

Yashil IQTISODIYOT va TARAQQIYOT

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- 08.00.17 Turizm va mehmonxona faoliyati



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MACROECONOMIC FACTORS IN THE DEVELOPMENT OF THE BANKING PERFORMANCE



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Abstract: This study examines the impact of inflation rates, interest rates, and GDP growth on the banking sector of Uzbekistan in 2014-2023. Using random effects regression analysis, this study examines key indicators of bank performance, including return on assets, return on equity, non-performing loans, and the overall efficiency of the banking system.

Key words: banking system activity, inflation, interest rates, GDP growth, normative quality.

Annotatsiya: Ushbu tadqiqot inflyatsiya sur'atlari, foiz stavkalari, yalpi ichki mahsulot o'sishining 2014–2023-yillardagi O'zbekiston bank sektori faoliyatiga ta'sirini o'rganadi. Tasodifiy effektlar regressiyasi tahlilidan foydalangan holda, ushbu tadqiqot bank faoliyatining asosiy ko'rsatkichlari, jumladan, aktivlar rentabelligi, o'z kapitalining rentabelligi, ishlaymagan kreditlar va bank tizimining umumiy samaradorligini o'rganadi.

Kalit so'zlar: Bank tizimi faoliyati, inflyatsiya, foiz stavkalari, YaIM o'sishi, normativ sifat.

Аннотация: В данном исследовании рассматривается влияние уровня инфляции, процентных ставок и роста ВВП на банковский сектор Узбекистана в 2014-2023 годах. Используя регрессионный анализ случайных эффектов, в этом исследовании изучаются ключевые показатели эффективности банков, включая рентабельность активов, рентабельность собственного капитала, проблемные кредиты и общую эффективность банковской системы.

Ключевые слова: деятельность банковской системы, инфляция, процентные ставки, рост ВВП, нормативное качество.

INTRODUCTION

The banking system in Uzbekistan has traversed a dynamic historical trajectory mirroring the nation's economic evolution. Rooted in rich historical tapestry, Uzbekistan's banking sector has emerged as a pivotal pillar shaping the country's economic framework(Khalid, 2016). The inception of banking in Uzbekistan can be traced back to its historical roots, where traditional moneylenders and informal financial networks have formed a rudimentary financial landscape.

The evolution of the banking system in Uzbekistan reflects a multifaceted journey marked by regulatory changes, technological advancements, and adaptations to global economic trends. As the country sought to integrate into the global economy, the banking sector underwent reforms to enhance its efficiency, stability, and competitiveness. These reforms encompassed liberalization measures, including privatization, deregulation,



RESEARCH METHODOLOGY

In the implementation of these research works, widely used methods in scientific research methodology were used. In the process of scientific analysis, these scientific research methods, in particular, observation, generalization, grouping, comparison, analysis, and synthesis and analysis methods were widely used.

ANALYSIS AND RESULTS

Data analysis was a critical component of this study as it involved processing and interpreting the collected data to draw meaningful conclusions about the relationships between macroeconomic variables and banking system performance. The analysis was conducted using a combination of descriptive and inferential statistical techniques facilitated by statistical software such as STATA. Descriptive statistics were used to summarize the basic features of the data and provide a clear overview of the sample characteristics. This included calculating measures of central tendency (mean and median) and dispersion (standard deviation, range) for each variable. Descriptive analysis helped to understand the distribution and variability of the data, identifying any outliers or anomalies that needed to be addressed before conducting further analysis. A correlation analysis was conducted to examine the strength and direction of the relationships between the independent variables (inflation rates, interest rates, and GDP growth) and the dependent variable (banking system performance). Pearson's correlation coefficients were calculated to determine the degree of linear association between these variables. This analysis provides initial insights into how changes in macroeconomic factors relate to variations in banking performance.

Table 1. Variable, Notation, Measurement Scale and Source.

Variable	Notation	Measurement	Scale	Source
Banking System Performance	ROA	Return on Assets	Ratio	Banks' Annual Reports
	ROE	Return on Equity	Ratio	Banks' Annual Reports
	NPL Ratio	Non-Performing Loans Ratio	Ratio	Banks' Annual Reports
Inflation Rate	CPI	Consumer Price Index	Percentage	World Bank
Interest Rate	Interest Rate	Annual Average Lending Rates	Percentage	World Bank
GDP Growth	GDP Growth Rate	Annual GDP Growth Rate	Percentage	World Bank
Government Policies	Regulatory Quality	Regulatory Quality Index	Index/Categorical	World Bank
Bank Size	Total Assets	Total Assets	Ratio	Banks' Annual Reports
Capital Adequacy	CAR	Capital Adequacy Ratio	Ratio	Banks' Annual Reports

Empirical Model

Based on the above specifications, the basic model for estimating the impact of macroeconomic variables on banking system performance is as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \beta_2 X_{2,it} + \beta_3 X_{3,it} + \beta_4 Z_{it} + \varepsilon_{it}$$

The basic model for estimating the impact of macroeconomic variables on banking system performance is as follows:

$$ROA_{it} = \beta_0 + \beta_1 CPI_{it} + \beta_2 IR_{it} + \beta_3 GDP_{it} + \beta_4 TA_{it} + \beta_5 CAR_{it} + \varepsilon_{it}$$

$$ROE_{it} = \beta_0 + \beta_1 CPI_{it} + \beta_2 IR_{it} + \beta_3 GDP_{it} + \beta_4 TA_{it} + \beta_5 CAR_{it} + \varepsilon_{it}$$

$$NPL_{it} = \beta_0 + \beta_1 CPI_{it} + \beta_2 IR_{it} + \beta_3 GDP_{it} + \beta_4 TA_{it} + \beta_5 CAR_{it} + \varepsilon_{it}$$

The empirical model, which incorporates the possibility of fixed or random effects, can be extended to include interaction terms and control variables to account for the potential moderating effects of government policies.

$$ROA_{it} = \beta_0 + \beta_1 CPI_{it} + \beta_2 IR_{it} + \beta_3 GDP_{it} + \beta_4 TA_{it} + \beta_5 CAR_{it} + \beta_6 Q_{it} + \beta_7 (CPI_{it} \times Q_{it}) \\ \beta_8 (IR_{it} \times Q_{it}) + \beta_9 (GDP_{it} \times Q_{it}) + \varepsilon_{it}$$

$$ROE_{it} = \beta_0 + \beta_1 CPI_{it} + \beta_2 IR_{it} + \beta_3 GDP_{it} + \beta_4 TA_{it} + \beta_5 CAR_{it} + \beta_6 Q_{it} + \beta_7 (CPI_{it} \times Q_{it}) \\ \beta_8 (IR_{it} \times Q_{it}) + \beta_9 (GDP_{it} \times Q_{it}) + \varepsilon_{it}$$

$$NPL_{it} = \beta_0 + \beta_1 CPI_{it} + \beta_2 IR_{it} + \beta_3 GDP_{it} + \beta_4 TA_{it} + \beta_5 CAR_{it} + \beta_6 Q_{it} + \beta_7 (CPI_{it} \times Q_{it}) \\ \beta_8 (IR_{it} \times Q_{it}) + \beta_9 (GDP_{it} \times Q_{it}) + \varepsilon_{it}$$

$\Omega\eta\epsilon\rho\epsilon$, ROA_{it} , ROE_{it} and NPL_{it} represent banking system performance for bank i at time t

CPI_{it} represents the inflation rate

IR_{it} represents the interest rate

GDP_{it} represents the GDP growth rate

TA_{it} represents bank size (total assets)

CAR_{it} represents capital adequacy ratio

β_0 is the intercept

Q_{it} represents the Regulatory Quality Index

$CPI_{it} \times Q_{it}$, $IR_{it} \times Q_{it}$ and $GDP_{it} \times Q_{it}$ are the interaction terms between the macroeconomic variables and the Regulatory Quality Index

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9$ are the coefficients for the respective variables and interaction terms ε is the error term.

Diagnostic Tests

Several diagnostic tests were conducted to ensure the validity and reliability of the regression models. These tests include:

Multicollinearity: The Variance Inflation Factor (VIF) was used to check for multicollinearity among independent variables.

Heteroscedasticity: The Breusch-Pagan test was employed to detect any heteroscedasticity in the regression models.

Autocorrelation: The Durbin-Watson statistic was used to test for autocorrelation in the residuals.

Normality: The Shapiro-Wilk test was applied to verify the normality of the residuals.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	310	-0.004	0.029	-0.049	0.049
ROE	310	0.025	0.073	-0.097	0.149
NPL	310	0.055	0.025	0.010	0.099
BSP	310	0.000	1.059	-2.505	2.634
CPI	310	0.097	0.057	0.003	0.199
IR	310	0.099	0.059	0.000	0.199
GDP	310	0.026	0.043	-0.050	0.099
Q	310	-0.070	1.436	-2.468	2.451
CAR	310	0.138	0.034	0.080	0.199
TA	310	19.728	0.953	14.317	20.722

Note(s): ROA: Return on Asset, ROE: Return on Equity, NPL: Non-Performing Loans, BSP: Bank System Performance, CPI: Inflation Rate, IR: Interest Rate, GDP: Gross Domestic Product Rate, Q: Regulatory Quality Index, CAR: Capital Adequacy Ratio, TA: Bank Size.



The study examines the influence of important macroeconomic indicators, including the Consumer Price Index (CPI), Interest Rate (IR), and Gross Domestic Product Growth (GDP), on the performance of the banking industry. These characteristics are indicative of the wider economic conditions under which banks function. In addition, independent variables such as the Regulatory Quality Index (Q), Capital Adequacy Ratio (CAR), and Bank Size (TA) are considered because they indicate regulatory and structural attributes that might potentially impact banking performance. This study focuses on Banking System Performance (BSP) as the dependent variable. The BSP is a comprehensive metric that assesses the banking system's financial well-being and stability. This variable is essential because it encompasses banks' total performance, including criteria such as profitability, asset quality, and efficiency.

Descriptive statistics provide crucial insights into the extent and dispersion of data. The Return on Assets (ROA) has an average of -0.004 and a standard deviation of 0.029. This suggests that, on average, banks have slightly negative profitability of assets, with some fluctuations around this average. The research period revealed a variation in profitability among various banks, with the smallest value for Return on Assets (ROA) at -0.049 and the greatest value at 0.049. The Return on Equity (ROE) has an average value of 0.025, with a standard deviation of 0.073. This indicates substantial variation in equity returns across banks, with some suffering negative returns as low as -0.097 and others attaining positive returns as high as 0.149. This difference is indicative of varying degrees of financial efficiency and profitability across institutions.

Table 3. Random Effect Regression Results on the Effect of Macroeconomic Factors on Banking System Performance

Variable	ROA	ROE	NPL	BSP
Constant	0.053*** (14.10)	0.098*** (15.35)	1.249*** (4.73)	0.100*** (13.65)
CPI	-13.006*** (-4.95)	-0.279* (-2.27)	0.006** (2.67)	2.661*** (9.57)
IR	11.394** (2.36)	0.245** (3.78)	0.379** (2.29)	0.678*** (12.56)
GDP	11.957** (2.97)	0.002** (2.51)	-0.036** (-2.20)	0.149*** (3.72)
Q	5.651** (3.01)	0.182*** (3.34)	0.039** (3.67)	0.076*** (4.51)
CPI×Q	5.104*** (4.87)	0.282** (2.30)	-0.176*** (-4.23)	0.046*** (5.72)
IR×Q	1.395*** (7.89)	0.156** (2.16)	4.767*** (17.02)	0.036*** (4.89)
GDP×Q	0.342*** (3.82)	0.004*** (5.44)	-3.848*** (-13.81)	0.192** (6.73)
CAR	0.206*** (1.83)	0.021** (4.83)	4.784*** (17.04)	0.131*** (3.98)
lnTA	1.201*** (3.98)	0.049** (3.78)	3.803*** (13.65)	0.018** (3.92)
R ²	0.732	0.744	0.853	0.770
Wald χ^2	182.383***	97.11***	128***	203.93***
Obs.	310	310	310	310

Note(s): ***, **, and * indicate significance at the 5% and 10% levels, respectively. ROA: Return on Asset, ROE: Return on Equity, NPL: Non-Performing Loans, BSP: Bank System Performance, CPI: Inflation Rate, IR: Interest Rate, GDP: Gross Domestic Product Rate, Q: Regulatory Quality Index, CAR: Capital Adequacy Ratio, TA: Bank Size.

The coefficient of determination (R^2) is a crucial metric in regression analysis that quantifies the proportion of variance in the dependent variable that is predictable from the independent variables. In the context of the Random Effects Model used in this research, the R^2 value indicates how well the model explains the variations in the dependent variables, such as Return on Assets, Return on Equity, Non-Performing Loans, and bank system performance. The R^2 values ranged between 0 and 1. An R^2 value close to 0 suggests that the independent variables in the model explain very little of the variation in the dependent variable, indicating that the model has a limited predictive power. Conversely, an R^2 value close to one indicates that the independent variables explain most of the variation in the dependent variable, suggesting that the model is highly effective in predicting the outcome variable.

In this study, the R^2 values obtained from the Random Effects Model provide insights into the effectiveness of the model in capturing the underlying relationships between the macroeconomic variables and bank-specific factors (independent variables) and the financial performance metrics (dependent variables) of banks. If the R^2 values are high, it indicates that the model successfully captures the key determinants of bank performance, suggesting that the chosen independent variables are appropriate and that the Random Effects Model is well suited for this analysis. However, if the R^2 values are low, closer to 0, the model does not account for much of the variation in the dependent variables. This could indicate that other factors not included in the model might influence bank performance metrics or that the relationships between the independent and dependent variables are weak.

The interpretation of R^2 in the context of this research also provides guidance for future model refinement. A lower R^2 value might prompt further investigation into additional variables or alternative modeling techniques to improve the explanatory power of the regression analysis. On the other hand, a high R^2 value strengthens the validity of the findings, confirming that the selected variables and the Random Effects Model are appropriate for explaining variations in bank performance. The R^2 value is a key indicator of the model's effectiveness in explaining variations in the dependent variables. High R^2 values would suggest that the Random Effects Model provides significant insights into the factors influencing bank performance in Uzbekistan, whereas low R^2 values would indicate that the model has limited explanatory power, necessitating further refinement or exploration of additional variables.

CONCLUSIONS

This study employed Random Regression Analysis to investigate the relationship between these macroeconomic variables and the performance metrics of the banking sector, including Return on Assets (ROA), Return on Equity (ROE), Non-Performing Loans (NPLs), and overall Bank System Performance (BSP). First, the findings suggest that inflation rates have a complex effect on banking performance. While higher inflation tends to negatively affect profitability metrics, such as ROA and ROE, effective regulatory frameworks can mitigate some of these adverse effects. The study shows that banks operating in strong regulatory environments can adapt to inflationary pressures, maintaining overall system performance despite the challenges posed by rising prices.

Second, interest rates positively influence banking profitability, as reflected in the positive coefficients for ROA and ROE. This indicates that banks can benefit from wider interest margins in a high interest rate environment, although this also comes with increased credit risk, as shown by the positive impact of interest rates on NPLs. This underscores the importance of robust risk management strategies for navigating the challenges of a fluctuating interest rate environment.

Third, GDP growth generally has a positive impact on banking performance, enhancing profitability and reducing credit risks. The positive correlation between GDP growth and BSP highlights the role of economic expansion in driving the banking sector's overall health. This relationship emphasizes the importance of sustained economic growth for bank stability and efficiency.

Finally, this study highlights the critical moderating role of government policies, as captured by the Regulatory Quality Index. Effective government policies were found to enhance the positive impacts of interest rates and GDP growth on banking performance while also mitigating some of the negative effects of inflation.

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