



## **Improving the Forecasting of Financial Resources of Commercial Banks**

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**Abstract:** This article examines the role of investment portfolio management in the effective management of bank financial resources, the state of investment portfolios of commercial banks and their impact on asset liquidity. According to the research materials and methods, the definitions and opinions given by a number of foreign and domestic economists-scientists on the topic were studied, and the author explained their meaning. In addition, the article provides proposals and practical recommendations for the development of a draft regulatory legal document on the management of financial resources of commercial banks of the Republic of Uzbekistan, and the development of a program of measures aimed at managing assets in commercial banks. As a result of the research, ways of expanding theoretical and practical knowledge of managing financial resources in commercial banks of our country, using convenient methods of their management, and studying subjects related to banking activities in higher educational institutions in the field of economics were studied. Suggestions are made for the preparation of teaching, curriculum, textbooks and study guides, as well as for their wide use as a resource for researchers conducting scientific research on the research topic. In particular, in the formation of digital assets in commercial banks, it is proposed to allow banks to participate in crypto-assets (tokens) in crypto-exchanges and to establish a crypto-depository in the structural structure of commercial banks.

**Key words:** commercial banking, asset, liability, deposit, equity, financial resource management, financial resource, bank assets, digital assets, liquidity, investment portfolio, securities.

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### **Introduction**

In the years of independence, a two-tier banking system typical for the market economy was formed in Uzbekistan, and this system is being regularly improved. The market element "competition" always operates in the market economy. One of the important tasks of banks in the way of economic competition is the ability to fulfill their obligations to their customers and counterparties.

In accordance with the Decree of the President of the Republic of Uzbekistan dated May 8, 2020 No. PF-5992 "On the strategy of reforming the banking system of the Republic of Uzbekistan for 2020-2025", increasing the quality of assets of commercial banks and ensuring their liquidity, the level of capitalization of banks, increasing financial stability are given as priorities [1]. In recent years, great efforts have been made to strengthen public trust in banks, to ensure liquidity, solvency and stability of bank assets.

Liquidity of bank assets demonstrates how quickly the assets of commercial banks turn into cash and thereby ensure timely, complete and continuous fulfillment of all monetary obligations of the bank, determines its reliability and the adequacy of funds in accordance with the needs of economic development.

Liquidity of bank assets is the ability of commercial banks to fulfill their obligations to their depositors, creditors and shareholders on time, to attract free funds of legal and natural persons, to provide loans and to develop investment activities.

Also, based on the Basel-3 requirements (Basel Committee on Banking Supervision (2021) of the international Basel Committee on banking supervision, special attention was paid to the liquidity of bank assets, including the liquidity of commercial banks[2]. Based on the recommendations of International Basel Committee, new normative indicators were introduced to assess the liquidity of commercial banks. In particular, for commercial banks, in addition to the current liquidity and leverage indicators, the normative coefficient of liquidity coverage and the normative coefficient of net stabilization were introduced. By ensuring that banks fulfill these standards, it will be possible to control the liquidity of banks and the liquidity of bank assets at the established standard level.

Stability of liquidity of bank assets leads to an increase in the confidence of bank customers in the bank and thus to the expansion of the flow of financial funds in the banking system. When the liquidity of bank assets is unstable, the confidence of customers in banks decreases, which causes them to withdraw their funds from banks. This leads to an increase in non-bank turnover in the economy.

For this reason, it is necessary to study the factors affecting the liquidity of bank assets. It will be necessary to carry out precise analyzes on the level of influence of each factor on the liquidity of bank assets, by changing which factors the best results can be achieved.

## **Review of literature**

We want to focus the object of research on the economic nature of the "resource". Resource is derived from the French word "resource" [3], which means money, auxiliary funds, opportunity, reserve, source of funds and opportunities, source of income, raw material. .

In economic sources, the word "resource" is often found in different meanings, i.e. natural resources, financial resources, economic resources, human resources and other forms. From this, economic resources can be considered as one of the main elements of economic opportunities that are distributed at each stage of society's development. It is used to achieve specific goals of economic and social development. The main part of economic resources is financial resources, which are monetary and credit funds used to ensure the development of the economy.

As the main source of financial resources, temporary idle funds, taxes, funds of individuals, funds related to check-deposit issuance and others were calculated.

Based on the main goal, we want to focus mostly on bank resources, which are an integral part of financial resources. A scientific research work was carried out in our republic by B.Babaev[4] on bank resources. He tried to reveal the essence, composition of bank resources, problems related to the formation of resources and ways to eliminate them. However, in our opinion, the problems related to bank resources and their nature and use have not found their full expression in the work of this author. In order to develop the strategy of banks' activities in the formation of the money market in our republic and conduct operations with monetary resources, it is necessary to fully understand and interpret the concept of bank resources and the nature of

operations conducted by banks in connection with resources [5].

Even though issues aimed at financial resources, credit resources, financial mechanisms and their effective use have been raised in the scientific research works carried out in our country, in textbooks, monographs, they have left out a comprehensive study of the management of bank resources. [6].

According to the Russian scientist O. Lavrushin, the resources of commercial banks or "banks' resources" are the sum of the bank's own and borrowed resources, which are used in the implementation of its asset operations [7]. Such an opinion can be found in the scientific research of another group of authors. Emphasizing that the resources of commercial banks are formed at the expense of own funds and borrowed funds, in our opinion, draws more attention to their resources. The need for bank resources is formed as a result of the organization and conduct of banking activities. In the first stages of the establishment of banks, banks are required to have their own capital and to attract funds for the further activities of the banks. Therefore, when describing the essence of the resources of commercial banks, it is necessary to take into account not only the sources from which they are organized, but also to take into account that these funds are necessary and important for the bank's target activity and to achieve their efficiency.

In modern conditions, the main focus in managing the financial resources of commercial banks is to attract sufficient funds for banking activities, i.e. "long money". In addition, the management of financial resources in commercial banks is crucial for their overall stability and profitability.

In the figure below, we present the main directions and strategies considered necessary for the management of financial resources in commercial banks.

**Liquidity Management:** Commercial banks must ensure that their customers have sufficient liquidity to meet their deposit obligations, especially demand deposits and other short-term obligations. They can manage liquidity through strategies such as maintaining a diversified funding base, monitoring cash flows, creating contingency funding plans, and using central bank funds when needed. Economists have discussed in detail the economic nature and importance of liquidity. In particular, Sh.Abdullaeva marked: "The term liquidity refers to the selling, realization of turning assets into cash, that is, the rational use of the bank's cash funds in the Central Bank or representative banks, the possibility of selling liquid assets, etc." [8], A. Omonov defines liquidity as: "Liquidity is the bank's ability to meet the demand for financial resources from customers in expected and unexpected situations" [9]. Also, B. Izbosarov in the scientific research on the liquidity of commercial banks wrote: "Regulation of the liquidity of commercial banks is to be able to fulfill the obligations of bank applicants of any form in full and at the time of demand the level of profitability of banking activities without reducing" [10].

### **Research methodology**

Theoretical approaches to the management of financial resources of commercial banks and their evolutionary development and indicators on the management of financial resources of commercial banks of our republic were analyzed. Theoretical approaches to the management of financial resources of commercial banks and their evolutionary development were studied and a database was collected. Based on the collected data, methods such as observation and comparison of economic analysis, systematic approach and logical approach were effectively used.

It will be necessary for commercial banks to determine short-term and long-term forecast values in determining their strategies and adopting the necessary programs. Based on the analysis of data on the financial resources of commercial banks collected from the first quarter of 2005 to

the fourth quarter of 2022, we determine reliable forecast values from 2023 to 2030 using the ARIMA method.

Emphasis is placed on the total fixed assets of commercial banks using the equations modeled in the previous sections. Based on our hypothesis, we use a statistically significant, economically meaningful equation between fixed assets of commercial banks and term deposits, savings deposits, and interbank loans.

$$\ln B_M = 0.35 \ln Mli_D + 0.21 \ln J_D + 0.44 \ln B_K + 0.959$$

In this:

B\_M- Total fixed assets of commercial banks ( million soums)

Mli\_D Term deposits ( million soums)

J\_D Savings deposits ( million soums)

B\_K Interbank loans ( million soums)

Currently, more than 30 methods of forecasting are used in the world experience. They are mainly divided into four groups. During the study, we use the ARIMA<sup>1</sup> method, which is one of the smoothing methods, together with the additive method, because in this case there is an opportunity to develop in the case of forecast scenarios, and each indicator and general the resulting factor is implemented in three scenarios: pessimistic, medium and optimistic.

The additive model has the following general appearance:

$$Y = T + S + E(1)$$

In this model, each level of the dynamic series is considered as a sum of trend (  $T$  ), seasonal (  $S$  ) and random (  $E$  ) components. The process of creating a model consists of several stages:

1. Smoothing the given series by the moving average method;
2. Calculation of the value of  $S$  – seasonal component;
3. Remove the seasonal components from the series equation and find the smoothed values in the additive model (  $T+E$  );
4. Analytical leveling of levels (  $T+E$  ) and calculation of values of  $T$  using the resulting trend equation;
5. Calculate the values of (  $T+E$  ) in the resulting model;
6. Determination of absolute or relative errors.

The Winter forecasting method, which is one of the smoothing methods, the degree of change of the indicator, the state of the trend and seasonality are taken into account. This method looks like this :

$$\begin{aligned} \hat{x}_t &= (1 - \alpha)(\hat{x}_{t-1} + T_{t-1}) + \alpha \frac{x_t}{F_{t-s}} & 0 < \alpha < 1 \\ T_t &= (1 - \beta)T_{t-1} + \beta(\hat{x}_t - \hat{x}_{t-1}) & 0 < \beta < 1 \\ F_t &= (1 - \gamma)F_{t-s} + \gamma \frac{x_t}{\hat{x}_t} & 0 < \gamma < 1 \end{aligned}$$

It  $x_t$  represents the degree of change of the indicator over time, and the degree of change is determined by  $\alpha$ ,  $\alpha$  which is within the acceptable range of values  $0 < \alpha < 1$ .  $T_t$  represents the state of the trend of the indicator, the trend level is determined by  $\beta$ ,  $F_t$  represents the seasonality of the indicator and  $\gamma$  is determined by the level of seasonality.

We will develop forecasting options for the indicators involved in the interrelated models developed in our previous chapters.

<sup>1</sup> ARIMA-autoregression integrated moving average

The maximum likelihood method was first used in scientific research by Carl Friedrich Gauss, Pierre Simon Laplace, Torvard Tillar <sup>2</sup>. However, this method was widely used between 1912 and 1922. Ronal Fisher, one of the founders of econometrics, explained the advantages of this method, as well as its differences from least squares, in his research <sup>3</sup>.

The maximum likelihood estimation method is used to find indicators using the log likelihood function .

The log likelihood function  $y_i$  looks like this:

$$P(y_i = 1)^{y_i}P(y_i = 0)^{1-y_i}$$

In this case, if  $y_i = 1$  when b dies  $P(y_i = 1)^1P(y_i = 0)^{1-1} = P(y_i = 1)$  ,  $y_i = 0$  if b dies  $P(y_i = 1)^0P(y_i = 0)^{1-0} = P(y_i = 0)$  b dies.

An overview of the log likelihood function:

$$\sum_{i=1}^n (y_i * \log P(y_i = 1) + (1 - y_i) * \log P(y_i = 0))$$

we replace  $P(y=1)$  with  $G(x\beta)$  , the log likelihood function also changes:

$$\sum_{i=1}^n (y_i * \log(G(x\beta)) + (1 - y_i) * \log(1 - G(x\beta)))$$

$\beta$  coefficient is found by maximizing this equation.

Thus, to find the  $\beta$  coefficient the method of maximum likelihood estimation the following equation represents the situation when it has a maximum:

$$\max \sum_{i=1}^n (y_i * \log P(y_i = 1) + (1 - y_i) * \log P(y_i = 0))$$

Based on maximum likelihood estimation method the coefficient  $\beta$  is checked to be statistically significant with Wald test, score test, likelihood ratio test .

After downloading the data into Stata, our research begins with the initial IDENTIFICATION step of the ARIMA method. At the determination stage, p, d, q values are determined. For this, the time series is checked for stationarity, in which the period of the integration process is found, which is expressed by the value d .

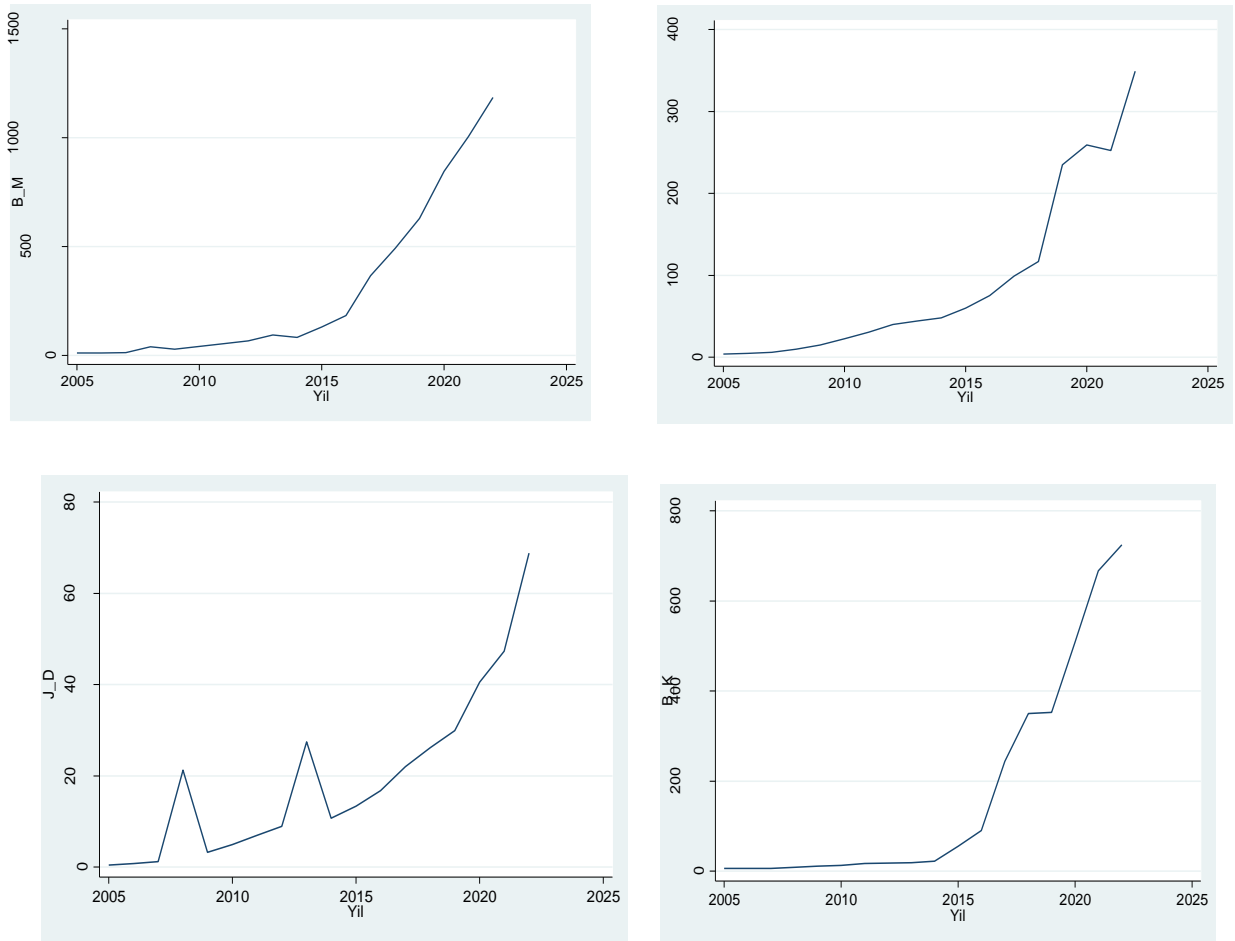
It is known that there are 3 different ways to check the stationarity of a time series, consisting of the graphical method, the autocorrelation method, and the test method.

By graphically checking the time series for stationarity in the STATA program, it is shown whether or not there are elements of trend, randomness, and seasonality in the time series.

The main indicators that affect the change in term deposits are more related to non-time deposits, wages. We make a forecast for 2023-2030 using ARIMA for all units affecting demand deposits.

<sup>2</sup> [Edgeworth, Francis Y.](#) (Sep 1908). "[On the probable errors of frequency-constants](#)". *Journal of the Royal Statistical Society*. 71 (3): 499–512. [doi : 10.2307/2339293](#) . [JSTOR 2339293](#) .

<sup>3</sup>Wilks, SS (1938). "The large-sample distribution of the likelihood ratio for testing composite hypotheses". *Annals of Mathematical Statistics* . 9: 60–62. [doi:10.1214/ aoms /1177732360](#)



**Figure 1. The dynamics of change of term deposits in commercial banks in 2005-2023.**

Term deposits change has a decrease in the second and third quarters, and increases in the first and fourth quarters.

However, in order to be completely sure of the stationarity of the time series, it is advisable to evaluate it using the test method. One such method is the Dickey-Fuller test. The Dickey-Fuller test, like other methods, requires a condition of  $p$  - value  $< 0.05$  . Based on the  $p$ -value , the following hypotheses are accepted or rejected:

$H_0$  : timed series stationary type belongs to;

$H_1$  : timed series is not stationary

If  $p$  - value  $< 0.05$ , the main hypothesis acceptance is done, the alternative hypothesis is rejected, on the contrary, if  $p$  - value  $> 0.05$  hypothesis acceptance is done, the main hypothesis is rejected . If timely series found to be non-stationary, it could be converted to stationary look. For this timely line differentiation is required . In econometrics this process is called an integration.

Table 1 .

Dickey-Fuller test

1	Indicators _	Not integrated without				First order differentiated				Second in order differentiated				De cisi on
		TS	1%	5%	10%	TS	1%	5%	10 %	TS	1%	5%	10%	
1	B_M	5.7 5	- 3.7	- 3.0	-2.6	- 0.9 6	- 3.7	-3 3.0	- 2.6	- 3.2	- 3.7	- 3.0	-2.6	II
2	Mli_D	1.9 3	- 3.7	- 3.0	-2.6	- 3.1	- 3.7	- 3.0	- 2.6					I
3	J_D	0.3 3	- 3.7	- 3.0	-2.6	- 5.0	- 3.7	- 3.0	- 2.6					I
4	B_K	2.7 2	- 3.7	- 3.0	-2.6	- 2.2	- 3.7	- 3.0	- 2.6					I

In the second- order integrated series, the Dickey-Fuller unit root test value is equal to -3.2 and smaller than the critical value of 1%, 5%, 10%, the MacKinnon approximate p- value for Z(t) is 0.002, i.e. 0.05 basis b dies . We decide d=2 in the ARIMA method.

Indicators are non-stationary, after first-order differentiation, Dickey-Fuller unit root test value and less than 1%, 5%, 10% critical value, MacKinnon approximate p-value for Z(t) is 0.000, or was found to be 0.05. We decide d=1 in the ARIMA method.

The meaning of p and q values is that they indicate the presence of autocorrelation of the time series and its residuals. If there is no autocorrelation, it is taken as p =0 or q =0, if there is autocorrelation, its order is taken as p(1;2) or q(1;2). It should be remembered that if the time series is converted to a stationary representation in the differentiated state, then the values of p and q are found on the same transformed time series.

First , to determine whether the variables in the time series are correlated or not, that is, to determine the value of q , *it is necessary* in the Stata program command and get the following graph.

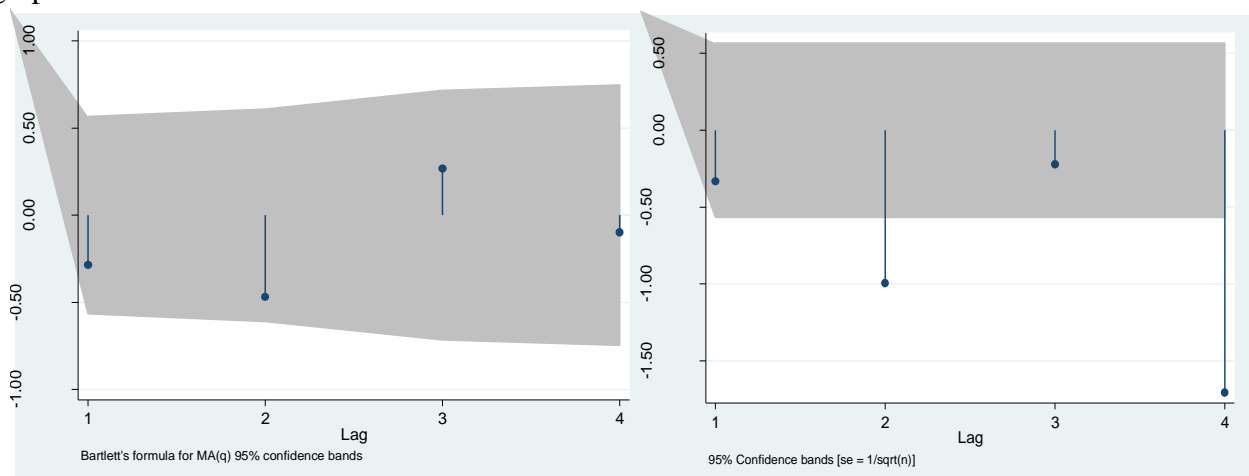


Figure 2. The result of autocorrelation lags

And there is autocorrelation over the power series because all lags do not lie on the surface of the confidence interval . Based on this, we can define the value of q as 2: q=2.

A special feature of the ARIMA method is that it selects types (families) of forecasting based on the determined p, d, q values. In particular, since q=2, the model representation is expressed as ARI.

There is a 2nd-order autocorrelation between Q priors. This is because 2 of the lags lie outside the confidence interval surface. This means that the indicator in the current state of the balance depends on the change in the indicator of 2 periods (years) before it. Therefore, the number 2 is accepted as the value of p: p=2.

Thus, after determining the values of p, d, q necessary for the ARIMA method, we write down the combinations of these values as in the following sequence:

$$\text{ARIMA} = ( p,d,q ) = ( 2, 1, 0 )$$

$$\text{ARIMA} = ( p,d,q ) = ( 1, 0, 0 )$$

$$\text{ARIMA} = ( p,d ,q ) = ( 0, 1, 0 )$$

$$\text{ARIMA} = ( p,d,q ) = ( 0, 1, 2 ) .$$

In these combinations only value of d does not change , the value of p and q will change between 0 and 2.

At the ARIMA method`s Estimation stage model`s importance ( quality ) is evaluated according to 5 types criterion and the best one is chosen.

According to the results of evaluation, choosing ARIMA(0,1,0) model rather than other models is relatively optimal , because this model completes all the requirements.

At the ARIMA method final stage - in the Forecasting stage for the chosen optimal ARIMA (0,1,0) we work out forecast options. The integral principle of present in practical econometrics – the assessment of any model through its residues also has its significance in forecasting on the ARIMA method. It follows that it is advisable to examine the remains of this model selected before forecasting using various methods. The fact that the mean of the sum of the residues is equal to 0 (or at least approaches 0), as well as the parameters [AR][I][MA], that is,the specific values in the form of existing P, d, q, are located inside the unit circle, is the basis for our reliable prediction using the selected model.

To determine the sum of the column of remainders, the results of the calculation are reflected as follows:

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. summ qoldiqs
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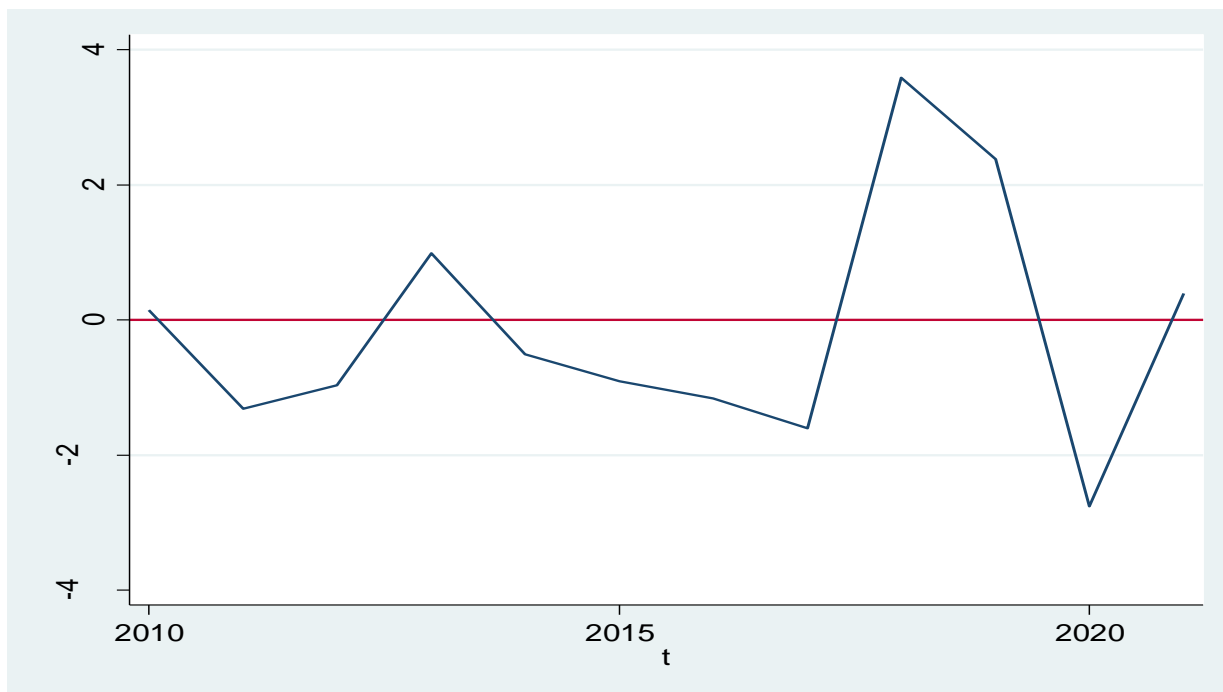
Variable	Obs	Mean	Std. Dev.	Min	Max
qoldiqs	12	-.1443043	1.776613	-2.762179	3.583233

**Figure 3. The determination of sum**

From the image above, it can be understood that the mean of the sum of the 21 lines of the column of the remainder is almost zero, representing 0 when rounded, which means satisfying the condition.

It is also enough to give the desired command in the sequence of commands to represent in the graph that the residues are in a stationary state, in which the image is displayed as follows:





**Figure 4. Stationary to express**

From Figure 4, it can be seen that the residues are in an almost stationary state, that is, in the period interval, the residues have changed around the average  $U=0.000$  line.

The graph itself is not enough to be fully confident in the stationary of the residues, there are many other tests other than the Dickey-Fuller test to confirm the stationary, with which the stationary can be evaluated. In particular, in the case of the Portmanteau test, the  $P > \chi$  indicator should be greater than 0.05, just like the IM-test, Brosh-Pagan, Shapiro-Wilk, Brosh-Godfrey tests. In this value determination bar, hypotheses are accepted or rejected as follows:

H0: residues tend to have a stationary property;

H1: residues are not stationary.

When we check the stationary through the Portmanteau test, a table appears as follows:

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Portmanteau (Q) statistic =	3.9347
Prob > $\chi^2(4)$ =	0.4149

**Figure 5. A portmanteau test .**

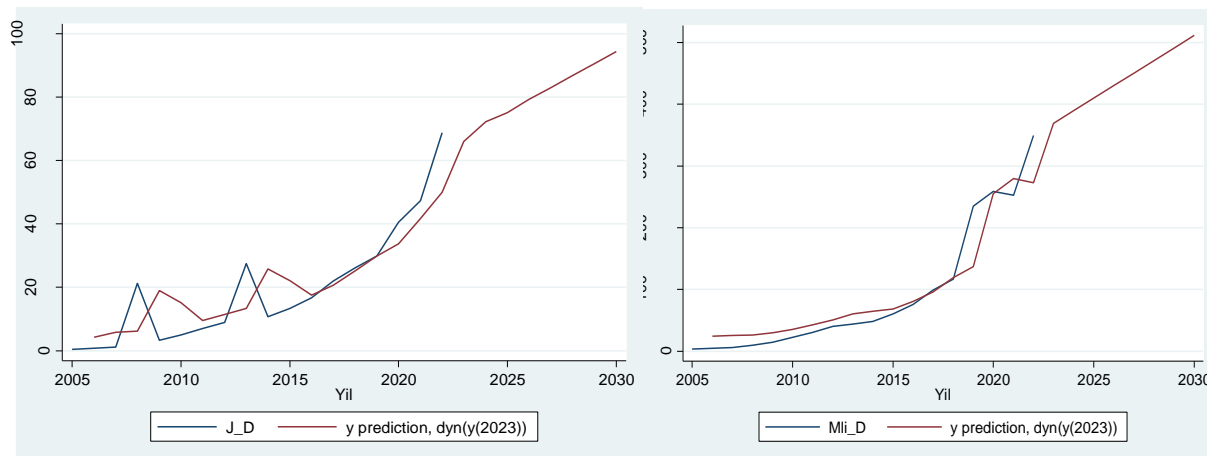
From Figure 5, we know that according to the results of the Portmanteau Test,  $p > \chi$  is  $2(1) = 0.33$ , which is greater than 0.05 in its place, which means that by rejecting the alternative hypothesis, we can accept the prime hypothesis and be fully convinced that the residues are stationary.

Another important pre-forecasting condition is the stability condition of the private values, which requires that the P and q parameter values be located inside the unit circle. Since the selected optimal model is in ARIMA representation, we will only check the p values.

Based on the results of the above examination, we can say that the selected ARIMA model, according to the required conditions, has a positive assessment of its stability and stability, and this model can be used as the most optimal (optimal) option when forecasting future growth rates.

Visualizing how closely it comes together in a cross section of years with the initial given empirical data, in which both temporal series manifest themselves in a graph as follows:

**Figure 6 . Commerce banks liquidity stationarity**



From the graph above, it can be seen that the constancy of the data given by the model results (a broken line in red) (a broken line in blue) caused them to overlap around one straight line, and they oscillated almost closely together.

We can interpret the 8-year forecast results calculated according to the selected ARIMA model as follows:

**Table 2.**

**ARIMA method through  
2023-20 30 -year forecast indicators , billion soums**

Years	B_M	Mli_D	J_D	B_K
2023	1345.13	369.19	66.08	773.61
2024	1489.14	389.50	72.29	818.11
2025	1620.31	409.81	75.19	860.73
2026	1741.07	430.11	79.32	902.50
2027	1853.39	450.42	82.99	943.87
2028	1958.88	470.73	86.84	985.08
2029	2058.81	491.04	90.61	1026.20
2030	2154.60	511.35	94.42	1067.20

Our analysis, based on the ARIMA method, showed its significance in a number of tests, in particular, Dickey-Fullar , Portmanteau , Brosh-Pagan. tests based on complete checking forecast values reliable the fact that confirmed .

In short, the liquidity of bank assets, as we mentioned above, determines the timely, complete and continuous fulfillment of all monetary obligations of the country's banking system, its reliability and the adequacy of funds in accordance with the needs of economic development.

The central bank plays an important role in increasing the liquidity of Bank assets and ensuring it. While the central bank directly affects the liquidity of bank assets through monetary policy instruments, it monitors the liquidity of bank assets by ensuring the implementation of established economic norms for commercial banks. Each commercial bank, which are participants in the banking system, contributes to ensuring the liquidity of bank assets by fulfilling the economic regulatory indicators established by the central bank.

Based on the above analyzes and data, we consider the following as directions for increasing the liquidity of bank assets:

Management of liquidity of bank assets through the central bank refinancing rate. In this case, when the problem of liquidity of bank assets arises, the central bank should raise the refinancing rate and thereby try to moderate the growth rate of loans and money supply of commercial banks. When the surplus of liquid assets of Bank assets is observed, it affects the liquidity of the money supply and banking system by lowering the refinancing rate, encouraging residents and business entities to take loans.

Keeping the refinancing rate high leads to the use of the national currency as a means of accumulation. This can attract the free funds held by commercial banks in the hands of the population to bank deposits and, through this, these funds to the bank's turnover. In this case, it is advisable to attract these vacant funds to long-term deposits of commercial banks. This serves to increase the liquidity of the banking system.

Through open market operations, the central bank has an impact on the liquidity of the bank's assets. In doing so, the central bank ensures that commercial bank assets are also profitably liquid due to the sale of government securities to commercial banks. Through this, commercial banks are encouraged to hold liquid assets in their asset structure at sufficient mikdor. In particular, the "NOSTRO" of commercial banks can direct funds on the bill to the purchase of state securities. This also serves to increase the profitability of commercial banks.

By ensuring that the central bank meets the economic regulatory indicators set up in commercial banks, commercial banks control the liquidity of their assets and, through this, the bank's systemicality.

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