# BANKING LIQUIDITY RISK MANAGEMENT IN UKRAINE BASED ON THE APPLICATION OF DIGITAL AND INFORMATION TECHNOLOGIES

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Abstract: The article discusses the peculiarities of liquidity risk management in modern conditions. The advantages of the transition to the use of liquidity standards determined by the provisions of Basel III have been determined. The higher efficiency of the LCR and NSFR standards, compared to the liquidity ratios previously used by the National Bank of Ukraine, has been proven. The peculiarities of the dynamics of liquidity standards in the banking system of Ukraine in general have been determined. The specifics of the impact of modern information and digital technologies on bank liquidity risk management are considered. The process of digital transformation of the liquidity management system based on the application of digital software solutions for liquidity risk analysis and forecasting is considered.

Keywords: Digital technologies, LCR, Liquidity, Liquidity standards, NSFR.

## 1 Introduction

The effectiveness of banking activity depends on many factors, the main of which are financial indicators of capital adequacy and adequacy, profitability and yield per share, etc. However, there is also a set of indirect indicators of the success of banking activity, which, in particular, include liquidity, as the ability to fulfil obligations under banking operations. The liquidity management system became especially relevant after the full implementation of the provisions of Basel III regarding the introduction of LCR and NSFR indicators into the practice of banking institutions. This allowed banks to form more flexible approaches to liquidity risk management based on new principles of forming bank assets not by their maturity, but by the regularity of cash flows.

However, effective liquidity risk management is possible only if there is sufficient information about financial flows and market trends affecting bank liquidity. Accordingly, a comprehensive assessment of banks' liquidity, based on the application of ratio analysis and specialized economic and mathematical methods, should take into account key external and internal factors affecting liquidity risk. Effective risk management of bank liquidity requires comprehensive information on all the nuances of its activity. In addition, in order to manage the bank's liquidity, operational data on all the processes taking place in it are necessary, including those related to issuing loans, attracting deposits, carrying out off-balance sheet operations, etc. All this determines the relevance of the use of specialized information technologies for the effective management of bank liquidity risks. It is also necessary to take into account the fact that in conditions of intensive growth of flows and volumes of data coming from various sources, new principles of their management are also being formed, which correspond to the principles of the digital economy. Thus, the need for Big Data processing, the use of specialized automated liquidity assessment tools in the 24/7 mode, as well as the use of artificial intelligence to effectively solve current liquidity problems or form long-term plans for its provision is added to the liquidity management system.

## 2 Literature Review

Studies of liquidity risk management problems of commercial banks and the banking system, in general, are not new to economic science and are sufficiently fully described in specialized financial studies. One of the key areas in the study of liquidity management principles is the establishment of liquidity standards that banking institutions must adhere to in their activities. This issue is widely disclosed in the works of such scientists and practitioners as O. Agres [1], I. Arutiunian [3], I. Balaniuk [5], T. Beridze [6], A. Boiar [8], O. Danchenko [17], A. Demianenko [18], M. Dziamulych [19-27], G. Karcheva [30], O. Krupskyi [33], T. Kulinich [35], M. Melnyk [37], N. Popadynets [42-44], J. Reitšpís [46], O. Sheptuha [48], T. Shmatkovska [49-52], A. Skrypnyk [54], O. Stashchuk [59-61], I. Yakoviyk [64], A. Yakymchuk [66], O. Yatsukh [68] and others. In addition, it is also necessary to note the significant contribution that was made to the study of practical problems of liquidity risk analysis and its management based on the application of specialized econometric and financial banking tools based on the works of such scientists as O. Apostolyuk [2], V. Baidala [4], O. Binert [7], I. Britchenko [9-15], Y. Chaliuk [16], O. Ivanenko [28], O. Karas [29], M. Khutorna [31], Z. Kireieva [32], M. Kryshtanovych [34], M. Maruschak [36], V. Nahornyi [38], T. Ostapenko [40], Y. Polishchuk [41], S. Prasolova [45], R. Ribeiro [47], N. Shvets [53] R. Sodoma [55-58], I. Voronenko [63], V. Yakubiv [65], Ya. Yanyshyn [67], A. Zielińska [69] and many others.

However, dynamic changes in the financial markets, taking place under the influence of the intensification of technical progress, lead to the widespread introduction of information and digital technologies in all areas of banking activity, including the liquidity risk management system. Therefore, there is an objective need to improve the existing tools of liquidity management based on deepening research on the application of new technologies in the practical activities of banks.

## 3 Materials and Methods

Currently, liquidity management is based on compliance with the mandatory liquidity standards LCR and NSFR, which were recommended by the Basel Committee on Banking Supervision and were adopted as key for the banking system in the process of implementing the provisions of Basel III. The practical calculation of these standards is also based on methodological recommendations of the Basel Committee. At the same time, both of the mentioned standards, unlike the previous methods of liquidity management, which were based on the application of term liquidity ratios, are based on determining the stability of the receipt of financial flows sufficient to meet the requirements for the bank's obligations.

The liquidity coverage ratio (LCR) requires commercial banks to have at their disposal a sufficient number of high-quality liquid assets at any time so that they can cover the total net cash outflows within 30 days under a stress scenario. The calculation of this norm is carried out according to the following formula [62]:

$$LCR = \frac{High\ quality\ liquid\ assets}{Total\ net\ liquidity\ outflows\ over\ 30\ days}$$

The Net Stable Funding Ratio (NSFR) is designed to encourage banks to rely on more stable and long-term sources of funding, reducing reliance on short-term sources of funding for current activities. The calculation of this norm is carried out according to the following formula [62]:

$$NSFR = \frac{Available\ amount\ of\ stable\ funding\ (ASF)}{Required\ amount\ of\ stable\ funding\ (RSF)}$$

At the same time, ASF and RSF are calculated as follows:

$$ASF = \sum_{i-1}^{n} (ASF_i \times K_{ASF_i})$$

where n – the number of components;
$ASF_i$ – i-th component of available stable financing (ASF);
$K_{ASFi}$ – the coefficient established for the i-th component of available stable funding (ASF) [62].

$$RSF = \sum_{i-1}^{n} (RSF_i \times K_{RSF_i})$$

where n – the number of components;
$RSF_i$ – i-th component of the necessary stable financing (RSF);
$K_{RSFi}$ – the coefficient established for the i-th component of the necessary stable financing (RSF) [62].

The permissible value for both standards is 100%.

**4 Results and Discussion**

The transformation of approaches to liquidity management and the transition from the use of the system of liquidity ratios to Basel III standards was caused by systemic problems with a lack of liquid funds in specific structured products and interbank markets. as well as an increased probability of off-balance sheet liabilities. All this caused serious problems with liquid funds for certain banks and required regular intervention of the National Bank of Ukraine (NBU) to maintain the liquidity of the banking system. Such trends led to an increase in the relevance of monitoring the relationship between funding and market liquidity risk, as well as the relationship between liquidity funding risk and credit risk.

In such conditions, the problem of liquidity management in conditions of financial market instability is that commercial banks perceived the NBU's requirements to maintain the necessary liquidity reserve as an obstacle to increasing their profits. Accordingly, quite often banks tried to hide real problems with liquidity, to falsify the results of their activities to meet the necessary requirements, by attracting additional liquidity on the interbank market with the help of overnight loans. All this also led to an increase in liquidity problems, when banks formally complied with the liquidity ratio requirements of the National Bank, but in fact, the bank experienced a real liquidity deficit, which led to significant problems with the fulfilment of obligations in the event of crisis situations.

In such conditions, the transition to liquidity management with the help of Basel III recommendations made it possible to significantly improve the liquidity management system of banks in Ukraine. In particular, as a result of the introduction of the LCR and NSFR regulations, the process of bank liquidity regulation became ensured on the basis of abandoning the assessment of liquidity on the basis of the balance sheet and was reoriented to the assessment of the stability of cash flows. In addition, the continuity of the bank's liquidity regulation was ensured by introducing new liquidity standards, which covered both short-term and long-term liquidity.

The advantage of the new liquidity risk management toolkit is the flexibility of the management process itself, which is formed on the basis of a combination of liquidity standards and monitoring tools based on the application of scenario modelling methods. Also, the requirements of Basel III regarding the regulation of liquidity risk contributed to the overall increase in the stability of the banking system due to the increase in the volume of liquid reserves and improving the quality of the bank's capital.

In addition, it is worth noting that liquidity risk management also involves the use of specialized tools for regulating the level of bank liquidity not only based on the standards established by the NBU but also enables banks to increase their own liquidity requirements based on objective needs. Such needs, first of all, may be caused by an increase in the level of liquidity risk itself, which requires the inclusion of approaches to the identification of risk and its potential threats in the management process. Identification of liquidity risk is the risk of a lack of assets for the timely fulfilment of the obligations of a commercial bank. It is also necessary to take into account that since the risk is divided into risks of current liquidity and prospective liquidity, it is necessary to different approaches to its identification (Table 1).

Table 1: Identification of liquidity risk of a banking institution

| Type of risk | Composition of risk | Types of assets and liabilities involved in the calculation | Methods of eliminating liquidity gaps |
|---|---|---|---|
| Current liquidity risk | Lack of free funds for making current payments, which may have the following consequences: an increase in expenses for attracting an unscheduled interbank loan; unearned profit or loss due to early realization of highly liquid assets and refusal of planned placement; damage to the bank's reputation. | Assets: bank accounts and cash register, assets placed for up to 1 month. Liabilities: non-permanent part of demandable liabilities and short-term liabilities drawn for a period of less than 1 month. | Involvement of short-term sources of funds. Refusal of planned placement of funds. Sale of highly liquid assets. |
| Prospective liquidity risk | Emergence of current liquidity risk in the future. Emergence of interest rate risk in the future. | All assets and liabilities divided into term groups. | Changing the policy of conducting active-passive operations. |

Source: [53].

If we talk about the practice of applying the new liquidity management methodology, which is based on the liquidity standards recommended by Basel III, it should be noted that the LCR standard was introduced into the practice of commercial banks of Ukraine in 2019, and the NSFR - from April 2021. Therefore, for an adequate and comparable assessment of the dynamics of these standards, let's analyze the quarterly change in their values from the moment of their parallel application in the activity of banks (Figure 1).

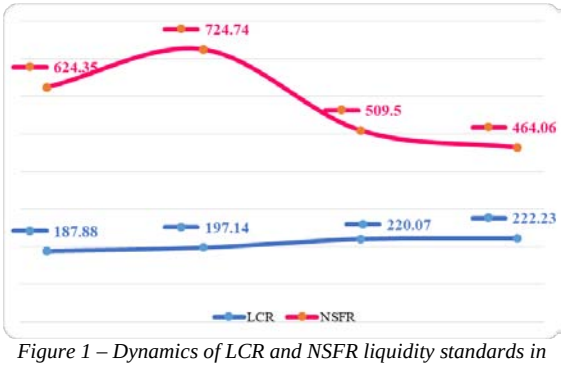


*Figure 1 – Dynamics of LCR and NSFR liquidity standards in the banking system of Ukraine on average, %*
*Source: [39].*

As we can see, during the analyzed period, the value of liquidity standards was sufficient on average for the banking system of Ukraine. At the same time, the trends regarding the dynamics of the values of these indicators were different. In particular, less than a year after the introduction of the NSFR standard, its value on average in the banking system has increased significantly. At the same time, for systemically important banks, the value of the standard remained practically unchanged. In general, this indicates sufficient financing of the activities of commercial banks and ensures their stable functioning in the current period.

At the same time, the change in the values of the LCR standard was unstable – it increased in the first half of the year. On the other hand, by January 1, 2022, the value of LCR decreased by 260 points, which indicates a general decline in banks' liquidity in the short term. On the other hand, the indicator of 464.06% as of the end of the analyzed period is four times higher than the permissible value, which indicates the presence of a sufficient reserve of liquidity on average in the banking system.

In general, it can be said that the introduction of the LCR and NSFR regulations contributed to the stabilization of the banking system and led to a general increase in the financial stability of Ukrainian banks. At the same time, the general multiple exceeding the values of these standards above the permissible level gives reason to assert the prospects for increasing the volume of active and passive operations by commercial banks and their successful passage of potential market stresses.

However, when analyzing approaches to liquidity risk management, it is necessary to take into account that in modern conditions its management is also complicated by a number of additional factors, both external and internal, which have a direct and significant impact and do not always depend on the specifics of the bank's activities. At the same time, the number of internal ones can include the implementation of risky activities, deterioration of the quality of assets, low level of management, significant deductions to reserves, increase in credit risk, etc. External factors are more complex in their nature and nature of influence, so they can be conditionally divided into two groups (Figure 2).

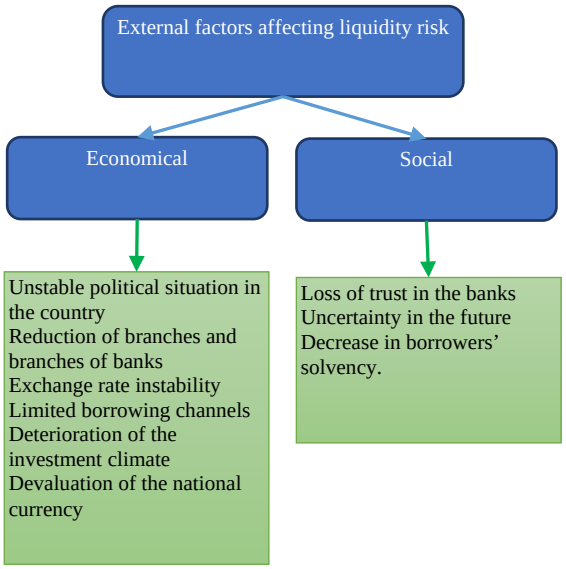


*Figure 2 – External factors affecting the liquidity risk of banks in modern conditions*
*Source: [31].*

Thus, it can be argued that liquidity risk management should be effective not only at the level of an individual bank but also at the level of the banking system as a whole, which significantly strengthens the role of the National Bank of Ukraine in this process. The reason for this is that all banks are interconnected, so the crisis of one bank, and especially of a system-forming one, can cause a "domino effect" that will drag other banks along with it and can lead to the inevitable decline of the entire financial system of the country. Therefore, effective liquidity risk management at the level of each individual bank and by the National Bank of Ukraine carried out on the basis of Basel III, will allow to minimize the development of crisis phenomena and prevent potential threats.

However, it is worth noting another important factor that has an impact on the regulation of banks' liquidity risk and whose influence has been increasing in recent years. It means the intensive integration of the global banking system into the digital economy, which is based on the use of modern information technologies and digital software solutions. At the same time, such factors of a non-financial nature can have a fairly significant impact on the liquidity management system in general.

The manifestation of information technologies in regulating the liquidity risk of banks has two main aspects:

1. Since the regulation of liquidity with the help of Basel III liquidity standards involves the constant analysis of cash flows and bank assets in both the short and long term, the use of digital processing of data on cash flows 24/7 with the help of artificial intelligence and cognitive of technologies contributes to increasing the flexibility of liquidity management and contributes to a more prompt response of the bank to market changes that have an impact on liquidity.
2. The use of Big Data processing capabilities allows banks to form and implement rather complex liquidity forecasting models based on detailed analysis of an extremely large number of different factors, which leads to the extremely high accuracy of such forecasts.

Therefore, it can be argued that commercial banks and their operating models of liquidity management, which are currently functioning, will not be able to remain unchanged in the future and will necessarily move to the implementation of digital software solutions in the field of liquidity risk regulation due to the growth of large-scale analytics capabilities data At the same time, such processes of digitalization and innovation within the framework of transformative transformations of the banking sector will result in increased efficiency in the field of liquidity regulation due to faster response to market changes, as well as in connection with more effective forecasting of the liquidity risk itself. In general, the process of digital transformation of the liquidity management system is shown in Figure 3.

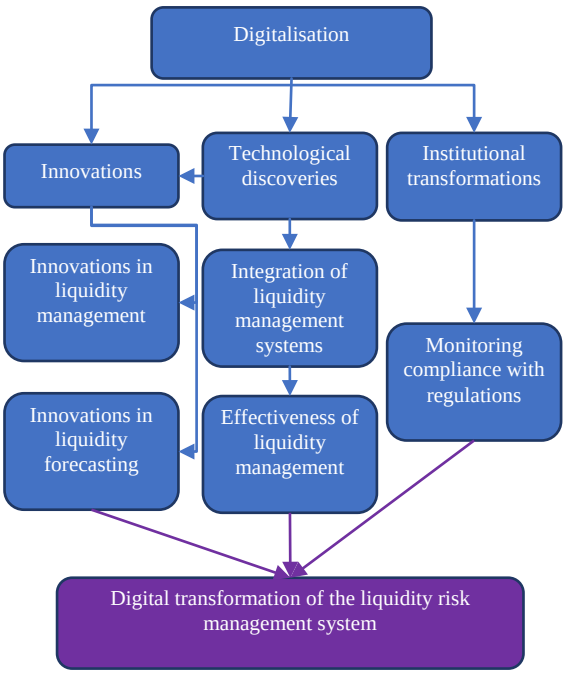


*Figure 3 – Transformation of the bank's liquidity management system in the conditions of the digital economy*
*Source: generated by the author.*

Thus, we see that the improvement of the liquidity risk management system of banks in the process of digitalization consists in the implementation of the principles of applying digital software solutions to the practical activities of the

banking institution. At the same time, such a system should be based on a comprehensive system for managing digitization processes and provide for:

- Increasing the level of product digitalization in order to improve the results of liquidity risk management;
- Building a system of effective relationships with companies that ensure the creation of new digital innovations in the field of liquidity management;
- Modernization of the cash flow analysis system and transition to a data processing system for all processes affecting liquidity;
- Formation of the bank's liquidity risk data architecture in order to ensure flexible and multifunctional management of it.

**5 Conclusion**

Thus, it can be concluded that liquidity risk is one of the most dangerous among all that the bank is exposed to in the course of its activities. In today's conditions, it is advisable for banks to focus on the recommendations of the Basel Committee on Banking Supervision, namely: to carry out a cash flow forecast for prompt response to potential imbalances in the receipt and expenditure of funds, to ensure the maintenance of intraday liquidity.

It was determined that the main consequences of the implementation of the Basel III recommendations for liquidity risk regulation in Ukraine were an increase in the financial stability of banks and the entire banking system, as well as an increase in the level of banks' capital. In addition, the implementation of Basel III standards contributed to the return of banks to simple business schemes and universal active operations.

In the conditions of active development of digitalization, it is expedient for banks to implement the main components of liquidity risk management based on the use of modern digital software solutions and multifactor liquidity forecasting models. At the same time, the fundamental algorithm for successful liquidity management from the application of digital economy solutions is the integration of innovative technological solutions into the liquidity forecasting process based on complex multifactor econometric models.

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**Primary Paper Section:** A

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