle of addition. Placements, permutations, combinations.
2. Random events. A random experiment. The space of elementary events. Algebraic operations on random events. Properties of probability. Conditional, unconditional, and joint probability. Independence of events. A complete group of events. Formulas of full probability and Bayes. A difficult experiment. Bernoulli's scheme. The Poisson formula.
3. Random variables. The law of distribution of a random variable. Properties of the distribution function. A discrete random variable and the law of its distribution. The binomial distribution law. The Poisson distribution law. A continuous random variable and the law of its distribution. Uniform distribution. Exponential distribution. The Cauchy distribution.
4. Normal distribution. The probability of a random variable falling within a given interval of a normal random variable. Standard deviation. The three sigma rule.
5. Moments of random magnitude. The first, second, third and fourth are the central points. Their properties.
6. The selective method of mathematical statistics. Point statistical estimates. Non-bias, consistency, and effectiveness of statistical estimates.
7. Statistical hypothesis testing and interval estimates. Null and alternative hypotheses. Errors of the first and second kind. Interval estimates of distribution parameters. The confidence interval for the mathematical expectation. The main stages of testing statistical hypotheses. The level of significance and the power of the criterion.
8. The main provisions of the theory of the selective method. The general population and the sample. The concept of representativeness. Deterministic and probabilistic samples.
9. The concept of a time series. Properties of time series. Trends. Indexes. Chain and base indexes. Absolute and relative growth and increment. The rate of growth and increment.
10. Distribution laws applied in mathematical statistics: Fischer, χ^2 , Student, Pearson distributions.
11. Purpose and place of correlation analysis in statistical research. Correlation analysis of quantitative features: paired correlation coefficient; multiple and partial correlation coefficients
12. Correlation analysis of ordinal variables: rank correlation. Spearman's rank correlation coefficient.
13. Fundamentals of regression analysis. The concepts of dependent and independent variables. The least squares method. Coefficient of determination. An F – test to check the constraints on the regression parameters. T is a criterion for checking constraints on model parameters. Standard errors of coefficient estimates. Confidence intervals of estimates of model parameters. Cumulative sum of squares, modeled sum of squares, residual sum of squares of the model.

Study Literature:

1. Brooks, C. (2014). Introductory econometrics for finance. Cambridge university press.
2. Dougherty, C. (2011). Introduction to econometrics. Oxford university press, USA.
3. Wooldridge, J. M. (2016). Introductory econometrics a modern approach. South-Western cengage learning.

Entrance exam assessment criteria

The admission exam is a set of tasks reflecting the content of two subjects:

- Financial statement analysis (block 1) – 32 points.
- Financial management (block 2) – 36 points.
- Probability theory and mathematical statistics (block 3) – 32 points.

Tasks are completed in English without the use of educational materials.

Types of tasks.

The tasks can be the two types:

- closed test tasks in which the applicant should choose one correct answer from the proposed options;
- open tasks in which there are no correct answer options; the applicant should give the only one correct answer independently.

Tasks are divided into three blocks.

Financial statement analysis (block 1) – 32 points.

The number of tasks is 10, including:

- closed test tasks – 8;
- open tasks – 2.
- Financial management (block 2) – 36 points.

The number of tasks is 10, including:

- closed test tasks – 7;
- open tasks – 3.
- Probability theory and mathematical statistics (block 3) – 32 points.

The number of tasks is 10, including:

- closed test tasks – 9;
- open tasks – 1.

The total score is 100 points.

Evaluation criteria.

For each correctly solved closed test task, 3 points are assigned.

For each correctly solved open task in the block Financial statement analysis, 4 points are assigned, in the block Financial Management and Probability theory and mathematical statistics - 5 points.

If in an open test, there is no final and only correct answer, no points are awarded for the task.

If all answer options in a closed test task are marked as correct, no points are awarded for the test task.

Assigned group

Chairman of the Subject Committee:

Director of the Institute of Industrial Management, Economics and Trade, V.E. Shchepinin

Supervisor of the Educational Program, V.S. Arteeva

Associate Professor, A.F. Tikhomirov

Associate Professor, D.S. Krasnova

Associate Professor, T.V. Mokeeva

Associate Professor, V.S. Arteeva