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Dynamics of commodity indices and shares of manufacturing companies as a factor in managing the assortment and inventory of an enterprise

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Abstract:

The study of the effective functioning of various business entities is one of the key areas in the research of various authors. At the same time, one of the factors in achieving such efficiency is to consider the issue of providing the enterprise with inventory for production. A solution to this issue is proposed based on an analysis of the dynamics of quotations of the corresponding commodity indices and shares of companies producing goods. Such an analysis is carried out based on the study of various data series using descriptive statistics and wavelet ideology. For the study, the methodology of wavelet coherence assessments was used, which allows us to obtain the necessary solutions. The work presents various graphs and diagrams that allow you to understand the progress of the study and the results obtained.

Key words: Commodity inventories, Business entity, Commodity indices, Shares of manufacturing companies, Statistical analysis, Wavelet analysis

Introduction

The effective and continuous functioning of a modern business entity is largely determined by the availability of a sufficient amount of necessary resources. Among such resources, as a rule, financial and energy resources are distinguished. At the same time, an important factor of production is the weighted volume of inventory necessary for the production and functioning of a business entity [1], [2]. Moreover, such a volume of reserves is determined by the type of a particular economic agent and the functional areas of its activity. In this aspect, inventory management of finished products is also equally important.

Thus, the relevance of the task is determined by the production tasks, efficiency and functional orientation of a particular business entity.

Consideration and solution of the designated area of research is possible on the basis of an analysis of the dynamics of data from the corresponding segments of the stock market [3], [4]. In this aspect, of interest is both the analysis of the dynamics of stock prices of manufacturing companies and the dynamics of the corresponding commodity indices. This interest is based on the analysis of supply/demand for individual product items and their components, which can influence the dynamics and assortment of various product inventories of the enterprise.

When studying the dynamics of quotes for various securities of the stock market, you can use both classical methods of analyzing economic data [5]-[16], and non-standard ones, which

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allow you to identify new directions for research or obtain additional data [17]-[24]. In any case, such an analysis allows you to conduct a comprehensive study and obtain the necessary solutions. Also important is the mutual analysis of data, which allows you to justify the necessary decisions, consider special points in carrying out the relevant analysis.

Thus, the main goal of this work is to analyze the dynamics of commodity indices and shares of companies producing goods as a factor in managing the assortment and inventory of an enterprise. Moreover, such an analysis involves, first of all, consideration of related works on the research topic and generalization of the general analysis procedure.

Related work

The problem of managing the assortment and inventory of an enterprise is multidimensional and is revealed from different points of view. Based on the main goal of this work, we will pay attention to its solution based on the analysis of the dynamics of the relevant stock market data.

O. Onyshchenko, O. Bukharina and A. Tupikina explore the features of inventory management in the logistics system of a trading enterprise [25]. The authors consider both general theoretical aspects of inventory management and practical aspects. Particular attention is paid to analysis and information technology in inventory management. In this aspect, analysis of the dynamics of securities quotes is a relevant and priority area in such research.

S. Mishra, S. B. Modi and A. Animesh empirically analyze the relationships between information technology capabilities, inventory efficiency and shareholder financial resources at the firm level [26]. The authors note the importance of such analysis, since the volume of reserves affects the welfare of shareholders. For this purpose, it is necessary to know the chains of effects connecting the capabilities of information technology, inventory efficiency, profitability and stock market risk. In this regard, consideration of securities quotations should be considered as a factor in inventory management. The work emphasizes that appropriate analysis plays an important role in increasing the efficiency of inventories and leads to increased returns on the stock market.

A. Mansur and T. Kuncoro consider the possibility of forecasting inventory volumes using a market basket analysis approach based on neural networks [27]. This forecast is used as decision support in determining the appropriate amount of inventory for each product that the enterprise produces. For this purpose, market basket analysis (MBA) and artificial neural network (ANN) backpropagation methods are used [27]. The needs of buyers are also taken into account, and it is possible to analyze the supply/demand relationship based on stock market data.

I. Britchenko and M. Bezpartochnyi use enterprise inventory optimization based on HML-FRM clustering [28]. The work examines the process of forming an enterprise's inventory and determines the optimal volume of commodity resources for sale. An analysis of the structure of the enterprise's inventory is also carried out, and the volume of turnover is determined. The authors use XYZ and ABC analysis to obtain more reliable results and predictive values of the enterprise's product supply, taking into account HML-FMR clustering [28]. For such purposes, you can use stock market data in the segment where the relevant enterprise operates.

T. L. Olsen and R. P. Parker consider the problems of enterprise inventory management, taking into account the size of the corresponding market segment [29]. For these purposes, various models are considered that allow taking into account consumer behavior, market size and the number of business entities in such a market. The basic operating conditions are also established

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under which the enterprise optimally applies the inventory policy based on the basic cost equilibrium policy. It is in this context that stock market data should be considered.

H. Srour and A. Azmy study the effectiveness of inventory management and the impact of this management on enterprise productivity [30]. For these purposes, the work examines data from the Egyptian stock market. The analysis of this study was conducted using both descriptive statistics and multiple regressions. This study confirms the importance of considering stock market data to analyze the research problem at hand.

Thus, the analysis showed the importance of considering the chosen issue as a direction for research. At the same time, to consider this issue, it is advisable to analyze stock market data.

The study [31] considers a comprehensive deep learning inventory management model. The authors analyze the problem of multi-period inventory replenishment based on data with uncertain demand. This formulation of the problem also allows the use of stock market data for deep training of the model and justification of decisions made.

A generalized procedure for analyzing the dynamics of commodity indices and company shares as an element of enterprise inventory management

Before moving on to a direct analysis of the dynamics of quotations in the corresponding segment of the stock market, we will consider a generalized procedure for this process as an element of managing the inventory of an enterprise. In Fig. 1 presents such a generalized analysis scheme.

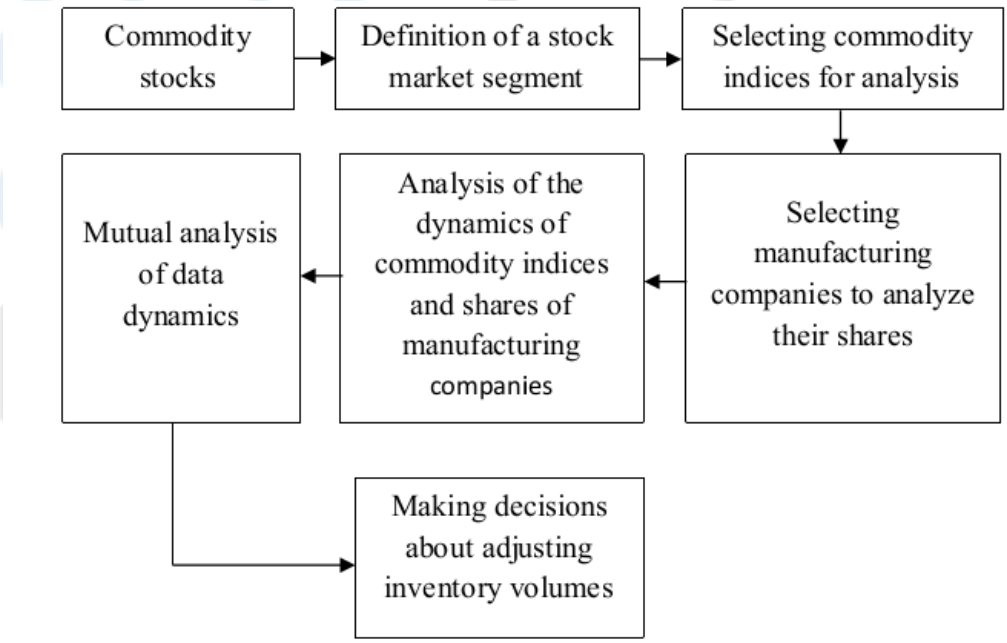

Figure 1: Generalized procedure for analyzing the dynamics of commodity indices and company shares as an element of inventory management

First of all, it should be noted that it is important to consider a specific segment of the stock market associated with the range of inventories and products that are produced. This helps to understand the dynamics of the supply/demand relationship, determine possible moments of

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entering the stock market, and develop appropriate inventory and production management strategies.

However, generalizing the presented procedure, it is also important to note the conduct of mutual analysis with manufacturers and competitors of the relevant product. This helps to better understand the market and the need to accumulate inventory, and possibly sell it over a certain period of time. In any case, such an analysis allows us to understand and estimate a certain effective volume of such inventories for the continuous production of goods.

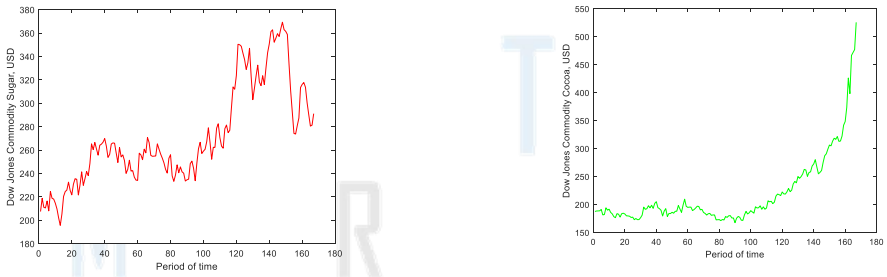
It is also possible to consider the mutual dynamics for different market segments. This will make it possible to assess the overall dynamics of the development of market relations under the influence of various influencing factors. The expediency of such an analysis is due to the fact that in modern conditions it is necessary to take into account the transience of changes in various influencing factors. This allows us to imagine the general dynamics of changes in the market, the development of various types of production, and evaluate the efficiency of their functioning.

For further research, we will adhere to the simplified analysis scheme, which is presented in Fig. 1. First, we will select a certain segment of the stock market with the corresponding types of goods and products of manufacturing companies. We will also first look at the dynamics of individual quotes for commodity indices and shares of manufacturing companies. Such an analysis will allow us to understand the general development trends of this market segment.

Next, we will consider the mutual dynamics of data for commodity indices and stocks. This will allow us to somehow track the reciprocity of the supply/demand link in terms of the formation of inventory. Among the areas for relevant analysis are considered: individual food manufacturers and the production of soft drinks, as well as some types of goods. All data is taken from American stock market data (https://www.investing.com/).

Dynamics of individual commodity indices and shares of manufacturing companies

In Fig. 2 and Fig. 3 shows the dynamics of quotations for individual commodity indices during the period 01.03.21-03.10.24 in their weekly averaging.



a) Sugar b) Cocoa

Figure 2: Commodity indices for sugar and cocoa

All figures show diverse dynamics for the corresponding quotes.

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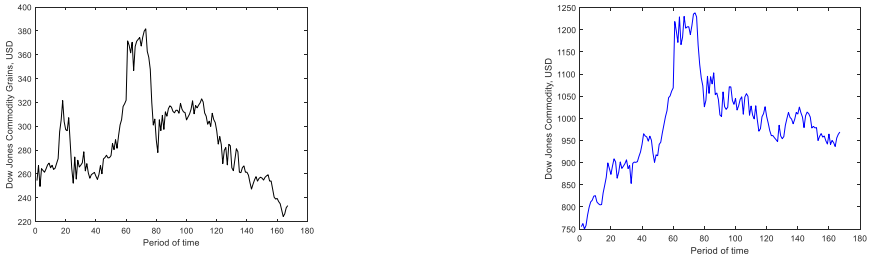

a) Grains b) Commodity

Figure 3: Commodity index on grains and generalized index on commodity

At the same time, it should be emphasized:

– for most of the time under study, sugar prices have been on the rise. However, recently there has been a decline in commodity index prices for sugar. This must be taken into account when forming inventories for this type of goods;

– the dynamics of quotations for the cocoa commodity index during the period of time under study is characterized by constant growth. Moreover, such growth has recently been accelerated (see Fig. 2b);

– prices for grains have been trending downward since the second half of the period under study. At the same time, one clearly defined maximum should be noted in this trend. Although at the beginning of the period under study there is also one local maximum;

– quotes for the general group of commodities have trends similar to quotes for grains. What should be noted here is the period of reaching the global maximum. Then there is a decrease in prices in terms of the general index for the commodity. All this should also be taken into account when developing an inventory management strategy.

A common fact is that three of the four commodity indices have been on a downward trend recently. Although the pace of such decline in commodity indices quotes is different.

In Fig. 4 shows the price dynamics for shares of General Mills Inc (food production) and Coca-Cola Co (soft drink production).

It should be noted that price dynamics for shares of manufacturing companies are not identical. Stock prices for General Mills Inc are somewhat similar to the dynamics of quotes for the commodity index for Grains and the general index for Commodity. The price dynamics of Coca-Cola Co shares are variable.

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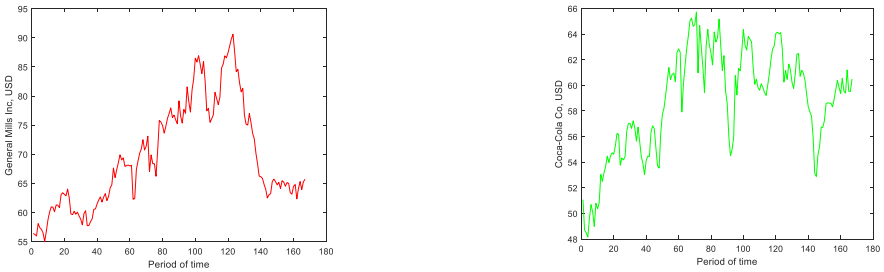


a) General Mills Inc b) Coca-Cola Co

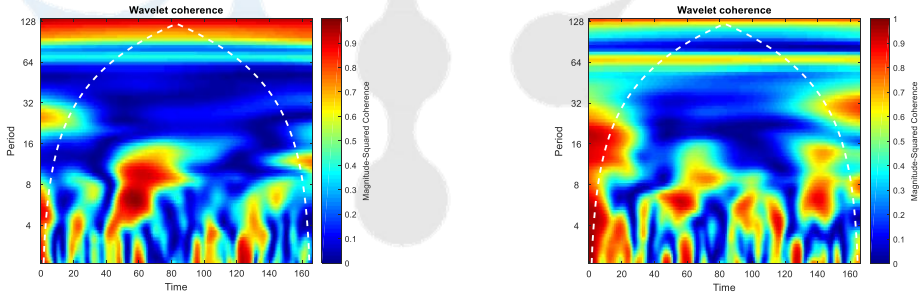
Figure 4: Price dynamics for shares of manufacturing companies

Next, we will consider estimates of the comparative dynamics of the data under consideration.

Comparative assessment of the mutual dynamics of the studied data

To conduct a comparative assessment of the mutual dynamics of data, we use the wavelet coherence method [32]-[34], which is used in this type of research [35]-[39].

In Fig. 5 presents an assessment of the mutual dynamics of prices for shares of General Mills Inc and the commodity index for Grains and the generalized index for Commodity.



a) Grains b) Commodity

Figure 5: Assessment of the mutual price dynamics of General Mills Inc shares and the commodity index on grains and the generalized index on commodity

First of all, it is worth noting the relationship between the data that displays certain estimates in Fig. 5. At the same time, the data in Fig. 5 shows the fragmentation of estimates between General Mills Inc shares and the Grains commodity index, as well as the Commodity summary index. At the same time, such fragmentation has a certain periodicity. It should also be noted the depth of relationships between the data under study. This can be taken into account in the process of forming and regulating the volume of inventory for production.

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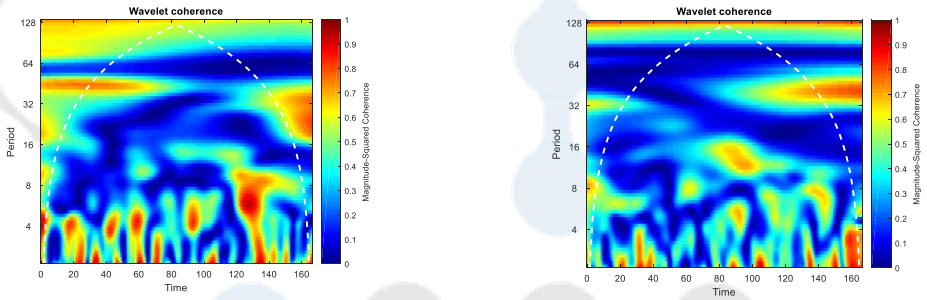
In Fig. 6 shows estimates of wavelet coherence of the mutual dynamics of prices for Coca-Cola Co shares and commodity indices for sugar and cocoa.

For the data in Fig. 6 there is also fragmentary consistency between share prices for Coca-Cola Co and commodity indices for sugar and cocoa. Moreover, the relationship for sugar is more significant than for cocoa. This indicates the different impact of individual products on the activities of the manufacturing company. At the same time, fragmentation in the sugar commodity index has a certain periodicity. The depth of such a connection is also significant. It is advisable to take this into account in the process of forming and regulating the volume of inventory for production, developing strategies for entering the stock market to replenish such reserves.

Considering the fact of random selection of data for analysis, the significance of the results obtained for the analysis and management of industrial inventories should be emphasized.



a) Sugar b) Cocoa

Figure 6: Assessment of the mutual dynamics of prices for shares of Coca-Cola Co and commodity indices for sugar and cocoa

Overall, the results obtained are significant and interesting.

Conclusion

The work examines certain aspects of the analysis of the dynamics of commodity indices and shares of commodity manufacturing companies. This was done taking into account the study of the possibility of influencing the management of the assortment and inventory of the enterprise.

At the first stage of the analysis, we examined the dynamics of individual commodity indices and stock prices of manufacturing companies.

At the second stage, the relationship between the dynamics of data reflecting commodity indices and stock prices was investigated. This made it possible to determine the level of such a relationship and justify the feasibility of using the results to manage inventory, determine a strategy for entering the stock market, the market for certain goods for production.

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