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Financial Market of Europe in Displaying the Dynamics of Prices for Shares of Major European Companies

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Abstract: *The financial market plays an important role in the implementation and development of economic relations between various business entities, the functioning of a market economy. This is due to the fact that the financial market is one of the key elements of the financial system. Therefore, a comprehensive analysis of the functioning of various segments of the financial market is important. One of the parameters for determining such segmentation of the financial market is the territorial affiliation of the relevant market segment. Based on this, we consider the European financial market. To analyze the European financial market, we consider its main indicators and the dynamics of prices for shares of major European companies. The paper also considers the issue of analyzing the mutual dynamics of prices for shares of major European companies. For such an analysis, we use the wavelet ideology. We use wavelet coherence estimates as a method for mutual analysis of relevant data. The paper presents a lot of empirical and statistical material in the form of relevant graphs and diagrams. This allows you to understand the logic of the study and the results obtained.*

Keywords—dynamics; price; stock; financial market; business entities; stock indices; market segments; wavelet analysis; wavelet coherence

1. INTRODUCTION

The financial market is one of the segments of the financial system, which allows you to implement market relations between various business entities. In the financial market, capital is mobilized and redistributed using various investment instruments [1], [2]. Thus, the financial market is an integral system of economic relations associated with borrowing, issuing, buying, selling securities, precious metals, currencies and other investment instruments [3], [4].

At the same time, the financial market is an organized system that is intended for trading in financial instruments [2]-[4]. Such trade is associated with the movement of the corresponding financial flows, the continuity of their movement within specific market operations with various investment instruments, the presence of significant relationships between such flows [5]-[11].

Consequently, the corresponding movement of financial flows is organized by the financial market. At the same time, the movement of such flows allows for a comprehensive analysis of the market, drawing appropriate conclusions and making the necessary decisions. For this, various methods and approaches can be used, both classical [12]-[14] and special ones, which are widely used in other areas and areas of research [15]-[18].

It should also be noted that the financial market is a clearly structured structure. The structure of the financial market includes various segments. It is possible to single out the primary, secondary and tertiary levels of the financial market. We can also consider the stock market, the foreign exchange market, the capital market. For various segments of the financial market, the corresponding movement of their financial flows is characteristic [5], [6], [19]. Therefore, it is important to take this into account when analyzing the relevant segment of the financial market. The regional affiliation of such a market also influences the movement of financial flows.

An equally important factor in the analysis of the movement of financial flows, the functioning of the corresponding segment of the financial market is the consideration of primary factors. From the point of view of the analysis of the financial market, such a factor may be the analysis of the dynamics of prices for shares of companies that are quoted in this segment of the financial market.

Thus, the purpose of this study is to analyze the dynamics of the European financial market in terms of share prices of leading European companies.

2. RELATED WORKS

Analysis of the financial market is one of the directions in the research of many theorists and practitioners. At the same time, both the analysis of the financial market as a whole and the analysis of its individual segments are carried out.

The study by Z. Q. Jiang, W. J. Xie, W. X. Zhou and D. Sornette provides an overview of financial market analysis methods [20]. For such an analysis, the authors consider multifractality and related methods. At the same time, the paper notes that multifractal analysis provides powerful tools

for understanding the complex nonlinear nature of time series in various areas. The paper considers the methods of multifractal analysis and multifractal models adopted or invented for financial time series, and their subtle properties applicable to time series in other disciplines [20]. The paper also presents the utility of multifractal analysis for quantifying market inefficiencies, supporting risk management, and developing other applications [20].

J. Schoenfeld is conducting a study that reveals the relationship between the functioning of the financial market and the development of a modern pandemic [21]. This study uses the COVID-19 pandemic as a natural experiment to test how large-scale pandemics affect financial markets. The findings suggest that pandemics are of systemic importance to financial markets. Overall, this study provides some of the first large-scale data on how pandemics affect financial markets [21]. This study also highlights the importance of conducting cross-analysis in the study of different datasets.

R. Matkovskyy and & Jalan explore the relationship between the financial market and the bitcoin market [22]. The authors consider different effects between traditional financial markets represented by five stock indices and centralized bitcoin markets in euros, US dollars, pounds sterling and Japanese yen [22]. For this, it is important to carry out cross-analysis between different data. The authors apply a skew-normal asset return model with mode switching, which distinguishes between linear and non-linear contagion, as well as structural shifts in periods [22]. This makes it possible to detect significant linkage effects between the financial market and the bitcoin market in terms of both correlation and mutual asymmetry of market returns.

The paper [23] considers the issues of big data analytics for forecasting financial market volatility. To do this, the authors use the support vector machine. The authors show that high-frequency data provide a lot of material and broad research perspectives for in-depth research and understanding of financial market behavior. At the same time, volatility is an important indicator for measuring market risk, and research and forecasting of the volatility of high-frequency data are of great importance for investors, government regulators, and capital markets [23].

J. Klaus and C. Koser explore special issues of the functioning of the financial market [24]. For such a study, the European financial market is considered in the work. The study examined the Wolfef index, a quantitative definition of the Twitter activity of US President Donald J. Trump, on the dynamics of European stock markets. The results obtained using a sliding window regression model show that the relationship between the Wolfefe index and the returns of the European stock market is heterogeneous and changes over time [24]. In such a study, an important aspect is the analysis of the mutual dynamics of the initial data.

S. M. Bartram, S. J. Taylor and Y. H. Wang explore the relationship between the Euro and the European financial market [25]. The authors construct a time-varying model to investigate the impact of the introduction of the euro on the relationship between 17 European stock markets over the period 1994–2003. The model is implemented using the GJR-GARCH-MA-t model for marginal distributions and the Gaussian copula for joint distribution, which allows fixing time-varying non-linear relationships [25]. The paper shows that in the euro area, market dependence increased after the introduction of a single currency only for large stock markets. It should be noted that an important aspect of this study is the analysis of the mutual dependence of various data.

G. M. Caporale, L. Gil-Alana and T. Trani explore the uncertainty in the financial markets that is associated with Brexit [26]. For this study, the concept of long memory and its methods are used to assess the impact on the degree of persistence of the implied volatility index (IVI). The authors consider the FTSE (Financial Times Stock Index) 100 index, the ratio of the pound against the major currencies traded on FOREX. As a result of cross-analysis of the data, an increase in the degree of constancy was found in all cases, except for the British pound-yen. This study also shows the importance of cross-analysis in order to obtain the necessary and reliable results.

S. Claessens considers the issues of fragmentation in financial markets [27]. This article examines the degree of fragmentation in various markets and classifies its possible causes. It then analyzes whether fragmentation is necessarily detrimental to financial stability and suggests that, more likely, there are various trade-offs [27].

Thus, from the above analysis it can be seen that for the corresponding analysis it is important to study the mutual dynamics of various indicators. At the same time, it is also important to consider both the general dynamics of the functioning of the European financial market and the dynamics of prices for the shares of individual companies that are quoted in the corresponding market segment. It is also necessary to consider the mutual dynamics of share prices of individual companies.

3. Dynamics of the Main Indicators of the European Financial Market

First of all, we note that the general trends in the functioning of the European financial market can be traced on the basis of the dynamics of its key indicators. These indicators include a number of stock indices, among which it should be noted (data from the site https://investing.com/):

DAX (GDAXI) is the German stock index. The index is calculated as a capitalization-weighted average of the share prices of the largest joint-stock companies in Germany;

FTSE 100 (FTSE) is the leading index of the British Stock Exchange (London Stock Exchange Index). The index is based on the stock prices of the 100 largest capitalization companies listed on the London Stock Exchange (LSE);

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CAC 40 (FCHI) – French stock index. The index is calculated as the arithmetic average of capitalization-weighted share prices of the 40 largest companies listed on the Euronext Paris stock exchange;

The Euro Stoxx 50 (STOXX50E) is a Eurozone stock index developed by STOXX, an index provider owned by the Deutsche Börse Group. The index consists of 50 stocks from 11 eurozone countries. EURO STOXX 50 represents Eurozone blue chip companies that are considered leaders in their sectors;

FTSE MIB (FTMIB) is the underlying stock market index for Borsa Italiana, the national Italian stock exchange. The index consists of the 40 most traded stock classes on the exchange;

IBEX 35 (IBEX) is a Spanish stock index. Calculated on the Madrid Stock Exchange. It includes shares of 35 largest companies.

Below are the graphs of such indices for the period from 01.01.2021 to 20.11.2022 in their weekly averaging (data from https://investing.com/).

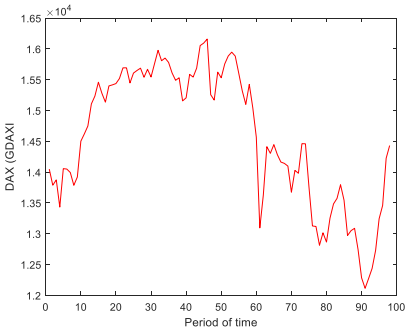

Figure 1: Dynamics of the stock index DAX

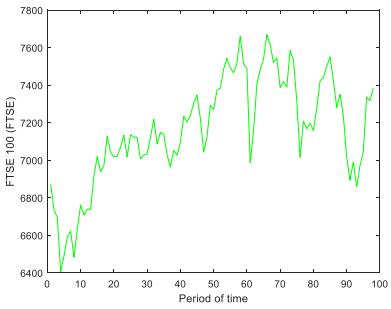

Figure 2: Dynamics of the stock index FTSE 100

The dynamics of the DAX stock index is characterized by the following statistical parameters: mean – 14564.74918; median – 14594.115; standard deviation – 1095.510649; sample variance – 1200143.583; kurtosis – -1.026246627; skewness – -0.425784946.

The dynamics of the FTSE 100 stock index is characterized by the following statistical parameters: mean – 7162.236224; median – 7151.825; standard deviation – 283.5728316; sample variance – 80413.55082; kurtosis – -0.166560502; skewness – -0.452915022.

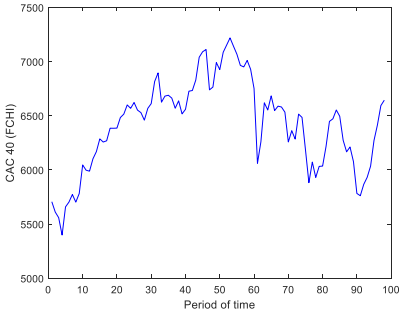

Figure 3: Dynamics of the stock index CAC 40

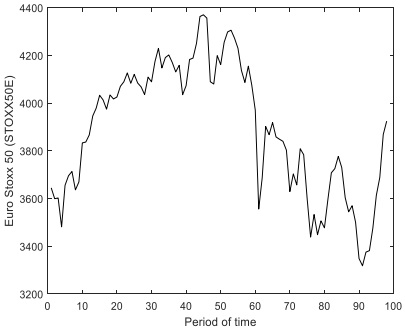

Figure 4: Dynamics of the stock index Euro Stoxx 50

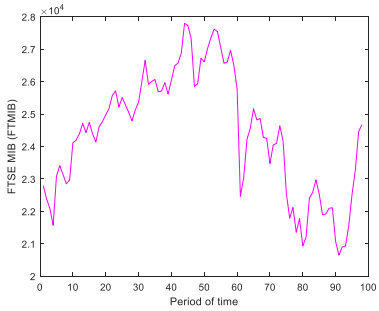

Figure 5: Dynamics of the stock index FTSE MIB

The dynamics of the CAC 40 stock index is characterized by the following statistical parameters: mean – 6421.496224; median – 6505.745; standard deviation – 415.6319292; sample variance – 172749.9006; kurtosis – -0.502790565; skewness – -0.266946243.

The dynamics of the Euro Stoxx 50 stock index is characterized by the following statistical parameters: mean – 3890.759898; median – 3921.76; standard deviation –

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275.6219616; sample variance – 75967.46571; kurtosis – -1.070882875; skewness – -0.232668226.

The dynamics of the FTSE MIB stock index is characterized by the following statistical parameters: mean – 24403.54255; median – 24624.15; standard deviation – 1898.648904; sample variance – 3604867.659; kurtosis – -0.956410773; skewness – -0.1834014.

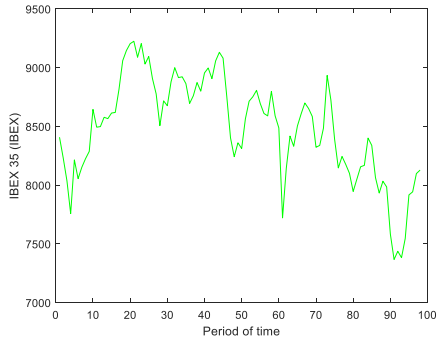

Figure 6: Dynamics of the stock index IBEX 35

The dynamics of the IBEX 35 stock index is characterized by the following statistical parameters: mean – 8482.947959; median – 8534.95; standard deviation – 433.5434154; sample variance – 187959.893; kurtosis – -0.157122406; skewness – -0.478193994.

We can note the significant volatility of the respective stock indices over the analyzed period of time. At the same time, in the first half of the study period, one can observe the increasing dynamics of various stock indices. Further, we observe a drop in the values of stock indices. The dynamics of the fall of such values is special for each stock index. Also for certain periods of time, we can observe the same trends. This suggests that the same factors influence the dynamics of European stock indices.

4. Dynamics of Stock Prices of Major European Companies and Their Statistical Characteristics

Each stock index, as noted above, is formed on the basis of stock prices of a number of companies. Therefore, the dynamics of prices for shares of companies also reflects the main points of the functioning and development of the relevant financial market.

Below is the dynamics of prices for shares of leading European companies, which are included in the calculation of various stock indices: Banco Santander (SAN) – IBEX 35 (IBEX); Intesa Sanpaolo SpA (ISP) – Euro Stoxx 50 (STOXX50E); Orange SA (ORAN) – CAC 40; Vodafone Group PLC (VOD) – FTSE 100 (FTSE); Deutsche Telekom AG Na (DTEGn) – DAX (GDAXI). These companies have the largest sales volumes of their shares in the structure of the respective stock indexes.

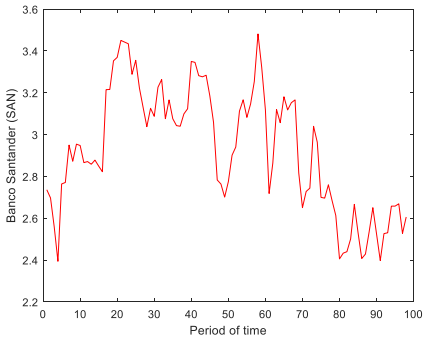

Figure 7: Banco Santander (SAN) stock price performance

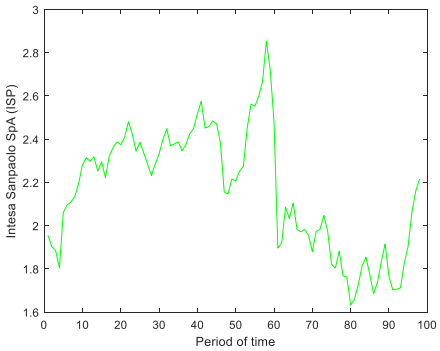

Figure 8: Intesa Sanpaolo SpA (ISP) stock price performance

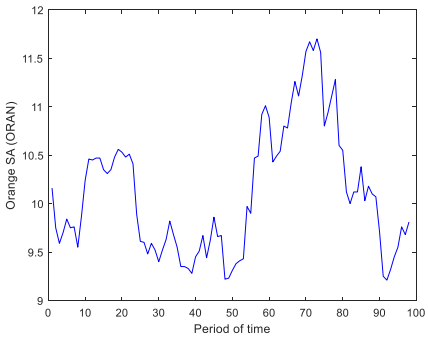

Figure 9: Orange SA (ORAN) stock price performance

The dynamics of Banco Santander (SAN) shares is characterized by the following statistical parameters: mean – 2.926871429; median – 2.9442; standard deviation – 0.2956862; sample variance – 0.087430329; kurtosis – -1.06481944; skewness – -0.071727343.

The dynamics of Intesa Sanpaolo SpA (ISP) shares is characterized by the following statistical parameters: mean – 2.159593878; median – 2.2105; standard deviation – 0.282879154; sample variance – 0.080020616; kurtosis – -0.916189162; skewness – -0.043508681.

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The dynamics of Orange SA (ORAN) shares is characterized by the following statistical parameters: mean – 10.11367347; median – 9.985; standard deviation – 0.655516461; sample variance – 0.42970183; kurtosis – -0.418546167; skewness – 0.662440587.

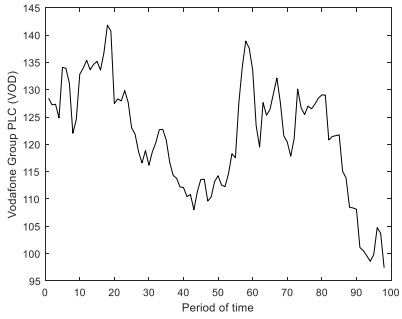

Figure 10: Vodafone Group PLC (VOD) stock price performance

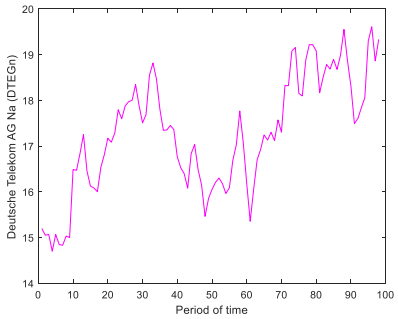

Figure 11: Deutsche Telekom AG Na (DTEGn) stock price performance

The dynamics of Vodafone Group PLC (VOD) shares is characterized by the following statistical parameters: mean – 121.3488776; median – 121.8; standard deviation – 10.30091867; sample variance – 106.1089255; kurtosis – -0.455143251; skewness – -0.332454828.

The dynamics of Deutsche Telekom AG Na (DTEGn) shares is characterized by the following statistical parameters: mean – 17.26523469; median – 17.291; standard deviation – 1.261825202; sample variance – 1.592202841; kurtosis – -0.781173485; skewness – -0.126961598.

The dynamics of stock prices of leading European companies generally differ from each other. At the same time, we can say that the dynamics of stock prices in some way inherits the corresponding stock indices. This allows us to say that the dynamics of prices for shares of leading companies reflects the dynamics of the functioning of the corresponding segment of the financial market.

5. Analysis of the Mutual Dynamics of Prices for Shares of Leading European Companies

For further analysis, consider the mutual dynamics of prices for shares of various European companies. We will do such an analysis using wavelet coherence estimates [28]-[31]. This approach is widely used in the study of economic data [32]-[35].

Below are estimates of wavelet coherence for the values of stock price dynamics for a number of companies.

Fig. 12 shows an estimate of the wavelet coherence of the share price dynamics between Banco Santander and Intesa Sanpaolo SpA.

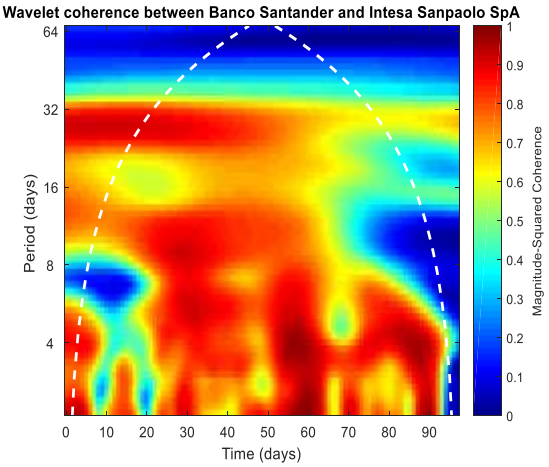

Figure 12: Estimation of wavelet coherence of share price dynamics between Banco Santander and Intesa Sanpaolo SpA

We can see that the price dynamics of Banco Santander and Intesa Sanpaolo SpA shares are mutual and interconnected. It should be noted that these companies represent different stock indices. Thus, we can say that the same factors act on the dynamics of the corresponding stock prices. This relationship also confirms the fact that the dynamics of prices for shares of leading companies reflects the processes in the respective financial markets.

Fig. 13 shows an estimate of the wavelet coherence of stock price dynamics between Intesa Sanpaolo SpA and Orange SA.

It should be noted that the estimate of wavelet coherence between Intesa Sanpaolo SpA and Orange SA is less pronounced. However, we can identify individual periods of time when such an assessment is mutual and significant. Thus, this suggests that the same factors are also at work here, which affects the price dynamics of the shares of leading companies. It also confirms the possibility of assessing the dynamics of the functioning of the financial market based on the analysis of the dynamics of prices for shares of leading companies.

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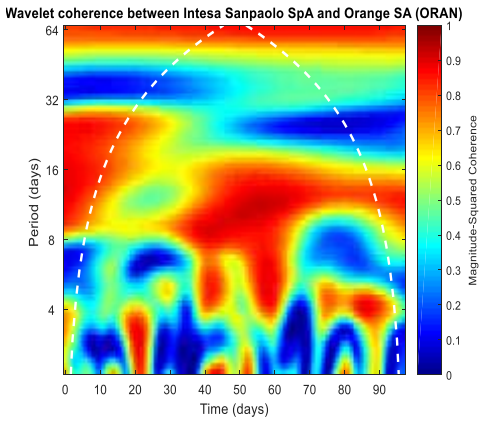

Figure 13: Estimation of wavelet coherence of stock price dynamics between Intesa Sanpaolo SpA and Orange SA

Fig. 14 shows an estimate of the wavelet coherence of share price dynamics between Vodafone Group PLC and Deutsche Telekom AG Na.

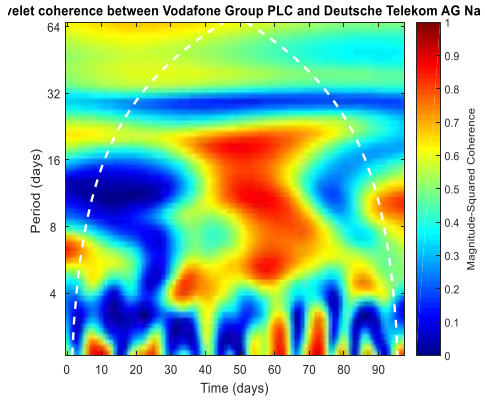

Figure 14: Estimation of wavelet coherence of stock price dynamics between Vodafone Group PLC and Deutsche Telekom AG Na

There is also less pronounced wavelet coherence between Vodafone Group PLC and Deutsche Telekom AG Na share prices. At the same time, there are also periods of time when such an assessment is mutual and significant. This also confirms the conclusions that were made earlier.

6. Conclusion

The paper shows the relationship between the dynamics of stock indices and the dynamics of prices for shares of leading companies. This makes it possible to assess the functioning and development of the financial market based on an analysis of the dynamics of prices for shares of leading companies. It is also shown that the dynamics of various stock indices and the dynamics of prices for shares of various companies are affected by the same factors. This makes it possible to evaluate the development of the corresponding segment of the financial market.

For analysis, the paper considers the main statistical characteristics of the financial market indicators that we are researching. The wavelet coherence estimate is also used for analysis, which allows concretizing the results of the study.

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