

Evaluation of internal factors affecting the financial stability of higher education organizations in Russia

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Annotation. The results of the activities of higher education are determined by the quantitative and qualitative indicators of the graduation of specialists. During the period of macroeconomic instability, the success of the functioning of higher education institutions depends on several conditions, including the provision of financial resources and financial stability in the market of educational services.

Based on the open data of the international university ranking (Round University Rankings) for the period 2017 - 2021 for 39 Russian state universities, using economic and mathematical methods, correlation analysis and data processing were carried out using the Chaddock scale tools. The study's findings demonstrated the degree to which internal factors impacting higher education institutions' financial stability are significant in relation to the major categories of operations.

The scientific significance lies in the establishment of a correlation between the indicators chosen for the study, characterizing the results of the work of Russian universities in the main types of activities (educational, scientific and international) and the financial stability of higher education organizations, and determining on this basis the Coefficients showing the closeness of the relationship between them for each of the indicators, as well as average values (indicators) for the types of activities presented.

Keywords: financial stability of the university, internal factors, types of activities of the organization of higher education, correlation analysis.

1 Introduction

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Research background. The modern period is marked by a rise in interest in the study of the financial sustainability of higher education institutions in Russia and abroad. There is a growing interest in the participation of domestic and foreign universities in international rankings to determine their position among competitors in certain indicators of educational, scientific and international activities. The financial sustainability of higher education organizations is being studied not only by scientists from various countries, but also by government agencies, consulting firms, and universities themselves. Financial stability is influenced by external and internal factors, the assessment of the statistical significance of which is essential when developing university development strategies. Russia's exit from the Bologna system and the beginning of a new stage in the reform of higher education indicate the need to study the factors affecting the financial stability of higher education organizations.

Overview of the theoretical basis of the study. Various aspects of the financial situation of higher educational institutions around the world are examined in the works of foreign authors using a variety of statistical, mathematical, and econometric approaches. M. Bisogno, F. Citro, A. analyze the difficult financial situation of public universities in Italy, and present the factors influencing the financial stability of universities and developed a methodology for its determination [1]. A.O. Afriyie when considering the financial situation of universities, expounds on the greatest importance of the "public relations" factor and its decisive impact on the financial stability of universities [2]. J. R. A. investigates the alleged factors influencing the financial sustainability of Ghanaian public universities and devises a methodology for determining it [3]. J. Minyoso's work presents an analysis of financial sustainability factors using the example of public universities in Kenya and based on econometric analysis tools. [4]. J. Alonso-Cañadas, A. Sáez-Martín, L. Saraite & C. Caba-Pérez, examine the impact of various factors on financial sustainability on the example of public universities in Spain [5].

Russian scientists have also investigated the issues of determining the factors of financial stability of universities. A.L. Kuznetsova and Yu.V. Kudryashov, when considering different approaches, determine a range of factors and their impact on the financial stability of the university, expressed through a change in both monetary and natural values [6]. T.V. Belyanchikov and A.A. Stauraskaya perform an analysis of the impact of destructive factors on the financial stability, derives a special formula for their calculation [7]. O.A. Grishina, V.A. Slepov, T.N. Rodenkova, and Zh.I. Gerzelieva identify external and internal, direct and indirect factors influencing university financial stability and develop a predictive model for its assessment[8]. The list of these factors is presented in the methodology of the Russian Federation's Ministry of Education and Science for assessing the quality of financial management in higher education institutions [9]. A.V. Krivosheev shows the role of financial management in managing the financial stability of universities [10]. Despite the undoubted advantages, scientific and practical significance, as a characteristic shortcoming of the presented works of Russian authors, one should point out their predominant use of the methods of logical and expert analysis and, accordingly, the limited use (or absence) of the economic and mathematical apparatus.

It should be noted that some authors use correlation analysis when studying the internal structural relationships of international ratings. For example, V.A. Gaisenok, O.A. Naumovich, V.V. Samokhval analyze the final indicators of international university rankings using the correlation coefficient [11]. While evaluating the strength of the relationship between the national aggregate rating and international rating systems with regard to universities in the Volga Federal District of Russia, T.A. Salimova, I.A. Ivanova, and E.A. Sysoeva employ correlation analysis [12]. Y.A. Shakirova, I.L. Shchetnikova, A.F.

Garyaeva, A.A. Shugaepova use correlation analysis to determine the degree of influence of indicators of the internationalization of education on the ratings of Russian universities [13]. Along with undoubted advantages, these works have certain imperfections, such as, for example, the lack of a relationship between the final indicator and the financial stability of a higher education organization.

The novelty of the study lies in its innovative application of mathematical and economic modeling techniques (econometrics) to a thorough and reasonable evaluation of the influence of statistically significant internal factors on the final level of financial stability of a higher education organization.

The hypothesis of the study assumes that the results of various types of activities carried out by a higher education organization (educational, research, international) to a very large extent depend on the financial stability of the university, which is the basis for including these factors in the methodology for its assessment.

The aim of the study is to identify statistically significant internal factors that affect the financial stability of higher education organizations in the market economy.

Research objectives. To do this, it is necessary to: 1) use data from the global university rankings produced by Round University Rankings as the basis of the study; 2) identify the variables influencing the university's financial stability; 3) determine the measure of their impact on the final index of financial stability, based on the use of tools of economic and mathematical analysis; 4) rank statistically significant factors according to the strength of their influence on the financial stability of the university; 5) to systematize the identified patterns in order to account for their relationship with the university's financial situation and the outcomes of its activities; 6) develop recommendations for the use of economic and mathematical apparatus, as well as econometric modeling tools, for analyzing financial stability and developing strategies for the development of state organizations of higher education, healthcare, and culture.

2 Materials and Methods

The study is based on the statistical data of the international university ranking Round University Rankings, which has been compiled since 2010 and every year its popularity is growing, including from higher education organizations in Russia. The first rating included 566 higher education organizations from 68 countries, and the 2021 rating included 869 such organizations from 74 countries. While only 11 Russian universities participated in the initial ranking, 95 Russian universities took part in the rating in 2021. The top three Russian universities over the duration of the rating's existence have been Moscow State University named after M.V. Lomonosov, Moscow Institute of Physics and Technology (National Research University), Peoples' Friendship University of Russia.

The final value of the university ranking, including financial stability, is derived from five financial indicators: the ratio of the university's income to the number of faculty members, the ratio of the university's income to the number of students, the ratio of the number of publications to the university's income from research activities, the ratio of the university's income from research activities to the number of scientific and teaching staff, the ratio of the university's income from research activities to total income. In addition, the final ranking of universities contains another fifteen indicators for three types of activity (educational, research and international), which can be used when conducting research in narrower subject areas. The objective of this study is to determine the relationship between each of the indicators of these types of activities and the final value of financial stability.

This is possible using correlation analysis to establish the close relationship between these indicators.

Based on open data on the results of universities from around the world participating in the international university ranking (Round University Rankings) from 2017 to 2021, 39 state institutions of higher education in Russia were selected for analysis. In line with the research objectives, the following tasks were set: for a fixed group of state universities for five years, to establish the closeness of the relationship between 15 indicators reflecting the results of educational, scientific and international activities, with the financial stability of universities, based on the methodology of correlation analysis on the Chaddock scale (Table 1).

Table 1. Interpretation of the final values of the correlation coefficient according to R.E. [14]

Significance	Correlation
<0,1	Very weak
0,1 - 0,3	Weak
0,3 - 0,5	Moderate
0,5 - 0,7	Noticeable
0,7 - 0,9	High
> 0,9	Very high

Source: Compiled by the authors based on: [14]

Based on the indicators selected for the study that characterize the results of the work of Russian state institutions of higher education in each of the three types of activities: educational, research and international, a correlation analysis was performed to determine the closeness of their relationship with the financial stability indicators of universities for 2021, using data from Round University Rankings. Based on the interpretation of the obtained values, conclusions were drawn regarding the importance of educational, scientific, and international activities, as well as the extent to which they influence the financial stability of a higher education organization.

3 Results

The results of the performed correlation analysis on the impact of educational, scientific, and international activities on the financial stability of state universities in Russia are presented in Table 2.

Table 2. Results of Correlation Analysis of the Impact of Non-Financial Indicators on the Financial Stability of Universities

Indicator correlated with financial stability	Year					Medium
	2017	2018	2019	2020	2021	
Indicators related to educational activities						
Academic staff per students	0,52	0,42	0,53	0,37	0,31	0,43
Academic staff per bachelor degrees awarded	0,34	0,44	0,57	0,59	0,50	0,49
Doctoral degrees awarded per academic staff	0,30	0,31	0,33	0,50	0,67	0,42
Doctoral degrees awarded per bachelor degrees awarded	0,43	0,58	0,61	0,67	0,78	0,61
World teaching reputation	0,67	0,58	0,65	0,68	0,78	0,67
Indicators related to scientific activities						
Citations per academic and research staff	0,70	0,75	0,72	0,76	0,84	0,75
Doctoral degrees per admitted PhD	0,09	-0,15	0,02	0,10	0,23	0,06
Normalized citation impact	0,45	0,56	0,54	0,59	0,68	0,56
Papers per academic and research staff	0,80	0,80	0,77	0,79	0,85	0,80
World research reputation	0,62	0,46	0,56	0,62	0,77	0,61
Indicators related to research reputation						
Share of international academic staff	0,54	0,67	0,70	0,74	0,79	0,69
Share of international students	0,38	0,43	0,48	0,47	0,47	0,45
Share of international co-authored papers	0,27	0,44	0,44	0,45	0,48	0,42
Reputation outside region	0,39	0,18	0,29	0,33	0,56	0,35
International level	0,54	0,63	0,66	0,70	0,76	0,66

Source: Compiled by the authors based on: [15]

The role of educational activities in ensuring the financial sustainability of state universities. The results of the calculations show that the indicators of the quality of education at the university correlate to an average degree with its financial stability. This is influenced by indicators related to the ratio in the number of faculty and students. In recent years, there has been an increase in the correlation significance due to the defense of PhD theses. International academic reputation is to a fairly high degree linked to financial sustainability. Thus, the growth in the number of students with the defense of a Ph.D. thesis and a decent reputation in international circles quite significantly (at a noticeable level of correlation) affect the financial stability of a public institution of higher education.

The role of research activities in ensuring the financial sustainability of public universities. The calculations show that the indicators "Citations per unit of faculty" and "Number of publications per unit of faculty" have a strong relationship with the financial stability of a public institution of higher education. This is because the methodology for assessing financial stability includes indicators related to the effectiveness of scientific activity, expressed through the indicators "The ratio of the number of publications to the university's income from research activities" and "The ratio of the university's income from research activities to the number of scientific pedagogical workers". At the same time, the indicator "Share of master's and postgraduate students in the total number of students" has

practically no effect on the financial sustainability of public institutions of higher education. However, when deciding on the choice of an indicator required to be considered when assessing financial stability, it is necessary to give preference to the indicator "Citation per unit of scientific and technical development". This indicator has a significant indirect impact on the components of financial stability according to the Round University Rankings methodology.

The role of international activities in ensuring the financial sustainability of state universities. The results of the calculations indicate a moderate (and noticeable in several positions) level of correlation between the international activities of the university and its financial stability. Indicators like "The share of foreigners in the total number of teaching staff" and "The level of internationalization of the organization of higher education" have also become more significant over the period of the study. The presence of highly qualified scientific and pedagogical personnel has a positive effect on the financial stability of higher education organizations. Attracting foreign experts to teaching and research activities allows universities to receive high incomes through participation in international projects and publications. For the scientists themselves and their colleagues, this means increasing their own prestige as specialists at the international level. These indicators also affect the financial sustainability of public institutions of higher education in Russia.

4 Discussion

All factors that were investigated in this work are internal. In the publications of Russian scientists, the factors influencing the financial stability of universities are divided into internal and external. Separation of these factors is made based on the attitude to the organization of higher education. The influence of external factors on financial stability is a rather difficult topic for research, since it is necessary to consider sectoral and macroeconomic indicators of development not only in the field of education, but also in a particular country and region of the world. Internal factors proposed in the works of T.V. Belyanchikova, A.A. Staurskaya, and A.V. Krivosheev for assessing the financial stability of universities are expressed through cost categories and have a monetary expression. In contrast, O.A. Grishina, V.A. Slepov, T.N. Rodenkova, and Zh.I. Gerzeliev are guided by the analysis of external factors, the majority of which are not cost categories.

Based on the analysis of various authors' positions and the study's findings, the following conclusion appears to be valid: financial stability can be expressed through both financial and non-financial factors. Along with this, such factors as the type of educational organization, the number of research and innovation projects, the level of qualification of managerial personnel, as well as other staff cannot be measured in terms of value, expressed in monetary terms. Furthermore, these internal factors are referred to as indirect. However, there are reasons to include these factors in the methods developed by various researchers when assessing financial stability. Non-financial and indirect internal factors may thus be considered in determining financial stability. In our study, the most significant factors influencing the financial stability of a public institution of higher education were identified, which are reflected in the following indicators: "Citation per unit of academic staff" and "Number of publications per unit of academic staff". In 2021, the average correlation coefficient of these indicators with financial stability was 0.84 and 0.85, indicating a strong relationship between them. The correlation analysis results show that international academic reputation (0.78 in 2021) is playing a growing role in the total set of factors that ensure a higher education organization's financial sustainability.

5 Conclusion

When developing new and improving existing methods for assessing the financial sustainability of public institutions of higher education, it seems appropriate to first use and characterize the internal factors and indicators discussed above. This creates a reliable basis both for analyzing the financial stability of the university and for substantiating its development strategy. To obtain new effective indicators, promising research in this area should focus on the use of correlation analysis tools to study other aspects of the university's activities. The sources of information can be both websites of higher education organizations and open data provided by the Russian Technological University (MIREA) [16] and the Ministry of Science and Higher Education of the Russian Federation. This suggestion should be followed to obtain reliable materials for identifying direct and indirect factors affecting the university's financial stability. It is recommended that methodological developments be built in accordance with the legal form and specialization of the state institution of higher education to be effectively applied.

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