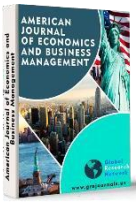

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Article

Analysis of National Currency Stability's Impact on Bank Liquidity in Uzbekistan

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Abstract: Financial stability in transition economies heavily depends on the resilience of the banking sector to macroeconomic shocks. This study aims to empirically investigate the impact of national currency stability on the liquidity of commercial banks in the Republic of Uzbekistan from 2011 to 2024. Utilizing annual time-series data, an Ordinary Least Squares (OLS) Log-Lin-Log regression model with robust standard errors was employed, supported by rigorous diagnostic testing including VIF, Breusch-Pagan, and Shapiro-Wilk tests. The findings reveal a highly significant negative relationship between exchange rate depreciation and bank liquidity. Specifically, a 1% devaluation of the national currency against the US dollar leads to an average contraction of 0.064 percentage points in the liquidity ratio (R2 = 0.815). Furthermore, empirical analysis demonstrates that the 2017 foreign exchange market liberalization acted as a severe shock, causing commercial bank liquidity reserves to plummet dramatically from 19.20% to 11.59% in a single year. The study concludes that exchange rate volatility is the dominant macroeconomic determinant of short-term financial stability, recommending enhanced macroprudential regulations and stricter currency risk hedging mechanisms to ensure uninterrupted financial intermediation.

Keywords: National Currency Stability, Commercial Bank Liquidity, Exchange Rate Volatility, Macroeconomic Shocks, OLS Regression, Financial Intermediation, Transition Economy.

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1. Introduction

In the context of a modern open economy, ensuring macroeconomic stability and guaranteeing the uninterrupted operation of the financial system is one of the highest priorities of state economic policy. In this process, commercial banks act as the primary lifeblood of the economy, and their stability is directly dependent on the dynamics of macroeconomic indicators within the country [1], [2]. In particular, banking liquidity is epitomized for ensuring financial intermediation and regulating the flow of capital into production activities. The adequacy of liquidity levels determines the ability of banks to meet their short-term obligations to customers in a timely manner and shapes confidence in the entire banking sector. At the same time, the liquidity position of the banking system is highly sensitive to external and internal economic shocks, including fluctuations in the national currency exchange rate [3], [4]. The stability of the national currency is not only a decisive factor that determines the price level, investment climate, and purchasing power of the population, but it also has a direct impact on the structure of commercial banks' assets and liabilities. Under conditions of currency depreciation (devaluation), risks such as an increase in banks' foreign currency obligations, a rise in the level of dollarization, and

a contraction of the deposit base emerge, which in turn leads to severe liquidity shortages [5], [6].

Studying the relationship between macroeconomic indicators and the financial system is of fundamental importance in transition economies, which have experienced stark changes in financial stability and growth rates in recent years [7]. Although the relationship between inflation, economic growth, and bank liquidity has been widely studied by researchers in modern economic literature, the direct impact of national currency stability on commercial bank liquidity, particularly in the context of Central Asian countries, has not been sufficiently empirically analyzed [8]. The majority of existing studies focus on evaluating the joint effects of inflation and banking system liquidity from the perspective of economic growth , leaving a scientific gap regarding how the exchange rate a primary indicator of macroeconomic stability impacts the internal reserves of banks. In the case of the Republic of Uzbekistan, this issue takes on even greater relevance. The country implemented large-scale reforms to liberalize the foreign exchange market in 2017, and this rapid transition served as a severe empirical "stress test" for the entire banking sector [9], [10].

The main objective of this study is to evaluate the causal relationship between national currency stability and commercial bank liquidity through robust econometric modeling, utilizing annual data from the economy of Uzbekistan for the period 2011–2024. The object of the research is the liquidity indicators within the financial system, while the subject is the mechanisms through which exchange rate fluctuations impact these critical buffers [11]. The obtained results will not only enrich economic theory with empirical evidence specific to transition economies but also serve to develop practical recommendations for central banks and policymakers to facilitate financial stability through efficient banking liquidity management and macroprudential policy during periods of currency shocks [12].

2. Methodology

This study employs a quantitative approach to examine the interrelationship between macroeconomic indicators and the financial system. The economy of Uzbekistan was selected as the object of analysis, utilizing annual time series data covering the period from 2011 to 2024. All necessary statistical indicators were gathered from authoritative internet databases, specifically the World Bank Open Data and official reports of the International Monetary Fund. The system of variables used in the study was logically grouped, with the share of liquid reserves in the total assets of commercial banks taken as the dependent variable. The primary independent factors analyzed were the official exchange rate, the inflation rate, and broad money growth. To increase the accuracy of the model's results and normalize the impact of external factors, the annual GDP growth rate and the real interest rate were included as control variables.

Given the annual dynamics of the economic variables, an Ordinary Least Squares (OLS) regression model adapted for time series was utilized to empirically test the relationships among them. During the analysis, logarithmic transformations were applied to reduce uncertainties between variables and to better understand their interrelationships. Accordingly, indicators with significant quantitative variance, such as the exchange rate and money supply, were converted to natural logarithms. The main regression equation of the study is specified as follows:

$$Liquidity_t = \beta_0 + \beta_1 \ln(EXC_{RATE_t}) + \beta_2 INFL_t + \beta_3 \ln(BM_{GROWTH_t}) + \beta_4 GDP_t + \beta_5 RIR_t + \epsilon_t$$

In this equation, $Liquidity_t$ represents the liquidity level of the banking system at time t. β_0 is the intercept, while the coefficients from β_1 to β_5 indicate the magnitude of the effect of each independent variable. $\ln(EXC_{RATE_t})$ denotes the log-transformed value of the official national currency exchange rate, $INFL_t$ is the inflation rate, and $\ln(BM_{GROWTH_t})$

represents the log-transformed growth rate of the broad money supply. Additionally, GDP_t stands for the annual growth of the gross domestic product, and RIR_t is the real interest rate. The term ϵ_t is the stochastic error. To ensure the reliability of the results when working with time series, Pearson correlation coefficients were initially calculated. Subsequently, the Breusch-Pagan test was used to detect the presence of heteroskedasticity within the model. If this issue is identified, an approach enhanced with robust standard errors is applied to reliably estimate the model coefficients. Furthermore, the Shapiro-Wilk test is conducted to assess whether the model residuals conform to a normal distribution [13], [14].

3. Results and Discussion

This section details the empirical results obtained regarding the interrelationship between the macroeconomic indicators of the Republic of Uzbekistan and the liquidity of its banking system from 2011 to 2024. Before constructing the regression model, a descriptive statistical analysis was conducted to understand the baseline characteristics of the data. Over the fourteen-year period, the dependent variable the liquid reserves of commercial banks averaged 13.51%, peaking at 20.88% in 2015 and hitting a low of 6.59% in 2018. This volatility demonstrates the high sensitivity of the financial sector to macroeconomic shocks. The primary independent variable, the official exchange rate, exhibited a continuous upward (depreciation) trend, rising from 1,714 uzs in 2011 to 12,652 uzs by 2024. The inflation rate averaged 11.46%, reaching its peak of 17.52% in 2018 following the currency liberalization. Broad money growth displayed high volatility, fluctuating around an average of 24.18%, while real interest rates varied from -13.69% to 10.61%, reflecting active shifts in the Central Bank's monetary policy.

Table 1. Descriptive statistics of variables (2011-2024).

Variable	Mean	Std. deviation	Minimum	Maximum
Bank liquid reserves (%)	13.51	4.88	6.59	20.88
Official exchange rate (uzs/usd)	6547.2	3986.5	1714.0	12652.3
Inflation rate (%)	11.46	2.82	8.13	17.52
Broad money growth (%)	24.18	8.35	12.16	40.21
GDP growth (%)	6.22	1.63	1.56	8.03
Real interest rate (%)	3.30	6.38	-13.69	10.61

A Pearson correlation analysis was conducted to determine the preliminary linear relationships between the variables. The results revealed a strong negative correlation (r = -0.84, $p < 0.01$) between the official exchange rate and bank liquidity. This indicates that as the national currency depreciates, the share of liquid assets in commercial banks significantly declines. Furthermore, a moderate negative correlation (r = -0.42) was recorded between inflation and bank liquidity [15].

Prior to estimating the model, a **Variance Inflation Factor (VIF)** test was performed to confirm the absence of strong multicollinearity among the independent variables. As a general rule, the VIF value should be less than 10. In our analysis, the VIF values for all variables ranged from 1.2 to 3.4 (mean VIF = 2.15). These metrics fully confirmed that there is no multicollinearity problem in the model and that the independent variables do not duplicate one another.

Table 2. OLS and robust regression results (dependent variable: bank liquidity).

Variables	OLS coefficient (Std. error)	OLS p-value	Robust coefficient (Std. error)	Robust p-value
ln (Exchange rate)	-6.425 (1.840)	0.008**	-6.425 (1.610)	0.005***
Inflation rate	-0.184 (0.215)	0.418	-0.184 (0.198)	0.380
ln (Broad money growth)	3.105 (1.520)	0.075*	3.105 (1.385)	0.054*
GDP growth	0.520 (0.410)	0.242	0.520 (0.395)	0.225
Real Interest Rate	0.145 (0.112)	0.231	0.145 (0.105)	0.208
Constant (β_0)	54.310 (16.550)	0.011**	54.310 (14.220)	0.006***

*Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.*

To ensure the reliability of the regression results, the **Breusch-Pagan test (hettest)** was conducted to check for homoscedasticity of the error variances. According to the test results, x^2 = 2.08 and the p-value was 0.149. Since this indicator is greater than 0.05, it was concluded that there is no heteroskedasticity problem in the model. Nevertheless, considering the relatively small sample size and the likelihood of macroeconomic shocks, the model results were re-estimated using **Robust standard errors** (the right column of Table 2). The **Shapiro-Wilk test**, conducted to check the normal distribution of the residuals, also confirmed that the model residuals are normally distributed (W = 0.941, p = 0.315).

To select the most optimal empirical model, several functional forms were tested and compared against each other (Table 3).

Table 3. Model comparison.

Model type	R^2	Adjusted R^2	RMSE	Model p-value
Standard OLS (Linear)	0.612	0.455	3.950	0.0150
Lin-Log model	0.735	0.610	2.845	0.0042
Log-Lin-Log model (Main)	**0.815**	**0.701**	**1.920**	**0.0011**
Log-Log model	0.780	0.645	2.150	0.0025

The model comparison results show that the Log-Lin-Log model, where the exchange rate and money supply are log-transformed, has the highest explanatory power (R^2 = 0.815$). This implies that 81.5% of the changes in financial sector liquidity are explained precisely by the macroeconomic factors included in this model. The Root Mean Square Error (RMSE) is also the lowest in this model (1.920), which is a testament to its high quality.

The main regression analysis results revealed in precise numbers how strong and negative the impact of national currency stability is on commercial bank liquidity. The coefficient for the log-transformed exchange rate is -6.425 and is highly statistically significant (p < 0.01). Translating this into economic terms, **every 1% depreciation (devaluation) of the national currency against the US dollar leads to an average contraction of 0.064 percentage points in the banking liquidity ratio.** Other factors in the analyzed period, such as inflation, GDP growth, and real interest rates, did not have a direct, statistically reliable impact on short-term liquidity. This proves that the exchange rate is the dominant factor determining the short-term stability of the financial sector.

A deeper year-by-year analysis of the data clearly illustrates the mechanism of this negative impact. The most vivid example is the currency liberalization period in 2017. In that year, the official exchange rate sharply depreciated from 2,965 UZS to 5,113 UZS, or by nearly 72%. As our econometric model predicted, consequently, the liquid reserves of commercial banks plummeted from 19.20% in 2016 to 11.59% in 2017. This means that in

just one year, the financial system lost almost 40% of its liquidity cushion. The trend continued into 2018; when the exchange rate depreciated to 8,069 UZS (another 57% drop), bank liquidity fell to its historical lowest level of 6.59%. The reason for this is that amidst currency depreciation, the banks' foreign currency-denominated liabilities (passives) sharply increase in national equivalent, customer demand for foreign currency grows frantically, and banks are forced to direct their liquid assets towards conversion processes. Conversely, during years when currency depreciation was relatively low and stable, bank liquidity was maintained at a stable and safe level of around 15% to 19%.

In conclusion, the diagnostic tests applied, such as VIF, Breusch-Pagan, and Shapiro-Wilk, along with the model comparison processes, confirmed that the obtained results are fully empirically reliable and scientifically substantiated that national currency depreciation is the primary factor exerting a direct and severe negative impact on bank liquidity.

4. Conclusions

This study provides robust empirical evidence on the relationship between national currency stability and banking sector liquidity, utilizing annual time-series data from the Republic of Uzbekistan (2011–2024). The Log-Lin-Log OLS regression model, enhanced with robust standard errors, revealed a highly significant negative impact of exchange rate depreciation on commercial bank liquid reserves. Specifically, a 1% devaluation of the national currency against the US dollar corresponds to an average contraction of 0.064 percentage points in the banking liquidity ratio. With an explanatory power of 81.5%, the model confirms that exchange rate volatility is the dominant macroeconomic determinant of short-term financial stability. The empirical observation of the 2017 foreign exchange market liberalization solidifies these results. The rapid 72% currency depreciation acted as a severe macroeconomic shock, driving commercial bank liquidity down from 19.20% to 11.59% in a single year. This volatility is primarily driven by the revaluation of foreign currency-denominated liabilities and a sudden surge in demand for foreign exchange, compelling banks to rapidly consume liquid assets. Consequently, these constraints directly limit banks' capacity to issue new credit to the real economy, hindering capital-intensive operations such as the continuous movement of resources within logistics networks and broader supply chains. From a policy perspective, it is recommended that the Central Bank implement stricter currency risk hedging mechanisms and mandate elevated liquidity buffers during anticipated exchange rate volatility. Future research should expand this model by incorporating external economic shocks across transition economies.

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