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How Crises Change the Impact of the Global Stock Market on the Russian Stock Market

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Annotation: The article is devoted to the indicators of the world and Russian stock markets, their history and the results of the study of their statistical relationship in 2006-2021. Special attention is paid to the impact of economic crises on these links, including the crisis caused by the COVID-19 pandemic. The analysis was carried out in relation to the Russian stock index RTS, stock prices of the largest oil and gas and financial companies in Russia and their dependence on the oil and gas and financial sectors of the global stock market.

Key words: Stock Markets, Global Stock Indexes, Global Oil Sector, Global Financial Sector, RTS Index, Russian Oil and Gas Companies, Russian Banks, Statistical Dependence, Pandemic, Statistical Analysis.

Как кризисы меняют влияние мирового фондового рынка на российский фондовый рынок

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Аннотация: Статья посвящена показателям мирового и российского фондовых рынков, их истории и результатам исследования их статистической связи в 2006-2021 гг. Особое внимание уделено влиянию экономических кризисов на эти связи, в том числе кризиса, обусловленного пандемией COVID-19. Анализ проведен в отношении российского фондового индекса РТС, курсов акций крупнейших нефтегазовых и финансовых компаний

России и их зависимости от нефтегазового и финансового секторов мирового фондового рынка.

Ключевые слова: фондовые рынки, фондовые индексы, индекс РТС, глобальный нефтяной сектор, глобальный финансовый сектор, российские нефтегазовые компании, российские банки, статистическая зависимость, пандемия, статистический анализ.

Introduction

In the early 1990s, the citizens of the former USSR got, one might say, from the "developed socialism" of the late 1980s almost straight into capitalism. Many large and small enterprises were then quickly incorporated and found private owners. Like mushrooms, closed and open joint-stock companies, financial pyramids began to grow. And already in January 1992, instead of the State Bank's currency exchange, where Vnesheconombank's ruble-dollar trades have been held since 1989, the Moscow Interbank Currency Exchange (MICEX) appeared, and in 1995 the Stock Exchange of the Russian Trading System (RTS) appeared. In January 2012 these exchanges merged into the Moscow Stock Exchange.

Many Russians still have little understanding of the problems of the stock market, although in the era of the Internet, you can participate in auctions without leaving your home or office, using various programs, ratings and forecasts. A modern stock exchange player, in order to enrich himself, must take into account many indicators: this is the general state of the market, the state and rating of the companies whose shares he acquires, forecasts of oil and raw materials prices, indicators of the development of the economy of a particular country, various ratings and even current statements and forecasts of leading economists and politicians.

Discussion

In general, it is not easy to be an investor on the stock exchange, and it is not easy for ordinary people who are far from economics to understand stock exchange terms, not to mention indices. We will briefly explain some of the terms.

A stockbroker is an intermediary in the market who participates in trading on behalf and at the expense of a principal, and a trader is actually performs transactions for himself personally and at his own expense. Both a broker and a trader can be both an individual and a firm.

Stock indicators are used to assess the state of the securities market quoted on a particular exchange, securities of a country, a group of companies, a group of countries. Although in the short-term range these indicators may be subject to sharp jumps due to stock speculation, inflating and bursting of so-called financial bubbles (excessive ups and downs of indices), in general they reflect the state of the economy, therefore they are important. You can learn more about the structure of stock markets from the book by L.I. Kolmykova [1, Chapter 5] and others. One of the best books on this topic in English is Barry D. Moore's manual [2].

Stock exchange indicators and their role in the economy

The earliest of the stock exchange indicators is the Dow Jones Industrial Index, named after Dow Jones & Company, founded by Charles Dow. The Dow Jones has been calculated since 1884 as the arithmetic mean of the market price of shares of leading American companies adjusted for their mergers and splits. At first there were 12 companies, since 1916 — 20, and since 1928 — 30. The first index value published in 1896 was 40.94 points, and the historical maximum has changed more than once in recent years. The highest value in the first months of 2022 was on January 4 — 36,807 points.

The RTS index, which characterizes the state of the Russian stock market, is the total market value of shares of 50 large companies (with fixed shares) in dollars compared to September 1, 1995. The index value on this day is equal to 100 points. The historical minimum of 37.7 points was noted during the default on October 2, 1998, and the maximum of 2491.1 points was in 2008 on the eve of the crisis. In 2021-2022, the value of the RTS[1] index fluctuated in the range of 1288-1916 points

[1] Source: https://www.moex.com/ru/index/RTSI/constituents/

until the collapse on February 24, 2022 due to the emergence of an acute foreign policy situation. At the time of writing, Gazprom has the highest share in the RTS index — 16.6%, followed by Lukoil —14% and Sberbank — 9.5%. The share of the oil and gas sector is about one third, and the financial sector is about 11%. In general, the shares of each of the 50 large companies in the index depend on their real market share. However, there are restrictions that are sometimes slightly violated: the share of one issuer of securities cannot exceed 15% and the share of the 5 largest — 55%. The MICEX index is similar to the RTS index, but the stock price is calculated in rubles.

Indices of other exchanges in different countries are built on similar principles. They are usually designated by abbreviations based on the name of the exchange. For example, SSE is an index of the Shanghai Stock Exchange in China. Indices of various Exchange Traded Funds (ETFs) are used by groups of countries, for example, the iShares MSCI Emerging Markets (EEM) is an indicator of emerging markets, in which Russia has a share of 3.4%, and China — 36.5%. Economic news often mentions the S&P500 index, which is developed and calculated by the rating company Standard & Poor's based on the stock price of 500 large US companies. This index better reflects the situation in the American economy compared to the Dow Jones index.

Stock indexes are interconnected and depend to one degree or another on the prices of strategic goods — oil, gold, metals, high-tech products. These prices and other indicators can be benchmarks for investors in different time periods. Behavioral aspects in the stock market have long attracted researchers, an example of which are scientific articles [3-7].

We often hear that Russian stock exchange indicators and the ruble exchange rate are almost directly dependent on the oil futures price, which is mysterious to many. Let's explain what are a futures or futures contract. The name comes from the English word «future». In other words, it is a simplified contract of the future for goods or securities, and all its conditions, except for the price and term, are set in advance by the exchange. Such standardized contracts can be concluded very quickly and for anything, so they are the most common. Initially, futures appeared in agriculture: a farmer in advance, at the beginning of the field season, signed a contract for the supply of his products at a fixed price to be sure that he would cover the costs incurred regardless of the market price of the grown products at the time of harvest. Thus, the farmer avoided the risks of getting losses (or, as they say, hedged the risks). Then futures spread to other sectors of the economy. It is important that real deliveries are carried out for approximately only 1% of oil futures, and the rest are settlement futures, for which only money settlements are made between the participants in the amount of the difference between the contract price and the actual oil price on the execution date.

Methodology

Does the Russian securities market really depend heavily on oil prices and is this true for all periods? Let's look at Figure 1, where the blue line is the dynamics of the RTS index, and the green line is the futures price of oil, or rather, the complex indicator of the United States Oil Fund (USO). The USO indicator, which is a composition of futures prices for different grades of oil and petroleum products. As you can see, both graphs resemble the contour of a mountainous area dotted with sharp rocks and deep canyons due to jumps in growth indices and collapses. The charts are similar, but not always synchronous, and even in some areas they are multidirectional, that is, with an increase in oil prices, the RTS index may sometimes fall and vice versa. This is because the price of oil is far from the only indicator that determines the level of the RTS index, although the share of the fuel and energy sector in it is very significant. It also affects the general state of global and emerging markets (for example, the EEM indicator), acceleration or slowdown of the country's economic development, short or long negative or positive political processes. Such indicators (factors) come to the fore if oil prices are more or less stable, and it does not matter whether at a low or high level. Exceptions are possible during wars, sharp political exacerbations or other stressful situations, for example, the coronavirus pandemic, which, judging by Figure 1, did not lead to such a sharp and rather prolonged collapse of stock indicators as the global crisis of 2008-2009, which was sometimes not quite reasonably compared with the Great Depression of the 1930s.

Fig. 1. / Рис. 1. **Dynamics of the RTS index and the USO oil futures price indicator in 2006-2021[2] / Динамика индекса РТС и индикатора фьючерсной цены на нефть USO в 2006-2021 гг.**

Let's try to investigate this process and assess the degree of interdependence of stock market indicators based on economic and statistical tools[3]. The properties of time series allow us to evaluate statistical dependence by means of a series of linear regression equations and the selection of time intervals during which each of them is relevant. For more information on the calculation methodology and results for the oil and gas and banking sectors of the Russian and global stock markets before and during the coronavirus pandemic, see our articles [8-11]. Below we will tell you about the most striking and significant results.

Results

Our calculations revealed 28 periods of relatively stable dependence of the RTS index on the USO in 2006-2021 [10, table. 1]. In 17 of them, the dynamics of the RTS index depends quite closely on the dynamics of the composite index of the USO oil futures price. The closeness of the connection is estimated by the value of the coefficient of determination. The closer this indicator is to zero, the weaker the statistical relationship, and the closer to one, the stronger. Interested readers can see how this indicator is calculated in books on mathematical statistics [12, 13]. During those very 17 periods of close connection, the coefficient of determination of the RTS regression equation from the USO ranged from 0.7 to 0.92. But there are periods when the correlation temporarily disappears, usually before and during crises with a sharp collapse or an increase in the variability (volatility) of the USO indicator. So, before the crisis of 2014, the relationship, which had been close and very close for many years, noticeably weakened (the coefficient of determination fell from 0.8—0.9 to 0.5—0.6, and in May— December 2013 it was even close to zero). A steady restoration of the tightness of communication happened only in the second half of March 2015, when oil prices began to stabilize.

[2] Sources for Fig. 1: https://www.moex.com/ru/index/RTSI/archive; https://www.investing.com/etfs/united-states-oil-fund.

[3] Statistical studies were carried out using Microsoft Excel and EViews packages. Data sources for calculations: https://www.investing.com/equities/gazprom_rts; https://www.moex.com/ru/index/RTSI/archive; https://www.investing.com/etfs/united-states-oil-fund; https://www.investing.com/equities/vtb_rts-historical-data; https://www.investing.com/etfs/ishares-s-p-global-financial-historical-data.

We are most interested in the period of the beginning of the coronavirus pandemic and during it. The calculations are clearly shown in Fig. 2. On the ordinate (Y) axis, the value of the RTS index is postponed, and on the abscissa (X) axis, the USO oil futures price in different periods 2018-2021 is postponed (lines with period numbers 23-28 according to the end-to-end numbering of periods since 2006). With the help of a special statistical software package, we calculated the parameters of the lines around which these values are grouped. If the connection is close, then the points "stick around" the regression line (lines 24, 26 and especially 28), if there is practically no connection, the points form a shapeless "cloud" around the line (lines 23, 27). An intermediate situation where a connection exists but is not very significant is illustrated by line 25.

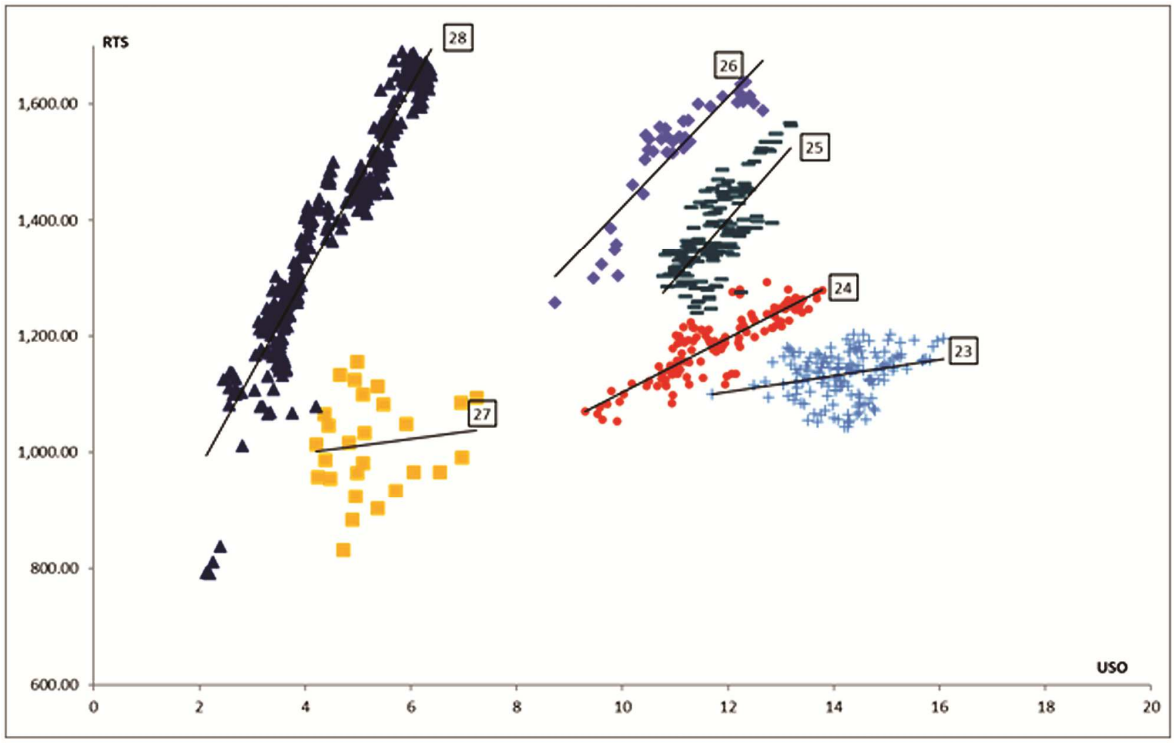

Fig. 2. / Рис. 2. **Diagram of change in the dependence of the RTS index on USO in 2018-2021**[4] **/ Диаграмма изменения зависимости индекса РТС от USO в 2018-2021 гг.**

This is what the diagram in Fig. 2. Immediately before the pandemic, the statistical relationship between USO and RTS indicators weakened (line 25, the period from May 2019 to early January 2020), followed by its strengthening in January—February 2020 (line 26, the period from January to early March 2020), after which the connection was completely interrupted with the onset of turbulence on the stock market at the beginning of the pandemic in March — mid-April (line 27), when the indicators collapsed sharply, but not synchronously. However, from April 17, 2020 a very close statistical relationship was established, which persisted throughout 2021, and with a high coefficient of determination of 0.91 and the maximum regression coefficient for the entire period (the "steepest" line 28). This means that the RTS index is very sensitive to changes in the USO indicator, which was an important benchmark for investors in the Russian stock market.

A similar situation was observed with respect to the stock prices of major oil companies PJSC Lukoil and NK Rosneft. But calculations of the statistical relationship between the share price of Gazprom PJSC and the USO indicator showed that such a relationship weakened long before the pandemic, at the end of February 2016. This can be seen in lines 13 and 14 compared to line 12 in Figure 3. At the beginning of the pandemic, the connection even strengthened a little, but did not

[4] Sources for Fig. 2: https://www.moex.com/ru/index/RTSI/archive; https://www.investing.com/etfs/united-states-oil-fund. The sources for constructing lines in Figures 2 are the calculations of the authors, presented in detail in [10, table. 1].

reach a significant level (line 15, determination coefficient 0.6), but at the end of April 2020 the tightness of communication increased to a significant level of the coefficient of determination of 0.7 (line 16), and in mid-July 2020 — to a high level of 0.9 (line 17), which lasted almost the whole of 2021.

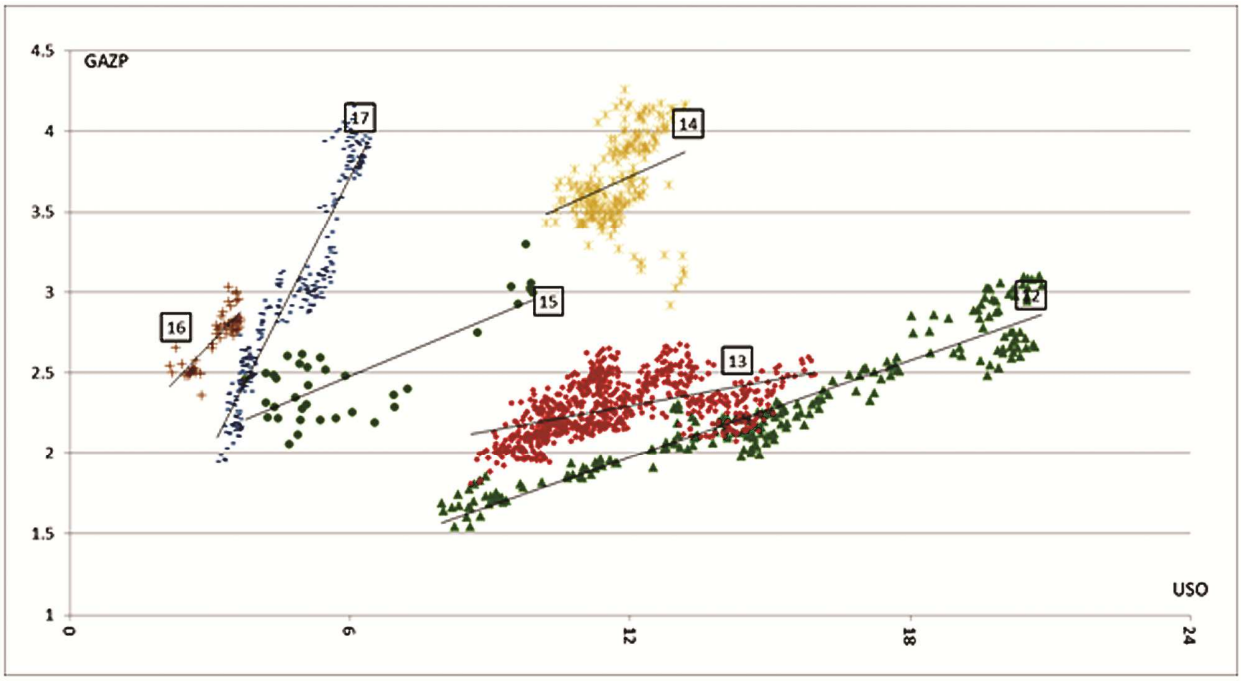

Fig. 3. / Рис. 3. **Diagram of change in the dependence of PJSC Gazprom shares of the USO oil futures price in 2015-2021**[5] **/**
Диаграмма изменения зависимости акций ПАО «Газпром» от фьючерсной цены на нефть USO в 2015-2021 гг.

This leads to the conclusion that the COVID-19 pandemic contributed to a sharp increase in the positive dependence of the oil and gas sector of the Russian stock market and individual large companies on global indicators of the oil sector of the world stock market. The sensitivity of the RTS index and stock quotes of large oil and gas companies to changes in the composite oil futures price index has increased. Investors who purchased shares of these Russian companies were guided largely by the indicators of the oil sector of the global stock market

Now let's assess the impact of the crises and the pandemic on the dependence of the RTS index and stock prices of large Russian banks on the financial sector of the global stock market, or rather on the iShares Global Financials ETF (IXG) indicator. These results are presented in detail in our article [11]. Figure 4 shows the dynamics of RTS indicators (dark blue line) and IXG (maroon line).

Here we see, at first glance, a picture similar to Figure 1. But if you look closely, you can see that IXG during the crises of 2008-2009 and 2020 (associated with the coronavirus pandemic) fell deeper and recovered more slowly than the RTS indicator, and during the crisis of 2014-2015, the situation was reversed. The recovery of both indicators after the coronavirus crisis seems to be synchronous.

[5] Sources for Fig. 3: https://www.investing.com/equities/gazprom_rts; https://www.investing.com/etfs/united-states-oil-fund. The sources for constructing lines in Fig. 3 are the calculations of the authors, presented in detail in [10, table 4].

Fig. 4. / Рис. 4. **Dynamics of IXG indicator and RTS index in 2006-2022**[6] / **Динамика индикатора IXG и индекса РТС в 2006-2022 гг.**

Let's examine the statistical dependencies of the RTS index on the IXG indicator during this crisis in more detail [11, table 1]. Since the end of 2016, the relationship between the indicators was close with a coefficient of determination of 0.81 until mid-May 2017 and then 0.75 until June 20, 2018 (line 14 in Figure 5). After that, the relationship completely disappeared until mid-May 2019 (line 15) and then recovered to the level of the coefficient of determination of 0.89, having lasted for it is the whole of 2021 (line 16). This means that the IXG indicator, although it fell deeper than the RTS, but really almost synchronously with it, that is, the coronavirus pandemic itself did not have much effect on the closeness of the relationship between these two indicators that remained high.

Calculations of the equations of dependence of the dynamics of the stock prices of Sberbank PJSC and VTB Bank showed that the closeness of the statistical relationship ceased to be significant for Sberbank shares in September 2021, and for VTB shares — already in mid-April 2021 [11, tables 2, 3]. It can be assumed that the impact of the pandemic was not decisive here. Most likely, economic wars and sanctions had a greater impact. VTB's share in the RTS index is 1.26%, while Sberbank's share is 15% (including 1.26% preferred shares). These are banks of different sizes: as of August 2021, the market capitalization of VTB and Sberbank was in billion rubles 648 and 7300 respectively. In general, the dependence of VTB Bank shares on IXG is less stable, the regression line changes more often.

[6] Sources for Fig. 4: https://www.moex.com/ru/index/RTSI/archive; https://www.investing.com/etfs/ishares-s-p-global-financial-historical-data.

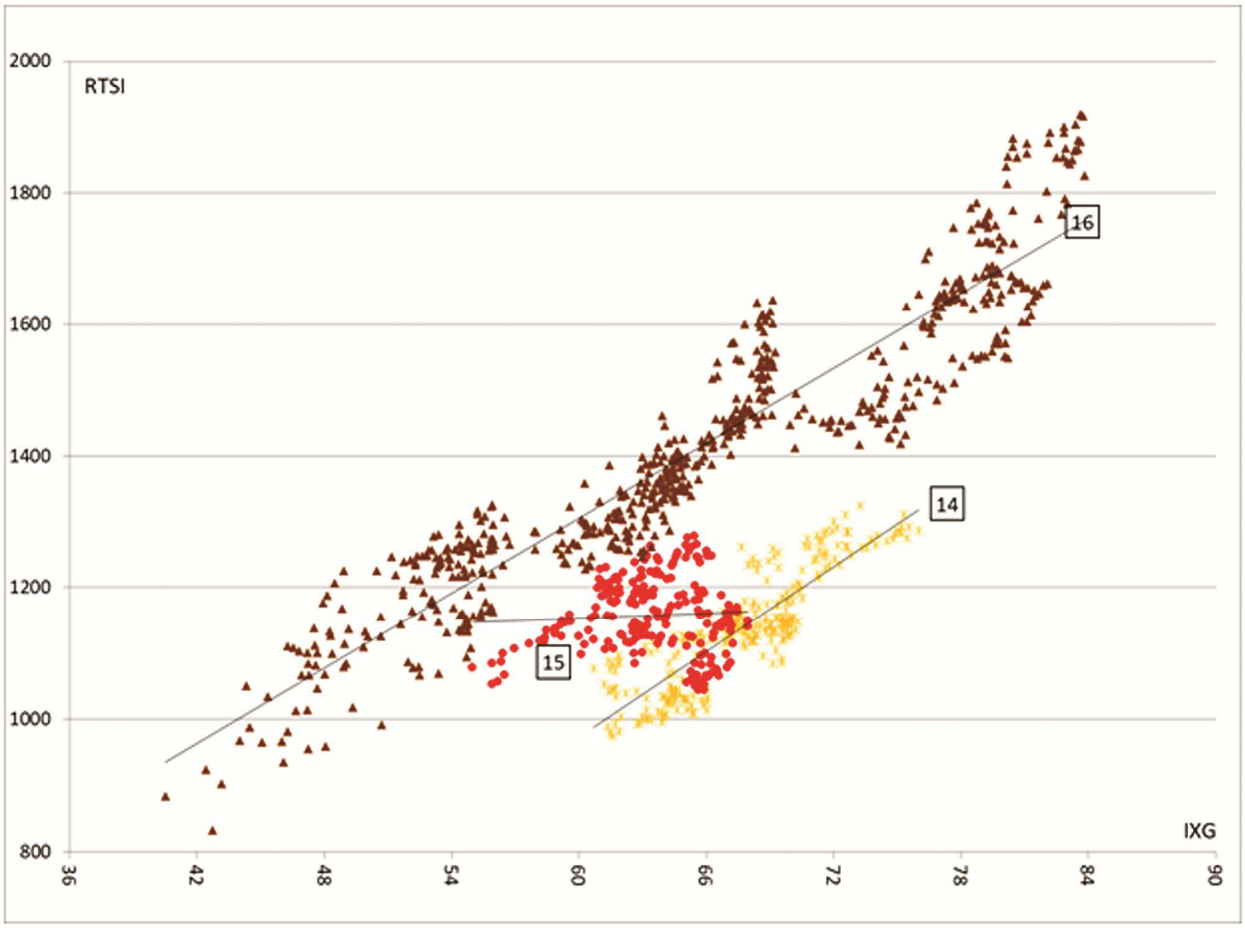

Fig. 5. / Рис. 5. **Diagram of change in the dependence of the RTS index on IXG in 2014-2021**[7] **/ Диаграмма изменения зависимости индекса РТС от IXG в 2014-2021 гг.**

A particularly interesting and unusual situation was observed in late 2012 — early 2018. During two periods 21.11.2012 — 22.05.2014 (line 8 in Fig. 6) and 09.12.2016 — 20.02.2018 (line 12) the regression coefficients were negative! That is, with the growth of the global stock market indicator IXG, the RTS index fell and vice versa. Figure 4 shows the multidirectional trends of these indicators in these periods. In the first case (line 8), there was a general trend of IXG to increase, and RTS to fall with local ups, so the tightness of the connection did not reach a significant level: the coefficient of determination was at the level of 0.59. In the second case (line 12), the connection was negative and close with a determination coefficient of 0.8. Figure 6 shows the opposite slope of lines 8 and 12 with respect to lines 6 — 7 and 9 — 11. There is also a much larger spread of points around line 8 compared to line 12. The alleged reason for this is the introduction of foreign sanctions against VTB and its lesser resistance to them compared to the much larger Sberbank.

On February 24, 2022, the VTB exchange rate collapsed as sharply as the Sberbank stock price and the RTS index due to unprecedented systemic sanctions in connection with the foreign policy situation, which led to the suspension of trading on the Moscow Stock Exchange from February 26, 2022.

[7] Sources for Fig. 6: https://www.moex.com/ru/index/RTSI/archive; https://www.investing.com/etfs/ishares-s-p-global-financial-historical-data. The sources for constructing lines in Fig. 6 are the calculations of the authors, presented in detail in [11, table 1].

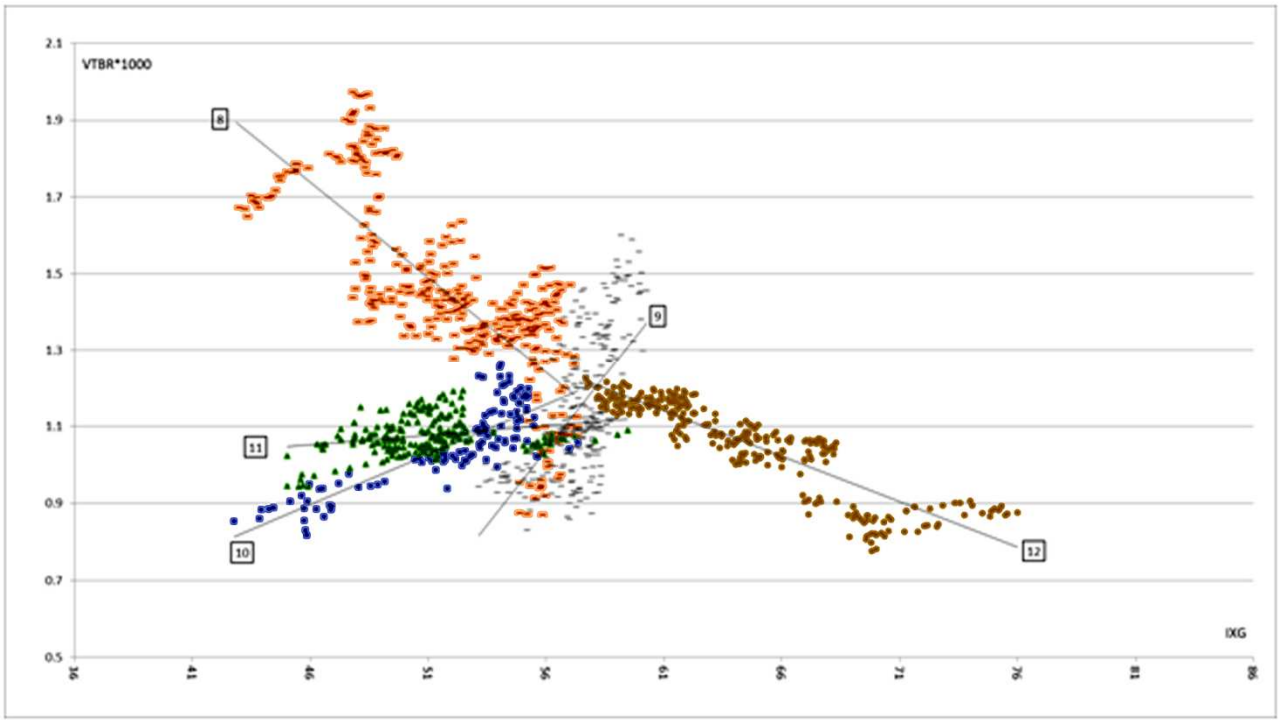

Fig 6. / Рис. 6. **Diagram of change in the dependence of VTB Bank shares (y) on IXG (x) in 2012-2018**[8] **/ Диаграмма изменения зависимости акций банка ВТБ (y) от IXG (x) в 2012-2018 гг.**

Conclusions

The situation on the Russian stock market largely depends on the global stock market, but its impact differs in various periods and for companies in different sectors of the economy. For example, during the coronavirus pandemic crisis, the dependence of the stock indicators of large oil and gas companies on the global oil and gas sector increased, and the financial sector "did not feel such an impact": the dependencies remained positive and close. A group of Turkish researchers came to similar conclusions regarding the Turkish economy [14].

Modern traders and brokers are mostly cosmopolitan people, they are more interested in their own wallet than politics, if we exclude situations of severe political pressure. Nevertheless, panic on the stock exchanges due to any negative information (for example, messages about the imposition of sanctions) is a typical phenomenon. However, when the securities exchange rate is low, they become more attractive to investors, so usually a sharp drop is followed by a rise in stock indicators. Therefore, investors should keep their finger on the pulse: take into account the general trends of the global and national stock markets, analyze the dynamics and mutual influence of stock indicators and significant volumes of other exchange analytics.

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