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Financial Security as Reflected by the Dynamics of Banking System Indicators

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Abstract: The financial sector of the economy plays an important role in the development of sustainable economic relations. Financial resources are the basis for the functioning of various business entities, ensuring the continuity of their activities. Based on this, the work examines the key aspects of assessing financial security as a generalized concept of the ability to resist negative phenomena in the financial sector. Banking activity, which plays an important role in economic processes both throughout the country and in individual sectors of the economy and business entities, was chosen as the object of study. At the same time, we take into account the flow approach to account for and reflect the dynamics of the banking system. For this purpose, we use wavelet coherence estimates. The work provides such estimates for specific operating conditions of banking systems. This will allow you to better understand the logic of the study and the results obtained.

Key words: Dynamics, Indicators, Banking system, Financial security, Flow approach, Wavelet coherence

Introduction

Sustainable economic development is impossible without comprehensive financial support. In this aspect, special attention is paid to the functioning of the financial sector of the economy [1], [2]. The effective interconnection of its individual segments and the continuity of movement of funds form the basis of such interaction and development. Moreover, such processes are reflected in the generalized concept of financial security [3], [4]. The key here is, first of all, consideration of the financial security of individual institutions (or multiple business entities) of the financial sector.

Financial security is combined with the general concept of economic security and reflects a set of various measures to prevent the occurrence and development of unforeseen situations in the financial sector [5]-[7]. In general, we can distinguish such components of financial security as: monetary and foreign exchange, credit and banking and budgetary and tax [8]-[10]. Each of these components reflects processes in individual segments of the financial sector of the economy. These processes are also characterized by relations in various segments of the financial market.

In this work, we highlight the banking services market, which allows not only to accumulate the necessary financial resources, but also to redistribute them, observing the conditions of financial security for different business entities. At the same time, financial security is ensured by the support of various financial instruments, methods and approaches for its assessment in order to achieve a certain level and support [11]-[18].

From the point of view of assessing financial security in the banking sector, various indicators of banking activity should be considered, where it is also important to take into account the flow approach [19]-[21]. It is the flow approach that allows us to consider the dynamics of the process and assess the overall state of financial security.

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Thus, the main goal of our study is to reveal financial security as reflected in banking performance indicators. To generalize this consideration, we will examine the dynamics of indicators not for one institution, but for the banking system as a whole.

Related work

Banking analysis and financial security are inextricably linked. This is reflected in various works of researchers and practitioners.

For example, L. Drake and M. J. Hall study the efficiency of banking activities based on the analysis of data from Japanese banks [22]. Various indicators for the banking system are used for analysis. For these purposes, a nonparametric boundary approach is used, which is the basis for the analysis of technical and scale efficiency. In particular, efficiency analysis is carried out for individual banks, types of banks and groups of bank sizes. The influence of individual indicators of banking activity on the assessment of efficiency is also taken into account. This allows you to obtain different estimates and link them together to study the level of financial security.

C. Minoiu and J. A. Reyes conduct a global analysis of banking activities, which covers the period 1978–2010 [23]. The authors examine the global banking network using cross-border bank flow data for 184 countries. For this analysis, a streaming approach is used. Therefore, the study emphasizes that the density of the global banking network is determined precisely by the flows associated with certain areas of banking activity. The impact of crises on flow processes and assessment of banks' activities is also noted.

M. Dieter and N. Tkacz draw attention to the possibility of modeling financial security [24]. At the same time, processes that are typical for banking activities are considered, taking into account individual banking applications. The basis of the study is a comparative analysis of individual time series data. These data series describe UK banking activities. The work also uses end-to-end analysis, which corresponds to the flow approach. The importance of conducting a comparative assessment of the processes under consideration is also noted.

The study [25] examines cyber security threats from the point of view of digital banking. Here the authors highlight certain types of risks that generally affect the financial security of banking activities. These risks are associated with the activities of hackers and fraudsters. The authors use the method of theoretical analysis. There are also many references to the results of other researchers. Nevertheless, the paper draws conclusions about the importance of such analysis and its prospects for identifying new approaches to assessing the level of financial security.

T. Ponomarenko, O. Prokopenko, H. Kuzmenko, T. Kaminska and M. Luchyk analyze the current state and ways to improve banking security from the point of view of data on Ukrainian banks [26]. The work examines the theoretical aspects of financial security in banking and ways to improve it. This helps identify the key indicators that need to be considered when analyzing financial security. Among such indicators, in particular, stand out: loan indicators, the volume of assets and their structure, expenses, profitability and much more. The concept of information security is also highlighted separately.

A. Burkhanov summarizes and examines various indicators for assessing the financial security of banks [27]. Particular attention is paid to ensuring liquidity and stability of banks. Based on this, A. Burkhanov believes that these indicators are an important prerequisite for ensuring financial security. The article also summarizes the methodology for collecting indicators that are used to assess financial security.

Thus, it should be noted the importance of the issue under consideration, which is confirmed by relevant studies by other authors. At the same time, an important aspect of such analysis is the consideration of the mutual dynamics of the data.

The study [28] examines a comprehensive risk management system taking into account the achievement of a certain level of financial security of banks. For these purposes, big data analysis methods are used. This allows you to search for various trends in the data being studied and objectively assess the level of security. You can also build various models for mutual data analysis.

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D. Malikova considers methods for effectively assessing the level of economic security of banks [29]. The article presents a generalized model for ensuring bank security and proposes an economic and mathematical model for assessing the state of financial stability of banks [29].

M. Rottner, based on quantitative analysis, considers changes in financial security assessments [30]. This takes into account the impact of financial crises and the functioning of shadow banks. The work uses data for the USA.

Wavelet coherence as a tool for analyzing mutual dynamics

To analyze the mutual dynamics of data, which can be used in assessing financial security, the wavelet coherence methodology is usually used. This methodology has proven itself in the study of various economic data [31], [32]. This interest in wavelet coherence is due to the fact that we can study the dynamics of data at different time intervals. At the same time, the data themselves are presented in the form of time series, which reflects changes in banking data over time. In addition, the result for individual intervals can be presented in one window, which is very convenient and informative. Here we can do analysis of relationships between individual time series data and relationships between different time series. This allows for multidimensional assessments of financial security.

So if we have two series of data ($f(t)$ and $h(t)$), each of which reflects the dynamics of an indicator over time t, then we can determine the value of wavelet coherence between the following series of data using the following formula [33], [34]:

$$Q^2(a,b) = \frac{\left| \Xi(a^{-1} W_{f(t)h(t)}(a,b)) \right|^2}{\Xi(a^{-1} \left| W_{f(t)}(a,b) \right|^2) \Xi(a^{-1} \left| W_{h(t)}(a,b) \right|^2)},$$

where:

$W(a,b)$ – values of transverse wavelet spectra,

a,b – the scale and center of time localization that determine the scale of the wavelet transform,

Ξ – smoothing operator,

$Q^2(a,b)$ – square of the wavelet coherence coefficient. $0 \le Q^2(a,b) \le 1$. If these values tend to zero, then we have a weak correlation. Otherwise we have a strong correlation [35], [36].

If we are talking about assessing financial security using a streaming approach, then we should take into account the consistency of the data that takes part in such a study. Thus, the assessment of financial security taking into account the dynamics of banking performance indicators lies in the level of consistency of the relevant data.

Then the general methodology for assessing financial security in the banking sector, taking into account the display of the dynamics of various indicators, is:

– the study period and corresponding indicators are selected;

– wavelet coherence estimates are constructed and the level of financial security is determined.

This allows us not only to consider the current level of financial security, for example, for a specific banking system, but also to compare such assessments for different banking systems or for different time periods.

Some data to analyze

Taking into account the fact that the basis of banking activity is funds raised in the form of deposits and loans provided, we will consider such parameters for the banking system as a whole,

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such as: the volume of attracted deposits and the volume of loans issued, as well as rates on deposits and loans.

Figure 1 shows the dynamics of deposits and loans in the Ukrainian banking system as a whole over a certain period of time (2005-2019, shown on a quarterly basis). We see that in some time periods there is consistency between the data series under study. However, it should also be noted that there are periods when such consistency does not exist. Therefore, it is important to examine the general dynamics of such consistency and, as a consequence, the assessment of financial security in this aspect.
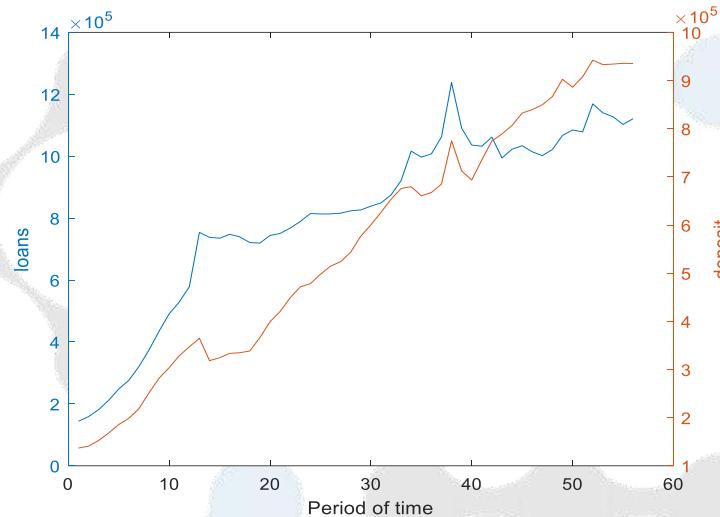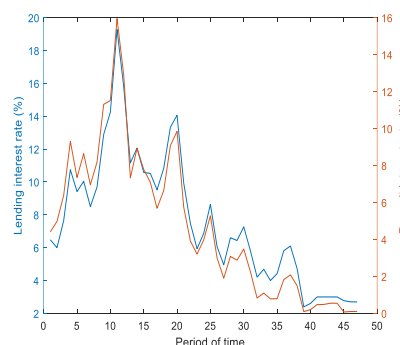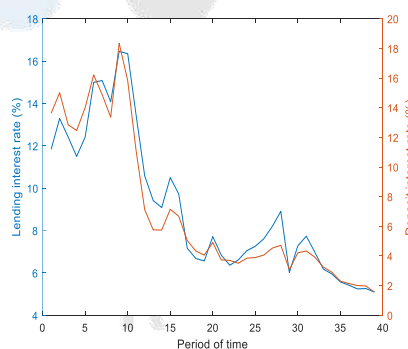

Figure 1: Dynamics of deposits and loans in the banking system of Ukraine in the period under study

Below we show the dynamics of loan and deposit rates for the following countries: Australia (Figure 2a) and Canada (Figure 2b). The data for Figure 2a covers the period 1981-2019, and the data for Figure 2b covers the period 1971-2017. All data is given in annual averaging.

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a)   b)

Figure 2: Dynamics of interest rates on loans and deposits in the banking system of Australia (a) and Canada (b)

It should be noted that the dynamics of lending and deposit rates for countries such as Australia and Canada are more consistent than the dynamics of the volumes of attracted deposits and issued loans in Ukraine.

Thus, we can talk about different degrees of consistency in the context of individual indicators of banking activity. The same fully applies to levels of financial security.

Therefore, in the future it is necessary to assess wavelet coherence and understand in this aspect the level of financial security of the banking system.

Wavelet coherence in assessing financial security

Let us first consider the consistency between data series that describe the dynamics of funds raised and loans issued for the Ukrainian banking system. This is presented in Figure 3.
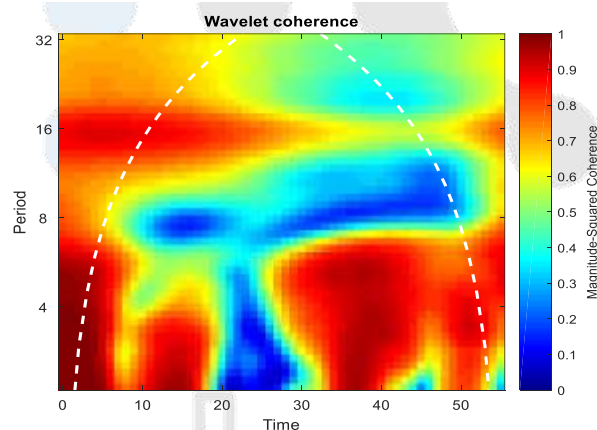
Figure 3: Wavelet coherence between attracted funds and issued loans for the Ukrainian banking system

Figure 4 shows wavelet coherence estimates for data on loan and deposit rates (a – for the Australian banking system, b – for the Canadian banking system).
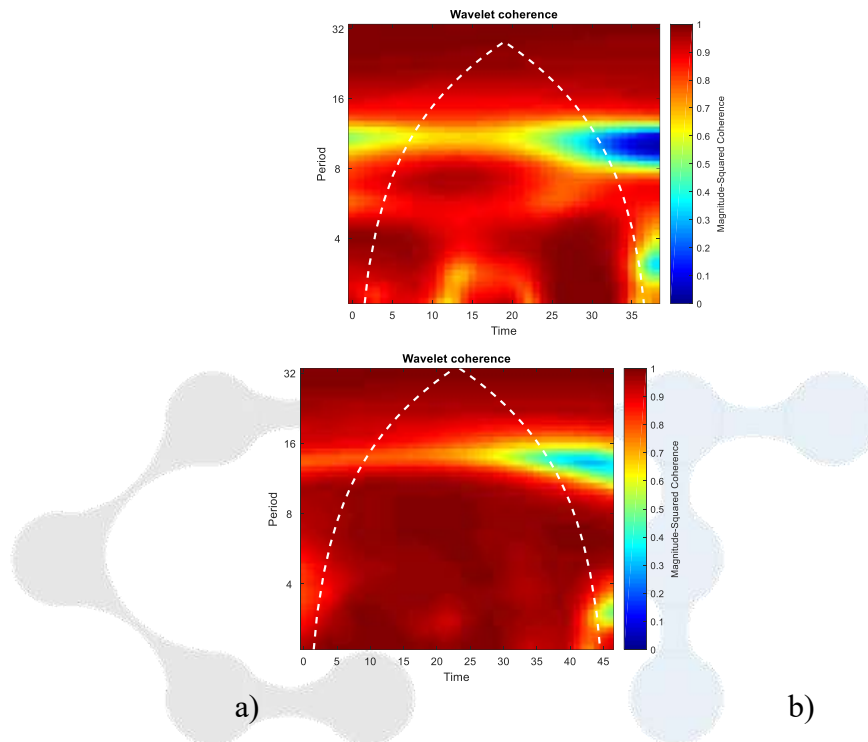
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Figure 4: Wavelet coherence estimates for data on loan and deposit rates for the banking systems of Australia (a) and Canada (b)

It should be noted that the consistency between funds raised and loans issued to the banking system in Ukraine is not absolute. There are periods of significant consistency and periods of lack of consistency. At the same time, during periods of great consistency, such consistency is significant. Consequently, we can note that the financial security of the banking system in this aspect is also not perfect. Moreover, it is obvious that in certain periods the financial security of the banking system in Ukraine is at an insufficient level. This is also noted in a number of relevant studies [2], [13], [14]. At the same time, we note that in theoretical terms there should be complete consistency between the volume of funds raised and loans issued in the banking system as a whole.

The picture of consistency between loan and deposit rates is somewhat different from the point of view of the banking systems of Australia and Canada. Here it should be noted that there is significant consistency throughout the entire time interval under study. Although there are also periods, when such consistency decreases slightly. Consequently, in this aspect, financial security for the banking systems of Australia and Canada is at a high level. This is fully consistent with the theoretical point of view and reflects the logic of the key areas of profit and expenses for banks.

If we compare the consistency between rates on loans and deposits from the point of view of the banking systems of Australia and Canada, it should be noted that for the Canadian banking system such consistency is higher. Consequently, the level of financial security in the Canadian banking system is more significant than in the Australian banking system.

Thus, we can talk about the advisability of using wavelet coherence estimates in the study of the financial security of banking systems based on the dynamics of various indicators of banking activity. At the same time, it is possible to assess the level of such security in a comparative aspect.

Conclusion

The work examines various problematic issues of financial analysis of the functioning of banking systems. This discussion focuses on the possibility of conducting financial security assessments based on the dynamics of banking performance. A variety of such indicators makes it possible to obtain such estimates taking into account a certain area of activity of both individual banks and their aggregate.

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For the corresponding analysis, it is proposed to use the wavelet coherence methodology. Using specific numerical data, the possibility and feasibility of obtaining various assessments of the financial security of individual banking systems is shown. The proposed approach to considering such estimates allows us to obtain comparative characteristics. This can be used for a comprehensive analysis of the functioning of the banking system, identifying bottlenecks in its financial security.

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