

Financial Flows Management Based on the Analysis of Their Interaction

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Abstract: *Economic dynamics is one of the central aspects of analysis in various studies. This is due both to the analysis of the functioning of individual business entities, and the development of the economy as a whole. No less important is the analysis of effective management, which, ultimately, determines the level of functioning and development of various business entities. The activity of any business entity has an impact on the sustainable development of both individual industries or areas of the economy, and other business entities. Therefore, various management issues are constantly in the spotlight. Among such issues, special attention is paid to the movement of financial flows. Financial flows reflect different areas of activity of a business entity, the corresponding movement of its tangible and intangible resources, changes in the dynamics of the volume of financial resources. Then we can talk about a variety of financial flow that reflects different aspects of the activity of a business entity. Moreover, each financial flow is a time series that allows you to conduct research for different time intervals. Consequently, the management of a business entity can be viewed through the management of the relevant financial flows. It is important to know the interaction of such flows, their relationship in time. For this analysis, we use the wavelet methodology. One of the methods for analyzing the relationship between various financial flows can be wavelet coherence. This approach makes it possible to evaluate the mutual dynamics of financial flows. At the same time, such an analysis can be done for different time horizons from the time interval that is being studied. As a result, we conclude about the effectiveness of the corresponding level of management. This allows you to make the necessary adjustments and improve the overall management system of a business entity. Using specific examples, we consider wavelet coherence estimates that reflect the mutual movement of various financial flows. Such an analysis is carried out for different time horizons. This allows you to specify the result of management, its effectiveness. The paper presents various drawings, graphs and diagrams that help to understand the logic of the study.*

Keywords—management; interaction; business entity; wavelet analysis; wavelet coherence; time series; input financial flow; output cash flow

1. INTRODUCTION

The sustainable economic development of the country as a whole, individual regions or sectors of the economy is largely determined by the effective functioning of various business entities. The basis of such functioning is effective management under the influence of various external and internal factors. This allows you to evaluate the results and determine further ways of functioning, development of a business entity. This task is important and relevant in the context of constant external challenges that any business entity faces.

Thus, the analysis and effective management of various business entities is one of the main tasks of management [1]-[4]. Such management makes it possible to achieve the necessary functioning of business entities and determine the main tasks of their development. Therefore, any problematic aspects that consider various issues of appropriate management are relevant. At the same time, various methods and approaches that are used in other areas of research can be used to ensure such management [5]-[11]. The choice of specific methods and approaches for analysis is determined by the problems of the research task.

One of the areas of management of various business entities is the analysis of financial flows [2], [3], [12], [13]. The concept of a financial flow reflects the movement of financial resources, which can be considered as a logistical system of financial and economic relations in the process of functioning of a business entity [14]-[16].

At the same time, both input financial flows and output financial flows are considered [2], [3]. Such a movement of financial flows is associated with the movement of various commodity and material and intangible assets, working capital, assets of a business entity in the process of its functioning and interaction with other subjects of market relations. Then, we can talk about the effectiveness of managing financial flows in terms of the effectiveness of managing a business entity.

Therefore, an important area of research in management theory is the management of financial flows. For such an analysis, it is important to know not only the dynamics of individual financial flows, but also the mutual dynamics of such flows. This allows us to understand the main trends in the movement of financial flows, the relationship of such flows and the direction of possible changes in the dynamics of these flows. Discussion of these issues and the individual details related to them is the basis of this study.

2. BRIEF OVERVIEW OF RELATED WORKS ON THE RESEARCH TOPIC

As noted earlier, sustainable development is largely determined by the quality of management. At the same time, one of the directions of this is the management of the corresponding financial flows.

J. G. Jurakulovna and R. R. Iskandarovich in their work consider various issues of economic analysis in the management of the modern economy [17]. At the same time, the authors pay special attention to the disclosure of the theoretical and methodological foundations of economic analysis, where special attention is paid to management.

In [18], management issues for an agricultural enterprise are considered. At the same time, special attention is paid to the management of the financial flows of such an enterprise. The authors note that effective management is largely determined by the development of accounting and improving the management of financial flows [18]. The authors also emphasize that the management of financial flows is carried out both for the internal environment of an agricultural enterprise and for the external environment [18]. This, in turn, suggests the need to analyze the relationship between such flows.

A. Maszewska analyzes in detail the movement of financial flows of insurance companies [19]. The author considers the formation of such financial flows, their change over time. Therefore, special attention is also paid to the characteristics of such flows. The author also examines the impact of financial flows on the sustainable functioning of an insurance company. This suggests that the author also considers the relationship between the financial flows of the insurance company.

The work [20] considers the issues of the movement of financial flows in the enterprise. At the same time, the issues of optimizing the movement of such flows are analyzed. Such an analysis is carried out on the basis of a logistic approach. The basis for such an analysis is the rationale for the use of logistics tools for the development and formation of competitive behavior. The authors use various methods and approaches of statistical analysis. This suggests that the authors consider the relationship between different financial flows.

E. Koèenda, J. Hanousek and P. Ondko analyze the movement of financial flows in the banking sector [21]. The authors analyze the development of the financial system in the countries of the so-called Visegrad Four (Hungary, Czech Republic, Poland and Slovakia) in the period 1993–2005 [21]. The authors analyze financial flows between the commercial banking sector and other sectors of the economy. This allows us to conclude that the development of the banking sector is sustainable.

M. Bussière, J. Schmidt and N. Valla explore the movement of international financial flows [22]. The authors also consider the main patterns of movement of such financial

flows. Addressing such issues should help build resilience and ensure true cross-border risk sharing. Here we also see the need for a mutual analysis of the movement of various financial flows.

F. Belo, X. Lin and F. Yang explore the relationship between equity financing, financial flows and asset prices [23]. The authors consider a dynamic analysis model with time-varying external equity financing costs. At the same time, special attention is paid to the analysis of the mutual influence of the movement of various financial flows. For this, classical statistical methods and approaches were used.

F. M. Kapingura explores the relationship between such financial flows as foreign capital flows, domestic investment and savings [24]. For such an analysis, the author uses a group cointegration test and a dynamic least squares (DOLS) method. This study confirms the need for a mutual analysis of various financial flows.

The study [25] examined the relationship between exchange rate volatility and financial flows, which are interconnected with trade flows. For this analysis, the GARCH model was used. To discover long-term relationships between variables, the ARDL boundary testing approach was applied. In addition, the Granger causality test was applied to determine the direction of causality [25].

S. Chakuu, D. Masi and J. Godsell in their study presented a systematic review of the literature, which examined the issues of the movement of financial flows in the financing of the supply chain [26]. The authors consider various classical tools for analyzing financial flows, factors affecting their formation and change over time.

The paper [27] considers the issues of optimizing financial flows from the point of view of stock analysis. At the same time, the authors note that the management of financial flows is a key aspect in the activities of an economic entity. The article discusses the methodological tools necessary for managing the financial flows of agricultural enterprises and based on available methods for analyzing and optimizing stocks [27]. For this, economic and statistical methods were used in the work: comparison, grouping, methods of system and functional analysis, analytical modeling, logical modeling [27].

Based on the above, we can note that one of the directions in the management of financial flows is the mutual analysis of various financial flows. At the same time, various statistical methods and approaches are used for such an analysis.

3. FINANCIAL FLOWS AS THE MAIN ELEMENT IN THE MANAGEMENT OF A BUSINESS ENTITY

First of all, it should be noted that financial flows are one of the key elements in the management of a business entity. The main relationships in such management are shown in Fig. 1. This allows you to highlight financial flows as an object of appropriate management and focus on the dynamics of various financial flows.

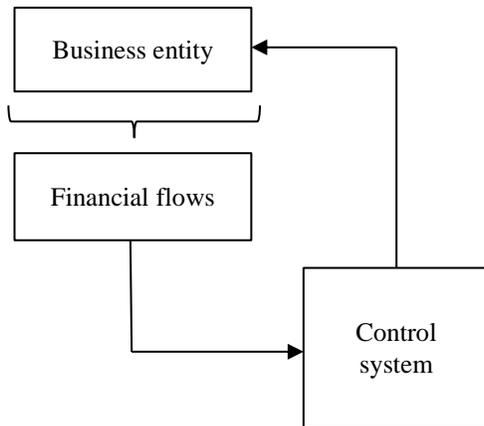


Figure 1: Financial flows in the management system of a business entity

At the same time, mutual analysis of various financial flows is important. For such an analysis, it is proposed to use the wavelet analysis methodology. This is based on the fact that the wavelet analysis methodology is effectively used in various studies where there are economic data [28]-[31]. At the same time, among the various tools of wavelet analysis, wavelet coherence estimates are most often used [32]-[37]. The use of wavelet coherence in the financial flow management structure is shown in Fig. 2.

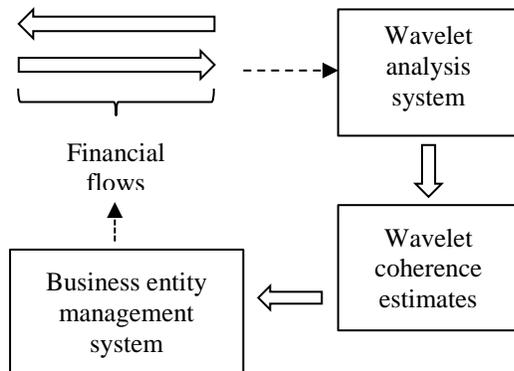


Figure 2: Wavelet coherence in a business entity management system

It should be noted that wavelet coherence helps to understand the relationship between different financial flows. At the same time, such a relationship is considered for different time intervals from the time period that we are studying. We can also determine the periods of greatest and least influence between the financial flows that we are examining. This helps to better understand the effectiveness of the respective management.

To implement the wavelet coherence method, the following expression is used [38], [39]:

$$R^2(a, b) = \frac{|\Theta(a^{-1}V_{g(t)z(t)}(a, b))|^2}{\Theta(a^{-1}|V_{g(t)}(a, b)|^2)\Theta(a^{-1}|V_{z(t)}(a, b)|^2)},$$

where:

$V(a, b)$ – is a values of cross wavelet spectra;

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

$g(t), z(t)$ – is a data series that we explore;

Θ – is a smoothing operator;

$R^2(a, b)$ – is a squared wavelet coherency coefficient.

$0 \leq R^2(a, b) \leq 1$. If these values tend to zero, then we have a weak correlation. Otherwise, we have a strong correlation.

4. SOME EXAMPLES OF ANALYSIS OF VARIOUS FINANCIAL FLOWS

In this section, we consider some examples of the analysis of financial flows based on wavelet coherence estimates. At the same time, attention will be paid to the effectiveness of the relevant management. We will consider banks and their activities as separate business entities.

For banking is a characteristic consistency of various financial flows. This is due to the nature of such activity.

At the same time, it should be borne in mind that banks, first of all, attract resources, which are then given to other business entities. Thus, a characteristic feature of the activities of banks is a certain correspondence between the attracted resources and the loans provided. Then we can talk about the effectiveness of the corresponding management.

On Fig. 3 shows the dynamics of attracted resources (for some bank A). On Fig. 4 shows the dynamics of loans issued for bank A.

First of all, it should be noted that the dynamics of attracted funds and the dynamics of loans issued by bank A have the same trends. This is also confirmed by the value of the correlation coefficient for the time series data. The value of the correlation coefficient is 0.902. Thus, in general, we can talk about the effectiveness of the relevant management.

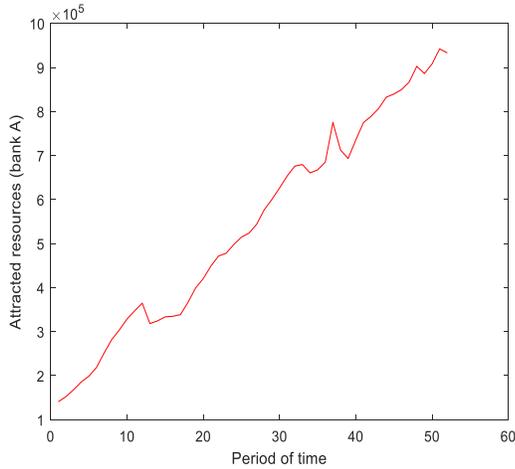


Figure 3: Bank A deposits

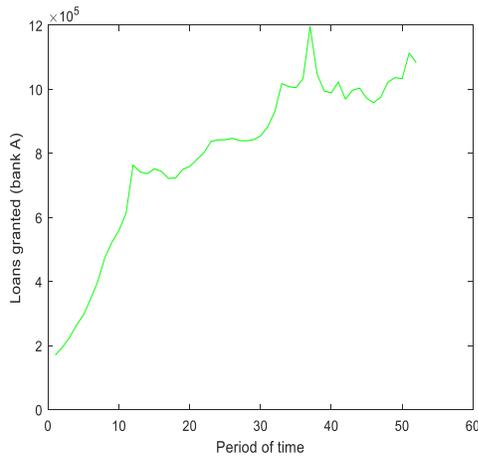


Figure 4: Loans from bank A

At the same time, from the data in Fig. 3 and Fig. 4 it is difficult to judge the effectiveness of management in certain periods of time. At the same time, we can see that in certain periods of time, the consistency between the dynamics of attracted funds and loans issued is not identical. Therefore, for a deeper analysis, it is advisable to use wavelet coherence estimates.

On Fig. 5 shows estimates of the wavelet coherence between the volume of attracted resources and loans issued for bank A.

We see that, in general, the consistency between the volume of attracted resources and loans issued by bank A is significant. However, such consistency is observed at the beginning and at the end of time intervals when we examine the corresponding wavelet coherence. In the middle of the time period under study, we see that the corresponding wavelet coherence is negligible.

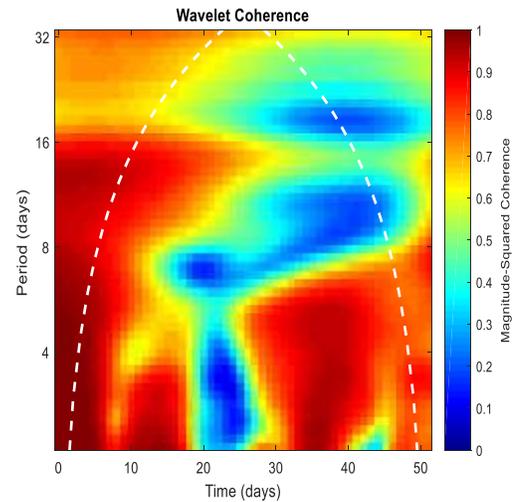


Figure 5: Estimates of wavelet coherence between the volume of attracted resources and loans issued by bank A

Therefore, the effectiveness of the management of the relevant financial flows for bank A is not constant and changes over time, when we study it.

On Fig. 6 shows the dynamics of attracted resources (for some bank B). On Fig. 7 shows the dynamics of loans issued for bank B.

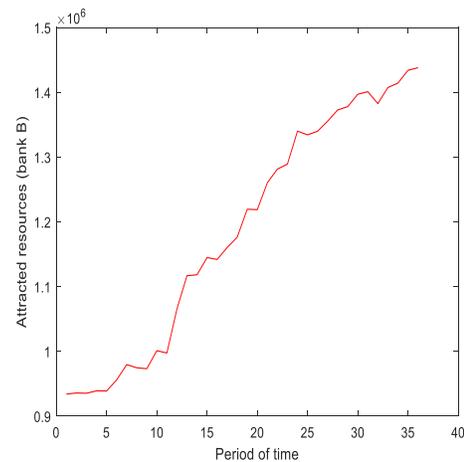


Figure 6: Bank B deposits

We see that the dynamics of attracted resources and the dynamics of loans issued for bank B are not the same and are not identical. Moreover, we can observe different trends at some time intervals for these financial flows of bank B. At the same time, the correlation coefficient between the data for the corresponding financial flows is 0.663. Therefore, it is important to conduct additional analysis to assess the effectiveness of the relevant management.

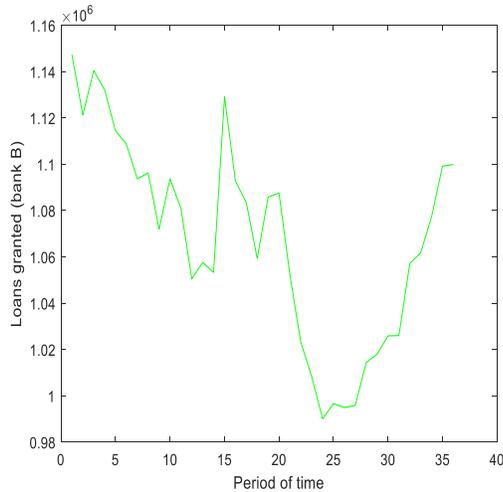


Figure 7: Loans from bank B

On Fig. 8 shows estimates of the wavelet coherence between the volume of attracted resources and loans issued by bank B.

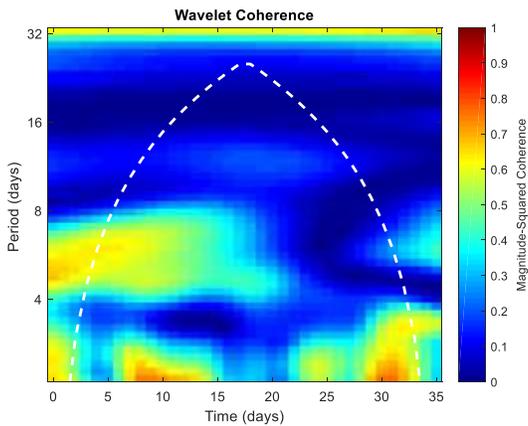


Figure 8: Estimates of wavelet coherence between the volume of attracted resources and loans issued by bank B

We see that the consistency between the volume of attracted resources and loans issued by bank B is fragmentary. However, such fragmentation is episodic and insignificant. Consequently, the management of the relevant financial flows for bank B is inefficient.

On Fig. 9 shows the dynamics of the spread between rates on loans and deposits for bank C. On Fig. 10 shows the dynamics of the corresponding rates on the interbank market.

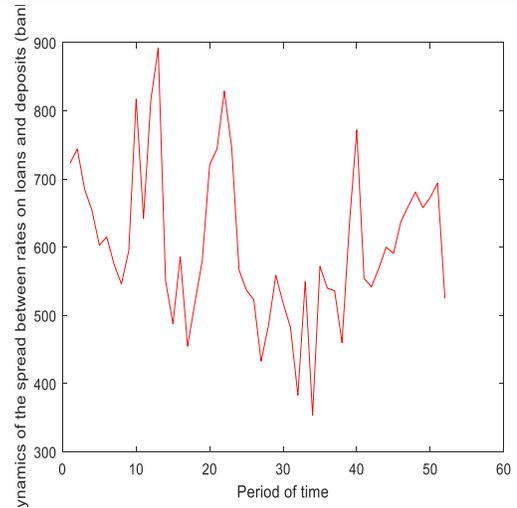


Figure 9: Dynamics of the spread between rates on loans and deposits for bank C

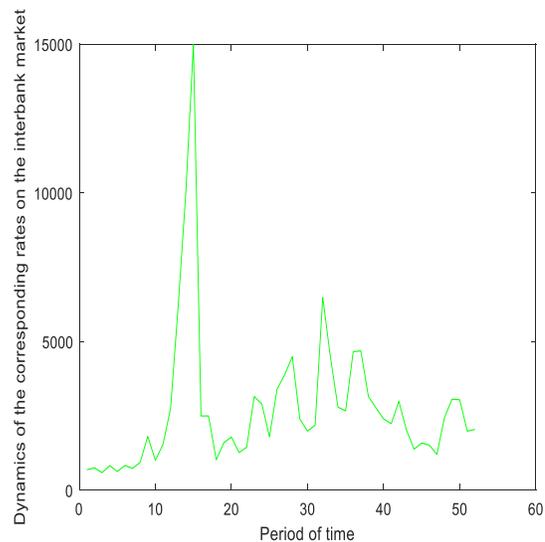


Figure 10: Dynamics of the relevant interbank rates

According to Fig. 9 and Fig. 10 it is difficult to judge the consistency of the respective financial flows. Therefore, we consider wavelet coherence estimates.

On Fig. 11 shows estimates of the wavelet coherence between the dynamics of the spread between rates on loans and deposits for bank C and the dynamics of the corresponding rates on the interbank market.

We can see some consistency between the financial flows that we consider in Fig. 9 and Fig. 10. However, this consistency is not significant.

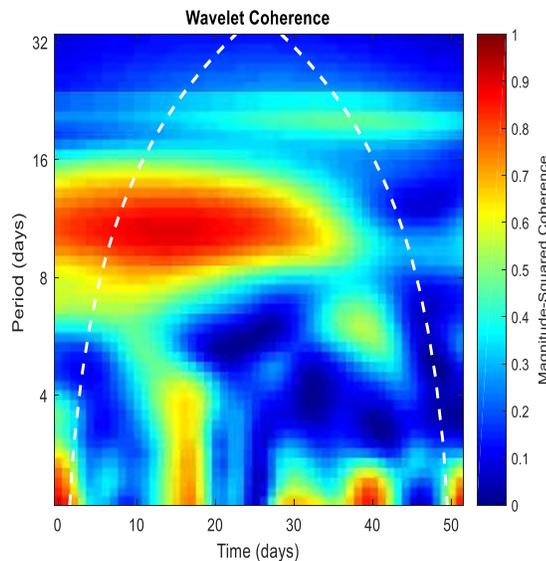


Figure 11: Estimates of wavelet coherence between the dynamics of the spread between rates on loans and deposits for bank C and the dynamics of the corresponding rates on the interbank market

Therefore, the appropriate management of financial flows for bank C is not effective.

5. CONCLUSION

Financial flows are one of the main elements of the functioning of various business entities. The characteristics of such flows can be indicators of proper functioning and management efficiency. Thus, the management of financial flows reflects the effectiveness of the management of the relevant business entity.

To analyze the effectiveness of financial flow management, we use wavelet coherence estimates. We show that wavelet coherence estimates allow us to estimate the corresponding control. This is shown in various specific examples. This approach can be used to build an effective management system for a business entity.

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