

INNOVATION SCIENCE AND TECHNOLOGY

ISSUE 8, PART 1 / AUGUST 2026

 Acceptance of papers



**Acceptance of
papers**

Published monthly



Topics

economics,
technology, social
sciences



ISSN 3060-5229



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THE SCIENTIFIC-POPULAR ELECTRONIC
JOURNAL **"INNOVATION SCIENCE AND
TECHNOLOGY"** HAS BEEN REGISTERED
UNDER THE NUMBER **C-5669633** BY THE
AGENCY FOR INFORMATION AND MASS
COMMUNICATIONS (AOKA) OF THE
REPUBLIC OF UZBEKISTAN, EFFECTIVE
FROM OCTOBER 9, 2024.

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The scientific electronic journal "Innovation Science and Technology" has been included in the list of scientific publications recommended for the publication of main scientific results of dissertations for the award of PhD and DSc degrees in economics and technical sciences, in accordance with the Resolution No. 370 of the Presidium of the Higher Attestation Commission of the Republic of Uzbekistan, dated May 8, 2025.

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IMPROVING THE METHODOLOGICAL FOUNDATIONS OF ASSESSING THE EFFICIENCY OF LENDING PRACTICES IN COMMERCIAL BANKS

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Annotatsiya. Tijorat banklarida kreditlash amaliyoti samaradorligini baholashning metodologik asoslarini takomillashtirish masalalari tadqiq etilgan. Cheklangan rentabellik ko'rsatkichlariga asoslangan amaldagi baholash amaliyoti kreditlash faoliyatining ko'p o'lchovli xususiyatlarini to'liq qamrab olmasligi va natijada boshqaruv qarorlari uchun yetarlicha aniq signallarni shakllantirmasligi asoslangan. Kreditlash rentabelligi, kredit riski sifati, resurs va tashkiliy parametrlar hamda kredit portfelining tarkibiy-innovatsion xususiyatlarini qamrab oluvchi to'rt blokli integral metodologiya taklif etilgan. Metodologiya normativ qiymatlarga nisbatan me'yorlashtirish, ekspert-entropiya asosida vazn koeffitsiyentlarini aniqlash, ko'rsatkichlarni yagona integral indeksga agregatsiyalash hamda natijalarni regressiya tahlili va ssenariy prognozlash orqali tekshirish usullarini o'zida birlashtiradi. "Asakabank" AJning 2021–2025-yillardagi ma'lumotlari asosida o'tkazilgan tahlil natijalariga ko'ra, kreditlash samaradorligining integral indeksi 0,605 dan 0,883 gacha oshgan bo'lib, bunda tarkibiy-innovatsion va risk sifati bloklari hal qiluvchi ahamiyat kasb etgan. Bazaviy ssenariy bo'yicha 2028-yilga kelib integral indeksning 0,951 darajaga yetishi prognoz qilingan. Taklif etilgan metodologiyadan tijorat banklarining ichki tahlilida hamda nazorat organlari tomonidan qiyosiy baholash jarayonlarida foydalanish mumkin.

Kalit so'zlar: tijorat banki, kreditlash amaliyoti, samaradorlikni baholash, integral indeks, metodologik asoslar, kredit riski, muammoli kreditlar, xarajatlar va daromadlar nisbati, raqamli kreditlash, kredit portfeli, ssenariy prognozlash.

Аннотация. Исследованы вопросы совершенствования методологических основ оценки эффективности практики кредитования в коммерческих банках. Обосновано, что сложившаяся практика оценки, основанная на ограниченном наборе показателей рентабельности, не в полной мере отражает многомерный характер кредитной деятельности и вследствие этого не всегда обеспечивает достаточно точные ориентиры для принятия управленческих решений. Предложена четырехблочная интегральная методология, охватывающая рентабельность кредитования, качество кредитного риска, ресурсные и организационные параметры, а также структурно-инновационные характеристики кредитного портфеля. Методология сочетает нормализацию относительно нормативных значений, экспертно-энтропийную процедуру определения весовых коэффициентов, агрегирование показателей в единый интегральный индекс и верификацию результатов посредством регрессионного анализа и сценарного прогнозирования. Апробация на данных АО «Асакабанк» за 2021–2025 годы показала увеличение интегрального индекса эффективности кредитования с 0,605 до 0,883, при этом определяющий вклад внесли структурно-инновационный блок и блок качества кредитного риска. Согласно базовому сценарию, к 2028 году прогнозируется достижение интегральным индексом уровня 0,951. Предложенная методология может применяться коммерческими банками для внутреннего анализа, а также надзорными органами для проведения сравнительной оценки.

Ключевые слова: коммерческий банк, практика кредитования, оценка эффективности, интегральный индекс, методологические основы, кредитный риск, проблемные кредиты, соотношение затрат и доходов, цифровое кредитование, кредитный портфель, сценарное прогнозирование.

Abstract. The methodological foundations for assessing the efficiency of lending practices in commercial banks are examined with a focus on their further improvement. It is demonstrated that the prevailing assessment practice, which relies on a limited set of profitability indicators, does not fully capture the multidimensional nature of lending activities and, consequently, may not provide sufficiently accurate signals for managerial decision-making. A four-block integral methodology is proposed, encompassing lending profitability, credit risk quality, resource and organisational parameters, and the structural and innovative characteristics of the loan portfolio. The methodology combines normalisation relative to normative values, an expert–entropy procedure for determining weights, aggregation of indicators into a single integral index, and verification of the results through regression analysis and scenario forecasting. Testing the methodology using data from "Asakabank" JSC for 2021–2025 demonstrates that the integral lending efficiency index increased from 0.605 to 0.883, with the structural–innovative and credit risk quality blocks making the most significant contributions. Under the baseline scenario, the integral index is projected to reach 0.951 by 2028. The proposed methodology can be applied by commercial banks for internal analysis and by supervisory authorities for comparative assessment.

Keywords: commercial bank, lending practice, efficiency assessment, integral index, methodological foundations, credit risk, non-performing loans, cost-to-income ratio, digital lending, loan portfolio, scenario forecasting.

INTRODUCTION

Lending remains the core function of commercial banks and the principal channel through which financial resources are transformed into productive investment. In the banking system of the Republic of Uzbekistan, the loan portfolio consistently accounts for the largest share of aggregate assets; therefore, the financial performance, risk level, and stability of an individual bank are determined primarily by the quality of its lending activities. Accordingly, the measurement of lending efficiency is not merely a technical issue: the chosen methodology directly shapes credit policy, loan pricing, capital allocation, and the system of managerial incentives.

The reforms implemented in the banking sector of Uzbekistan — including the reduction of the state share in bank capital, the transition to international financial reporting standards, the implementation of transformation programmes, and the expansion of digital lending channels — have substantially transformed the environment in which lending decisions are made. Under these conditions, assessing lending performance solely on the basis of two or three profitability ratios does not fully reflect the multidimensional nature of lending activities. A bank may demonstrate a high return on its loan portfolio while simultaneously facing increased credit risk, whereas a conservative bank with a high-quality portfolio may operate with relatively high costs. Therefore, a comprehensive assessment incorporating both profitability and risk-related indicators provides a more balanced basis for evaluating lending efficiency.

The aim of this article is to develop and empirically test an improved methodological framework for assessing the efficiency of lending practices in commercial banks by integrating the profitability, risk, resource-organisational, and structural-innovative dimensions of lending into a single interpretable measure. In accordance with this aim, the following tasks were set: (a) to systematise existing approaches to measuring lending efficiency and identify opportunities for their methodological improvement; (b) to substantiate a system of indicators reflecting the multidimensional nature of lending activities; (c) to develop a procedure for the normalisation, weighting, and aggregation of the selected indicators into an integral index; and (d) to test the methodology using empirical data and verify the results through econometric methods. The object of the research is the lending activity of commercial banks in Uzbekistan, with empirical testing conducted using data from “Asakabank” JSC for 2021–2025. The subject of the research is the set of methodological relationships arising in the measurement of lending efficiency.

LITERATURE REVIEW

The theoretical foundations for measuring bank efficiency were established within the intermediation approach developed by Sealey and Lindley [1], in which borrowed funds are treated as inputs and loans as outputs. Farrell [2] introduced the distinction between technical and allocative efficiency; Charnes, Cooper, and Rhodes [3] developed data envelopment analysis (DEA), while Aigner, Lovell, and Schmidt [4] and Battese and Coelli [5] formalised stochastic frontier analysis (SFA). The survey conducted by Berger and Humphrey [6] demonstrated that the results of efficiency measurement depend considerably on the selected technique and the specification of inputs and outputs, thereby highlighting the importance of an appropriately designed methodological framework for frontier estimates.

A separate line of research focuses on the relationship between efficiency and credit risk. Berger and DeYoung [7] formulated the “bad management”, “bad luck”, and “skimping” hypotheses, demonstrating the relationship between changes in cost efficiency and the subsequent dynamics of non-performing loans. Fiordelisi, Marques-Ibanez, and Molyneux [8], using European data, confirmed that improvements in efficiency can contribute to reducing bank risk in subsequent periods. Credit risk assessment instruments have evolved from the models developed by Altman [9] and Merton [10] to the regulatory frameworks of the Basel Committee [11] and the expected credit loss model under IFRS 9 [12], thereby enabling the risk component of lending efficiency to be measured in a more standardised manner.

The digital dimension has been examined by DeYoung [13] and Beccalli [14], who established that investment in information technology can affect bank profitability with a considerable time lag. Consequently, the share of loans originated through digital channels has become an independent factor influencing the operational efficiency of lending.

In the scientific literature of Uzbekistan, the problems of bank lending have been investigated by Abdullayeva [15], Jumayev [16], Omonov [17], Karaliyev [18], and Berdiyarov [19], who substantiated approaches to improving credit policy, mechanisms for managing problem loans, and criteria for assessing the credit potential of banks. The analysis of these studies makes it possible to identify three areas for further methodological

development. First, a significant proportion of applied studies assess lending efficiency primarily through either profitability ratios or the level of non-performing loans, creating opportunities for the integration of these two dimensions within a unified assessment framework. Second, frontier techniques generally require a sufficiently large and homogeneous sample of banks, whereas the internal analytical needs of an individual bank may be better addressed through complementary methodological approaches. Third, the structural and innovative characteristics of the loan portfolio can be more extensively incorporated into the assessment framework, particularly because, under current conditions, these characteristics increasingly influence the prospective efficiency of lending. The present article seeks to contribute to the further development of these methodological areas.

RESEARCH METHODOLOGY

The information base of the research consists of the published financial statements of “Asakabank” JSC prepared in accordance with International Financial Reporting Standards, statistical data from the Central Bank of the Republic of Uzbekistan, and analytical reviews of rating agencies for 2021–2025. Quarterly data for the same period were used in the econometric analysis. The research employed the methods of comparative and structural analysis, normalisation and index construction, expert evaluation, regression analysis, and scenario forecasting. The starting point of the methodological framework was the systematisation of existing approaches to assessing lending efficiency, as presented in Table 1.

Table 1

Comparative characteristics of approaches to assessing the efficiency of bank lending¹

Approach	Analytical content	Advantages	Methodological limitations
Ratio (coefficient) approach	Separate ratios of profitability, risk, and cost of lending	Simplicity, availability of data, and transparency of calculation	Indicators are assessed separately; different indicators may produce different signals; there is no single aggregate criterion
Frontier techniques (DEA, SFA)	Relative efficiency of a bank against the constructed frontier	Consideration of multiple inputs and outputs; statistical inference (SFA)	Require a large homogeneous sample; their application to an individual bank requires additional methodological adaptation
Rating and scoring models	Ordinal ranking of banks according to a set of criteria	Convenient for supervisory comparison	Weighting procedures can be further substantiated; the risk dimension can be assessed in greater detail
Integral index approach (proposed)	Aggregation of four blocks of indicators into a single index	Applicable to an individual bank; multidimensional; interpretable over time	Its reliability depends on the quality of normative values and the expert weighting procedure

The proposed methodology is structured as a four-block hierarchical framework (Figure 1). The selection of indicators was based on four criteria: substantive relevance to the lending process, measurability on the basis of publicly disclosed reporting, absence of functional duplication, and comparability over time.

¹ Source: Developed by the author

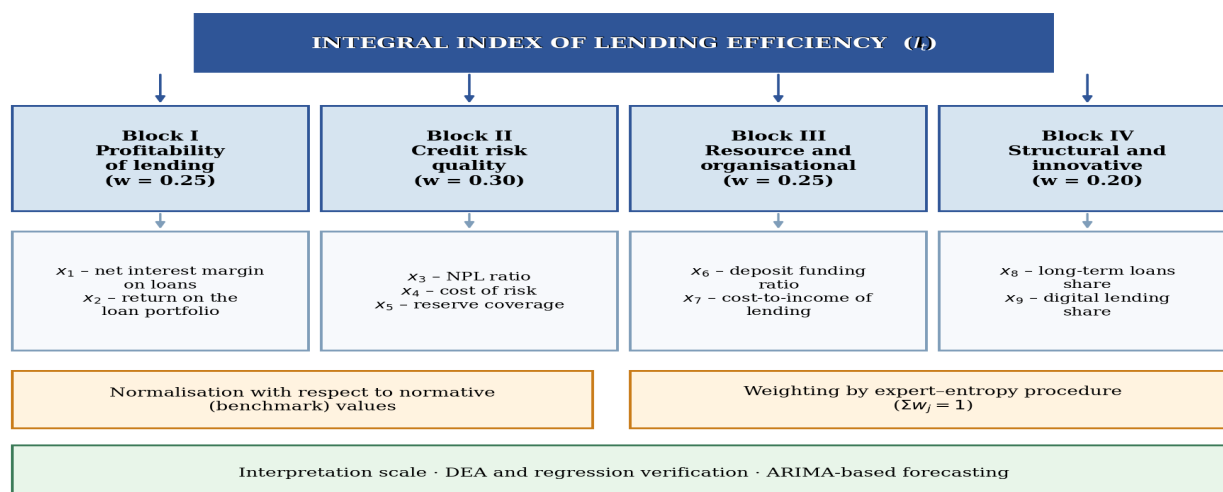


Figure 1. Structural scheme of the proposed methodology for assessing the efficiency of bank lending²

At the second stage, the raw indicators are normalised. In contrast to the min–max transformation, in which the result depends on the sample and the extreme observations are automatically assigned values of 0 and 1, each indicator is normalised with respect to a normative (benchmark) value determined by prudential requirements and the average parameters of the banking system:

$z_j = \min(x_j / x_j^{norm}; 1)$ for stimulants;

$z_j = \min(x_j^{norm} / x_j; 1)$ for destimulants. (1)

where z_j is the normalised value of the j -th indicator, x_j is its actual value, and x_j^{norm} is the corresponding normative value. Truncation at unity ensures a balanced assessment by preventing an exceptionally high result for one indicator from compensating for a significant deviation in another, which is a substantively important requirement for assessing risk-bearing activities.

At the third stage, the weights are determined. The block weights were established through a survey of seventeen experts — heads of credit and risk management departments and specialists in banking supervision. The consistency of their opinions was verified using Kendall's coefficient of concordance ($W = 0.78$), and the weights were additionally checked using the entropy method, with the divergence between the two sets not exceeding 0.02. The indicator system, normative values, and weights are presented in Table 2.

Table 2

System of indicators for the integral assessment of lending efficiency³

Symbol	Indicator	Block (block weight)	Normative value	Type	Weight w_j
x_1	Net interest margin on the loan portfolio, %	I (0.25)	4.5	Stimulant	0.125
x_2	Return on the loan portfolio, %	I (0.25)	2.5	Stimulant	0.125
x_3	Share of non-performing loans (NPL), %	II (0.30)	3.0	Destimulant	0.120
x_4	Cost of risk, %	II (0.30)	1.0	Destimulant	0.090
x_5	Reserve coverage of non-performing loans, %	II (0.30)	100.0	Stimulant	0.090
x_6	Deposit funding ratio of the loan portfolio, %	III (0.25)	80.0	Stimulant	0.125
x_7	Cost-to-income ratio of lending operations, %	III (0.25)	60.0	Destimulant	0.125
x_8	Share of long-term (investment) loans, %	IV (0.20)	70.0	Stimulant	0.100

² Source: Developed by the author

³ Source: Developed by the author

x_9	Share of loans originated through digital channels, %	IV (0.20)	50.0	Stimulant	0.100
	Total	1.00	x	x	1.000

At the fourth stage, the normalised values are aggregated into the integral index:

$$I_t = \sum (w_j \cdot z_{jt}), \quad j = 1, \dots, 9; \quad \sum w_j = 1; \quad 0 \leq I_t \leq 1. \quad (2)$$

The obtained values are interpreted using a four-level scale: from 0.80 to 1.00 — a high level of lending efficiency; from 0.60 to 0.79 — a sufficient level; from 0.40 to 0.59 — a moderate level with opportunities for further improvement; and below 0.40 — a level requiring comprehensive measures to enhance lending efficiency. In parallel, the four block indices are calculated, making it possible to identify the factors contributing to changes in the aggregate index.

Finally, the results are verified using a multiple regression model in which the return on the loan portfolio is explained by risk quality, the cost level, and the degree of digitalisation. In addition, a scenario forecast is constructed using a saturation (logistic-type) model of the following form:

$$I_{t+1} = I_t + \lambda(1 - I_t),$$

where the convergence parameter λ is estimated from the actual dynamics of the index. The saturation model is applied to ensure that the forecast values remain within the established interval of the integral index.

ANALYSIS AND RESULTS

The initial values of the nine indicators of the lending activity of “Asakabank” JSC for 2021–2025 are presented in Table 3.

Table 3

Dynamics of the lending activity indicators of “Asakabank” JSC in 2021–2025⁴

Indicator	2021	2022	2023	2024	2025	Change, 2025 to 2021
Net interest margin on loans, %	3.1	3.4	3.6	3.8	4.1	+1.0 p.p.
Return on the loan portfolio, %	1.42	1.58	1.71	1.86	2.09	+0.67 p.p.
Share of non-performing loans, %	5.8	5.2	4.9	4.5	3.6	–2.2 p.p.
Cost of risk, %	1.9	1.7	1.6	1.4	1.1	–0.8 p.p.
Reserve coverage of NPLs, %	72.4	78.1	84.6	91.2	98.5	+26.1 p.p.
Deposit funding ratio of loans, %	46.7	50.5	55.2	59.9	65.8	+19.1 p.p.
Cost-to-income ratio of lending, %	78.2	76.5	75.1	73.4	69.4	–8.8 p.p.
Share of long-term loans, %	61.3	63.0	64.8	66.5	68.2	+6.9 p.p.
Share of digital origination, %	8.4	14.7	22.3	31.6	42.8	+34.4 p.p.

The data presented in Table 3 demonstrate consistent improvement across all nine indicators, although the intensity of these changes differs considerably. The most pronounced improvement was observed in the share of loans originated through digital channels, which increased more than fivefold, and in the reserve coverage of non-performing loans, which approached full coverage. At the same time, despite an 8.8-percentage-point improvement in the cost-to-income ratio of lending, its value remained above the normative benchmark throughout the analysed period. This indicates further potential for enhancing the operational component of lending efficiency.

The application of formulas (1) and (2) to these data produced the results presented in Table 4.

Table 4

Normalised values of the indicators and the integral index of lending efficiency⁵

Indicator/index	Weight	2021	2022	2023	2024	2025
z_1 — net interest margin	0.125	0.689	0.756	0.800	0.844	0.911
z_2 — return on portfolio	0.125	0.568	0.632	0.684	0.744	0.836
z_3 — NPL ratio	0.120	0.517	0.577	0.612	0.667	0.833
z_4 — cost of risk	0.090	0.526	0.588	0.625	0.714	0.909
z_5 — reserve coverage	0.090	0.724	0.781	0.846	0.912	0.985

⁴ Source: Developed by the author

⁵ Source: Developed by the author

z_6 — deposit funding	0.125	0.584	0.631	0.690	0.749	0.823
z_7 — cost-to-income	0.125	0.767	0.784	0.799	0.817	0.865
z_8 — long-term loans	0.100	0.876	0.900	0.926	0.950	0.974
z_9 — digital origination	0.100	0.168	0.294	0.446	0.632	0.856
Block index I	0.25	0.628	0.694	0.742	0.794	0.874
Block index II	0.30	0.582	0.642	0.686	0.755	0.902
Block index III	0.25	0.676	0.708	0.744	0.783	0.844
Block index IV	0.20	0.522	0.597	0.686	0.791	0.915
Integral index I_t	1.00	0.605	0.662	0.715	0.779	0.883

Over the analysed period, the integral index increased from 0.605 to 0.883, representing an increase of 0.278 points, or 45.9 per cent. According to the interpretation scale, this reflects a transition from a sufficient level of lending efficiency to a high level, which was achieved in 2025. The decomposition of the index by blocks (Figure 2) reveals the internal structure of this improvement.

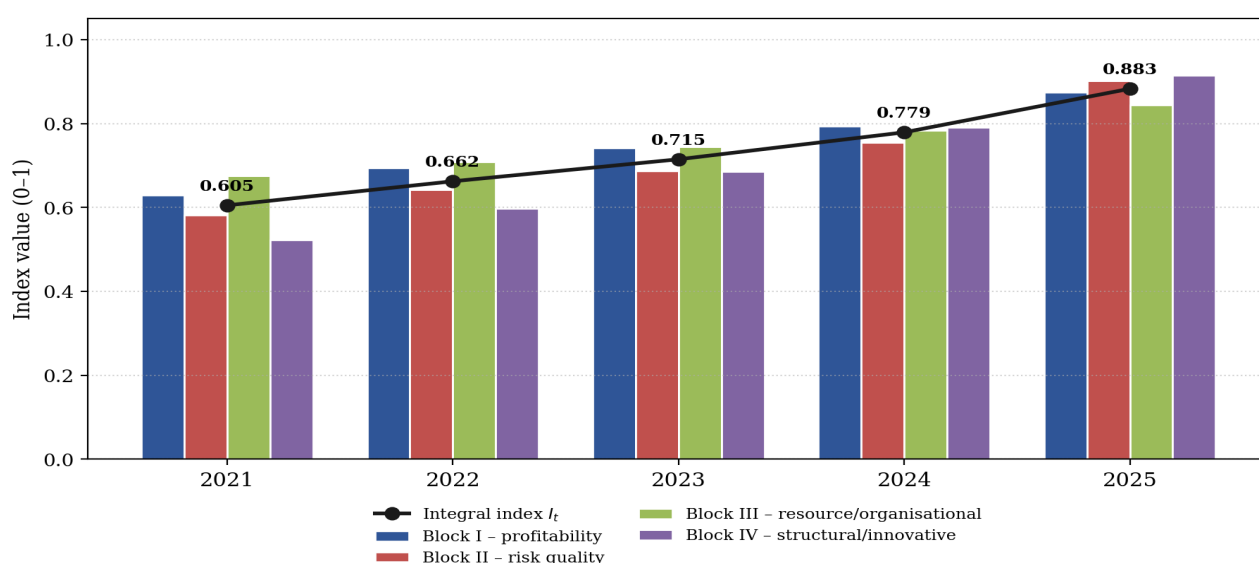


Figure 2. Dynamics of the block indices and the integral index of lending efficiency of "Asakabank" JSC in 2021–2025⁶

In 2021, the structural-innovative block (0.522) and the risk-quality block (0.582) had the greatest potential for improvement. By 2025, these two blocks had become the main drivers of the aggregate result, increasing by 0.393 and 0.320 points, respectively. The resource-organisational block demonstrated more moderate growth (+0.168 points) and, by the end of the analysed period, had the lowest value among the four blocks, at 0.844. This indicates that further growth in lending efficiency can be supported primarily by optimising the operating costs of the lending process and further strengthening the deposit base, alongside maintaining the achieved improvements in portfolio quality.

To verify the internal consistency of the methodology, a multiple regression model was estimated using quarterly data for 2021–2025 ($n = 20$), with the return on the loan portfolio as the dependent variable (Table 5).

Table 5

Results of the regression estimation of factors affecting the return on the loan portfolio⁷

Variable	Coefficient	Standard error	t-statistic	p-value
Constant	3.842	0.512	7.504	0.000
NPL ratio (x3)	−0.214	0.048	−4.458	0.000
Cost-to-income ratio (x7)	−0.031	0.011	−2.818	0.012

⁶ Source: Developed by the author

⁷ Source: Developed by the author

Digital origination share (x9)	0.018	0.006	3.000	0.008
R-squared	0.870	Adjusted R-squared	0.845	x
F-statistic	35.2	Durbin–Watson	1.92	x

All coefficients are statistically significant at the five-per-cent level and have the theoretically expected signs. A one-percentage-point reduction in the NPL share is associated with a 0.214-percentage-point increase in the return on the loan portfolio, which quantitatively supports the substantial weight assigned to the risk block. The negative coefficient of the cost-to-income ratio and the positive coefficient of digital origination substantiate the inclusion of the resource-organisational and structural-innovative blocks. Thus, variables traditionally treated as qualitative characteristics of lending demonstrate a measurable relationship with its financial performance. The Durbin–Watson statistic indicates no evidence of first-order autocorrelation in the residuals.

Based on the saturation model, the forecast of the integral index for 2026–2028 was constructed. The convergence parameter estimated from the actual dynamics amounted to $\lambda = 0.25$ for the baseline scenario, $\lambda = 0.33$ for the optimistic scenario, which assumes an accelerated reduction in the operating costs of lending, and $\lambda = 0.15$ for the inertial scenario (Figure 3).

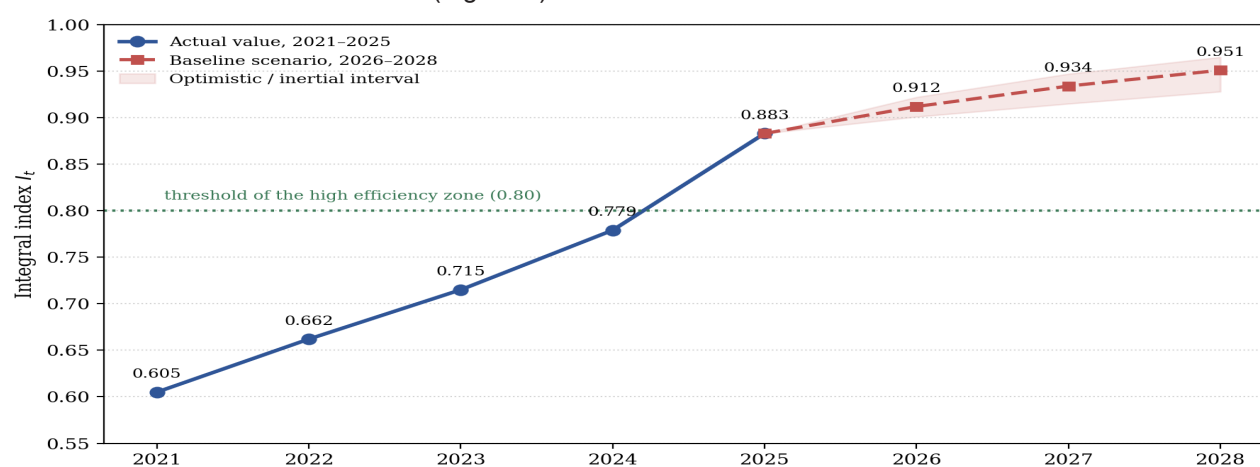


Figure 3. Actual and forecast values of the integral index of lending efficiency for 2021–2028⁸

Under the baseline scenario, the integral index is projected to reach 0.912 in 2026, 0.934 in 2027, and 0.951 in 2028. The convergence of the optimistic and inertial trajectories towards the end of the forecast horizon reflects diminishing returns: as the index approaches unity, each additional increment requires progressively greater managerial effort. This property distinguishes the proposed model from linear extrapolation, which, under the same conditions, may generate values exceeding the upper boundary of the integral index by 2027.

A comparison with the traditional assessment procedure demonstrates the practical advantages of the integral approach. When assessed solely on the basis of the return on the loan portfolio, the improvement over the five-year period would amount to approximately 47 per cent — numerically close to the growth rate of the integral index. However, such an assessment would provide limited information about the specific sources of improvement and would not fully reveal the resource-organisational block as the area with the greatest potential for further development. Therefore, the proposed integral methodology performs not only a measurement function but also an important diagnostic function.

CONCLUSION AND SUGGESTIONS

The prevailing practice of assessing lending efficiency, based on a limited set of profitability ratios, does not fully reflect the multidimensional nature of the credit process and, therefore, provides opportunities for developing more comprehensive signals for managerial decision-making. The proposed framework addresses this aspect by integrating four dimensions of lending activity — profitability, credit risk quality, resource-organisational parameters, and structural-innovative characteristics — into a single index constructed through normative-based normalisation, expert–entropy weighting, and additive aggregation.

Testing based on the data of “Asakabank” JSC for 2021–2025 showed that the integral index increased from 0.605 to 0.883, indicating that the bank moved into the high-efficiency range. The principal contribution to this

8 Source: Developed by the author

improvement was made by the structural-innovative and risk-quality blocks, while the resource-organisational block demonstrated the greatest potential for further improvement. The regression estimation confirmed the statistical significance and theoretically expected direction of the effects of risk, cost, and digitalisation factors.

The scientific novelty of the research consists in substantiating a four-block integral methodology that, in comparison with existing approaches, is applicable to an individual bank, incorporates the structural and innovative dimensions of the loan portfolio, and combines normative-based normalisation with a saturation forecasting model.

Three recommendations follow from the research results. First, commercial banks should incorporate the calculation of integral and block indices into their quarterly internal analytical reporting, using block decomposition to identify areas with the greatest potential for improving the lending process. Second, normative values should be reviewed periodically in line with changes in prudential requirements, while the target parameters of credit policy should be established on the basis of the saturation model rather than solely on linear trends. Third, supervisory authorities may use the block indices as a supplementary instrument for comparative analysis.

The methodological framework also provides opportunities for further development. The empirical testing can be extended from a single bank to a representative sample of commercial banks, while the expert weighting procedure can be further enhanced through additional quantitative methods. Expanding the length of the analysed time series may also improve the accuracy and robustness of forecast estimates. Further research may therefore extend the testing to a representative sample of banks, compare the integral estimates with the results of data envelopment analysis, and incorporate the macroeconomic environment as an exogenous factor.

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Proofreader: Zokir ALIBEKOV

Layout and Designer: Oloviddin Sobir ugli

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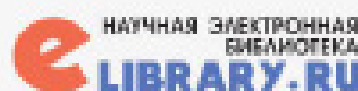
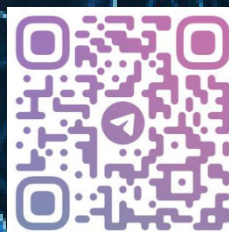
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