The Impact of the Covid-19 Pandemic on the Dynamics of Financial Instruments in the World Trade

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Abstract: - The aim of the research was to measure the impact of the COVID-19 pandemic on the dynamics of financial instruments in international trade. The study examined the dynamics of price changes and determined the impact of the COVID-19 pandemic on the price of futures contracts on the global market. The impact of the COVID-19 pandemic on the futures volatility dynamics in the global financial market was explored for major commodity groups. The least-squares method was used as the main regression testing tool, while dynamics of the indicators was assessed through graphical and trends methods. The study involves the World Bank's data for 2000-2021. The impact of the COVID-19 pandemic on the coal, natural gas, metals, beverage and food futures price on the global financial market was established and proved to be statistically significant. It was found that the pandemic had a statistically significant impact on the volatility of futures for coal, natural gas and tin on the global financial market. The futures price is being affected by the COVID-19 pandemic because of the collapse of global supply chains and countries' protectionist measures. In aggregate, this produces imbalances in the distribution of goods in the world and impedes their flow. The market is consequently responding to the restrictions imposed by the COVID-19 pandemic by raising prices. The results obtained open up new lines for research, in particular the impact of the COVID-19 pandemic on the supply and demand structure on the world commodity markets.

Key-Words: - Futures, Commodity Flows, Commodity Groups, Volatility, International Trade, Foreign Trade Financing.

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1 Introduction

The 2020-2021 crisis caused by the COVID-19 pandemic required the governments around the world to take measures to stimulate the economy. A combination of an easing monetary policy environment and the quantitative instruments of monetary policy triggered an inflationary surge worldwide [1]. Stimulating the economy with monetary measures produces such effects after each economic crisis. Inflation is spreading around the world through international trade channels. Increased inflation rate in one country entails the increased value of its exports, thus increasing its value in the international market. International financial markets trading futures contracts for various categories of goods are also involved in the inflation transmission mechanism.

The economic downturn caused by the pandemic has turned into an economic recession in some regions of the world due to the disruption of supply chains and problems with the movement of capital. The world economy has no experience of such a large-scale and all-encompassing negative factor as a pandemic, so no country in the world was

unprepared for the economic consequences of closing borders and restricting the movement of labor, financial resources, commodity flows, etc.

As a result, many countries of the world began to show signs of economic decline, which intensified and transformed into a financial crisis. The main characteristics of the economic recession were the growing deficit of state budgets in many countries around the world, the fall in GDP, and the increase in the burden on social and medical programs.

Nevertheless, the economic crisis caused by the COVID-19 pandemic has spread through several channels, which made it unprecedented. The first channel is the collapse of international supply chains. Many global supply chains have been disrupted because of lockdowns and the ban on border crossings, which led to a shortage of goods on the international market. The second channel is reduced export production caused by the reduced demand as timely delivery has become impossible. This resulted in increased prices for certain types of products on the international market. The third channel is energy prices. Rising energy prices in 2021 entailed an increased producer price index (PPI), as energy is a component of the cost of all goods without exception. Energy is used either for the production or supply of goods, while energy is used in both cases in the vast majority of consumer and industrial goods. Besides, the share of energy in the cost may be more than 50% in certain types of industrial goods, such as metal and metal products. In this case, increased cost of energy significantly results in increased cost of production. Negative expectations of rising prices also have a negative effect on the futures value. Although the negative impact of the COVID-19 pandemic on the economy is undeniable [2], [3], [4], [5], the impact of the pandemic on the dynamic changes in financial instruments in world trade requires an in-depth study. In particular, futures contracts obligating the parties to transact products in the future are the most common contacts in the financial markets. The dynamics of commodity market prices in the future with a certain time lag is determined by the futures [6], [7]. Accordingly, the aim of our study was to measure the impact of the COVID-19 pandemic on the dynamics of futures in the international financial market. The aim involved the following research objectives:

- examine the dynamics of futures prices in the global financial market for major commodity groups;
- measure the impact of the COVID-19 pandemic on the dynamics of futures prices in the global financial market for major commodity groups;
- analyze the dynamics of futures volatility in the global financial market for major commodity groups;
- determine the impact of the COVID-19 pandemic on the dynamics of futures volatility in the global financial market for major commodity groups.

2 Literature Review

Many researchers focused on the effects of the pandemic on various aspects of economic activity. A pandemic can affect both the value of commodities and the value of financial instruments in international trade, such as futures contracts, through a variety of channels. Authors [8] found a direct impact of the pandemic on the foreign trade of all the Visegrad Group countries of varying extent. The authors studied the impact of the pandemic on the volume of imports and exports of these countries in the short term only. But it is important to determine the impact of the pandemic not so much on the trade volume as on the qualitative indicators of international trade in general and on the instruments of international trade in particular.

The organization [9] report entitled The Effects of Covid-19 Pandemic on International Trade and Logistics states that the world is facing a serious problem for international trade. In addition to restricted movement of goods between countries, the pandemic also triggered rising prices on the global market. The shifts in supply and demand in the global commodity market are transmitted to the financial market. It especially affects the volatility of financial instruments that service the movement of commodity flows.

Authors [10], who evaluated the global economic effects of COVID-19, emphasized a rapid reduction in trade flows. The collapse of global supply chains was stated as the main reason, which has significantly complicated the delivery of goods from one country to another. The authors did not, however, consider the impact of the pandemic on the instruments of international commodity trade.

The organization [11] study indicates that the international trade drop caused by the pandemic has triggered a chain reaction of declining output worldwide. This has led to growth of unemployment and aggravation of the economic situation in many countries around the world. Nevertheless, the report

did not cover the effects of the pandemic on international trade instruments, although this issue is extremely important for evaluation of current trends in international trade. A study of the impact of the pandemic on financial markets and its implications [12], [13] indicates that the pandemic has significantly affected the macroeconomic conditions of the economic environment. New conditions trigger new risks, which can cause volatility in financial markets. In turn, the value of commodity futures contracts determines their future value in the market. So, the price of foreign trade instruments on the secondary market determines the value of commodities traded in international markets.

In their study of the impact of the COVID-19 pandemic and the consequent restrictions for international trade on the value of agricultural products, authors [14] stated its high volatility. Prices for agricultural products largely depend on yields that cannot be forecasted or set. The volatility increased even more in the pandemic context, according to the authors, it increased by 22% due to the restrictions imposed by the pandemic.

Authors [15] maintain that world food prices are rising due to the food shortages, even if there are no signs of a food crisis. Those shortages are caused by disruptions in food supplies; they increase cost of energy used for transportation. Besides, many countries have introduced protectionist measures to meet their own food needs because of uncertainty about the future food supplies. Such actions have intensified the agiotage around food prices, which has also contributed to rising prices. On the other hand, financial market transactions with food futures can promote redistribution of trade flows and stabilization of prices in certain regions [1], [16]. This will provide a more even distribution of food products between regions of the world and will incentivize the restoration of old supply chains or the creation of new ones.

A literature review indicated that pandemic restrictions have made international trade suffer severely. The main problem is increased cost of production caused by the failure of global supply chains. This problem is best manifested in the financial markets, where the market value of products is formed through financial instruments such as futures contracts. But the studies did not address the use of financial instruments serving international trade, which is a very important issue today. Consequently, the aim of our study is to determine the impact of the COVID-19 pandemic on the dynamics of financial instruments used in international trade.

3 Problem Solution

This research involved several stages, each accompanied by building and testing regression models. The first stage provided for analyzing the dynamics of changes in futures prices in the global financial market for major commodity groups. We determined the general trend of changes in futures prices for different commodity groups based on the data obtained. The second stage involved determining the impact of the COVID-19 pandemic on the dynamics of changes in futures prices in the global financial market for major commodity groups, and determining the statistical significance of the impact. We studied the dynamics of futures volatility for commodity groups. The final stage was aimed to determine the impact of the COVID-19 pandemic on the dynamics of futures volatility in the global financial market for major commodity groups. We used the World Bank's methodology [17] in our study to divide commodities on the international market into the following groups (Figure 1).

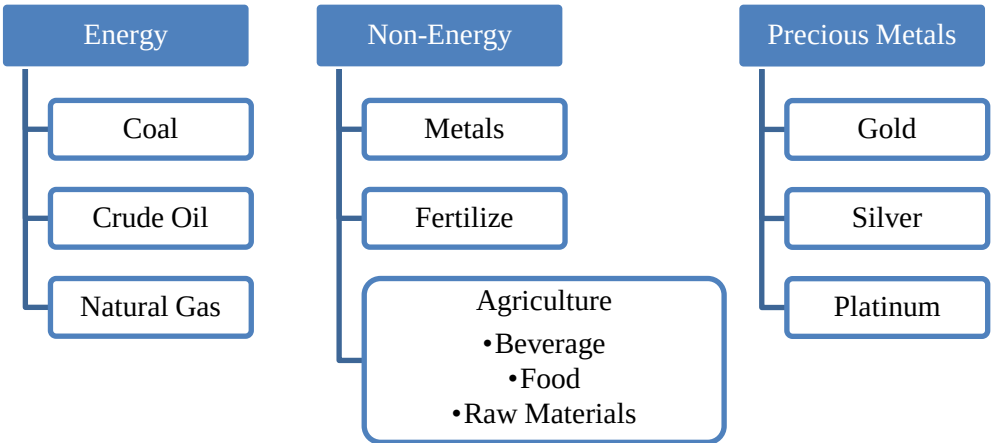

Fig. 1: Division of commodities into groups according to the World Bank's methodology

We generated initial data for the study through this approach, which included information on the value of futures contracts as of the end of trading (closing a position). The study covers the period of 2000 to 2021, involving monthly metrics in US dollars taken from the official statistical database of the World Bank on commodity markets [18]. The aim of this study was achieved through building and testing several models of the impact of the COVID-19 pandemic on futures prices:

Model 1: Dependence of futures prices on the international energy market on the COVID-19 pandemic:

$$P_{Coal}, P_{Crude\ Oil}, P_{Natural\ Gas} = f(COVID19) \quad (1)$$

where: P_{Coal} – coal futures price; $P_{Crude\ Oil}$ – crude oil futures price; $P_{Natural\ Gas}$ – natural gas futures price; $COVID19$ – pandemic factor.

Model 2: Dependence of futures prices on the international non-energy market on the COVID-19 pandemic:

$$P_{Metals}, P_{Fertilize}, P_{Agriculture} = f(COVID19) \quad (2)$$

where: P_{Metals} – metals futures price; $P_{Fertilize}$ – fertilizer futures price; $P_{Agriculture}$ – agricultural futures price; $COVID19$ – pandemic factor.

Model 3: Dependence of futures prices on the international precious metal market on the COVID-19 pandemic:

$$P_{Gold}, P_{Silver}, P_{Platinum} = f(COVID19) \quad (3)$$

where: P_{Gold} – gold futures price; P_{Silver} – silver futures price; $P_{Platinum}$ – platinum futures price; $COVID19$ – pandemic factor.

We also built and tested models of the impact of the COVID-19 pandemic on futures volatility.

Model 4: Dependence of futures volatility on the international energy market on the COVID-19 pandemic:

$$VP_{Coal}, VP_{Crude\ Oil}, VP_{Natural\ Gas} = f(COVID19) \quad (4)$$

where: VP_{Coal} – coal futures volatility; $VP_{Crude\ Oil}$ – crude oil futures volatility; $VP_{Natural\ Gas}$ – natural gas futures volatility; $COVID19$ – pandemic factor.

Model 5: Dependence of futures volatility on the international non-energy market on the COVID-19 pandemic:

$$VP_{Metals}, VP_{Fertilize}, VP_{Agriculture} = f(COVID19) \quad (5)$$

where: VP_{Metals} – metals futures volatility; $VP_{Fertilize}$ – fertilizer futures volatility; $VP_{Agriculture}$ – agricultural futures volatility; $COVID19$ – pandemic factor.

Model 6: Dependence of futures volatility on the international precious metal market on the COVID-19 pandemic:

$$VP_{Gold}, VP_{Silver}, VP_{Platinum} = f(COVID19) \quad (6)$$

where: VP_{Gold} – gold futures volatility; VP_{Silver} – silver futures volatility; $VP_{Platinum}$ – platinum futures volatility; $COVID19$ – pandemic factor.

The information was visualized through a graphical method. The trend method was applied to identify trends in the dynamics of indicators. The least-squares method was used to measure the impact of the pandemic on the resulting indicators. The source data set was formed in Microsoft Excel, while the regressions were built and tested followed by graphing in Gretl.

4 Results

We started with a description of the research results by analyzing the dynamics of energy futures prices on the global market. The energy price demonstrates positive dynamics in periods of growth of the world economy and decline during crises (Figure 2). This is evidenced by a significant drop in prices for all energy resources without exception in 2008, 2014 and 2020.

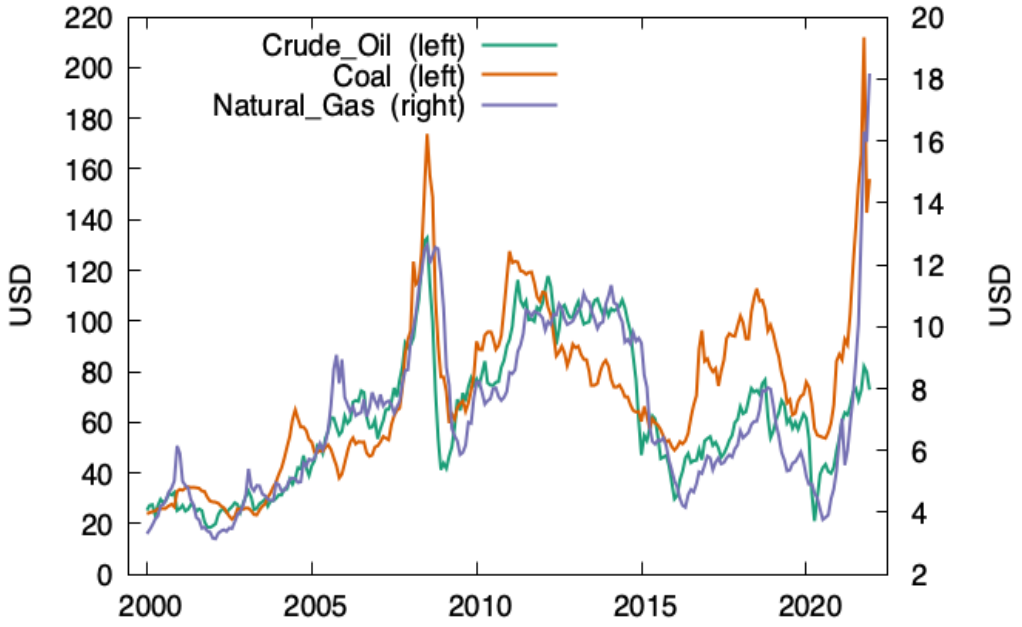

Fig. 2: Dynamics of energy futures prices on the global market

The pandemic outbreak caused a sharp drop in energy prices due to the lockdowns introduced in many countries around the world. This has significantly reduced the international migration and commodity flows. The collapse of global supply chains has led to a significantly decreased energy demand on the global market, which has entailed a price drop. However, the natural gas and coal prices increased from the second half of 2021. We analyzed the impact of the COVID-19 pandemic on the price of coal, crude oil and natural gas futures contracts in the global financial market (Table 1).

Table 1. Impact of the COVID-19 pandemic on the price of coal, crude oil and natural gas futures on the global market. Model 1 data: OLS, using observations 2000:01-2021:12 (T = 264).

Dependent variable	*Coefficient*	*Std. Error*	*t-ratio*	*p-value*	R-squared
Price Coal	27.6016	6.77670	4.073	<0.0001***	0.059548
Price Crude Oil	−7.64513	5.91279	−1.293	0.1972	0.006340
Price Natural Gas	0.253042	0.562068	0.4502	0.6529	0.000773

Model 1 data evidence that the COVID-19 pandemic had a statistically significant effect only on coal pricing, as shown by a p-value of less than 0.0001. The pandemic had no statistically significant effect on crude oil and natural gas futures prices, where the reason may be the use of energy resources, in particular oil and gas, as instruments to exert economic pressure in the international geopolitical arena. In this context, the futures price depends on the current supply volume, which yields to the demand, thus triggering a price increase. In particular, this is the case with the natural gas prices in late 2021 and early 2022 on the global market.

Next, we analyzed the dynamics of non-energy prices, in particular for the commodity groups such as metals, fertilizers and agricultural products. Figure 3 visualizes information on the dynamics of the metals futures prices on the global market.

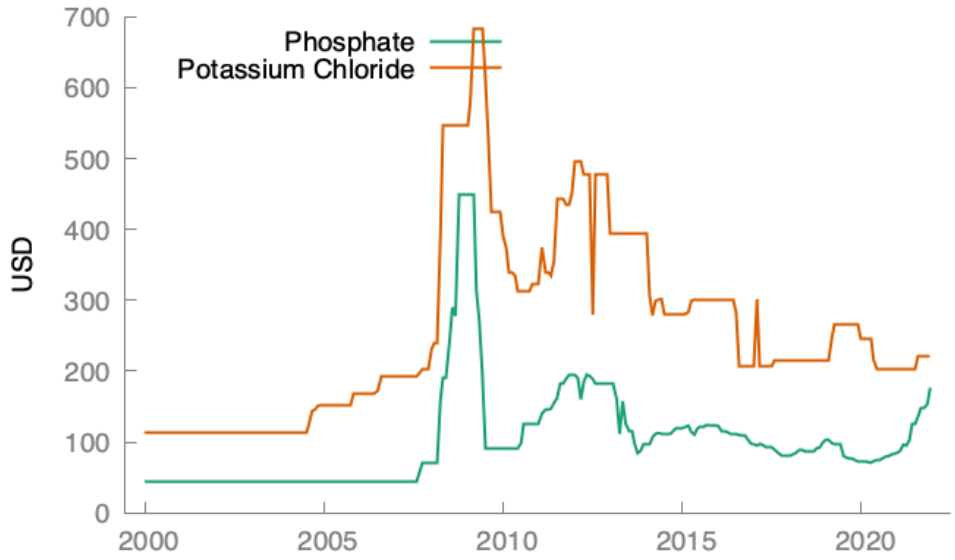

Fig. 3: Dynamics of the metals futures prices on the global market

1 In particular, metal prices had increased from the early 2000's until 2008. The economic recovery of 2010-2012 saw similar futures price increase. During the economic recession of 2008-2009, 2014-2015 and 2020, the metals futures price on the global market dropped. This is an economic trend, because the demand for finished products of industries that use metal as a raw material decreases in times of crisis. Figure 3 shows the dynamics of the fertilizer futures contract price.

The dynamics of the fertilizer price on the global market is also cyclical, depending on the world economy development phase. The increase in the fertilizer futures price is, however, determined not so much by the dynamics of demand for fertilizers, but by the cost of their production. Fertilizer demand on the global market is relatively stable, because the demand for agricultural products is stable despite economic crises. But fertilizer production requires energy, so the cost of fertilizer futures contracts depends on the cost of fertilizer production, in particular the cost of energy.

The dynamics of the agricultural futures prices is illustrated in Figure 4.

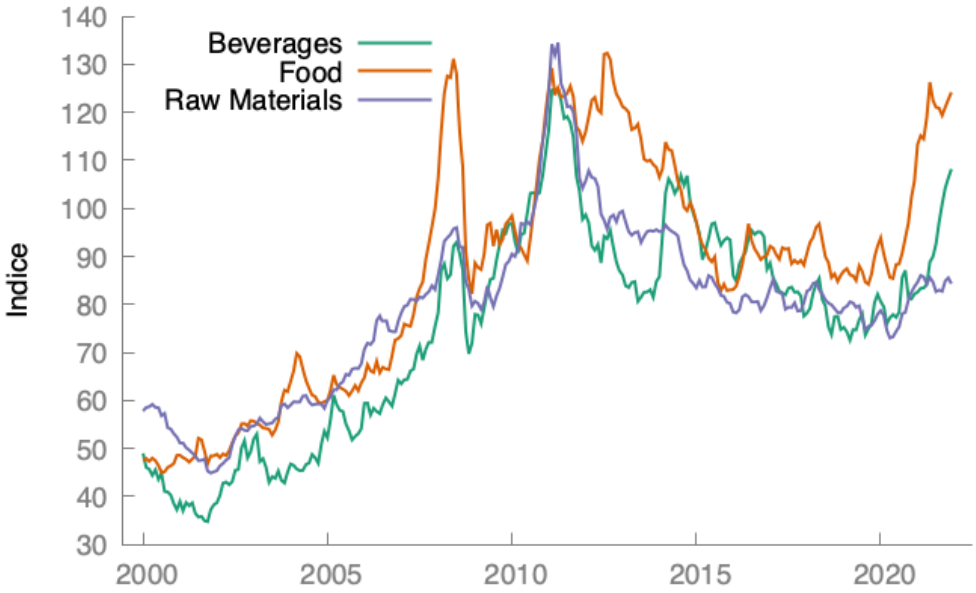

Fig. 4: Dynamics of agricultural futures prices on the global market

The price of beverage, food and raw materials futures contracts also depends on the cost of energy used for their manufacture. That is why the periods after the active energy price increase are

accompanied by simultaneous increase in price of beverages, food and raw materials futures. Besides, the collapse of global supply chains played an active role during the COVID-19 pandemic, which caused supply and demand imbalances on the global market. This resulted in the significantly increased price of this commodity group, especially of food.

We further analyzed the impact of the COVID-19 pandemic on the non-energy futures contracts (Table 2).

Table 2. Impact of the COVID-19 pandemic on the metal, fertilizer and agricultural futures prices on the global market. Model 2: OLS, using observations 2000:01-2021:12 (T = 264).

Dependent variable	*Coefficient*	*Std. Error*	*t-ratio*	*p-value*	R-squared
Metal					
Price Aluminum	174.173	90.3646	1.927	0.0550*	0.013981
Price Iron ore	51.5472	9.99847	5.156	<0.0001***	0.092104
Price Copper	2403.90	499.175	4.816	<0.0001***	0.081319
Price Lead	387.843	156.444	2.479	0.0138**	0.022920
Price Tin	10014.1	1559.01	6.423	<0.0001***	0.136055
Price Nickel	631.725	1629.24	0.3877	0.6985	0.000574
Price Zinc	691.561	168.551	4.103	<0.0001***	0.060374
Fertilizers					
Price Phosphate	−0.987750	15.8173	−0.06245	0.9503	0.000015
Price Potassium chloride	−48.3174	28.4151	−1.700	0.0902	0.010915
Agriculture					
Beverages Index	12.4528	4.68729	2.657	0.0084***	0.026233
Food Index	21.2839	5.10445	4.170	<0.0001***	0.062230
Raw Materials Index	2.09850	3.86349	0.5432	0.5875	0.001125

Model 2 regression data show that the COVID-19 pandemic had a statistically significant positive effect on all commodities other than nickel, which means that the pandemic contributed to the increase of metals futures price. Statistical significance confirms this conclusion: aluminum (p-value=0.0550), iron ore (p-value=0.0001), copper (p-value=0.0001), lead (p-value=0.0138), lead (p-value=0.0001), zinc (p-value=0.0001). These data indicate that the pandemic factor was conducive to the decreased global demand for metals.

The pandemic had no statistically significant effect on the futures contract price for the fertilizer commodity group. This may be caused by a stronger factor — the cost of energy resources. The pandemic had a statistically significant effect on the beverage and food futures price. The evidence is the corresponding p-value of 0.0084 for beverages and 0.0001 for food. At the same time, the pandemic contributed to rising prices for these goods.

The results of testing the model of the COVID-19 pandemic impact on non-energy commodities show a significant impact of the pandemic on metals and agricultural products. The pandemic was conducive to increasing prices for these commodities, primarily because of the failure of global supply chains, resulting in supply and demand imbalances. Besides, increasing the cost of energy also exert additional pressure on the futures price for these commodity groups. We analyzed the dynamics of precious metals futures prices on the global market (Figure 5).

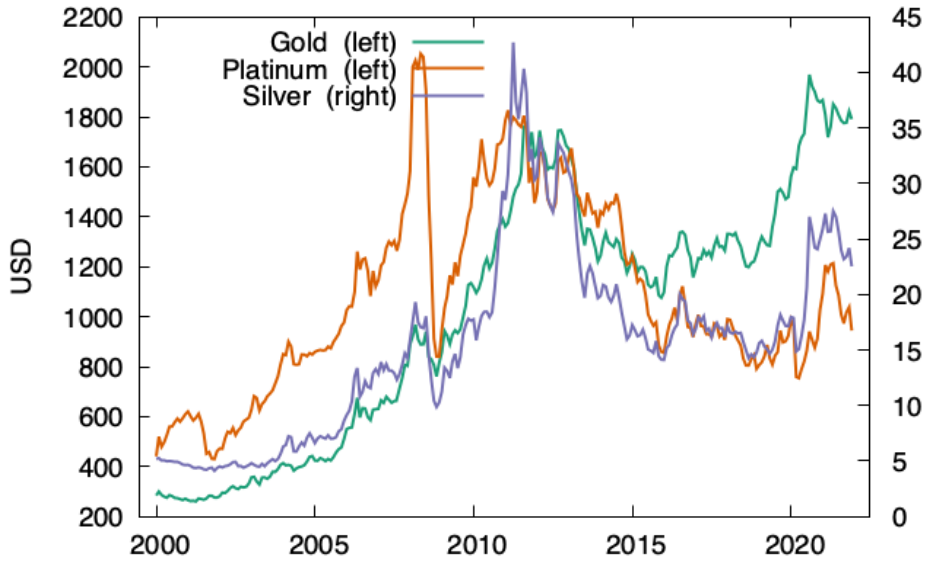

Fig. 5: Dynamics of agricultural futures prices on the global market

The data of Figure 6 show that there is a correlation between precious metals futures contract prices depending on the world economy development stage, as in the case of energy and non-energy commodities. A peculiar feature is the greatest dynamics of futures change observed for platinum, and the smallest — for gold. Gold is a classic tool for hedging financial risks, so the gold futures price is the least prone to rapid changes. Moreover, gold is a banking metal used to maintain the reserves of central banks around the world. This factor also affects the dynamics of its value during crises.

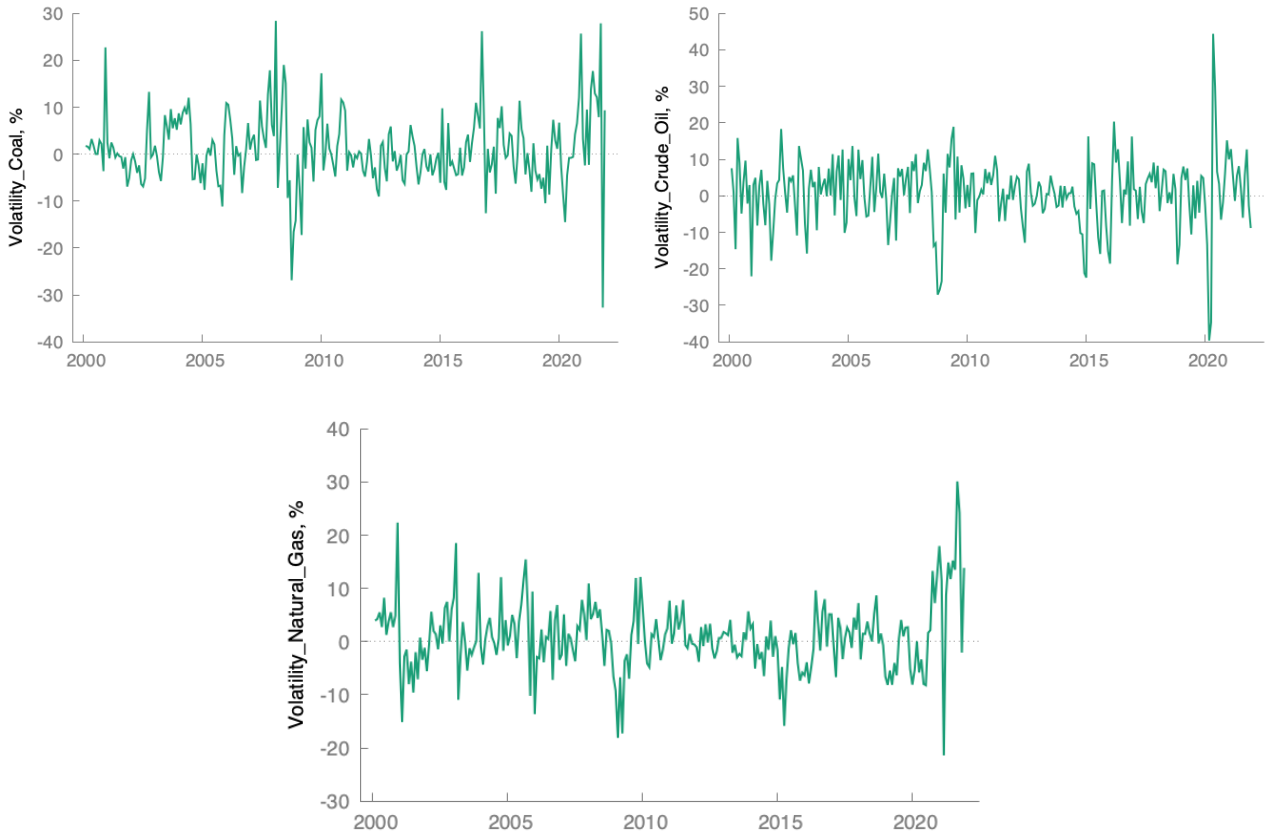

Fig. 6: Volatility of energy futures prices on the global market

We further analyzed the impact of the COVID-19 pandemic on the precious metals futures contract price on the global market (Table 3).

Table 3. Impact of the COVID-19 pandemic on the gold, platinum and silver futures prices on the global market. Model 3: OLS, using observations 2000:01-2021:12 (T = 264).

Dependent variable	*Coefficient*	*Std. Error*	*t-ratio*	*p-value*	R-squared
Price Gold	850.309	95.2790	8.924	<0.0001***	0.233122
Price Platinum	−100.404	80.7118	−1.244	0.2146	0.005872
Price Silver	7.91796	1.76351	4.490	<0.0001***	0.071446

Model 3 data demonstrate a significant impact of the COVID-19 pandemic on the gold and silver futures prices. The pandemic was conducive to the increased price of these metals on the global market, as evidenced by p-value of 0.0001 for gold and 0.0001 — for silver. But the platinum prices were not significantly affected by the pandemic.

On the global financial markets, not so much the price as price volatility is an important parameter of commodity prices, which are mainly represented by the futures contract prices. Price volatility describes the long-term market trend towards the stable price dynamics. Accordingly, the higher the price volatility of a particular commodity, the higher the risk of financial instruments related to that commodity, including futures contracts. So, we further analyzed the volatility of futures contracts for different commodity groups.

The data of Figure 6 demonstrate significant volatility in the energy futures contract prices. Price volatility exceeds 20%, which is quite a high figure. Besides, if we analyze the pandemic period, in 2020-2021 the maximum differences in the coal, crude oil and natural gas futures price reach from +30% to -20-30% for coal and natural gas, and from +50% to -40% for crude oil. Such rapid fluctuations in the futures prices spread uncertainty in the financial market, thus leading to a persistent volatility, as all participants try to compensate for such differences by setting a high price. Next, we analyzed the impact of the COVID-19 pandemic on the volatility of the value of coal, crude oil and natural gas futures contracts (Table 4).

Table 4. Impact of the COVID-19 pandemic on the volatility of coal, crude oil and natural gas futures on the global market. Model 4: OLS, using observations 2000:01-2021:12 (T = 264).

Dependent variable	*Coefficient*	*Std. Error*	*t-ratio*	*p-value*	R-squared
Volatility Price Coal	3.46634	1.60097	2.165	0.0313**	0.017644
Volatility Price Crude Oil	1.35433	2.01413	0.6724	0.5019	0.001729
Volatility Price Natural Gas	5.29377	1.36619	3.875	0.0001***	0.054397

Model 4 data indicate a statistically significant impact of the pandemic factor on price volatility for coal and natural gas futures contracts. The p-value 0.0313 for coal futures and 0.0001 for natural gas futures confirm the above. At the same time, there is no statistically significant impact of the pandemic on the crude oil futures prices on the global market.

We further analyzed the dynamics of price volatility for metals futures contracts on the global market (Figure 7).

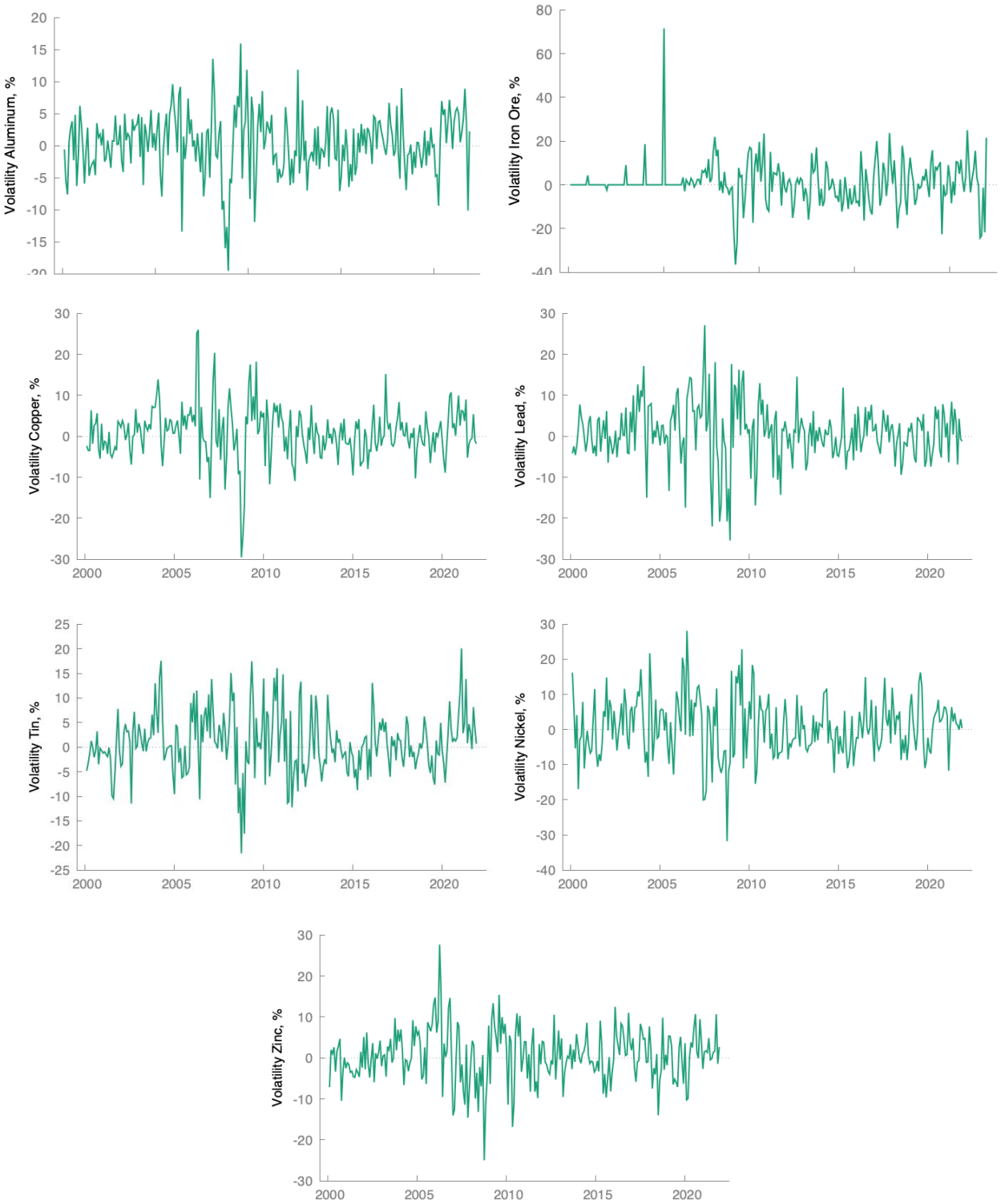

Fig. 7: Volatility of metals futures prices on the global market

The data of Figure 8 indicate the high volatility of the metals futures contract prices during global economic downturns. In particular, the period 2008-2009 was characterized by high volatility, when metals demand dropped significantly on the global market. According to the charts, the global market didn't see any abnormal spikes in the volatility of the metals futures contract prices in 2020-2021. Figure 9 shows the volatility of the fertilizer futures contract prices on the global market.

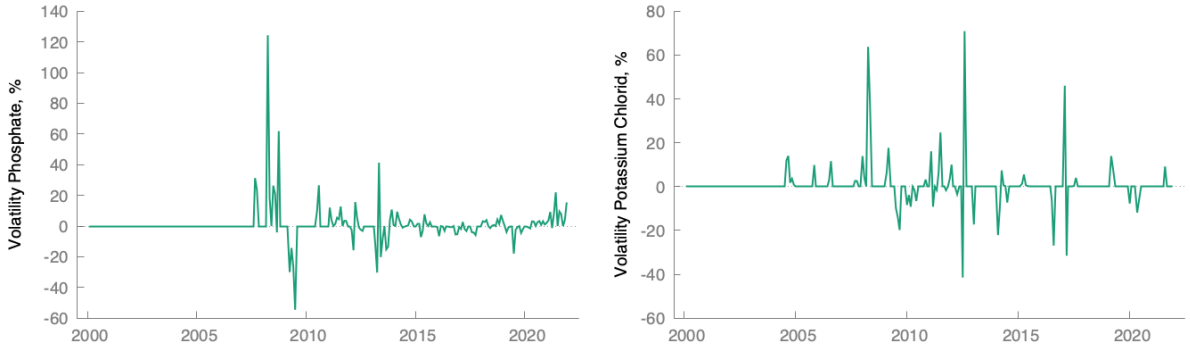

Fig. 8: Fertilizer futures contract prices on the global market

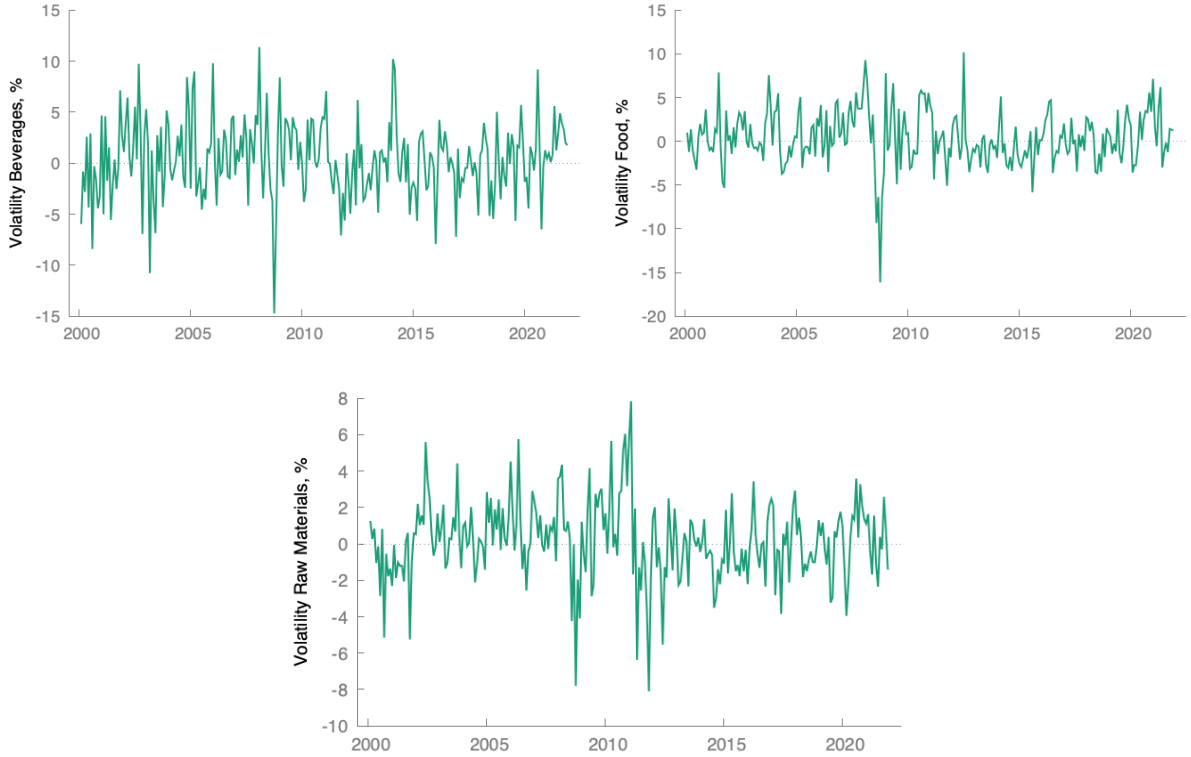

Fig. 9: Volatility of the agricultural futures contract price on the global market

The data of Figure 9 demonstrate almost no fertilizer price volatility throughout periods of economic growth in the world economy. The only exceptions were the periods of crises of 2008 and 2011. In general, we can state that the market for fertilizer futures contracts on the global market is not volatile. Figure 9 illustrates the volatility of the agricultural futures contract price on the global market.

Figure 9 illustrates high volatility of the beverage and raw materials futures prices, which is typical not only for periods of economic downturn. Food futures with fluctuations averaging 10% showed slightly less volatility. Table 5 contains a detailed analysis of the impact of the COVID-19 pandemic on the non-energy futures prices.

Table 5. Impact of the COVID-19 pandemic on the volatility of metals, fertilizer and agricultural futures prices on the global market Model 5: OLS, using observations 2000:01-2021:12 (T = 264).

Dependent variable	*Coefficient*	*Std. Error*	*t-ratio*	*p-value*	R-squared
Metal					
Volatility Price Aluminum	1.74595	1.02321	1.706	0.0891	0.011033
Volatility Price Iron Ore	0.827845	2.09176	0.3958	0.6926	0.000600
Volatility Price Copper	1.32417	1.34947	0.9813	0.3274	0.003676
Volatility Price Lead	0.0745767	1.49759	0.04980	0.9603	0.000010
Volatility Price Tin	3.04797	1.30833	2.330	0.0206**	0.020371
Volatility Price Nickel	1.07103	1.79377	0.5971	0.5510	0.001364
Volatility Price Zinc	1.32906	1.37396	0.9673	0.3343	0.003572
Fertilizers					
Volatility Price Phosphate	3.13397	2.45050	1.279	0.2021	0.006228
Volatility Price Potassium Chloride	−1.43663	1.91411	−0.7505	0.4536	0.002154
Agriculture					
Volatility Beverages Index	0.916040	0.795709	1.151	0.2507	0.005052
Volatility Food Index	0.964756	0.664179	1.453	0.1475	0.008019
Volatility Raw Materials Index	0.194339	0.466689	0.4164	0.6774	0.000664

The metrics in Table 5 demonstrate that the COVID-19 pandemic had a statistically significant impact on the volatility of tin futures prices only among all non-energy commodities, which is confirmed by the p-value of 0.0206. The pandemic had no significant impact on volatility for all other commodities. Therefore, volatility is caused by other factors that are not taken into account in this model. Figure 10 shows data on the dynamics of volatility of precious metals futures contract prices on the global market.

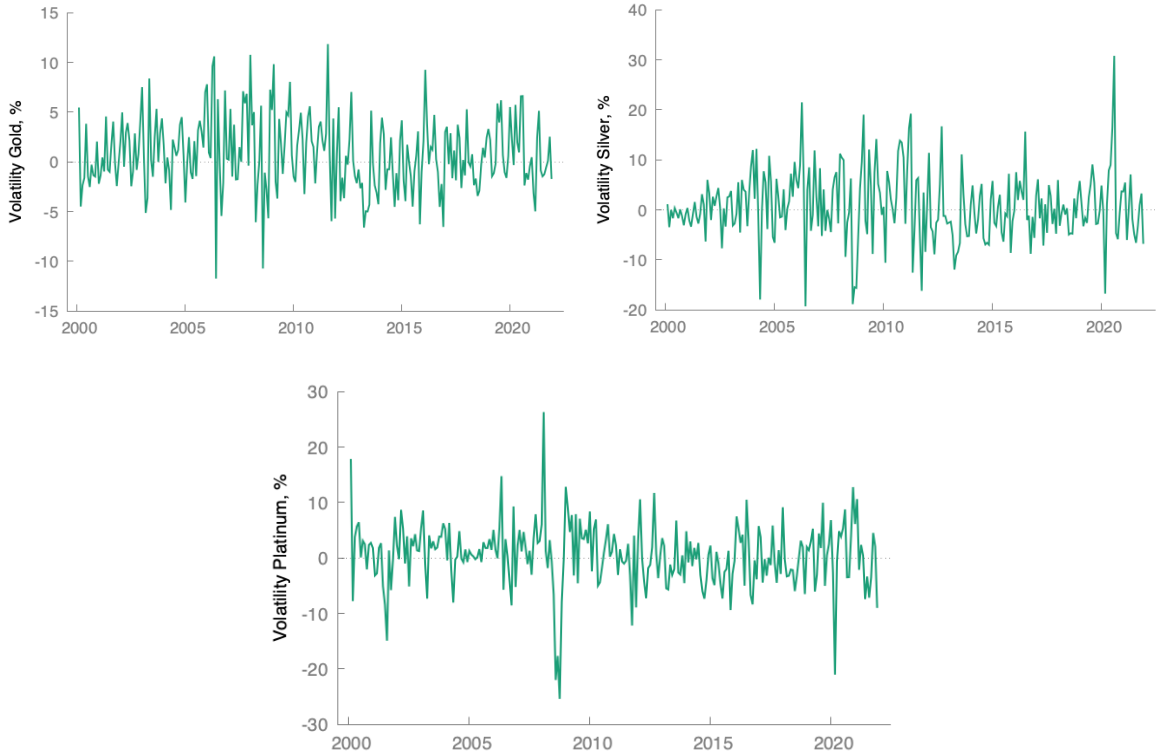

Fig. 10: Volatility of precious metals futures contract prices on the global market

The charts of Figure 10 show relatively stable volatility of gold futures prices ranging within 10%, as well as platinum and silver futures prices — within 20%. There were peak volatility values in the periods of economic downturn as for other commodities, but they got out of the general trend. Table 6 provides a detailed analysis of the impact of the COVID-19 pandemic on the volatility of the

precious metals futures contract price on the global market.

Table 6. Impact of the COVID-19 pandemic on the volatility of gold, platinum and silver futures prices on the global market. Model 6: OLS, using observations 2000:01-2021:12 (T = 264).

Dependent variable	*Coefficient*	*Std. Error*	*t-ratio*	*p-value*	R-squared
Volatility Price Gold	0.0862393	0.788620	0.1094	0.9130	0.000046
Volatility Price Platinum	−0.109266	1.23811	−0.08825	0.9297	0.000030
Volatility Price Silver	0.810163	1.47026	0.5510	0.5821	0.001162

The data shown in Figures 6-10 allow you to assess the volatility of prices for different groups of goods on the international market. Comparing the peak periods of volatility with the peaks of the outbreak of the pandemic allows a better understanding of the impact of the pandemic on international trade and the role of financial instruments in minimizing risks. Model 6 metrics show that there is no statistically significant impact of the pandemic on the volatility of precious metals futures contract prices. This indicates that the prices for precious metals were relatively stable on the global market; price stability is not crisis-dependent in the long run.

5 Discussion

Authors [19] studied the effect of the pandemic on the use of financial instruments and found that changes in financial quotations during the 2020 economic downturn were much greater than during previous crises. The authors emphasize with their finding that the COVID-19 pandemic has no analogues. Our study also confirms the high volatility of futures on major commodity groups that are objects of international trade.

Many countries impose restrictions on the export of agricultural products to meet their own food needs. For example, Kazakhstan banned the export of wheat flour and other food commodities in March 2020 [20]. International commodity trade volumes reduced by 8%, trade in commercial services — by 21% year-over-year 2020/2019 because of the quarantine restrictions imposed by the COVID-19 pandemic. The total exports volumes reduced by 7.7% and exports of industrial goods — by 5.2% in 2020. Besides, the reports of international organizations emphasize a significant reduction in international trade volumes because of the pandemic [21], [22], [23]. This resulted in the increased futures volatility on the global market, as evidenced by our research results. We found that the pandemic factor is one of the reasons underlying the financial futures volatility.

Commodity price fluctuations on the international market are an important factor in the macroeconomic environment of countries that are dependent on the export of certain commodities [24]. For example, oil-producing countries are dependent on the price of oil on the global market [25]. The price volatility for their export commodities can have quite unpredictable consequences for such countries. Our study confirms this finding, as futures for certain commodities (such as metals, coal and natural gas) are experiencing an increasing volatility because of the pandemic.

According to authors [26], the COVID-19 pandemic made the interdependence of financial markets of different countries even more acute. Besides, the authors found that the stock market and the gold market are more popular and attractive than the crude oil market, especially during the COVID-19 crisis. These findings are explained by decreasing oil demand during crises, which results in a decreased investment attractiveness. Our research confirms these findings, as we established that the pandemic did not have a significant impact on precious metals futures.

The organization [27] notes some financial markets maintain pro-cyclicality. Those markets are characterized by increased asset demand when it declines on other markets. We also indicated that in our research, as the pandemic has made significant changes in global supply chains, entailing shifts in commodity flows. Authors [28] write that global financial markets have experienced significant volatility since the onset of the pandemic crisis. This effect was mainly caused by the pessimistic investor sentiments and the increasing number of confirmed Covid-19 cases. This research did not take into account the number of Covid-19 cases, but the obtained results prove the importance of the pandemic factor for the futures price on the global financial market.

Authors [29] studied overturning crisis developments between the financial markets of different countries exemplified by China’s

economy. The authors found that China's financial market started to suffer negative effects just days after China's official announcement of an outbreak of the pandemic. The spread of crisis developments over other financial markets around the world was the secondary effect. The authors emphasize that the spread of volatility caused by the COVID-19 pandemic is stronger than that caused by the pandemic of influenza of different strains [30]. The same effects of the COVID-19 pandemic on the rate of turbulence in financial markets are reported by the authors of other studies [31], [32], [33], [34].

The results that we obtained in this study also confirm the statistical significance of the pandemic for the most important commodity groups for the world economy — energy and metals. So, our study confirms the significant impact of the pandemic on the world economy, and details the pandemic's contribution to futures volatility for major commodity groups in the global market.

6 Conclusion

The COVID-19 pandemic has undermined global supply chains, thus entailing a rapid rise in prices on the global commodity market. The pandemic has also affected the price of futures contracts as the main financial instrument for international trade. The aim of the study was to measure the impact of the COVID-19 pandemic on the dynamics of financial instruments in world trade. The results of our study demonstrated that the pandemic had a statistically significant impact on the price of the following commodities on the world market: coal, all metals except nickel, beverages, food, gold and silver. We also found that the pandemic had a significant impact on the volatility of futures prices for the following commodity groups: coal, natural gas, and tin. We also established that the pandemic had a significant impact on the volatility of futures prices for the following commodity groups: coal, natural gas, and tin. The obtained results show that the COVID-19 pandemic had a significant impact on increased prices for the major commodity groups that represent competitive markets. Nevertheless, the pandemic had no impact on pricing or price volatility of crude oil futures. The reason is that oil is often used as an economic tool of confrontation in the geopolitical arena, so the price is set on the basis of political factors, not on the basis of supply and demand in the global market. The results obtained can be used in the analysis of the dynamics of futures contracts for different commodity groups. The research findings can be used to develop macroeconomic arrangements in order to respond to crises in the world economy and to forecast futures price vectors. This study opens up new lines of research, in particular the impact of the COVID-19 pandemic on the supply and demand structure in global commodity markets.

The obtained results are interesting because they demonstrate financial instruments' ability to minimize the pandemic's impact on international trade. The practical aspects of the obtained results are that using the received data, companies can use them in developing strategies for foreign economic trade operations in terms of developing appropriate tools for minimizing risks due to outbreaks of the coronavirus pandemic.

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