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# Providing a loan payment model to depositors of the banking system

**Rouhollah Kiani Ghaleh no [1], Ali Akbar Davrpanah [2]**

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**Abstract**

Purpose: One of the needs of customers in financial and credit institutions is the use of bank loans, and banks have a score calculation table for loan payments according to customers' deposits. The main goal of this research is to provide a practical and optimal model for calculating facility scores. Methods: attracting deposits and paying bank loans in financial and credit institutions are different according to their statutes, the priority of some of them is to earn profit and the priority of specialized banks is to attract resources to pay loans in their specialized field of activity. By obtaining the required parameters, this research calculates the loan score for depositors in line with the variety of policies. At the same time, the basis of the work is based on mathematical calculations. Findings: Providing a mathematical model for decision makers in the financial field, with the ability to support a variety of strategies, is the main finding of this research. Conclusion: First, a basic formula for balancing loans with deposits has been presented. In the second step, the formula has been developed in such a way that the balance is established after deducting a coefficient from the deposit, and finally, the calculation formula has been developed for the addition of bank interest to the financial process. At the end of the article, the formulas are confirmed.

**Keywords**

Bank deposit, bank loan, financial and credit institutions, financial engineering.

1. Department of Industrial Engineering, Aliabad Katoul Branch, Islamic Azad University, Aliabad Katoul, Iran.

2. Department of Poultry Breeding and Management, Faculty of Agriculture, Tarbiat Modares University, Tehran, Iran.

## 1 Introduction

Banks in the world are established with specific goals, the ownership of banks in Iran is divided into three types: government, semi-government and private. Some financial and credit institutions and loan funds also have banking activities in Iran. In terms of mission and job descriptions, banks can be divided into two categories: specialized and development banks and commercial banks. Specialized and development banks have the task of providing credit support to projects in their specialized field. For this purpose, the responsibility of providing cheap short-term and long-term resources for paying loans to the country's economic projects is unavoidable. In fact, the description of the activities of these banks is to attract resources and support the economic policies of governments, which is provided through the collection and injection of resources to the important economic sectors of the country. The focus of specialized banks is to support economic activities, the main nature of which is the production of strategic products of the country. On the other hand, the three tasks of deposit acceptance, facility payment and investment can be introduced as the description of the main activity in commercial banks. These banks are responsible for financing companies and paying small and medium-sized facilities in the service and commercial cycle, relying on 90% of attracted deposits. It should be noted that investment in Iran tends more towards the service and commercial sector, because investment in these sectors is more profitable than the production sector. in order to invest in the production sector and projects that do not have a guaranteed return on investment. also be supported, development and specialized banks in Iran are under the supervision of the government. Of course, it should be noted that specialized banks are also given the authority to enter the field of commercial activity. The reason for this is the possibility of attracting resources. In general, governments cannot provide all the necessary resources to pay infrastructure loans to state banks, so specialized banks are allowed to pay welfare loans to depositors in order to compete with commercial banks in order to attract depositors.

With the mentioned explanations, the ground was prepared for entering the topic of this research, this research intends to answer the question that, according to the different policies that exist in banks, how should the relationship between paid loans and deposits to be provided? Naturally, in commercial banks, the priority is to earn profit. That is, they expect the income from the paid loan to be more than the cost incurred for the deposit and the source of the loan. And the higher the profit, the more attractive it will be for the commercial bank. But in specialized and development banks, more than the attention of the managers of these banks is on the profit, they focus on the durability of the resources after the loan payment. In fact, these banks expect the calculation formula for loan payment to be in such a way that eventually, surplus resources will be created. In such a way that managers can pay a part of the deposit to the customer in the form of welfare loan, and use part of it to pay the loan in their specialized field.

Therefore, what will be followed in this research is to present a fully applicable formula in the real world for the banking system of Iran, which, due to political reasons, diversity in the strategies of its banking system is inevitable. This formula has a mathematical basis and all the calculation steps of the formula have been verified by referring to mathematical sciences.

## 2 Theoretical Foundations

### 2-1 The flow of resources and uses in the banking system of Iran:

Deposits are the most important bank resources, as other bank capitals are very small compared to bank deposits. Bank deposits are funds that are kept in banks by natural and legal persons, according to specific laws. These deposits play a prominent role when granting

all kinds of bank loans, while the opportunity to use banking services will also be provided to the depositor. In Iran's banking system, there are different types of deposits.

In Qarz al-Hasaneh bank deposits, the account openers deposit their cash in the bank in order to enjoy the benefits of various banking services and increase the speed of money transfer. In this type of account, customers do not expect to receive bank interest. Loan deposits are divided into two groups:

- Qarz al-Hasaneh Savings bank deposit: in this bank account, depositing, withdrawing and transferring money is possible, and to perform these banking processes, you can use credit cards and account books. Lottery and prize giving are the most important advantages of these accounts.
- Qarz al-Hasna current bank deposit: the best advantages of such bank accounts are the possibility of issuing check books for qualified customers.

Investment bank deposits: people who do not have a specific purpose for using their capital make deposits in the bank in order to preserve their principal capital and also to receive interest in a certain period of time. This group of deposits is divided into two categories:

- Short-term bank investment deposit: individuals intend to carry out banking operations and use part or the entire deposit amount in short periods of time and at the same time want to benefit from bank profits.
- Long-term bank investment deposit: People are looking for investment with very low risk and more profit, and they do not intend to withdraw from their deposit for a long period of time, more than one year.

The flow of resources and uses in the banking system of Iran:

The opposite side of bank resources is bank uses, where bank loans are the major part of uses, granting bank loans is one of the ways of earning money for banks and it should be proportional to bank deposits, in fact, bank deposits provide resources. They are for paying loans, and if a bank pays more than the bank deposit, it has to pay a considerable borrowing fee. There are different types of bank loans, and with different names, they charge different interests from the customer. Qarz al-Hasna is a loan that is interest-free, but banks charge a rate of 0 to 4% earns money. Other loans have various bank interest rates depending on the type of contract.

**2-2 Limitations of Iran's banking system**

Legal deposit ratio[1]: A percentage of bank customers' deposits that banks are required to deposit with the central bank according to the regulations of the central bank is called the legal deposit ratio and is one of the monetary policy tools of the central bank. By increasing the legal deposit ratio, the central bank shrinks, amount of facilities granted by banks and by reducing it, it expands the banks' credits. In Iran, according to the monetary and banking law, the legal deposit ratio will not be less than 10% and not more than 30%, and the central bank may determine different ratios for it according to the composition and type of activity of the banks.

**2-3 background research**

In the field of financial portfolio, various researches have been done from different aspects, which in recent years can be referred to the following articles. Asadi (2019) has introduced the formation of a portfolio of assets as one of the methods to reduce investment risk, and for

[1] https://wikipedia.org/wiki

this purpose, the effectiveness of financial ratios to each other using the Dimtel method and network analysis to determine the importance Used indicators and their weight determination. Labbafi et al. (2020) has presented a mathematical model for optimizing the assets and liabilities of Bank Melli Iran in conditions of uncertainty, using the deficit planning model approach. Khajehzadeh and Shahverdian (2020) with the aim of creating an optimal stock portfolio using the edge regression algorithm, has predicted stock returns and with the aim of achieving an optimal stock portfolio with risk-taking and risk-avoidance tendencies. Metaxitis (2012) proposed a linear programming model for stock portfolio optimization and used evolutionary algorithms to solve the model because the model was designed for multiple purposes. Punic et al. (2013) similarly presented a multi-objective function for stock portfolio optimization and used evolutionary algorithms to solve it. Rahmani et al. (2019) examined the companies operating in Tehran Stock Exchange from 2005 to 2015 and solved the stock portfolio optimization model using three meta-heuristic algorithms. The results showed that the artificial bee colony algorithm performed better than the ant genetic and algorithm algorithms. Khodamoradi et al. (2020) used the MAD model in an uncertain environment to optimize stocks. In this research, a linear combination of return and risk has been used in the objective function.

Shahvaisi, et al (2019). This research seeks to provide a model to improve the financial performance of banks based on new financial technologies. The findings show that the independent variable named as new financial technologies through the indicators of cost reduction, improvement of financial services, increase in income, financial security, financial transparency, asset management, increase in cash flow, reduction of information asymmetry and audit time, on the variable Affiliate (improvement of financial performance of banks) is effective. The results show that, with the help of fintechs, traditional banks will be able to act faster and more efficiently, introduce new products, facilitate processes, increase customer satisfaction and increase their income. Ostadi, Tadrisi Pajou (2018). The hypothesis of this research is the existence of a significant relationship between financial risks and financial ratios, and by studying the statistical method of focal correlation analysis, the relationship between financial risks and financial ratios has been measured based on the severity of the impact of risks. To calculate financial risks and ratios, the information available in the financial statements and balance sheets of 10 banks has been used. After performing the calculations, it is clear that liquidity risks have the greatest impact on the liquidity, leverage and profitability ratios of the bank, respectively.

## 3 Research Method

Regardless of any theorizing, this research is goal-oriented in nature, and from the perspective of the goal, it is placed in the group of basic researches. In this research, a new calculation formula for Iran's banking system is presented. A formula that can determine the relationship between the two main variables of resources and uses, in line with the various strategies of financial managers, and ultimately lead to an acceptable balance sheet for the bank. In this research, targeting is done from part to whole. In this way, by calculating the logical score for loan applicants, it will balance the bank's resources and expenses in the balance sheet. Managers can place the parameters of the formula according to their strategies and finally see the variable value of the problem, which is the loan payment coefficient that is proportional to the customer's deposit.

4 Problem Statements

The main mission of credit financial institutions is to attract liquidity and inject it into the production and service sector. In Iran, banks incur costs to attract people's deposits and then earn money by paying loans. In many cases, the depositor is also an applicant for a bank loan, and during a financial process, He expects, for the time he deposited his funds in the bank, Use a bank loan. Therefore, this question is raised, with what mechanism can the customer's expectations be answered, while maintaining the bank's interests from two aspects:

- First, the average inflow of cash to the bank, which will be per customer deposit, has a reasonable and acceptable ratio with the loan paid to the customer.
- Second, the income earned from this financial process is more than the costs imposed for the bank.

There are also limitations for the mentioned purposes:

- Some depositors apply for interest-free facilities.
- Some applicants focus on speeding up the loan payment, and the payment of bank interest is not important for them.
- Some customers don't want to take a loan at the beginning of the deposit and their focus is to get bank interest, but they want to use the loan points if needed in the future.

A formula that has a mathematical basis and can cover the mentioned goals and limitations is the main issue of this research.

**4.1 Modeling a Periodic Problem**

With the aim of clarifying the presented model of the research, the process of forming the final model is expressed step by step. For this purpose, first the basic model is presented and then the model is developed to meet the desired goals and limitations.

**4. 1. 1 Basic model: the ratio between deposits and loans**

In the initial model, it is assumed that, the loan is paid according to 100% of the deposit amount. For this purpose, it should be determined how much cash has been in the bank's possession for how long, so that the amount of the facility can be determined accordingly for a certain period of time. In fact, the loan amount depends on three variables, the deposit amount, the deposit period, and the requested loan period.

The following notation will be used in the research.

$X_d =$ Deposit period
$Y_l =$ Requested loan duration
$A_d =$ Average deposit amount
$A_l =$ loan amount

Two important points have been noted in this symbolization.

1- The depositor may change the deposit amount during the deposit period, so the average deposit amount will be calculated.

2- A customer applying for a loan, does not have a limit on the requested loan period, for example, he can make a deposit for three months and request a 6-month loan.

The goal of the problem is to establish a balance between deposits and loans, which can be expressed as follows.

$$\text{Balance point} \quad \leftrightarrow \quad A_l * R_l = A_d * R_d \rightarrow A_l = \frac{R_d}{R_l} * A_d \qquad (1)$$

$R_l =$ The retention rate of cash due to deposit with the bank
$R_d =$ The outsourcing rate of cash from the customer′s loan

To calculate the retention rate of cash per deposit, the length of the deposit period is calculated on a monthly basis. On the other hand, in the paid loan, the installments are received from the customer monthly, so every month, a part of the paid loan is returned to the bank and the remaining amount of cash at the customer's disposal is reduced. With the explanations provided, the cash retention rate for deposits and payday loans can be compared as follows.

$$R_l = \frac{\frac{Y_l}{2} + 0.5}{12} = \frac{Y_l + 1}{24} \quad (2)$$

$$R_d = \frac{X_d}{12} \quad (3)$$

Equations 2 and 3 are placed in equation 1 and the formula for calculating the loan amount payable to the customer can be calculated.

$$A_l = \frac{R_d}{R_l} * A_d = \frac{\frac{X_d}{12}}{\frac{Y_l + 1}{24}} * A_d \rightarrow A_l = \frac{2 * X_d}{Y_l + 1} * A_d \quad (4)$$

Equation 4 has the ability to calculate the loan score for the customer based on the value of three variables. The table below calculates the facility score based on the various values of the variables.

**Table 1- Calculations of the facility factor for the basic formula**

| Deposit 100 | Deposit period (one month to 12 months) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Loan repayment period 6 | 28.6 | 57.1 | 85.7 | 114.3 | 142.9 | 171.4 | 200.0 | 228.6 | 257.1 | 285.7 | 314.3 | 342.9 |
| 12 | 15.4 | 30.8 | 46.2 | 61.5 | 76.9 | 92.3 | 107.7 | 123.1 | 138.5 | 153.8 | 169.2 | 184.6 |
| 24 | 8.0 | 16.0 | 24.0 | 32.0 | 40.0 | 48.0 | 56.0 | 64.0 | 72.0 | 80.0 | 88.0 | 96.0 |
| 36 | 5.4 | 10.8 | 16.2 | 21.6 | 27.0 | 32.4 | 37.8 | 43.2 | 48.6 | 54.1 | 59.5 | 64.9 |

### 4.1.2 Calculating the loan amount by removing part of the deposit

With the explanations provided in the introduction section, banks are obliged to block a percentage of the deposit with the central bank, which is called the legal reserve. Therefore, in practice, the block amount with the central bank is the amount that has been made compulsory and the rest of the deposit is eligible for loan payment. If the banks want to set aside a part of the deposit for other purposes in addition to the legal deposit, in fact, a percentage of the deposit, which includes the blocked deposit with the central bank and the deposit required by the bank itself, will be removed from the terms of granting the loan. Despite these conditions, the formula calculated in the previous section is modified as follows.

$$A_l = \frac{2 * X_d}{Y_l + 1} * \%(100 - \alpha) * A_d \quad (5)$$

$\alpha =$ The sum legal deposit of the central bank and the deposit required by the bank, based on a percentage of the total deposit

For example, if the bank is obliged to block 10% of the legal deposit in the central bank and due to the requirements of the internal instructions, use 5% of the deposit amount to pay the loan in the field of specialized activity, so in total, 15% of the sum deposit should be set aside. And the balance of deposit and loan should be established, for 85% of the deposit.

$$A_l = \frac{2 * X_d}{Y_l + 1} * 0.85 * A_d \quad (6)$$

### 4.1.2 Development of the formula with the addition of bank interest

Bank interest was not considered in the equations presented so far. It has been assumed that the bank does not pay interest for the customer's deposit, and the bank will not earn interest for the loan paid to the customer either. In this section, receiving and paying interest is added to the problem. The new assumptions of the problem are as follows.

[1] The customer receives bank interest at the rate of $RI_d\%$ for the deposit.

[2] Bank earns a $RI_l\%$ interest rate for loan payments.

[3] If there is no balance in the durability of the cash obtained from the customer's deposit and loan, it will be calculated at the rate of $RI_t\%$ of income or financing cost. In fact, in the financial process between depositability and loan payment, longer cash retention with the bank will result in income, and on the contrary, if the customer's cash retention is longer, the bank will incur costs. Obviously, if there is an imbalance in the duration of deposits and loans, the bank is forced to borrow the deficit and invest the excess in another place. which will have financing cost and financing income, respectively.

[4] Profitability is a necessity in the financial process including depositability and loan repayment. An important point is the interest rate that is taken into account in planning. Symbol $R_{int}$ is intended for the interest rate of the mentioned financial process. The result of the income and cost of this financial process divided by the deposit amount shows the interest rate of this financial process. The details of which are given in relation 7.

$$R_{int} = \frac{\left(\frac{Y_l + 1}{24} * A_l * RI_l\right) - \left(\frac{X_d}{12} * A_d * RI_d\right) + \left(\beta * \frac{X_d}{12} * A_d - \frac{Y_l + 1}{24} * A_l\right) * RI_t}{A_d} \quad (7)$$

$(\beta = 100 - \alpha)$: Equation 7 can be simplified as Equation 8.

$$R_{int} = \frac{\left(\frac{Y_l + 1}{24} * A_l\right) * (R_l - R_t) + \left(\beta * \frac{X_d}{12} * A_d\right) * (R_t - R_d)}{A_d} \quad (8)$$

In equation 8, the loan payment is a known value and the profitability ratio of the financial process is an unknown value. In the following, the equation is rewritten to calculate the amount of loan paid for the known value of the profitability factor. (9)

$$\left(\frac{Y_l + 1}{24} * A_l\right) * (R_l - R_t) + \left(\beta * \frac{X_d}{12} * A_d\right) * (R_t - R_d) = R_{int} * A_d$$

$$\left(\frac{Y_l + 1}{24} * A_l\right) * (R_l - R_t) = R_{int} * A_d - \left(\beta * \frac{X_d}{12} * A_d\right) * (R_t - R_d) \quad (10)$$

$$\left(\frac{Y_l + 1}{24} * A_l\right) * (R_l - R_t) = A_d * \left(R_{int} - \frac{\beta X_d}{12} * (R_t - R_d)\right) \quad (11)$$

$$A_l = \frac{2A_d\left(12R_{int} - \beta X_d(R_t - R_d)\right)}{(R_l - R_t)(Y_l + 1)} \quad (12)$$

Equation 12 suggests the amount of the loan based on the profits related to the deposited amount, the type of loan requested and the bank's expected interest rate.

**4.2 Discussion**

To verify and demonstrate the effectiveness of the presented formulas, various types of deposits and payable loans are presented in the form of practical examples.

**4.2.1 Example 1**- Suppose a customer deposits 250 monetary units in the bank for 4 months, this customer does not want to receive and pay bank interest. We can discuss the loan packages offered to this customer as follows.

Equation 4 has the necessary conditions for submitting a loan proposal.

| | | |
|---|---|---|
| $\mathbf{A_l = \frac{2 * X_d}{Y_l + 1} * A_d}$ | For $Y_l = 6$ | $A_l = 285.7$ |
| | For $Y_l = 12$ | $A_l = 153.7$ |
| | For $Y_l = 24$ | $A_l = 80$ |

The results show that for a customer who deposits 250 currency units and does not want to pay bank interest, the bank can pay a 6-month loan in the amount of 285.7 or a one-year loan in the amount of 153.7 or a two-year loan in the amount of 80 units.

**Table 2- Verification of the calculated coefficient for facilities in the basic formula**

| 12 months | m1 | m2 | m3 | m4 | m5 | m6 | m7 | m8 | m9 | m10 | m11 | m12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Deposit method | 250.0 | 250.0 | 250.0 | 250.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Deposit value | 83.3 | 83.3 | 83.3 | 83.3 | 83.3 | 83.3 | 83.3 | 83.3 | 83.3 | 83.3 | 83.3 | 83.3 |
| average | | | | | | **83.3** | | | | | | |
| | | | | | | | | | | | | |
| 12 months | m1 | m2 | m3 | m4 | m5 | m6 | m7 | m8 | m9 | m10 | m11 | m12 |
| Loan value | 285.7 | 238.1 | 190.5 | 142.9 | 95.2 | 47.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| average | | | | | | **83.3** | | | | | | |
| | | | | | | | | | | | | |
| 12 months | m1 | m2 | m3 | m4 | m5 | m6 | m7 | m8 | m9 | m10 | m11 | m12 |
| Loan value | 153.7 | 140.9 | 128.1 | 115.3 | 102.5 | 89.7 | 76.9 | 64.0 | 51.2 | 38.4 | 25.6 | 12.8 |
| average | | | | | | **83.3** | | | | | | |
| | | | | | | | | | | | | |
| 12 months(1) | m1 | m2 | m3 | m4 | m5 | m6 | m7 | m8 | m9 | m10 | m11 | m12 |
| Loan value | 80.0 | 76.7 | 73.3 | 70.0 | 66.7 | 63.3 | 60.0 | 56.7 | 53.3 | 50.0 | 46.7 | 43.3 |
| 12 | m13 | m14 | m15 | m16 | m17 | m1 | m1 | m2 | m2 | m2 | m2 | m2 |

| months(2) | | | | | | 8 | 9 | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loan value | 40.0 | 36.7 | 33.3 | 30.0 | 26.7 | 23.3 | 20.0 | 16.7 | 13.3 | 10.0 | 6.7 | 3.3 |
| average | =61.7+21.6=83.3 | | | | | | | | | | | |

**4.2.2 Example 2-** Suppose a customer deposits 250 monetary units in the bank for 4 months, this customer does not want to receive and pay bank interest. The bank is required to block ten percent of the deposit amount with the central bank, and spend ten percent of the deposit amount in the specialized field of activity. We can discuss the loan packages offered to this customer as follows.

Equation 5 has the necessary conditions for submitting a loan proposal.

**Table 3- The suggestions provided for example 2**

| | | |
|---|---|---|
| $\mathbf{A_l = \frac{2 * X_d}{Y_l + 1} * 80\% * A_d}$ | For $Y_l = 6$ | $A_l = 228.6$ |
| | For $Y_l = 12$ | $A_l = 123$ |
| | For $Y_l = 24$ | $A_l = 64$ |

**4.2.3 Example 3-** Suppose customer deposits 250 money in the bank for 4 months, the loan packages offered to the customer for receiving and paying bank interest can be discussed as follows.

With the aim of providing a better financial process, Excel software has been used. In order to use formulas 8 and 12, it is necessary to determine the parameters of the problem including ($A_d, R_d, X_d, Y_l, R_l, \beta, R_t$ ) from the bank. In Figure 1, which is the output of Excel software, these values are placed in the left part.

**Figure 1- Calculations of example 3**

| | | |
|---|---|---|
| Ad | deposit amount | 250 |
| Rd | Deposit interest rate | 2% |
| Xd | Deposit period | 5 |
| Yl | Loan repayment period | 10 |
| Rl | Facility interest rate | 10% |
| $\beta$ | Allowed loan payment percentage | 80% |
| Rt | External financing rate | 18% |
| Rint | be assumed: Al, No bank interest | 3% |

| Rint | Al | profit of the financial process |
|---|---|---|
| 1% | 295 | 3 |
| 2% | 227 | 5 |
| 3% | 159 | 8 |
| 4% | 91 | 10 |
| 5% | 23 | 13 |
| 6% | 0 | 0 |

$$R_{int} = \frac{\left(\frac{Y_l + 1}{24} * A_l\right) * (R_l - R_t) + \left(\beta * \frac{X_d}{12} * A_d\right) * (R_t - R_d)}{A_d}$$

$$A_l = \frac{2A_d\left(12R_{int} - \beta X_d (R_t - R_d)\right)}{(R_l - R_t)(Y_l + 1)}$$

To calculate the amount of facility in the presented formula, a profitability factor of $R_{int}$ is required, on the right side of Figure 1, the amount of facility for different values of $R_{int}$is

shown. In order to have a better understanding of $R_{int}$, the payment amount of the facility was calculated from formula 4, excluding the interest received and paid, and then from formula 8, we obtained the profitability coefficient according to the existing conditions. Considering these conditions, the profitability factor is 3%. The results show that the maximum expected interest rate with the conditions announced by the bank is 5%, because practically there is no facility for the expected interest higher than 5%. This issue can be verified in the data on the right side of Figure 1.

## 5 Conclusion

Innovation in the financial industry leads to economic development. In today's era, the need for innovation is felt in the banking industry more than in other service industries. Financial technology has overshadowed the banking industry. Considering the important role that the financial services industry plays in the society, one should have a view of the potential changes that can revolutionize the banking industry, especially for the actors of this industry. For this purpose, it is necessary to move from traditional mechanisms to technology-oriented models. For example, it is important to mention that all financial institutions and banks face risks during their activities that they could not solve, but it is possible to manage these risks. Therefore, financial institutions must identify, control and reduce risks in order to survive. One of the operational solutions is to use financial engineering and mathematical sciences to provide practical formulas in the bank's accounting process. In the study conducted by Shah Vaisi (2018) and Ostadi (2017), liquidity risk is considered one of the most important risks in the banking industry, in this research, the focus has been on managing and reducing liquidity risk, in this regard, the financial model based on Based on mathematical sciences that have an accurate forecast of bank resources and costs, this financial model can control cash flow. The formula presented in this research provides the conditions for establishing the balance of deposit input and loan output for the bank. The formula presented is developed based on the bank's strategy, so it will be able to cover expectations and ultimately reach an acceptable balance. The presented formulas are verified by several examples, and it is shown that the objectives and constraints specified in the formula are fully met.

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