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RESEARCH ARTICLE
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Assessment of Bank Profitability through Structural Indicators: Evidence from Kazakhstan

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ABSTRACT

Bank profitability remains a central concern in assessing financial sector resilience, especially in systems undergoing institutional and regulatory transformation. This study aims to examine the impact of key internal structural indicators, namely capital adequacy, management efficiency, liquidity, and market-based funding, on the return on equity (hereinafter – ROE) of the banking sector in Kazakhstan. The analysis uses linear regression based on data from 2013 to 2023, incorporating standardized indicators to measure the relationship between structural financial variables and profitability. The model includes adjusted capital adequacy ratio, pre-tax return on assets, ROE, liquidity ratio based on client deposits, and the share of market-based funding in total liabilities. Results demonstrate that management efficiency has a substantial and statistically significant effect on ROE ($\beta = 11.41$, $p < 0.01$), while capital adequacy, liquidity, and market-based funding show weaker or statistically insignificant effects. The high explanatory power of the model ($R^2 = 0.970$) suggests that internal operational factors, rather than the balance sheet, drive profitability in Kazakhstan's banking sector. A comparative analysis of marginal effects further supports the dominant role of internal operational performance over passive balance sheet structure. The study is complemented by a literature-based framework highlighting mixed evidence on the role of liquidity and capitalization under different institutional conditions. Findings indicate that in transitional financial systems, profitability is primarily driven by internal cost and risk management rather than by regulatory capital levels or external funding strategies. Policy implications should prioritize operational efficiency and coordinated prudential regulation according to system-specific constraints.

KEYWORDS: Bank, Banking Performance, Economy, Capital Adequacy, Management Efficiency, Liquidity, Liability Structure, Internal Stability

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1. INTRODUCTION

Following the global financial crisis of 2007–2008, banking system resilience and vulnerability to liquidity shocks became central to the international agenda (Florackis et al., 2014). The disruption of short-term funding and the halt in interbank settlements showed that existing regulatory mechanisms could not cope with liquidity risks. In response, the liquidity coverage ratio (hereinafter – LCR) was established under Basel III (Schmitz, 2013; Hong et al., 2014). Thus, increasing the share of stable funding sources, primarily retail deposits, strengthens the sector's resilience and reduces the risk of contagious instability during financial shocks. At the same time, substituting short-term market instruments for deposits was supposed to reduce liquidity volatility, and the total cost of funding, deposit-based funding, led to rising interest rates, falling margins, and reduced lending volumes.

International organizations are forming a coordinated position on the role of stable funding in strengthening the financial system. The Basel Committee views stable sources as a means of reducing short-term vulnerability and enhancing confidence. The International Monetary Fund assesses liquidity requirements to prevent systemic imbalances, especially in economies with limited access to capital markets (Papadamou et al., 2021). The World Bank emphasizes the importance of adapting regulatory requirements to the specificities of national banking systems to avoid putting pressure on small and regional financial institutions.In some countries, implementing sustainable funding models has had mixed effects. In South Korea, increased liquidity requirements have increased the share of term deposits and reduced dependence on external borrowing while limiting lending volumes. In Brazil, increased requirements for liquid assets have reduced bank profitability and stimulated a redistribution of assets towards government securities. In Turkey, adaptation to new standards occurred in the context of inflationary pressure and currency instability, which has led to higher funding costs and a reduction in the maturity of obligations. The impact of regulation has proven to be dependent on market structure, macroeconomic conditions, and the level of institutional maturity.

In emerging markets, the vulnerability was exacerbated by the predominance of deposits in the liability structure, limited opportunities to raise capital through markets, and weak institutional regulatory frameworks. In several countries, conflicts have been identified between regulatory liquidity and economic performance, universal regulatory models, and national conditions of banking behavior. At the same time, the question remains: how do various sustainability parameters - capitalization, liquidity, funding structure, and management effectiveness - relate to performance in the context of institutional constraints? This study aims to examine the impact of key internal structural indicators, namely capital adequacy, management efficiency, liquidity, and market-based funding, on the ROE of the banking sector in Kazakhstan

2. LITERATURE REVIEW

ROE is considered in the research literature as a complex indicator reflecting the relationship between the internal stability of a bank and external environmental conditions. Athanasoglou et al. (2008) defined bank profitability as the interaction of internal characteristics - capital structure, operating expenses, and asset risk - with industry and macroeconomic conditions. The specific characteristics make the main contribution to the formation of the ROE of banks, while macro factors play a supporting role. Sufian and Habibullah (2009) focused on banks in Bangladesh, where the key source of profitability is recognized as the intensity of lending, and cost management is considered a decisive tool for retaining profits. In contrast to this approach, Heffernan and Fu (2010), studying the Chinese banking system, link

performance not so much to the volume of operations as to the quality of financial management.

Marginal profit and economic added value indicators are brought to the forefront, which reflects the institutional specificity and strategic focus of Chinese banks. Albulescu (2015), analyzing data on emerging market countries, points out the dependence of profitability on the macro level, including inflation, the volume of government spending, and the quality of regulation. In this context, ROE is understood not as an indicator of efficiency but as an indicator of the bank's ability to remain stable in the face of external changes. Al-Homaidi et al. (2018), examining Indian banks, record the influence of assets and management decisions and the multidirectional effects of inflation and economic growth. Concluding, Rumaly (2023) showed that in conditions of institutional instability, return on capital loses predictability and becomes dependent on the short-term macroeconomic environment, including currency and inflation risks. The high climate volatility negates the importance of internal strategies, limiting their effect.

Some studies have considered capital adequacy and solvency of banks as critical stability parameters that affect the return on capital and financial institutions' behavior in macroeconomic instability conditions. Peura and Jokivuolle (2004) proposed a simulation model of stress testing, showing that the required amount of capital should vary depending on the cycle phase. In this case, capital adequacy was interpreted not as a constant value but as a variable buffer regulating the level of vulnerability in conditions of deteriorating asset quality. Drumond (2009) interpreted standards growth in expansion phases as a condition for smoothing out procyclicality and reducing profitability volatility in the downturn phase. This approach complements the interpretation of capital as a limiter on ROE during periods of tightening but a stabilizing factor in overheating conditions. Greenwood et al. (2017), analyzing the institutional structure of regulation, pointed to the fragmentation of requirements as a factor complicating the achievement of stable profitability. At the same time, the idea of unifying the regulatory framework to increase the predictability of capital policy was put forward. In contrast, Gurrea-Martínez and Remolina (2019) found that the universal approach of Basel III in emerging markets led to a restriction of lending activity and a decrease in ROE in the context of structural incomparability of markets. The increase in capital requirements was interpreted as restraining profitability, especially in banking systems with limited access to funding. Oino (2021), studying the largest UK banks, empirically confirmed that a decrease in lending activity accompanies a capital increase but, at the same time, stabilizes overall solvency. Such a two-way relationship showed that capital can simultaneously play a protective role and reduce profitability. In the context of the regression model used in this study, the lack of a significant effect of capital on ROE may be due to the offsetting of the positive impact of sustainability by the negative dynamics of profitability arising in the context of regulatory overload.

Studies on managerial efficiency and internal optimization strategies have considered it a key source of sustainability and profitability in the banking sector. Using nonparametric analysis, Ariff and Luc (2008) documented high cost and profit inefficiencies in Chinese banks, which were explicitly determined by internal management processes. Inefficiencies were interpreted not as deviations from standards but as systemic weaknesses in operational settings unrelated to macro conditions or formal constraints. Abuzayed et al. (2009) linked the market undervaluation of banks to the lack of real managerial mediation between reported profit and sustainable profitability. When comparing market and book value, an inconsistency was revealed, which is explained by hidden inefficiencies in business models. The work of Soyemi et al. (2014), based on Nigerian material, found that risk management practices play a decisive role in shaping financial results.

Insufficient integration of risk assessment into day-to-day management increased sensitivity to operational failures and reduced the ability to maintain profitability. Adem (2022), studying the impact of diversification, showed that product line expansion without synchronized management transformation increases vulnerability, especially in developing systems. The relationship between diversification and resilience was negative when controls for internal coordination were weak. Hoque et al. (2024) analyzed the Vietnamese banking sector and found that digital transformation reduced credit risk but did not improve liquidity. Changes in the liability structure did not accompany the transition to digital platforms in the context of persistent administrative inertia. Hordofa (2024), studying the Ethiopian market, confirmed that digitalization without institutional support is limited in its sustainable effect: a technological shell without a strategic reorientation of management does not reduce long-term risks. Therefore, managerial efficiency was considered a structural condition of profitability, directly impacting return on capital and indirectly impacting funding sustainability and risk profile.

Studies on the liquidity structure and dependence on deposit funding have considered the internal organization of liabilities as a key element of resilience in the face of regulatory and market constraints. Allen et al.(2015) constructed a model in which deposits performed a dual function as a funding source and a factor forming the capital structure. With a high share of deposits, market control was weakened, and sensitivity to depositors' behavioral reactions increased. DeYoung and Jang (2016) analyzed approaches to liquidity management using the example of American banks. Thus, liquidity was regulated through the asset structure and active management of attracted funds. The dependence of behavior on the phase of the credit cycle and regulatory pressure increased the heterogeneity of decisions. Edem (2017), studying Nigerian banks, found that excess liquid assets reduced profitability, and an aggressive placement strategy increased risk. The effectiveness of management was determined not by the level of liquidity as such but by the balance point between profitability and the acceptable level of risk. Mashamba and Magweva (2019), analyzing the effects of the LCR in emerging markets, showed that Basel III requirements shifted the funding structure towards short-term deposits, which increased vulnerability to outflows. Using Indonesian data, Trinugroho et al. (2020) documented differences in the deposit structure depending on the type of ownership: state-owned banks demonstrated increased sensitivity to depositor discipline, while private banks relied on more stable funding channels. Africa and Agustia (2023) found that the effectiveness of liquidity management depended on institutional control: active oversight by the risk committee strengthened the link between operational transparency and financial performance. Liquidity and liability shaped sustainability, influencing profitability and adaptability to regulatory and market changes.

Market funding mechanisms and external vulnerabilities of banks have been considered in the literature as a source of instability, creating a dependence of the financial system on short-term capital and limiting the possibilities of control through traditional regulatory channels. Hanson, Scharfstein, and Sundaram (2015) analyzed reforms of money market funds, showing that even small fluctuations in liquidity can cause significant cascading effects in the market funding system. The mechanism of instability transmission was associated with the concentration of assets in instruments with limited transparency and high sensitivity to market signals. Polzin et al. (2017) considered the resilience of market-oriented systems in energy transition financing. In the context of poorly diversified funding channels, the emphasis shifted to expanding institutional mechanisms to attract stable capital.

Market funding was noted to be highly susceptible to external shocks and information asymmetries. Gabor (2018) described the shift from shadow banking to market-oriented

finance as an institutional transformation that altered the architecture of money circulation. In the context of the disintermediation of banks, there was an increased reliance on structured markets, where the rules were determined not by the regulator but by the logic of asset circulation. Mertzanis (2020) focused on the limitations of decentralized regulation in the context of the growing share of non-bank lending. The lack of coordination between supervisory structures increased fragmentation, reducing the effectiveness of supervision of transactions outside the banks' balance sheets. Bavoso (2020) examined the P2P lending model in the UK, where the promise of access to alternative finance was accompanied by increasing systemic risks, including the absence of protections for borrowers and the lack of institutional backup. The P2P structure was perceived as a private platform, not embedded in a system of public guarantees, which exacerbated external vulnerabilities. According to Knafo (2022), the transition to market-oriented banking is a change in the regulation logic. Thus, attention is shifted to managing risk perception through ratings, liquidity metrics, and signals instead of standards and ratios. Nevertheless, market funding creates structural vulnerability despite its flexibility since it takes risks beyond the scope of banking supervision and transforms resilience into a function of market trust.

The analysis showed that existing works consider individual sustainability parameters, but there is no comparison of their impact in a single analytical structure. The links between the configuration of sustainability parameters and the nature of profitability, considering institutional differences, remained unexamined. The study aims to fill this gap by assessing the impact of management efficiency, capitalization, liquidity, and market funding on the return on capital in the banking sector of Kazakhstan.

3. RESEARCH METHODS

In line with the stated research objective to examine how the banking system's internal structural parameters affect Kazakhstan's ROE, the methodological framework was structured into three main stages. The first stage involved the formulation of working hypotheses grounded in the literature on banking sustainability and performance evaluation. The second stage consisted of selecting relevant financial indicators from official aggregated sources and calculating derived variables based on an adapted version of the KAMEL model. The third stage included statistical testing of the proposed hypotheses through multiple regression analysis and supporting diagnostics.

The selection of variables was based on the availability of consistent data for the period 2013–2023. Table 1 presents the indicators used for constructing the analytical framework.

TABLE 1. Selected indicators and units of measurement

Indicator	Unit of Measurement
Charter capital	billion KZT
Reserve capital	billion KZT
Retained earnings (uncovered loss) of the current year	billion KZT
Total liabilities	billion KZT
Equity capital	billion KZT
Total assets	billion KZT
Net income after tax	billion KZT
Net income before tax	billion KZT
Client deposits	billion KZT
Securities issued	billion KZT
Borrowed funds	billion KZT

Note: compiled by authors

Assessment of banking sector stability factors in Kazakhstan for the period 2013–2023 was carried out using an adapted version of the KAMEL model, which initially includes five key components: (1) Capital Adequacy (K); Asset Quality (A); Management Efficiency (M); Earnings (E); Liquidity (L). In this study, the A component (asset quality) was excluded due to the unavailability of comparable data on non-performing assets. Instead, the model incorporates the Market Funding Ratio (MF) to reflect the sector's dependence on borrowed and external funding sources.

To ensure a consistent and interpretable model, a set of diagnostic and inferential statistical procedures was applied (Figure 1).

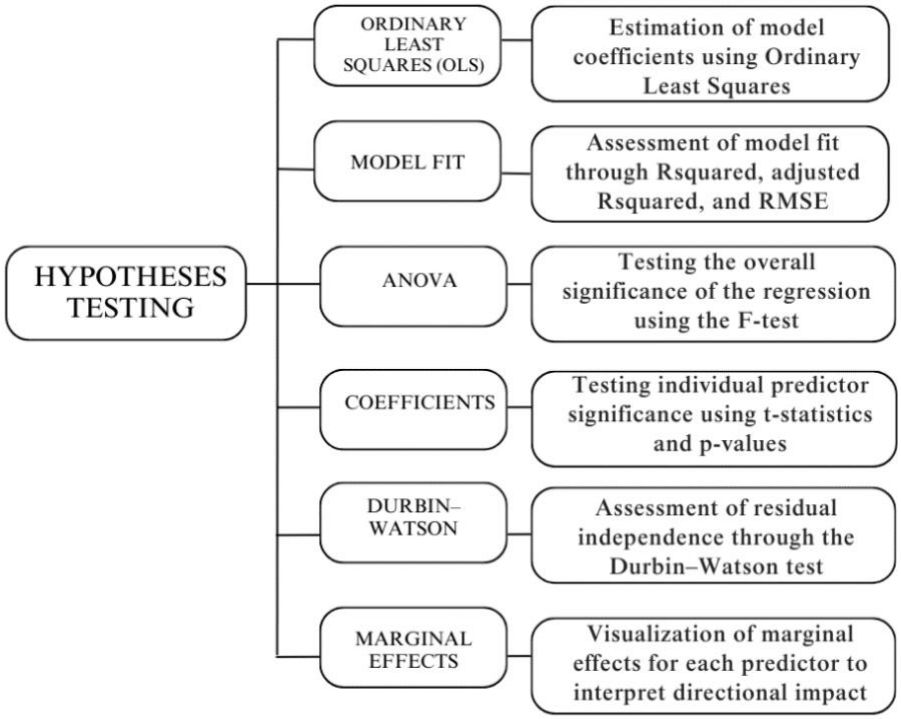

FIGURE 1. The sequence of procedures for hypothesis testing in the regression model

The following hypotheses were developed to capture potential relationships between components of financial stability and capital profitability:

H_1: An increase in the management efficiency ratio positively affects ROE.

H_2: An increase in the capital adequacy ratio is associated with a decrease in ROE.

H_3: A higher liquidity ratio (based on client deposits) leads to an increase in ROE.

H_4: A higher market funding ratio leads to a decrease in ROE.

The dependent variable is the ROE. The following indicators are used as independent variables: (1) Management efficiency, pre-tax profit to total assets (M); Capital adequacy (K); Liquidity ratio, client deposits to total liabilities (L); Market funding ratio, securities issued and borrowed funds to total liabilities (MF).

To assess the impact of internal stability indicators on capital profitability, a multiple linear regression model was applied. The model estimates the marginal influence of each factor, management efficiency, capital adequacy, liquidity, and market funding on ROE across the banking sector of Kazakhstan from 2013 to 2023. The multiple linear regression model is specified as follows:

$$ROE_t = \beta_0 + \beta_1 M_t + \beta_2 K_t + \beta_3 L_t + \beta_4 MF_t + \varepsilon_t \quad (1)$$

where:

ROE_t – return on equity in year *t*;
M_t – management efficiency;
K_t – capital adequacy;
L_t – liquidity;
MF_t – market funding ratio;
β_0 – Intercept;
β_1,β_2,β_3,β_4 — coefficients of the explanatory variables;
ε_t – error term.

The goal of the proposed methodology was to ensure the banking sector's stability based on internal parameters, with subsequent verification of their impact on the return on capital. The calculation formulas ensured the indicators' reproducibility and the model's structure allowed us to exclude duplication of effects and hidden intersections between variables. Regression analysis made it possible to establish a difference between formally influential and significant factors, to record the dominant influence of management efficiency, and to show the limited role of capital, liquidity, and market funding in profit generation. The advantage of the approach is that it allows us to construct reasonable quantitative relationships between internal characteristics and financial results on a limited set of aggregated data. This makes the method applicable in banking systems with a high regulatory burden and limited opportunities for expanding active operations.

4. FINDINGS AND DISCUSSIONS

To quantitatively assess the sustainability of the banking sector, an adapted KAMEL model was used, including five key indicators: capital adequacy ratio (K), management efficiency ratio (M), return on equity (E), liquidity level based on customer deposits (L) and the share of market funding.

The calculations cover 2013–2023 and are based on aggregated data on the banking sector of Kazakhstan. All indicators are presented as a percentage.

TABLE 1. Dynamics of Banking Sector Sustainability Indicators in Kazakhstan under the KAMEL Model for 2013–2023, %

Indicator	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
K – Adjusted Capital Adequacy Ratio	18,845	15,847	8,242	8,219	8,436	9,016	8,935	7,768	7,128	6,251	6,848
M – Management Efficiency Ratio	1,485	0,960	1,144	1,647	0,460	2,629	3,234	2,627	3,364	3,346	4,343
E – Return on Equity (ROE)	6,741	3,534	10,369	16,867	0,566	24,473	29,130	29,012	41,228	45,369	55,563
L – Liquidity Ratio I (Based on Client Deposits)	64,053	62,721	66,074	68,192	69,212	68,159	66,717	68,952	69,411	69,726	67,526
Market Funding Ratio	10,347	11,979	13,032	11,247	9,434	10,072	10,269	9,010	7,184	8,321	8,530

Note: compiled based on author's calculations

Institutional and economic changes occurred in Kazakhstan's banking sector from 2013 to 2023. Three waves of tenge devaluation (in 2014, 2015, and 2022), strengthening of regulatory control by the National Bank, liquidation of problem

financial institutions, and consolidation of the most prominent players were recorded. Funding strategies, capital levels, and profitability indicators changed under the influence of both internal restructuring and external shocks.

The capital adequacy ratio decreased from 18.85% in 2013 to 6.85% in 2023. The minimum value was recorded in 2022 – 6.25%. The sharpest decrease occurred in 2015, when the indicator decreased to 8.24%. The decrease occurred in the context of the rapid growth of liabilities caused by the active expansion of lending operations and the redistribution of resources toward borrowed funds. At the same time, equity capital increased more slowly, which led to an increase in the share of attracted resources in the liability structure and a decrease in the stability buffer against external risks.

The management efficiency indicator, calculated as the profit ratio before tax to assets, increased from 1.49% in 2013 to 4.34% in 2023. Until 2017, the values were below 2%. Since 2018, steady growth has begun against the backdrop of the completion of the withdrawal of insolvent banks from the market and the transition to centralized cost management systems. During the same period, active implementation of digital solutions began, which made it possible to reduce administrative expenses, reduce the share of non-performing assets, and increase the stability of income operations. The increase in the indicator was accompanied by stabilization of profit rates without the need to expand assets.

ROI increased from 6.74% in 2013 to 55.56% in 2023. Steady growth began after 2015: 24.47% in 2018, 41.23% in 2021, and 55.56% in 2023. The main factor is net profit growth with a limited equity increase. This situation leads to a rise in return on each unit of capital but, at the same time, increases sensitivity to potential losses: even a slight decrease in profit with a low capital base can cause a sharp deterioration in the financial situation. An increase in financial stress accompanies high profitability in such conditions. The share of deposits in the liabilities structure varied between 62.72–69.73%. The maximum value was reached in 2022. Throughout the period, deposits remained the primary source of funding. This ensured stable coverage of current liabilities without turning to external markets. The high share of deposits indicates a stable level of trust in the banking system, supported, among other things, by attractive interest rates and the relative availability of services. At the same time, the concentration of funding sources in one channel reduced the level of diversification and increased dependence on the behavior of investors.

The share of market funding, including borrowings and securities issuance, decreased from 10.35% in 2013 to 8.53% in 2023. The fluctuation range was between 7.18% and 13.03%. The decrease in the share of market instruments was accompanied by a gradual displacement of external borrowings by internal resources. Priority was given to less volatile and more predictable funding channels. This strategy made it possible to reduce the risks associated with fluctuations in interest rates, exchange rates, and the availability of credit lines. The main goal is to strengthen control over liquidity and reduce dependence on unstable sources.

A transformation of the banking sector sustainability model was recorded at the end of the decade. The level of capitalization decreased more than twofold while operating efficiency and profitability indicators increased significantly. Funding began to be concentrated within the sector, mainly through deposits, while the role of market instruments gradually weakened. The changes occurred in the context of exchange rate fluctuations, rate changes, and regulatory revisions. The sector's stability was ensured not by capital volumes but by internal adaptation of the cost structure, profitable areas, and sources of liquidity.

Time series were constructed for each component of the KAMEL model to visually represent the structure and directions of changes in the calculated indicators. The graphs allow us to identify the features of the

dynamics, including turning points, stable phases, and differences in the trajectories of individual indicators.

In Figure 2, key trends in the long-term sustainability of the banking sector are presented.

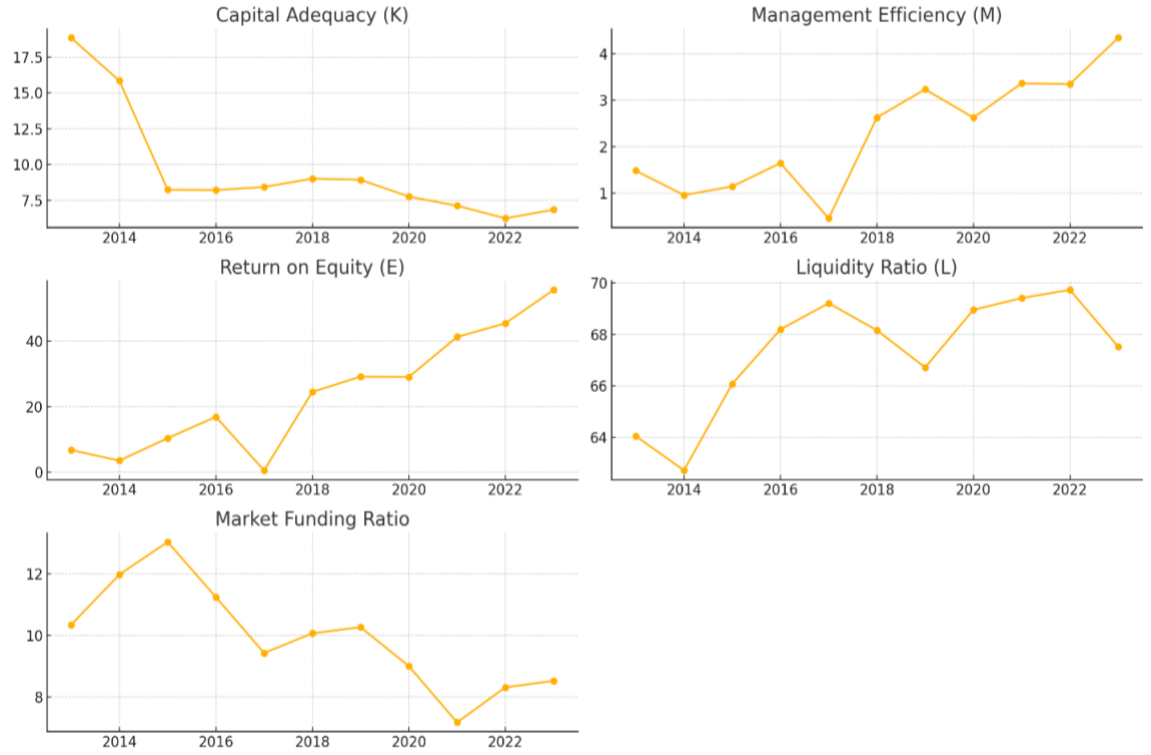

FIGURE 2. KAMEL Indicators in the banking sector of Kazakhstan for 2013-2023, %

The obtained results allowed us to draw the following conclusions.

1. Capital Adequacy Ratio (K) shows a clearly defined downward trend throughout the period. The value fell from 18.85% in 2013 to a minimum of 6.25% in 2022. The sharpest collapse occurred in 2015, possibly due to devaluation and restructuring of liabilities. In 2018–2021, the dynamics stabilized, but without a confident recovery. Only in 2023 was a weak growth of 6.85% recorded, which may indicate the ultimate point of adaptation of the sector to new standards and asset structure. The trajectory is characterized by high inertia of decline and the absence of phases of return to previous levels.

2. Management Efficiency Ratio (M) demonstrates unstable and wave-like dynamics. In 2013–2017, low values were recorded, not exceeding 1.65%, with a local minimum in 2017 (0.46%). Starting in 2018, the curve enters a phase of accelerated growth, reaching 2.63% in 2018 and 4.34% in 2023. The development of the management efficiency ratio since 2018 indicates a change in management practices: the priority has shifted from risk retention and elimination of problem assets to improving operational efficiency. The sequence of changes in the indicator reflects the transition of the banking sector from the rehabilitation stage to the phase of profitability restoration and cost optimization.

3. Return on Equity (E) is characterized by the sharpest and most stable upward trend. The value increased from 6.74% in 2013 to 55.56% in 2023. The period since 2017 has become a turning point: after a short-term drop to 0.57%, rapid growth began — more than 80 times in six years. Such dynamics indicate a significant

gap between profit growth and capital growth rates. The curve represents an exponential development type, forming a potential risk zone when income flows deteriorate. The sustainability of this trend requires further analysis of profit sources and dependence on the interest margin.

4. Liquidity Ratio (L) remains within a narrow corridor: from 62.72% to 69.73%. Since 2015, the values have stabilized above 66%. A weak positive trend is observed, especially in 2019–2022, which may be due to an increase in the share of deposits and a reduction in market borrowings. The absence of sharp fluctuations confirms the deposit funding model's stability and liquidity's predictability. The graph reflects a stable resource base with other changing parameters.

5. The Market Funding Ratio shows a moderately decreasing trend: from 10.35% in 2013 to 8.53% in 2023. The peak value was observed in 2015 (13.03%), followed by a phase of steady decline. The graph records a gradual rejection of external market financing in favor of internal sources. IBanks maintain a cautious policy in borrowing management despite the instability of external markets and periods of temporary availability of market instruments. Individual increases in the share of market funding, including the 2019 value (10.27%), reflect short-term returns to the use of external resources in the context of favorable placement conditions or individual transactions. Such fluctuations were temporary and did not change the overall liability structure towards a permanent increase in market borrowings. Throughout the period, there was a gradual decrease in the share of external financing and an increase in the role of internal sources, primarily deposits.

A multiple linear regression analysis was conducted, where the dependent variable is ROE, to assess the impact of sustainability indicators on the final profitability (Table 2).

TABLE 2. Regression results: the impact of sustainability indicators on ROE (2013–2023).

Model	R	R^2	R^2	RMSE	R^2 Change	df1	df2	p	Durbin-Watson		
									Autocor-relation	Statis-tic	p
M_0	0.000	0.000	0.000	18.176	0.000	0	10		0.618	0.372	< .001
M_1	0.985	0.970	0.970	4.036	0.970	4	6	< .001	0.373	1.201	0.037
M_1 includes M – management efficiency ratio, K – adjusted capital adequacy ratio, L – liquidity ratio I (based on client deposits), market funding ratio											

Note: compiled based on author's calculations

The M_1 regression model demonstrates a high level of explained variance (R^2 = 0,970). The value of the determination coefficient indicates that 97% of fluctuations in ROE in the banking sector of Kazakhstan in 2013–2023 are associated with changes in management efficiency, capital adequacy, liquidity, and market funding volumes. This value reflects a direct dependence of profitability on internal stability parameters. Thus, institutional characteristics strongly impact the context of a controlled and structurally closed financial space. Increased sensitivity of profit to internal factors is typical for systems under the influence of administrative restrictions, with limited external market impact. A significant improvement in the model compared to zero ($p < 0.001$) means the statistical validity of including management, capital, liquidity, and funding components in explaining profitability. The economic interpretation is that the behavior of the banking sector profit is not subject to random processes and can be represented as a function of controlled financial indicators. The stability of the model is confirmed by the correspondence of the actual values to the predicted ones when including the specified predictors.

The value of the Durbin-Watson statistics (1.201) does not indicate the presence of autocorrelation of the residuals. That is, the sequence of errors does not form systematic deviations. Such behavior of the residuals suggests the absence of omitted time factors in

the model, which ensures the independence of predictions from chronological structures. The lack of autocorrelation allows us to consider the model suitable for analyzing time data in stable or slowly changing economic regimes.

Among the included variables, only the management efficiency coefficient was statistically significant ($p = 0.001$). The main contribution to the formation of profitability is provided by the indicator reflecting the profit ratio before tax to assets. The high significance of this variable confirms the decisive role of the internal organization of processes, cost control, digitalization of operations, and optimization of product lines. During the specified period, the management of flows and structures, rather than the scale or sources of assets, formed the basis for increasing profits. Such a dependence is typical for restructuring completion and the transition to a performance policy.

The remaining predictors - capital adequacy, liquidity level, and the share of market funding - are statistically insignificant in this model. This does not mean the absence of economic influence but indicates that within the observed time window, these parameters remained relatively stable or mutually neutralized their effects. Insignificance may be because the permissible limits for these indicators were observed by all market participants, resulting in variations within the sector that did not lead to significant differences in profits. Financial stability was ensured not so much by structural relationships in the balance sheet as by the nature of operating activities.

A high R^2 value with one significant coefficient reflects a high concentration of explanatory influence. Such a model structure indicates the management component's dominance in forming profitability with the relative homogeneity of other factors. The results suggest that the banking sector's profitability in 2013–2023 was formed mainly due to internal management decisions implemented under strict regulatory control, limited access to external sources of financing, and a predictable macroeconomic environment. This model means that profits were maintained by redistributing internal resources and cost optimization rather than through operations or external activity growth. As a result, the main burden of ensuring stability was transferred to the internal reserves of banks and, indirectly, to customers - through tariffs, interest rates, and the narrowing of the product line.

ANOVA was used to assess the statistical significance of the linear regression model. The method helps to establish whether the set of selected predictors explains the variation in ROE better than a simple constant. Table 3, presents results for ANOVA analysis.

TABLE 3. Statistical significance of ROE dependence on stability parameters

Model		Sum of Squares	df	Mean Square	F	p
M_1	Regression	3206.032	4	801.508	49.204	< .001
	Residual	97.736	6	16.289		
	Total	3303.769	10	-		
M_1 includes M – management efficiency ratio, K – adjusted capital adequacy ratio, L – liquidity ratio I (Based on Client Deposits), market funding ratio						
The intercept model is omitted, as no meaningful information can be shown						

Note: compiled based on author's calculations

The obtained value of the F-criterion (49.204) at $p<0.001$ confirms that the included variables — management efficiency, capital, liquidity, and market funding — together provide a significant explanation for changes in profitability. The high value of the sum of squares for the regression part (3206.032 out of 3303.769) reflects that almost the entire spread of ROE values is associated with variations in the selected stability parameters. The remaining share (97.736) is attributed to the residual variation, which indicates a minimal

influence of unaccounted factors. The statistical significance of the model allows us to state that the behavior of profit in the banking sector can be analytically explained through institutional parameters and is not due to random external fluctuations.

Multiple linear regression coefficients were calculated to determine each factor's contribution to the change in ROI. The assessment is carried out based on the t-statistics value and the significance level (p), considering both standardized and non-standardized coefficients.

Table 4, presents results for coefficients analysis.

TABLE 4. Coefficients of the regression model for the impact of sustainability parameters on ROE for 2013–2023

Model		UnSTND	STND Err	STND	t	p
M_0	(Intercept)	23.896	5.480	-	4.360	0.001
M_1	(Intercept)	130.672	159.192	-	0.821	0.443
	M – Management Efficiency Ratio	11.410	2.001	0.771	5.703	0.001
	K – Adjusted Capital Adequacy Ratio	-1.433	0.965	-0.314	-1.484	0.188
	L – Liquidity Ratio I (Based on Client Deposits)	-1.488	1.958	-0.186	-0.760	0.476
	Market Funding Ratio	-1.910	1.832	-0.179	-1.043	0.337

Note: compiled based on author's calculations

The management efficiency ratio exerts the most significant impact on ROE. Each additional point for this indicator is associated with an increase in ROE by 11.41 percentage points at a significance level of p = 0.001. This variable's contribution is not only statistically significant but also economically justified: an increase in profitability before tax per unit of asset is accompanied by a direct increase in ROE. The remaining parameters - capitalization, liquidity, and market funding - did not show statistical significance at the selected confidence level. Negative values of the coefficients for capital (-1.433), liquidity (-1.488), and market funding (-1.910) indicate an inverse relationship. Still, the p-levels (0.188, 0.476, and 0.337, respectively) do not allow us to confirm the presence of a stable influence. Such a picture may reflect compensating effects between the variables or the absence of pronounced changes over the period. The model emphasizes that profitability in 2013–2023 was formed primarily through internal management mechanisms, while structural parameters remained relatively stable.

Figure 3, presents marginal effects plots for analyzed variables.

The marginal effects graphs reflect the nature of the impact of each of the four model predictors on ROE, given fixed values of the other variables. Based on the results of the analysis, hypotheses about the direction and significance of these dependencies were tested. Hypothesis H_1 about the positive impact of the management efficiency coefficient (M) on ROE was confirmed. With an increase in the value of the M indicator from low to high, a steady increase in ROE is observed, which is recorded by a clear upward slope of the effect line and a narrowing of the confidence interval. This dependence indicates that the banking sector of Kazakhstan in 2013–2023 ensured profitability growth primarily due to internal management decisions. The digitalization of services accompanied increased efficiency, decreased administrative costs, restructuring of unprofitable operations, and asset optimization. With the dominance of operational mechanisms, profit was generated under a fixed capital and funding structure without large-scale expansion of activities. This dependence forms a model in which an increase in profitability does not require an increase in the resource base but is associated with an increase in internal productivity and management adaptability.

Hypothesis H_2 about a decrease in ROE

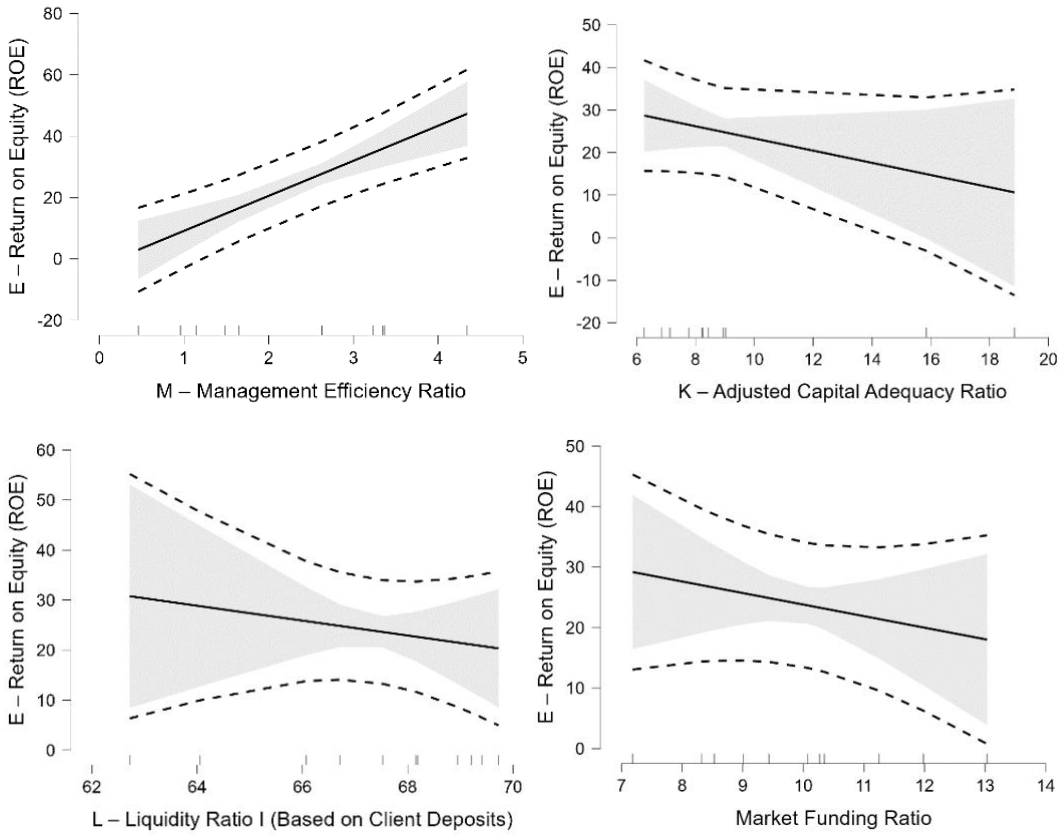

FIGURE 3. Marginal Effects Plots

with an increase in the capital adequacy ratio (K) was partially confirmed. A negative slope of the regression line is observed, but a wide confidence interval reduces the conclusion's reliability level. The inverse dependence may be because an increase in the volume of capital is not accompanied by a corresponding rise in profitable assets, resulting in a decrease in the turnover of resources. Maintaining high capital adequacy ratios in Kazakhstan places a significant share of funds in low-yield or non-market instruments. The lack of synchronization between capital growth and opportunities for active income-generating activities restrains the overall profitability of the banking sector, especially with weak investment demand in the real economy.

Hypothesis H_3 about a positive relationship between the level of liquidity and ROE was not confirmed. The graph of the marginal effect for the liquidity indicator based on customer deposits demonstrates a virtually horizontal trajectory; the confidence interval is wide. This structure indicates the absence of a clear relationship between liquidity and profitability in the period under study. The probable cause is the stability and homogeneity of the deposit base, formed mainly by funds from the population and businesses. The lack of sensitivity of ROE to changes in the share of deposits means that access to resources did not limit active operations but did not create an additional source of income. The macroeconomic conditions of Kazakhstan reflect the saturation of the passive base and indicate the need for further development of alternative funding models to increase the flexibility and diversification of the resource base.

Hypothesis H_4 about a decreased profitability with increased market funding was not confirmed. The regression line has a

negative slope, but the confidence interval is wide, and the concentration of observations does not support a stable relationship. An increase in the share of borrowings and placed debt instruments did not significantly impact profitability.

In summary, the banks' funding structure for the analyzed period was primarily supported by client deposits, while market sources were used in limited volumes. Thus, the funding model of banks in Kazakhstan ensured stability against external fluctuations but could limit opportunities for financing large projects and participating in investment initiatives. With the increasing need for long-term financing, the insufficient role of market instruments could become a factor restraining growth.

5. CONCLUSION

The study examined the determinants of ROE in Kazakhstan's banking sector during the post-crisis period. The results showed that, profitability was driven by management efficiency and capital adequacy, liquidity, and funding structure did not significantly affect ROE. Under conditions of limited growth and low asset turnover, stability was maintained through internal decisions. The profit structure was based on operational optimization, digitalization of processes, cost redistribution, and increased productivity of current balance sheets. Expansion of the resource base did not lead to an increase in profitability. The balance between regulatory sustainability and commercial performance shifted towards maintaining formal requirements. Funding was based primarily on deposit sources. The use of market instruments remained episodic, which limited strategic flexibility.

Institutional changes are required to increase profitability. Capital must be redistributed to active areas, internal management contours strengthened, and funding mechanisms revised. Lack of market flexibility reduces the banking system's potential to serve long-term investment objectives. The prevalence of operational efficiency over structural scalability excludes expansion unless growth sources are updated.

In the current configuration, Kazakhstan's banking sector ensures stability but does not perform capital redistribution in the economy. The lack of connection between profitability and liquidity or market funding means a decrease in transmission potential. Maintaining stability requires not an increase in volumes but an increase in their efficiency.

Limiting banks' role as mechanisms of economic growth is becoming a strategic risk. If the closed model is maintained, the sector maintains its current position but is unable to expand support for structural transformations. Unlocking the potential is possible only with the integration of market funding sources, the transition to active profitability management, and the formation of an institutional environment for the sustainable involvement of capital in economic development.

AUTHOR CONTRIBUTION

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