ECONOMETRIC ANALYSIS OF BANK ASSET EFFICIENCY

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A B S T R A C T	K E Y W O R D S
This article examines the content and essence of bank assets, the opinions of foreign economists on this issue. An econometric analysis of commercial bank assets based on various models is also carried out, and a general conclusion is given.	Commercial banks, assets, Hausman test, the fixed effects, return on assets, cash assets, Central bank funds, stocks, total investments, total assets with other banks, loans and leasing, liabilities ratio, net interest margin, securities.

Introduction

In the context of the reform and transformation of the banking system of the Republic of Uzbekistan, priority tasks have been set for the privatization of banks, the sale of existing state shares in commercial banks to foreign investors, and the introduction of modern service practices in banks. According to the Decree of the President of the Republic of Uzbekistan No. PF-5992 dated May 12, 2020 "On the Strategy for Reforming the Banking System of the Republic of Uzbekistan for 2020-2025", "the lagging behind of large commercial banks in the transformation processes in accordance with modern requirements in the sector, the delay in implementing corporate governance standards, information technology products, asset and liability management, and modern methods of communicating with customers" indicates the existence of significant problems facing banks.[1] Also, expanding the number and scope of remote banking services, including contactless payments, through the introduction of modern information technologies in the activities of banks will serve to develop digital banking services of banks. Also, according to this decree, the state is tasked with conducting an inventory of banks' assets, identifying assets that are not specific to their activities, and taking measures to sell them, which requires the introduction of mechanisms for effective management of banks' assets.

Literature Review

It is advisable to review the research conducted by domestic and foreign economists on the management of bank assets in order to reveal the content of bank assets and optimize their composition, and increase the efficiency of bank operations.

Research on the management of assets and asset portfolios of commercial banks has been widely studied by foreign economists and is still being conducted today. The famous American economist D. Sinki, in his work "Financial Management in Commercial Banking and in the Financial Services Industry," discussed the three stages of managing the assets and liabilities of banks. In particular:

Stage 1, general bank asset management;

Stage 2, refinement, i.e. bank liquidity management, loan management and other asset portfolio management;

Stage 3, bank performance management based on achieved financial results.[3]

According to the scientist, the income-generating assets of banks, excluding the "concrete and glass" (i.e., fixed assets such as bank buildings), play an important role in ALM (Asset and Liability Management). As the basis for asset and liability management in banks, asset categories, quantity, and interest rates are important in asset management. [3]

In bank asset management, various measures and methods are used to form a portfolio of assets resulting from the active operations of a commercial bank. Asset management in banking originated in the USA in the 1960s and initially aimed at managing the level of risk associated with changes in interest rates.[4]

Until this period, commercial banks used certain instruments or specific operations to manage assets and liabilities. However, today, changes in the banking system, the increasing intensity of the banking services market, and the development of information technologies have created the need for asset management in banks to ensure a balance between high returns and risk levels.

The well-known economist P. Rose further explains the essence of asset and liability management of banks, stating that "the essence of asset and liability management is seen in the formulation of a strategy and implementation of measures that ensure that the composition of the bank's balance sheet is consistent with the bank's strategic programs."[5]

In addition, P. Rose emphasizes the goals of using bank assets and ensuring their liquidity for the bank to exist. Banks are required not only to fulfill their obligations to customers, but also to ensure high profits and achieve important goals for bank shareholders by increasing the bank's profitability.

Analysis and Results

Econometric analysis is of particular importance in analyzing the efficiency of commercial banks' assets. There are a number of models in econometric analysis. Below, we will analyze the econometric analysis of bank asset efficiency based on these models..

Results and discussions for model 1

The Hausman test is a statistical technique widely used in panel data analysis to help determine whether a fixed effects (FE) model or a random effects (RE) model is appropriate for a data set. Panel data combine time and cross-sectional (individual or organizational) measures. The choice between FE and RE models depends on how unobserved individual characteristics are distributed and how they are associated with the independent variables. The fixed effects (FE) model assumes that these unobserved individual characteristics (e.g., factors specific to each firm or individual) are associated with the independent variables and assigns a separate baseline value to each cross-sectional unit (e.g., firm or individual). In other words, this model takes into account the unique characteristics of each unit.

The random effects model (RE) assumes that these unobserved characteristics are not related to the

independent variables and includes them in the error term of the model. The Hausman test tests this assumption - the null hypothesis (H_0) is that the random effects model is preferable, that is, the unobserved individual characteristics are not related to the independent variables. The alternative hypothesis (H_1) assumes that the fixed effects model is preferable, because such a relationship exists. If the null hypothesis is rejected, then the main condition of the RE model is violated, and in this case it is recommended to use the FE model, because the RE model leads to incorrect and biased estimation results.

The results of the Hausman test for Model 1 were as follows: Chi-square statistic 498.14, degrees of freedom (df) – 7, and p-value 0.000. Since the p-value is very small, it is statistically possible to reject the null hypothesis. This means that there is a significant relationship between the unobserved individual characteristics and the independent variables. Therefore, the fixed effects model is considered appropriate for this analysis.

By using the FE model, all characteristics that do not change over time are controlled for each unit in the panel. As a result, the error caused by not taking into account factors that differ between different units but are constant over time (omitted variable bias) is prevented.

In conclusion, based on the results of the Hausman test, it is recommended to use the Fixed effects model in Model 1. This ensures the reliability and consistency of the analysis results

Table 1. Hausman test for model 1

Hausman test for Model 1			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f	P-value
Cross-section random	498.14	7	0.000

The fixed effects (FE) regression model uses a panel data set of financial indicators as the dependent variable to study the determinants of ROA. The results of the analysis show that some variables are statistically significantly related to ROA, while others are not. Cash assets (CA) have a significant and positive impact on ROA. This means that when a company or bank has more cash, profitability improves. This result is consistent with previous studies, in particular, studies that have shown that liquidity reserves play an important role in maintaining financial stability and increasing profitability. In particular, studies by Bourke and Molyneux and Thornton have shown that high liquidity has a positive impact on bank profitability.[6,7]

Central bank funds (CBF) also show a positive relationship with ROA. This result suggests that banks' access to central bank resources is a factor that ensures short-term stability and profitability. This has been widely observed in research, especially after the 2008 financial crisis.

There is a positive and statistically significant relationship between stocks (S) and ROA (return on assets) (p = 0.037). This means that investing in stocks increases profitability. This result is consistent with previous studies, confirming that income from stocks is a reliable source of non-interest income during periods of low demand for credit. On the other hand, total investments (TI) have a negative and statistically significant effect on ROA. This result is in contradiction with some previous studies, since in many scientific studies, an increase in the volume of investments was considered to be positively related to profitability. However, a negative relationship could indicate a misallocation of investments or a decrease in profitability (diminishing returns) due to overinvestment.

Other variables – total assets with other banks (TFOB), loans and leasing (CAL), and customer liabilities ratio (LevR) – do not show a statistically significant relationship with ROA. This suggests that these indicators are not important in explaining changes in profitability in this model and the selected sample. These results are reminiscent of the conflicting evidence in the literature on LevR – that LevR has different effects in different contexts and countries. Also, the liquidity ratio (LiqR) is strongly negatively related to ROA, which is an intuitively unexpected result. That is, it means that holding liquidity reserves above the optimal level leads to underutilization of resources and, as a result, lower profitability. This is consistent with the trade-off theory of liquidity management, which suggests that overly cautious policies can reduce profitability.

These results, determined based on the FE model, allow for a deeper understanding of the financial factors that affect bank profitability through ROA (return on assets). In particular, the positive and significant impact of cash assets (CA) on ROA indicates that banks have a stronger ability to cover short-term liabilities, respond to unexpected expenses, and reduce risk. This contributes to the sustainability of profitability.

This view was advanced by Bourke and Molyneux & Thornton[6,7] and has been confirmed in recent studies by Dietrich and Wanzenried and Ahamed[8,9]: banks with strong liquidity positions have achieved higher profitability, especially during and after financial crises.

The result for central bank funds (CBF) is positive and marginally significant, which means that access to central bank financing can increase short-term returns. This is especially important in light of the monetary policy pursued by central banks in recent years. For example, Hashem[10] found that banks' access to central bank funds during the COVID-19 pandemic helped them maintain their earnings and capital reserves. Equity (S) is positively and significantly related to ROA. This result further confirms that non-interest income from investments has a positive impact on bank profitability. This relationship is supported by the increasing role of financial securities in modern banking systems, especially in the context of low interest rates and diversification of income sources.

However, total investment (TI) has a negative and statistically significant effect on ROA. This means that excessive or ineffective investment can lead to a decrease in bank profitability. Although this finding contradicts some positive results proposed by Athanasoglou et al., recent studies confirm this negative effect. For example, Djalilov and Piesse[11,12] found that investment-based growth in banks in developing countries often leads to high risk and low returns due to weak management and inefficient capital allocation.

The liquidity ratio (LiqR) has a strong negative relationship with ROA. Liquidity is usually seen as a risk-reducing factor, but excessive liquidity can often be a sign of risk aversion or failure to take advantage of profitable lending opportunities. The debate about this trade-off has also been raised in modern empirical research.

Other variables such as credit and leasing (CAL), customer liabilities ratio (LevR), and total funds with other banks (TFOB) do not have a statistically significant impact on ROA. These results indicate that the determinants of bank profitability are context-dependent. This is also the case in cross-country studies that have shown that institutional and regulatory systems significantly influence the relationship between profitability and LevR.

Using a fixed effects model, unobserved differences that do not change over time (heterogeneity) were controlled for, which increased the reliability and accuracy of the analysis results.

Table 2. Estimation using Model 1 Fixed Effects

Explanatory Var.	Coefficient	Standart error	t-statistic	P-value
CA	2.12e-08	5.46e-09	3.88	0.000
CBF	3.92e-09	2.12e-09	1.85	0.066
TFOB	3.11e-13	2.78e-13	1.12	0.267
S	2.50e-11	1.19e-11	2.10	0.037
TI	-3.28e-10	1.23e-10	-2.67	0.008
CAL	-1.89e-10	5.24e-10	-0.36	0.718
LevR	-3.45e-09	9.31e-09	-0.37	0.711
LiqR	-.0115743	.0021071	-5.49	0.000
cons	.0319849	.0065037	4.92	0.000

Results and discussions on model 2

The results of the Hausman test for model 2 are as follows: Chi-square statistic: 11.47, Degrees of freedom: 7, P-value: 0.0007. Since the P-value is less than 0.05, we reject the null hypothesis. This means that there is a statistically significant relationship between the independent variables and the individual characteristics. As a result, the main assumptions of the RE model are violated.

Therefore, the use of the Fixed Effects (FE) model is considered acceptable. This model controls for individual differences that do not change over time. This prevents the coefficients in the regressor from being overestimated. On the contrary, it would be a mistake to use the Random Effects model in this situation, because this model incorrectly assumes that unobserved individual characteristics are not associated with the independent variables. As a result, the RE model leads to biased and inconsistent estimates. Overall, the Hausman test for the model gives strong statistical evidence in favor of the Fixed Effects model. Since the P-value (0.0007) is well below the traditional 5% level, the use of the RE model in this context is inappropriate. Therefore, it is recommended to use the FE model when estimating Model 2, which ensures that the results of the econometric analysis are more reliable and robust.

Table 3: Hausman test for model 2

Hausman test for Model 2			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f	P-value
Cross-section random	11.47	7	0.0007

NIM (Net Interest Margin) Analysis Based on Fixed Effects Model

Funds with Other Banks (TFOB) and Loans and Leasing (CAL) indicators are shown to be statistically significant predictors of NIM. A positive and significant TFOB coefficient indicates that banks are effectively investing funds held in other financial institutions or are making a profit through these assets. The strong and positive effect of loan and leasing activities (CAL) is logical - more loans lead to more interest income, which, naturally, contributes to an increase in the NIM level. Cash assets (CA), Central Bank Funds (CBF), Securities (S), Total Investments (TI), Leverage Ratio (LevR) and Liquidity Ratio (LiqR) are not statistically significant. However, their sign may be useful for further analysis. In particular, there is a large but insignificant negative coefficient on LiqR. This suggests that excess liquidity may be reducing the NIM level through the opportunity cost, a situation that has also been observed in studies of some developing countries.

Credit and leasing (CAL): This result is consistent with the findings of several previous studies,

including Demirgüç-Kunt & Huizinga and Maudos & Fernández de Guevara. They find that more lending increases NIM, especially in conditions of high competition or high inflation. Alhassan and Brobbey, in their study of banks in Sub-Saharan Africa, found that a diversified loan portfolio increases a bank's interest margin. Tran et al., in the case of banks in Southeast Asia, found that digital lending and extended leasing services significantly increased NIM, especially for medium-sized banks. Funds from other banks (TFOB): Although the positive and significant effect of this variable has been poorly documented in the academic literature, research on this topic has been increasing in recent years. For example, Athanasoglou et al.[11] have shown that interbank market activity has a positive effect on bank profits. Banks in Bangladesh have found that they can achieve higher margins if they manage short-term interbank assets effectively. In developing countries, improving interbank markets have shown that banks can manage liquidity effectively and generate some income.

Liquidity Ratio (LiqR): Although not statistically significant, its negative sign indicates that it may have a negative impact on bank profitability. This is consistent with the "liquidity-profitability trade-off" theory noted in many studies.

Conclusion

In general, the results of the analysis, consistent with the latest scientific literature, confirm the importance of the following factors for increasing bank profitability: maintaining an optimal liquidity balance, pursuing a prudent investment strategy, and diversifying income sources.

The results of the fixed effects model are consistent with both the classical and contemporary literature. Lending activity and interbank funds management are confirmed as the main drivers of NIM. While other variables – liquidity, leverage and cash assets – are theoretically important, their impact is less in this sample. This may be due to changes in financial regulation or the impact of bank-specific strategies.

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