

# Dynamics of Development of the USA, Canada and UK Financial Markets in the Display of Stock Indices of their Banking Institutions

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**Abstract:** *The stock market and the banking segment of the economy are key elements of the financial system. These key elements of the financial system are aimed at the effective functioning of both individual business entities and the country as a whole. Therefore, an important task of the study is to analyze the dynamics of development of both the stock market and the banking segment of the economy. At the same time, one of the points for achieving such efficiency is the coordinated interaction between the stock market and the banking segment of the overall financial system. Ultimately, such interaction contributes to the sustainable development of the economy and the country as a whole. Sustainable interaction between the stock market and the banking segment of the economy is achieved using various tools. Then, in order to analyze the interaction between the stock market and the banking sector of the economy, a study should be carried out for the relevant tools for analyzing such segments of the financial market. At the same time, the effectiveness of such interaction can be assessed on the basis of an analysis of the dynamics of the relevant stock indices. Among such stock indexes, we have chosen indices of banking institutions, which reflect the activities of banks in each individual country. Such indices reflect the development of the respective business entities, as they take into account the value of such companies. These stock indices make it possible to consider the dynamics of the functioning of the banking sector of the economy in conjunction with the development of the relevant stock markets. Among such countries, we consider USA, Canada and UK. To carry out the corresponding analysis, we use the ideology of wavelets. As an analysis tool, we chose the wavelet coherence method. This choice of instruments for our study allows for a comparative analysis of the data. This makes it possible to assess the dynamics of development of the relevant business entities, to give a mutual assessment of such development. The work presents many graphs and diagrams. This allows you to understand the logic of the study and better interpret the results.*

**Keywords**—stock market; banking sector of the economy; financial market; stock index; banking institutions; wavelet analysis; wavelet coherence; dynamics

## 1. INTRODUCTION

Banks play an important role in the functioning and development of the economy. Banks are able to accumulate financial resources and redistribute these resources between different sectors of the economy, business entities [1]-[5]. At the same time, banks are able to attract funds from the population, save these funds, invest these funds in the development of the economy [6]-[8]. Thus, the attracted funds can be increased and given the opportunity to earn those who invested such funds. In this regard, we should talk about the investment component of the work of banking institutions.

The work of banks is coordinated by the central bank of the country, which, together with other banks, forms an integral banking system [9]-[12]. Such a system obeys certain laws of work and is able to function in various conditions. At the same time, the banking system is part of the country's financial system, where the movement of financial resources is ensured. Therefore, an important point is to consider the relationship between different segments of the financial market. At the

same time, banks closely interact with various components of the country's financial system, where the stock market should also be singled out [13]-[15]

Thus, banks are institutions that provide the movement of financial resources necessary for the functioning of various business entities, the development of the economy as a whole. For such purposes, various banking tools are used. There are also tools that can take into account and reflect the development of banking activities. Among such instruments, stock indices should be singled out [16], [17]. These indices reflect the dynamics of the development of banking institutions in the context of a single country. Analysis of the values of such indices helps to understand the dynamics of the development of banking institutions for each country. At the same time, a comparative analysis of the relevant stock indices helps to compare the dynamics of the development of banking institutions between different countries. Based on this, the presented topic of this study is relevant and practically significant.

## 2. RELATED WORK

The activities of banks and the functioning of the stock market are constantly in the focus of the researcher. This confirms the importance of choosing the topic of this study and its practical significance for the functioning and development of the economy.

The study by O. Zharikova and K. Cherkesenko provides a detailed analysis of the activities of Ukrainian banks, ways to optimize the financial condition of banks in the context of the development of the banking system of Ukraine [18]. At the same time, special attention is paid to the interaction of banks and the insurance market, as one of the segments of the Ukrainian financial market. The authors consider the general financial and economic characteristics of Ukrainian banks. This is done based on the analysis of various regulatory indicators. The paper also presents theoretical and practical information on the process of merging the capital of banks and insurance companies, which affects the development of the financial market [18].

The work [19] considers the issues of the functioning of Malaysian banks. At the same time, special attention is paid to the development of bank lending. The authors consider various factors, among which they highlight those that negatively affect bank lending. At the same time, the authors note ways to overcome such negative factors for the development of bank lending. In this aspect, the authors draw attention to liquidity, which may hinder the development of bank lending.

In the study by B. A. Abugri and T. T. Osah, consider key issues of regulation and supervision in the field of banking [20]. In particular, the authors consider the impact of banking regulation on the capital buffer and the risk of bank insolvency, which is important for the sustainable functioning of the financial market as a whole. The role of regulators is also discussed in terms of achieving efficient operation of banks, reducing the risk of their behavior. Therefore, the authors study the influence of the regulator on the reserve capital and the risk of bank insolvency [20]. The authors also point out that the policy of restricting banking activities is not always effective for banks that are actively involved in risky activities [20]. Thus, in this aspect, it is necessary to have a balance in the development of various segments of the financial market. Therefore, the analysis of the dynamics of stock indices can be useful for making appropriate management decisions.

The paper [21] considers the development of financial markets. Key attention is paid to the development trends of financial and credit organizations. Among the factors of such development is the transition to a digital economy. The authors also touch upon such issues as: capital flows, advantages of direct investments over portfolio ones; activities and functions of transnational banks, the relationship between individual segments of the financial market. Thus, we see that this study also draws attention to the need to assess the mutual development of various segments of the financial market.

S. Salameh and A. Ahmad study in detail the development of the stock market on the example of India [22]. The authors note that the stock market is important in the financial sector of the economy. Therefore, the paper pays special attention to the relationship between the stock market and other segments of the financial sector of the economy. The paper also analyzes the relationship between the stock market and economic growth. Based on this, the authors considered various factors that play a positive role in the development of the stock market [22].

The study [23] deals directly with the issues of interaction between banks and the stock market. At the same time, such interaction is considered from the point of view of the effectiveness of innovations and the impact on the development of the country as a whole. The authors come to the conclusion that the development of the stock market plays a key role in the development of the financial market and the country's economy. Therefore, the analysis of the interaction between the stock market and the banking sector of the economy plays an important practical role in determining the direction of innovation development.

El. Zarutka in his article considers various issues of the functioning of the banking system of Ukraine [24]. At the same time, special attention is paid to the issues of structural and functional analysis, which also touches upon the issue of interaction between banks and other segments of the Ukrainian financial market. For such an analysis, the author uses the apparatus of Kohonen's self-organizing maps [24]. The application of this approach makes it possible to identify the main problematic aspects of the activities of banks that affected the deterioration of the financial stability of the system and individual banks [24].

F. Kiesel, F. Manz and D. Schiereck consider the relationship between the stock market and the banking segment of the economy through the prism of the reaction to the sale of distressed banking assets [25]. The authors analyze the reaction of the stock market to announcements of banks selling non-performing loans (NPL) depending on whether credit default swaps (CDS) on the debt of the provider bank are traded or not [25]. The article also discusses the issues of the influence of regulatory bodies on such issues of interaction between the stock market and banks.

In [26], various estimates of the effectiveness of regulation in financial markets are considered. To do this, the authors analyze various models of functioning and regulation of banks, their interaction with other institutions of the financial market.

If we talk about the methods and approaches that are used to analyze the interaction between the stock market and the banking sector of the economy, we should point out their great diversity. These are methods of simple descriptive statistics, regression analysis, correlation analysis, fuzzy number theory approaches, artificial intelligence theories, neural networks, special analysis methods that are used in other topics and areas of research [27]-[33]. At the same time, among such a variety

of research methods for analyzing the relationship between the stock market and banks, one should dwell on the ideology of wavelets.

### 3. IDEOLOGY OF WAVELETS AS AN ANALYSIS TOOL

The choice of wavelet ideology for carrying out the corresponding analysis is based on the fact that such an ideology is focused on working with data that is presented as a time series. At the same time, among the wavelet ideology methods, there are those that allow for a comparative analysis of data between different data, which are presented in the form of time series. This is the wavelet coherence method, which allows not only to compare the development of the dynamics of different time series, but also to identify the features of such mutual dynamics [34]-[38].

So if we have two series of data ( $f(t)$  and  $g(t)$ ), 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 [39]-[42]:

$$Q^2(a,b) = \frac{|\Lambda(a^{-1}W_{f(t)g(t)}(a,b))|^2}{\Lambda(a^{-1}|W_{f(t)}(a,b)|^2)\Lambda(a^{-1}|W_{g(t)}(a,b)|^2)}$$

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,

$f(t), g(t)$  – series of data that we study,

$\Lambda$  – smoothing operator,

$Q^2(a,b)$  – square of the wavelet coherence coefficient.

$0 \leq Q^2(a,b) \leq 1$ . If these values tend to zero, then we have a weak correlation. Otherwise we have a strong correlation [43]-[46].

Analyzing the information presented above, it should be noted that the wavelet coherence method allows not only to analyze the mutual dynamics of the corresponding data series, but also to visualize such an analysis. This helps to better understand the processes that are taking place and make the necessary decisions.

### 4. DATA FOR ANALYSIS

To conduct an appropriate analysis, consider several stock indices USA, Canada and UK. All data is taken from the site <https://investing.com> and reflects the dynamics of such indices in the period from 04.01.21 to 31.12.21. Among such stock indices we consider:

Dow Jones Banks (DJUSBK) – an index that is designed to measure the performance of US companies in the banking sector;

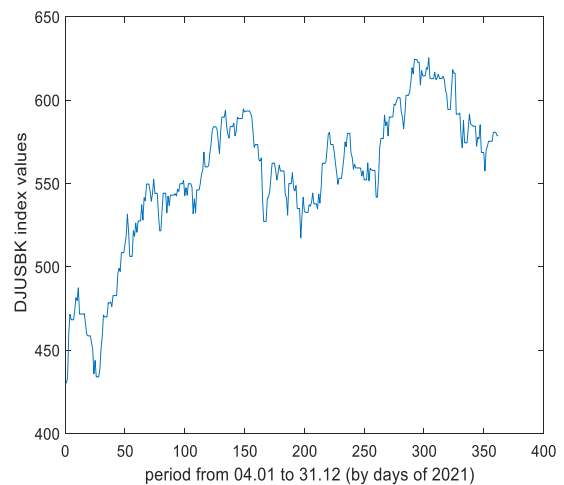
S&P/TSX EqWgt Diversified Banks (GSPTXDE) – an index that is designed to measure the performance of Canadian companies in the banking sector;

S&P/TSX Canadian Financials (SPTTFS) – an index that is designed to measure the performance of Canadian companies in the financial sector, taking into account the banking sector of the economy;

FTSE 350 Banks (FTNMX301010) – an index that is designed to measure the performance of UK companies in the banking sector based on buy/sell signals based on moving averages;

FTSE All Share Banks (FTASX301010) is an extended index that measures the performance of UK companies in the banking sector.

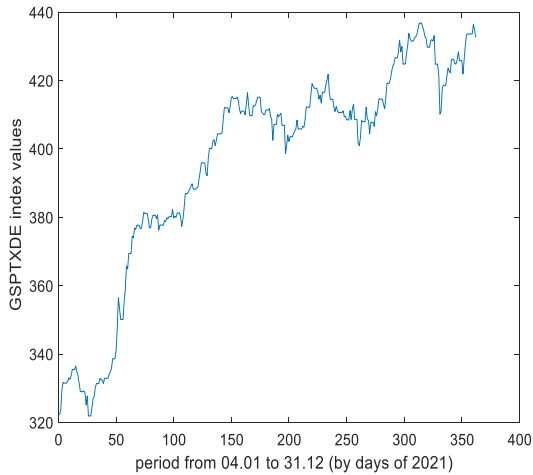
On fig. 1 shows the dynamics of the stock index DJUSBK.



**Figure 1:** Dynamics of the stock index DJUSBK

We can observe changeable dynamics in the time interval that we are examining. At the same time, in general, such dynamics is positive.

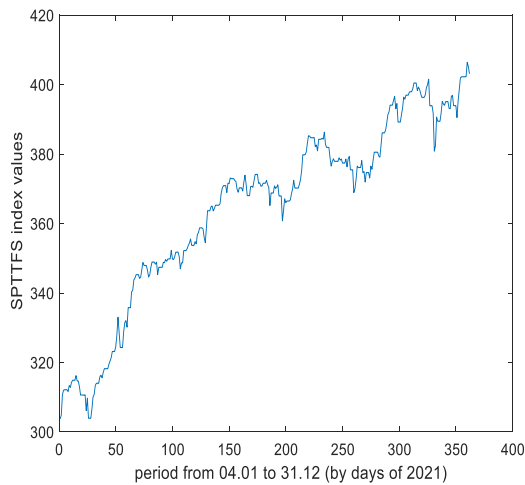
On fig. 2 shows the dynamics of the stock index GSPTXDE.



**Figure 2:** Dynamics of the stock index GSPTXDE

The dynamics of the GSPTXDE stock index is also generally positive. At the same time, its inherent variability should be noted. In this aspect, the dynamics of the stock index DJUSBK and GSPTXDE are comparable, although they differ significantly.

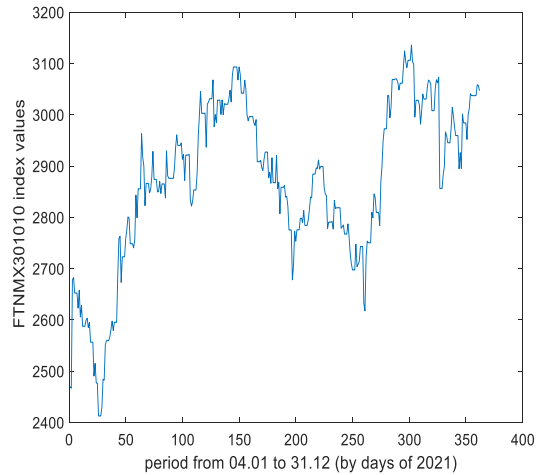
On fig. 3 shows the dynamics of the stock index SPTTFS.



**Figure 3:** Dynamics of the stock index SPTTFS

The dynamics of the SPTTFS stock index is similar to the dynamics of the GSPTXDE stock index. This is explained by the fact that both stock indexes reflect the performance of Canadian companies in the banking sector of the economy.

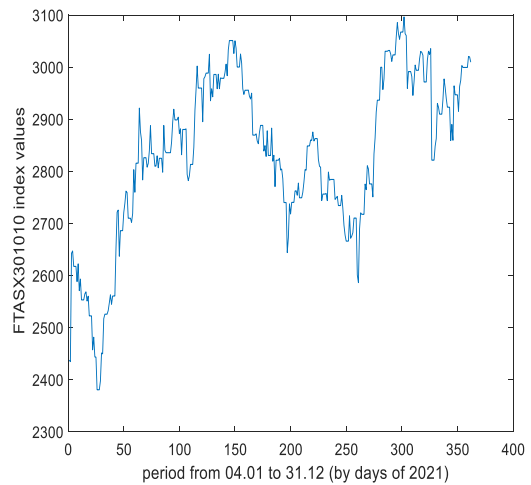
On fig. 4 shows the dynamics of the stock index FTNMX301010.



**Figure 4:** Dynamics of the stock index FTNMX301010

The dynamics of the stock index FTNMX301010 differs from the data presented above. In general, the dynamics of the FTNMX301010 stock index is positive, although the growth of such dynamics is slower.

On fig. 5 shows the dynamics of the stock index FTASX301010.



**Figure 5:** Dynamics of the stock index FTASX301010

The dynamics of the stock index FTASX301010 is similar to the dynamics of the stock index FTNMX301010. This is due to the fact that both stock indices reflect the performance of UK companies in the banking sector of the economy.

Thus, the use of the wavelet coherence method will make it possible to conduct a more detailed analysis and find out the degree of identity of individual time series for the stock indices that we are studying.

5. RESULTS AND DISCUSSION

First of all, consider the relationship between stock indices, which reflect the performance of Canadian companies in their banking sector and UK companies in their banking sector.

On fig. 6 presents an estimate of the wavelet coherence between the data values for the GSPTXDE and SPTTFS stock indices, which reflect the performance of Canadian companies in their banking sector of the economy.

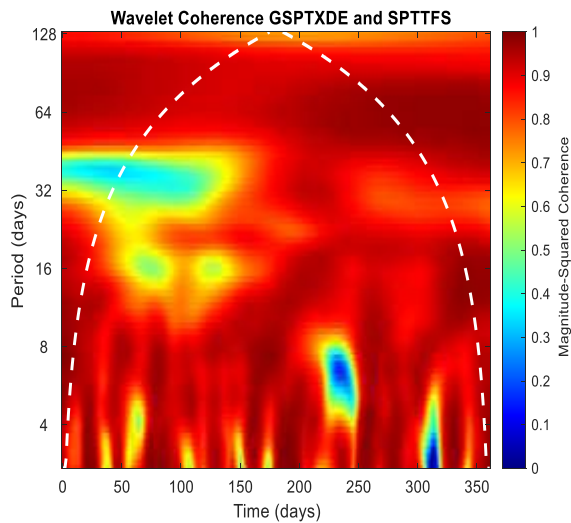


Figure 6: Evaluation of wavelet coherence between data values for stock indices GSPTXDE and SPTTFS

We see that the dynamics of the data values for the GSPTXDE and SPTTFS stock indices is consistent on almost the entire interval that we are exploring. At the same time, such consistency is high and reliable. At the same time, it is impossible to talk about the identity of the time series of the corresponding fund series, as it could be observed from the data in fig. 2 and fig. 3.

On fig. 7 shows an estimate of the wavelet coherence between the data values for the stock indices FTNMX301010 and FTASX301010, which reflect the performance of UK companies in their banking sector of the economy.

We can observe complete consistency between the data values for the stock indices FTNMX301010 and FTASX301010. Therefore, we can talk about the identity of the data dynamics for fig. 4 and fig. 5, although such data differ in absolute values.

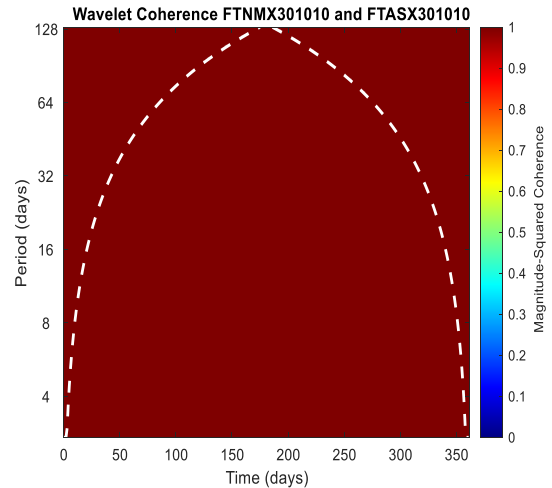


Figure 7: Evaluation of wavelet coherence between data values for stock indices FTNMX301010 and FTASX301010

Thus, the wavelet coherence method allows one to consider in more detail the identity of the corresponding time series of data, which increases the information content of the analysis that is being carried out.

Next, consider the mutual dynamics of stock indices, which reflect the effectiveness of the banking sector of the economy from the point of view of different countries.

On fig. 8 shows an estimate of the wavelet coherence between the data values for the DJUSBK and GSPTXDE stock indices, which reflect the performance of American companies and Canadian companies in their banking sectors of the economy.

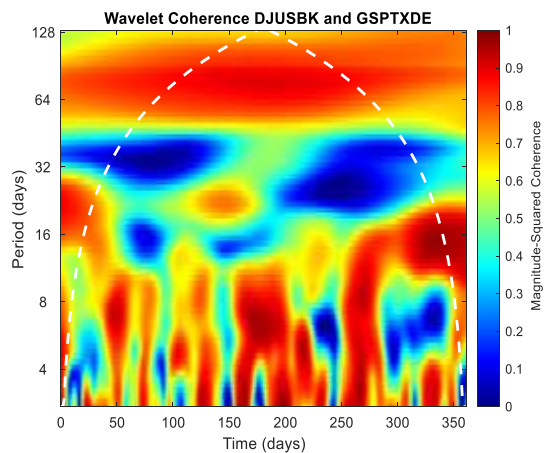
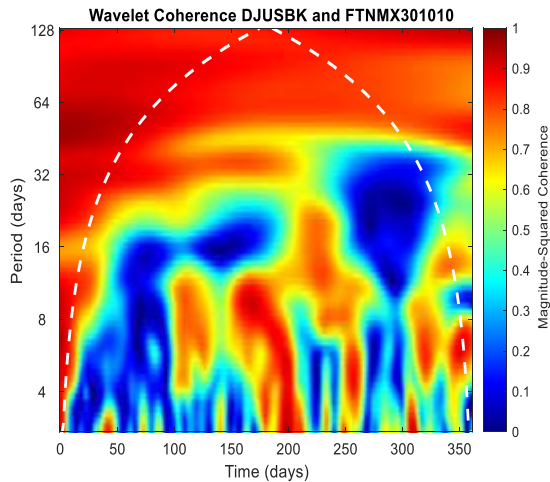


Figure 8: Evaluation of wavelet coherence between data values for stock indices DJUSBK and GSPTXDE

We can observe moderate consistency between the data values for the DJUSBK and GSPTXDE stock indexes. But it should be noted that such consistency is typical for shorter time periods.

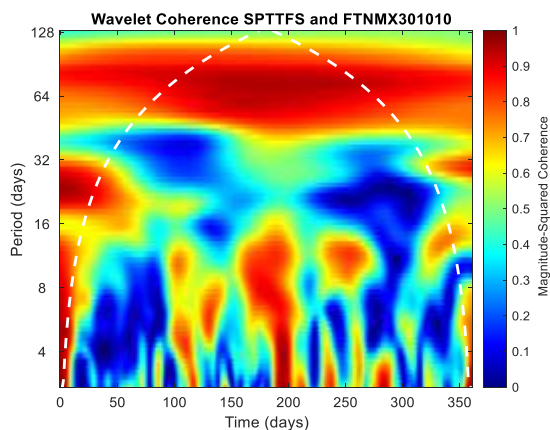
On fig. 9 shows an estimate of the wavelet coherence between the data values for the DJUSBK and FTNMX301010 stock indices, which reflect the performance of US companies and UK companies in their banking sectors of the economy.



**Figure 9:** Evaluation of wavelet coherence between data values for stock indices DJUSBK and FTNMX301010

We see that the consistency between DJUSBK and FTNMX301010 is more moderate than the consistency between DJUSBK and GSPTXDE.

On fig. 10 presents an estimate of the wavelet coherence between the data values for the stock indices SPTTFS and FTNMX301010, which reflect the performance of Canadian and UK companies in their banking sectors of the economy.



**Figure 10:** Evaluation of wavelet coherence between data values for stock indices SPTTFS FTNMX301010

The agreement between the data values for the stock indices SPTTFS and FTNMX301010 (see fig. 10) is even more modest than the agreement shown in fig. 8 and fig. 9.

Note that wavelet coherence data can be used to analyze and make decisions in the field of activities in the stock market and in the field of banking activities when entering the markets of the respective countries.

## 6. CONCLUSION

The article analyzes the mutual dynamics of the development of stock markets in a number of developed countries. Among such countries, we considered the USA, Canada and the UK. The corresponding study was conducted on the basis of an analysis of the dynamics of stock indices, which reflect the effectiveness of the functioning of banking institutions in such countries.

For analysis, we use the ideology of wavelets. In particular, we consider the wavelet coherence method. The use of this method allows us to analyze in detail the mutual dynamics of the data that we study and which are presented as the values of the corresponding stock indices.

The paper also provides a brief analysis of related studies where similar issues are considered. The paper contains graphs and diagrams that allow you to understand the research process and the results obtained. The results of this study can be useful in making decisions about entering the stock market or interacting with the banking sector of the economy from the point of view of a particular country.

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