

Mutual Analysis of the Dynamics of Development of the Banking Sectors of Key Countries in Europe, Asia and America

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Abstract: *The banking sector plays an important role in the economy and development of every country. The banking sector is an important segment of the financial market. Banks normalize and ensure the continuity of the movement of various financial flows between different economical agents. At the same time, banks play an important role in international trade. Banks contribute to ensuring the parity of currency quotes, mutual settlements between countries, and support the movement of financial flows at the international level. For such provision, an important point is the mutual analysis of the banking systems of different countries. One of the indicators of the functioning of different banking systems are the corresponding stock indices. We consider the dynamics of changes in a number of such stock indices for some countries in Europe, Asia and America. We also consider some statistical characteristics of the dynamics of changes in the corresponding stock indices selected for analysis. This allows a better understanding of the functioning and development of the respective banking systems. For analysis, we use the wavelet ideology. We consider the corresponding wavelet coherence estimates. The paper presents a series of graphs and charts that allow you to understand the results of this study. The results obtained allow us to form appropriate strategies for entering the international banking market.*

Keywords—dynamics; analysis; statistics; Europe; Asia; America; banking; stock indices; wavelet coherence; financial flows

1. INTRODUCTION

Banks play an important role in providing the economy with financial resources, which can ultimately be transformed into any kind of resources. This is based on the fact that banks are able to accumulate financial resources and, through various tools, redistribute these resources between different participants in market relations [1]-[4]. These opportunities are enhanced and multiplied by the functioning of a set of banks, which, together with the central bank, form a single banking system [5]-[7]. This system allows you to generate new opportunities based on the existing resource base.

The banking system closely interacts with other segments of the financial market. Such interaction ensures the continuity of the movement of various financial flows [8], [9]. As a result, the stability of the movement of such flows, the reliable functioning of all segments of the financial market, the balanced development of individual business entities and the economy as a whole are achieved.

The banking system of a particular country also closely interacts with certain sectors of the international financial market. Among such sectors, first of all, the banking systems of different countries should be considered. This makes it possible to synchronize the development of international trade, ensure the conduct of international transactions, and maintain the parity of currencies. As a result, this leads to the mutual development of international trade, the reliable functioning of

the economies of individual countries, and overall sustainable economic development.

An important aspect is also the proper functioning of the banking system itself, where the key source of information is the movement of its various financial flows. These flows can be viewed as separate or as a generalized indicator (for example, the corresponding stock indexes).

For the implementation of efficient banking activities, it is necessary to analyze the various indicators that reflect such development dynamics. This can be done both with the help of classical methods and approaches [10]-[12], and with the help of specialized methods that are used in other areas of research [13]-[16]. It is also necessary to use various non-standard approaches that make it possible to more accurately reveal various factors influencing the development of the banking sector. Among such factors, implicit ones can also be distinguished, which also have a significant impact on the functioning of the banking system. At the same time, an important point of such an analysis is the study of mutual dynamics, which makes it possible to specify various aspects of the corresponding development of banking systems.

Thus, the main purpose of this work is to analyze the mutual dynamics of the development of the banking sectors of various countries. Among such countries, we consider in the work individual countries of Europe, Asia and America.

2. RELATED WORKS

Traditionally, the functioning of the banking system is considered in general or in the context of certain banking operations. At the same time, such operations are considered in the context of input or output financial flows.

J. Begenau and T. Landvoigt consider the issues of financial regulation for the sustainable functioning of the modern banking system [17]. In particular, the paper deals with the regulation of the capital of commercial banks and the reaction to this from the banking system. The paper considers a quantitative general equilibrium model with regulated and unregulated banks to study the unintended consequences of regulation [17]. The model uses various time series of data that describe certain indicators of banking activity. In this case, an important aspect is the analysis of the mutual dynamics of such data.

H. Hassani, X. Huang and E. Silva explore the general issues of banking [18]. At the same time, the authors consider banking from the point of view of using relevant data as big data. To implement this point of view, the authors consider blockchain. The authors believe that the blockchain is changing the banking industry and contributes to the increase in the volume of big data in the banking sector [18]. Based on this, the paper provides a broad overview of the impact of blockchain on banking, highlighting the opportunities and challenges from the perspective of bankers. The authors also discuss the impact of big data on banking data analytics, where an important point is the behavior of the mutual analysis of the dynamics of such data.

L. Laeven and F. Valencia in their study consider and systematize the database of banking crises [19]. The authors cite evidence that crises in high-income countries tend to last longer and are associated with higher output losses, lower fiscal costs, and greater use of bank guarantees and expansionary macroeconomic policies than crises in low- and middle income [19]. These data allow a better understanding of the functioning of various banking systems.

J. Bai, A. Krishnamurthy and C. H. Weymuller explore the issues of liquidity mismatch in the banking sector [20]. For these purposes, the authors build a liquidity mismatch index (LMI) to measure the mismatch between the market liquidity of assets and the liquidity of financing liabilities [20]. This index is calculated for 2882 bank holding companies for the period from 2002 to 2014. The basis for the generalization of such an index is the mutual dynamics of various indicators of banking activity. The author conducts an LMI stress test that reveals the fragility of the banking system in early 2007 [20]. The paper notes that the LMI index makes it possible to predict the probability of a bank's stock market crash and the government's decision on loans during the financial crisis [20]. This provides information both on the liquidity of an individual bank and on the liquidity risk of the entire banking system. This is an important indicator of the functioning of the banking system.

P. Giudici and A. Spelta explore the issues of mutual movement of international financial flows, where the main attention is paid to the flow of banking systems of different countries [21]. The importance of such consideration is determined by the need to understand the global financial system. At the same time, the totality of different countries is considered as a network where cross-border financial ties play a fundamental role in the spread of systemic risks [21]. For such an analysis, the authors generate the corresponding relationships in the form of multidimensional graphical models. Bayesian graphical models are also introduced, which take into account model uncertainty, and dynamic Bayesian graphical models, which provide a convenient basis for modeling temporal cross-border data [21]. At the same time, the key aspect in this type of modeling is the analysis and consideration of the mutual dynamics of various financial flows.

E. Koèenda, J. Hanousek and P. Ondko study the sectoral financial flows of the banking sector in a number of European countries [22]. The authors analyze the development of the financial system in such countries as Hungary, the Czech Republic, Poland and Slovakia. Classical methods of statistical analysis are used for the analysis. At the same time, the significance of individual channels of financial flows is assessed using intermediation coefficients [22]. The authors also note the role of banks in mobilizing savings from non-financial sectors. In this study, we also see the importance of analyzing the mutual dynamics of various financial flows.

C. de Moraes and H. de Mendonça consider a model of banking regulation based on the controlled movement of various financial flows [23]. At the same time, the authors discuss the most effective regulatory mechanisms in the financial system. For these purposes, a two-period model of financial flows was developed. At the same time, the authors adhere to the concept that financial instability does not mean a crisis, but is a deviation in the behavior of the total financial intermediation and in the financial operations of each of the banks from equilibrium [23]. The originality of the proposed model lies in the possibility of considering an effective financial stability policy based on advanced financial regulation [23]. The authors note that the approach is a counterpoint to financial regulation based on capital requirements [23]. However, for such research and modeling, it is also important to analyze the mutual dynamics of various financial flows.

C. V. Oliveira and B. M. Tabak conduct an international comparison of the functioning of the banking sectors of the economies of various countries [24]. For this, a non-parametric mathematical methodology for data coverage analysis (DEA) is used. This approach makes it possible to compare different countries that have different accounting rules and cannot be compared using standard models [24]. At the same time, the basis of the approach under consideration is also the mutual analysis of data.

U. Bindseil considers the advantages of central bank digital currencies (CBDC) available to the general public, their impact on the relevant financial flows [25]. The paper also discusses the benefits and risks of such a CBDC. The author also compares the implications of CBDC for a financial account with those for crypto assets, stablecoins, and narrow banking digital money [25]. All this allows you to expand the depth of understanding in the movement of various financial flows.

We see a variety of directions in the study of banking systems, a variety of methods that are used for this. At the same time, a characteristic feature of such an analysis is the study of the mutual dynamics of different data that characterize banking activities.

3. STOCK INDICES IN DISPLAYING THE DYNAMICS OF THE BANKING SECTORS

As noted earlier, the dynamics of the functioning of the banking system can be viewed through a certain generalized indicator. Such a generalized indicator can be a stock index designed to track the activities of leading banks whose shares are traded on the open market.

In this study, we consider the development of the banking sectors in key countries in Europe, Asia and America. Among these key countries we consider:

from Europe – Germany and Great Britain;

from Asia – China and India;

from America – USA.

Then, as generalized indicators of the development of the banking systems of individual countries, we consider:

USA – KBW Bank;

Germany – DAX Banks;

Great Britain – FTSE 350 Banks;

China – FTSE China A600 Banks;

India – Nifty Bank.

Below is the dynamics of such stock indices. All data are displayed on a weekly average for the period from 03.01.2021 to 04.12.2022 (data from the website <https://investing.com/>).

Fig. 1 shows the dynamics of the KBW Bank stock index, which in some way reflects the dynamics of the functioning and development of the USA banking sector.

We see that the dynamics of the KBW Bank stock index has a peak in the middle of the study period. At the same time, in the second half of the study period, there is a constant decline in the KBW Bank stock index. This is a reflection of the processes that are taking place in the banking sector of the US economy. At the same time, such processes are taking place against the backdrop of the COVID-19 pandemic and Russia's full-scale war against Ukraine.

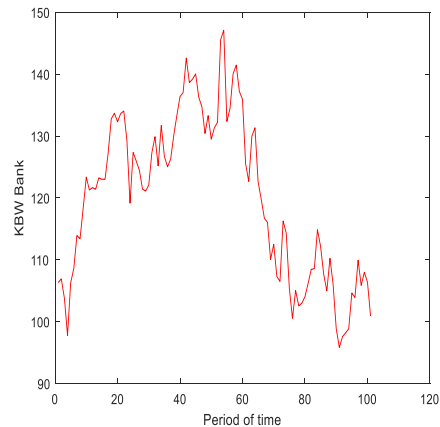


Figure 1: The performance of the KBW Bank stock index as a proxy for the USA banking sector

The dynamics of the KBW Bank stock index is characterized by the following statistical indicators: mean – 120.0823762; median – 121.67; standard deviation – 13.24971012; sample variance – 175.5548183; kurtosis – 1.146876737; skewness – -0.027064753.

Fig. 2 shows the dynamics of the DAX Banks stock index, which in some way reflects the dynamics of the functioning and development of the Germany banking sector.

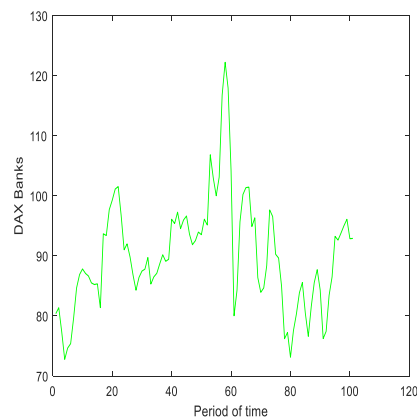


Figure 2: The performance of the DAX Banks stock index as a proxy for the Germany banking sector

The dynamics of the stock index DAX Banks also has a clearly defined maximum. At the same time, the decline dynamics of this index is more restrained than the dynamics for the KBW Bank stock index. Therefore, we can note the influence of various factors on the functioning and development of the US and German banking systems.

The dynamics of the DAX Banks stock index is characterized by the following statistical indicators: mean – 90.1080198; median – 89.44; standard deviation – 9.178019287; sample variance – 84.23603804; kurtosis – 1.445922283; skewness – 0.732616023.

Fig. 3 shows the dynamics of the FTSE 350 Banks stock index, which in some way reflects the dynamics of the functioning and development of the Great Britain banking sector.

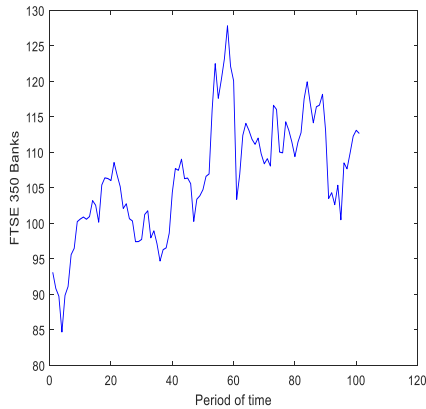


Figure 3: The performance of the FTSE 350 Banks stock index as a proxy for the Great Britain banking sector

Fig. 4 shows the dynamics of the FTSE China A600 Banks stock index, which in some way reflects the dynamics of the functioning and development of the China banking sector.

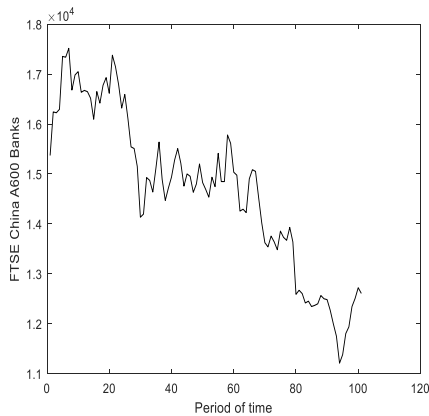


Figure 4: The performance of the FTSE China A600 Banks stock index as a proxy for the China banking sector

The dynamics of the stock index FTSE 350 Banks as a whole is increasing in the studied time interval. At the same time, we can note a clearly defined maximum. However, in the second half of the study period, we see a slight decline in the FTSE 350 Banks stock index.

The dynamics of the FTSE 350 Banks stock index is characterized by the following statistical indicators: mean – 106.6242574; median – 106.42; standard deviation – 8.240479154; sample variance – 67.90549669; kurtosis – -0.103598972; skewness – -0.017267251.

The dynamics of the FTSE China A600 Banks stock index has a downward trend over the entire studied interval.

However, this decline is rapid. Although you can also note some bursts of quotes. All this is a reflection of the processes in the banking sector of China, against the backdrop of new covid restrictions.

The dynamics of the FTSE China A600 Banks stock index is characterized by the following statistical indicators: mean – 14661.83208; median – 14848; standard deviation – 1611.50054; sample variance – 2596933.991; kurtosis – -0.828445645; skewness – -0.217781942.

Fig. 5 shows the dynamics of the Nifty Bank stock index, which in some way reflects the dynamics of the functioning and development of the India banking sector.

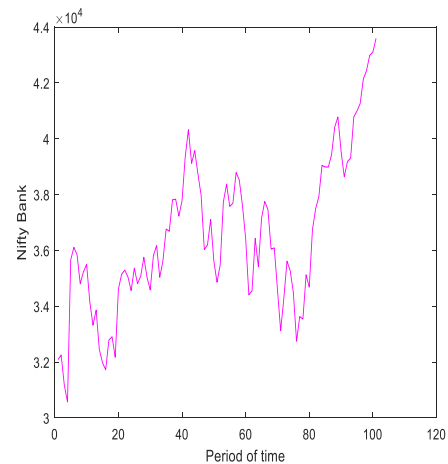


Figure 5: The performance of the Nifty Bank stock index as a proxy for the India banking sector

The dynamics of the Nifty Bank stock index as a whole is increasing over the entire studied interval. At the same time, it should also be noted the periods of time when the quotes of this index are declining. This speaks of its conditions for the functioning and development of the banking system of India.

The dynamics of the Nifty Bank stock index is characterized by the following statistical indicators: mean – 36491.97822; median – 36044.75; standard deviation – 2779.116556; sample variance – 7723488.833; kurtosis – -0.105114376; skewness – 0.374231023.

In general, it should be noted that the dynamics of the respective stock indices differ from each other. This indicates different conditions for the functioning and development of the respective banking sectors in different countries. Therefore, it is important to mutually analyze the dynamics of the respective stock indices.

4. WAVELET ANALYSIS AS A TOOL FOR STUDYING THE MUTUAL DYNAMICS OF THE DEVELOPMENT OF THE BANKING SECTORS OF INDIVIDUAL COUNTRIES IN EUROPE, ASIA AND AMERICA

To analyze the mutual dynamics of various stock indices, we use wavelet coherence estimates [26], [27], which are widely used to estimate the dynamics of economic data [28]-[34].

Fig. 6 shows an estimate of the wavelet coherence between the banking sector in Germany and Great Britain (according to the dynamics of their stock indices).

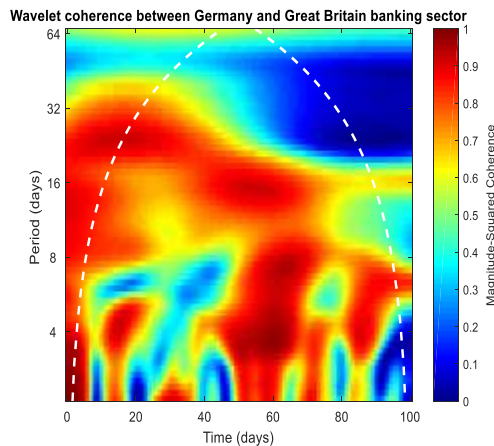


Figure 6: Estimation of wavelet coherence between the German and Great Britain banking sectors (according to the dynamics of their stock indices)

In general, we can talk about a high level of wavelet coherence assessment between the banking sector in Germany and Great Britain (in accordance with the dynamics of their stock indices). At the same time, the highest level of such consistency occurs in the middle of the time period that is being studied. The fact of such consistency is understandable, since the respective banking systems operate predominantly in the same financial space. It also follows that there is a close relationship between such financial institutions, which until a certain time were also connected by the same legal acts.

Fig. 7 shows an estimate of the wavelet coherence between the banking sector in China and India (according to the dynamics of their stock indices).

We see a low estimate of wavelet consistency between China and India's banking sector (in line with the performance of their stock indices). Some fragmentary bursts of consistency can only be observed in the first half of the time period under study. Therefore, we can say that the functioning of the banking sectors of China and India is influenced by different factors. One such factor is the different response environments to the COVID-19 pandemic.

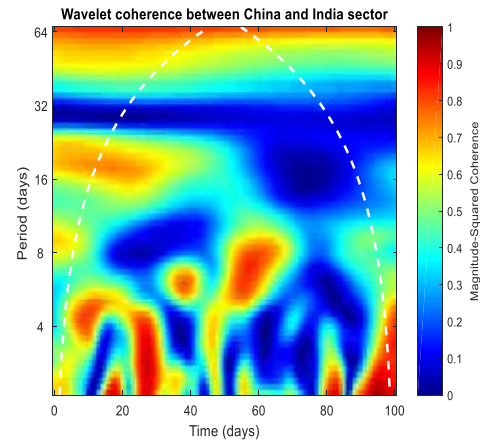


Figure 7: Estimation of wavelet coherence between the China and India banking sectors (according to the dynamics of their stock indices)

Fig. 8 shows an estimate of the wavelet coherence between the banking sector in USA and Great Britain (according to the dynamics of their stock indices).

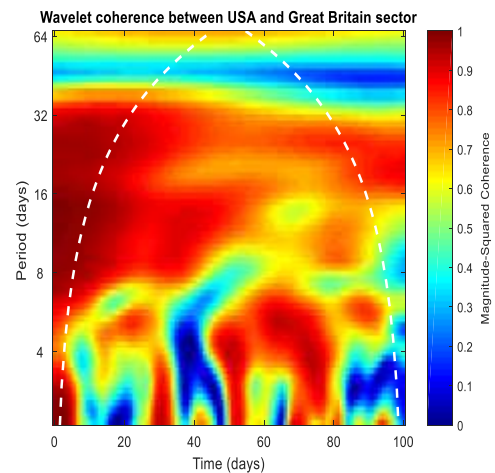


Figure 8: Estimation of wavelet coherence between the USA and Great Britain banking sectors (according to the dynamics of their stock indices)

We note generally significant estimates of wavelet coherence between the banking sector of the USA and Great Britain (according to the dynamics of their stock indices). At the same time, the greatest consistency of such estimates falls on the beginning of the second period of time, which we are studying. This consistency is due to the close relationship between the USA and Great Britain.

Fig. 9 shows an estimate of the wavelet coherence between the banking sector in USA and China (according to the dynamics of their stock indices).

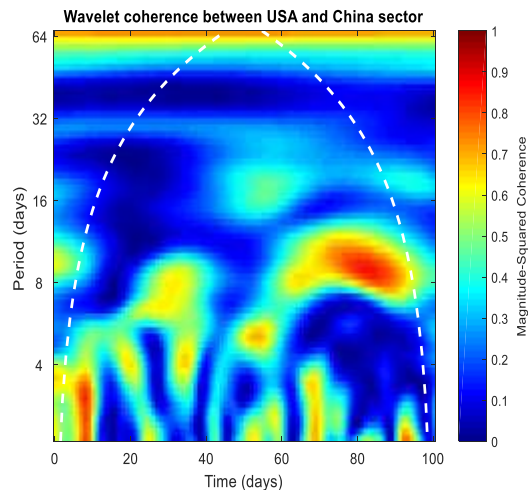


Figure 9: Estimation of wavelet coherence between the USA and China banking sectors (according to the dynamics of their stock indices)

Fig. 10 shows an estimate of the wavelet coherence between the banking sector in Germany and India (according to the dynamics of their stock indices).

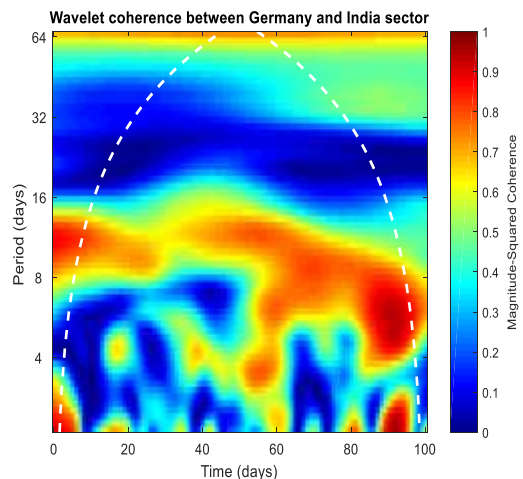


Figure 10: Estimation of wavelet coherence between the Germany and India banking sectors (according to the dynamics of their stock indices)

We note the low estimate of the wavelet coherence between the US and China banking sector (in line with the dynamics of their stock indices). This is due to different conditions for the functioning of the respective banking systems, factors influencing the banking systems of the USA and China. It should also be noted that there is a certain confrontation between the USA and China.

We also note a more significant consistency between Germany and India banking sector (in line with the dynamics

of their stock indices), which is manifested at the depth of the studied horizon. This fact may be useful in developing a cooperation strategy between Germany and India.

5. CONCLUSION

The paper considers various aspects of the analysis of the dynamics of the banking sectors of the economies of a number of countries. We conducted an analysis of related work and found out the importance and necessity of studying the mutual dynamics of the development of banking sectors. For these purposes, we consider the dynamics of the development of the banking sectors of Germany, Great Britain, China, India and the USA. For analysis, we use the dynamics of the relevant stock indices.

We have considered the statistical characteristics of the dynamics of the respective stock indices for the banking sectors Germany, Great Britain, China, India and the USA. We also provide estimates of wavelet coherence for a number of banking sectors of the economies of the countries that we study. This makes it possible to assess the mutual dynamics of the development of the banking sectors of the economies of a number of countries, to give appropriate recommendations on their interaction and cooperation.

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