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Gold and Bitcoin Price Dynamics as a Reflection of Investor Sentiment

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Article Info	Abstract
	The modern pandemic affects all areas of human activity. In this regard, various aspects of the preservation of economic activity become fundamental. One of these issues is the choice of an investment strategy, the choice of investment instruments. To do this, we examined the mutual dynamics of gold and bitcoin prices during the pandemic. For the analysis we use the wavelet coherence methodology. This made it possible to substantiate some strategies and the choice of investment instruments.

Introduction

The dynamics of changes in the modern world is constant and may depend on many factors. These factors can be determined by both human actions and the impact of nature on a person. One of these factors is the development of a pandemic, which is associated with the SARS-CoV-2 virus (Barcaccia et al, 2020; Johnson et al., 2020). The COVID-19 pandemic has affected all areas of human activity. At the same time, the most negative impact of the COVID-19 pandemic has on the economic sphere of activity (Mustafa et al., 2020; Vasiurenko et al, 2020; Baranova et al, 2020). As a consequence, such an impact affects the development of interstate relations, trade, culture, and the level of human life.

As a result of the development of the COVID-19 pandemic, certain areas of economic activity are closed (Costa Dias et al, 2020), there is a change in the dynamics of prices for basic energy resources (Mustafa et al., 2020), prices for precious metals (Baranova et al, 2020) and other types of raw materials (Balleer et al, 2020). Thus, certain types of economic activities are not a priority for investors in the short term. This makes investors look for new areas of investment, new investment instruments. All of the above leads to a global rethinking of economic development, redistribution of financial flows, and the development of new forms of investment.

Nevertheless, the development of new forms of investment and the redistribution of financial flows must be based on careful research. It is advisable to conduct these studies using various methods and approaches that allow for appropriate analysis and reveal various trends. We

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consider some of these issues in our work. At the same time, we chose the dynamics of prices for gold and bitcoin as an object of research.

Brief Overview of the Research Topic

First of all, it should be noted that gold and bitcoin are some of the attractive tools for investors. Gold is traditionally used by investors to save their funds in a crisis of economic development. Bitcoin is a relatively new investment tool that is actively developing and used in the context of the transition to the digital economy.

G.Tuna is conducting a study examining the role of gold as a safe investment vehicle (Tuna, 2017). To do this, the author reveals a causal relationship between the price of gold and the price of oil. The author showed that the analysis of such a relationship is of concern both with positive and negative shocks, as well as during periods of important economic, social or political events (Tuna, 2017). Therefore, in a pandemic, analyzing the dynamics of gold prices is an important task. Of particular importance, such an analysis is important to investors. The role of gold in the development of the COVID-19 pandemic and the use of gold as a tool to reduce the risks of oil and stock markets is discussed in the work (Adekoya et al, 2020). The authors conclude that investors in the short term can find protection in investments in gold from falling oil prices and stock indices.

Vanitha and Saravanakumar (2019) analyze general issues of the use of gold, where the focus is on the investment attractiveness of gold. The authors also consider the issues of hedging risks when using gold; using gold prices as an indicator to determine the level of long-term inflation. This is an important point for investors in determining their strategies in the gold market.

Brabenec et al., (2020) petras investigate various aspects of gold price dynamics (Brabenec et al., 2020). At the same time, special attention is paid to the issues of the future development of gold prices. The authors investigate various time series balancing models that reflect the dynamics of gold prices. Brabenec et al (2020) note the cyclical nature of the dynamics of gold prices. However, this cyclicality may change as a result of the development of the current COVID-19 pandemic. The role of bitcoin and its ability to be an investment tool are considered in work (Stensås, et al, 2019). The authors analyze what is better for bitcoin: a diversification tool, a hedging tool, or a tool for investors. At the same time, the article emphasizes that bitcoin is important for all participants in the financial market who are looking for protection from market shocks and downward movements (Stensås et al, 2019). It was also concluded that bitcoin is useful for investment. Jang et al (2019) compare bitcoin with other investment instruments, highlighting the attractiveness of bitcoin. The authors also show that bitcoin is closely related to various asset market instruments. This underlines the importance of bitcoin as an investment tool. Koçoğlu et al (2016) consider such properties of bitcoin as efficiency, liquidity and volatility. The authors conclude about the importance of bitcoin in the field of investment. At the same time Koçoğlu et al (2016) emphasize the need for new research to determine the role of bitcoin as an investment tool.

The article by Kwon (2020) examines the classification of bitcoin as a currency, commodity or investment asset. It analyzes the prices of bitcoin, gold and stock market indices. The author shows that bitcoin is part of a time-varying investment opportunity. It is also concluded that bitcoin is an alternative to medium of exchange and investment (Kwon, 2020).

Thus, it should be noted that there are many works in which an essential analysis of behavior in the bitcoin and gold market, the dynamics of prices for gold and bitcoin is carried out. The authors emphasize the importance of using gold and bitcoin as an investment vehicle. At the

same time, it is noted that new studies are needed that reveal the possibilities of gold and bitcoin in special conditions. Such conditions may be the pandemic that humanity is experiencing at the present time. At the same time, as a research tool, we propose to use the wavelet coherence as a new location for analysis (Mustafa et al., 2020; Baranova et al, 2020).

Wavelet Coherence as an Analysis Tool

To study relationships, the concept of correlation is used (Kuzeminet al, 2005; Dobrovolskaya&Lyashenko, 2013). Correlation allows you to assess the level of connection between different data that is being investigated. As a rule, such data is a time series describing individual parameters of a phenomenon or process that are being investigated. If the level of communication between data is higher, then the dependence between this data is higher. These values can be used by investors to assess decision making.

Wavelet coherence is used to estimate the levels of relationship between data series in the time plane (over time) and frequency plane (taking into account such relationships between different time periods).To implement wavelet coherence, the concept of cross wavelet spectra is used. Suppose we have two series of data $f(t)$ and $z(t)$ then we can determine the wavelet coherence (Torrence& Webster, 1999;Vasiurenko et al, 2020):

$$R^2(a,b) = \frac{\left|S(a^{-1}V_{fz}(a,b))\right|^2}{S(a^{-1}|V_f(a,b)|^2)S(a^{-1}|V_z(a,b)|^2)}, \qquad (1)$$

where: $V(a,b)$ – values of cross wavelet spectra; a – determines the size of the wavelet and is called the scale, b – specifies the temporal localization of the wavelet and is called a shift (the abscissa is the wavelet shifts (time axis – t), the ordinate is the scale; abscissa is the variable that displays the data number in the series under investigation and ordinate is the variable that displays the depth of cross-links for a time series); S – is a smoothing operator; $R^2(a,b)$– the squared wavelet coherency coefficient. $0 \le R^2(a,b) \le 1$. If these values tend to zero, then we have a weak correlation. Otherwise, we have a strong correlation (Torrence& Webster, 1999).

Results and Discussion

For analysis, we will consider the data on the dynamics of prices for gold and bitcoin in the period from 22.01.2020 to 01.11.2020. This is the period of development of different phases of the COVID-19 pandemic, which is associated with the impact of the SARS-CoV-2 virus. Figure 1 shows the dynamics of the COVID-19 pandemic.

This data reflects the dynamics of diseased peoples (summarized data from the site https://www.who.int/emergencies/diseases/novel-coronavirus-2019 that is presented on a cumulative basis).
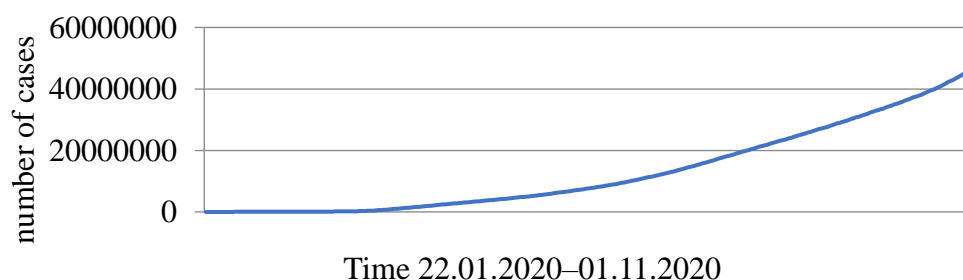

Time 22.01.2020–01.11.2020

Figure 1. Dynamics of the total number of confirmed cases of the COVID-19 pandemic (cumulative total)

Figure 2 shows the dynamics of gold prices in the period from 22.01.2020 to 01.11.2020.
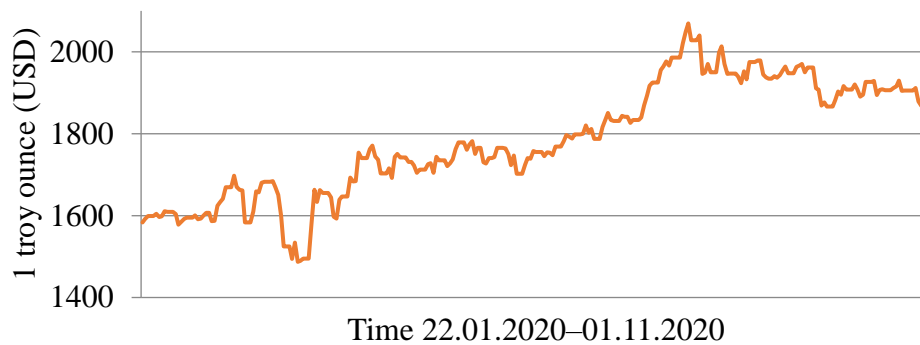

Figure 2. Dynamics of gold prices in the period from 22.01.2020 to 01.11.2020

Figure 3 shows the dynamics of bitcoin prices in the period from 22.01.2020 to 01.11.2020.
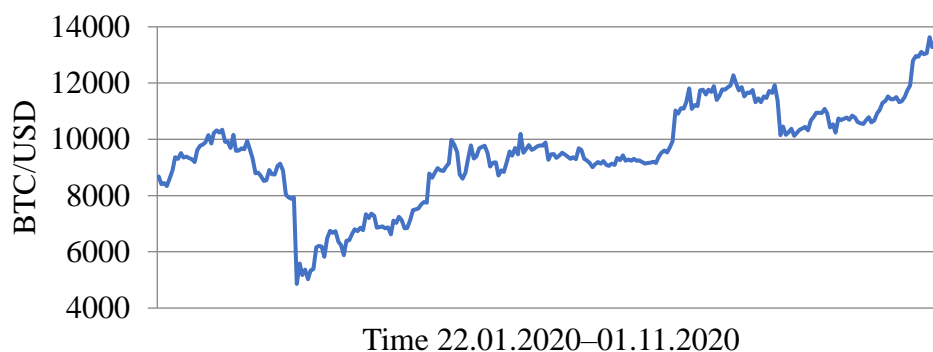

Figure 3. Dynamics of bitcoin prices in the period from 22.01.2020 to 01.11.2020

We see that the dynamics of the pandemic is positive and rapidly increasing. The dynamics of gold and bitcoin prices are variable. We can observe both periods of rising prices for gold and bitcoin, and periods of falling prices for gold and bitcoin. This happens in accordance with those measures that affect economic activity. At the same time, the general dynamics of prices for gold and bitcoin is increasing over the period of time that we are studying.

It should also be noted the difference in the dynamics of prices for gold and bitcoin. There are times when the price of gold rises and the price of bitcoin declines. There are periods of time when exactly the opposite happens. This is important in choosing an investment instrument. At the same time, it should be noted that in the last periods of time from the studied interval, the price of bitcoin increases sharply, and the price of gold tends to decrease. This means bitcoin is a more attractive instrument.

It is important to emphasize that gold is not only an investment tool, gold is also a commodity. But the demand for goods is falling, therefore, the price of gold as a commodity tends to decline. Bitcoin is more of an investment vehicle, so the price of Bitcoin is going up. Ultimately, this determines the behavior of investors. This is the basis for choosing a strategist when investing.

The mutual dynamics of the price of gold and the price of bitcoin is presented in Figure 4. The data in Figure 4 clearly represents the mutual price change, which was mentioned above.
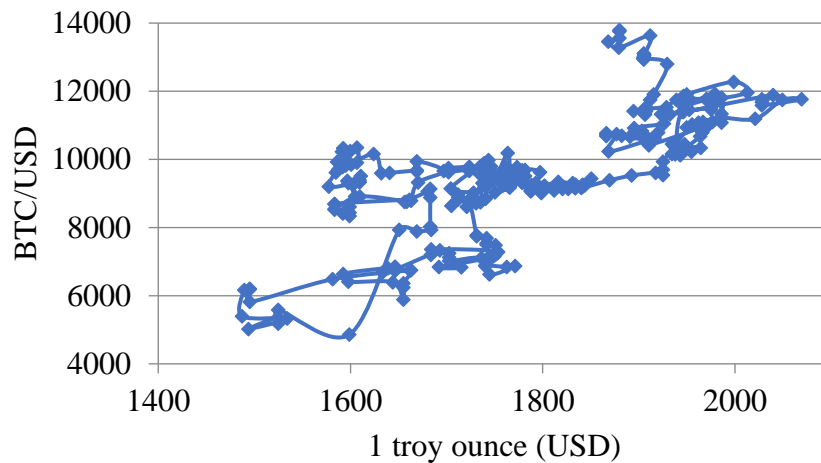
Figure 4. The mutual dynamics of the price of gold and the price of bitcoin

From the data in Figure 4, it can be seen that recently, with the rise in the price of bitcoin, the price of gold has been decreasing. We will conduct a more detailed analysis using the wavelet coherence methodology. Figure 5 shows the values of the wavelet coherence between the data that reflect the dynamics of the COVID-19 pandemic and the dynamics of gold prices (Figure 5a), as well as the dynamics of the COVID-19 pandemic and the dynamics of bitcoin prices (Figure 5b).

First of all, it should be noted that we see fragmentary consistency between the data series that are being investigated. This generally speaks of the ambiguity of the conclusions of various authors regarding investing in gold or bitcoin. But in this aspect, it is also necessary to take into account the fact of the government's influence on the development of the COVID-19 pandemic. This forms a kind of shocks, which affects the dynamics of prices for gold and bitokin.

a)   b)
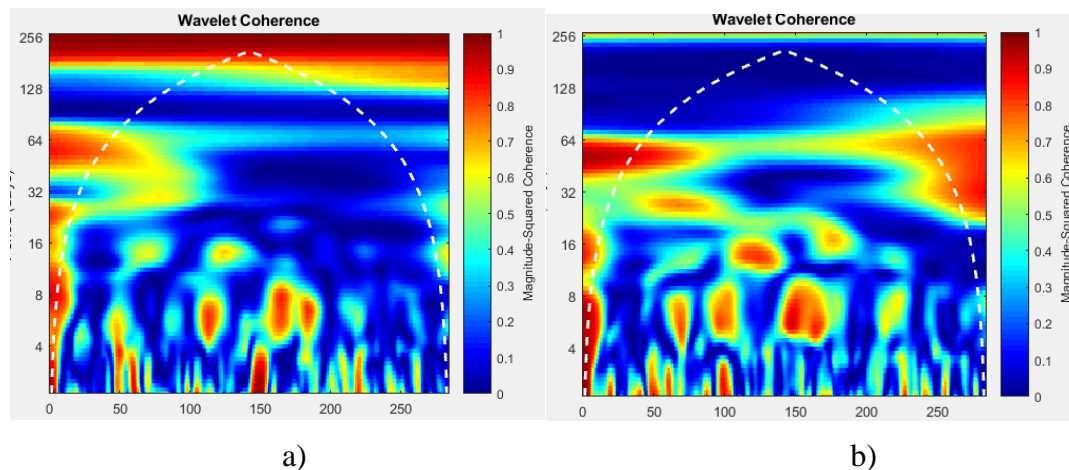
Figure 5. Values of the wavelet coherence between the data that reflect: the dynamics of the COVID-19 pandemic and the dynamics of gold prices (a); the dynamics of the COVID-19 pandemic and the dynamics of bitcoin prices (b)

It should also be said that the fragmented consistency between data that reflects the dynamics of the COVID-19 pandemic and the dynamics of gold prices is more significant than for the same data in terms of Bitcoin prices. This underlines the great attractiveness of bitcoin as an investment vehicle.

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It is also important to note the depth of fragmentary consistency between the data being examined. In this aspect, the depth of consistency in terms of bitcoin prices is higher than for gold prices. Thus, this fact can be used when choosing a strategy for investing in one or another instrument: gold or bitcoin. Based on the data in Figure 5, you can invest in gold and bitcoin in the short term. In the medium term, it is advisable to invest in bitcoin.

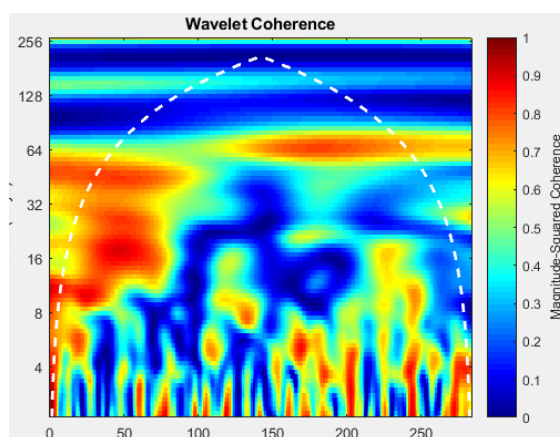Figure 6 shows the wavelet consistency values between the gold price and the bitcoin price.

Figure 6. Wavelet consistency values between the gold price and the bitcoin price

Using the data in Figure 6, you can adjust the investment strategy. Where the consistency between the price of gold and the price of bitcoin is deepest, it should be the same to choose gold or bitcoin for investment. If the depth of consistency between the price of gold and the price of bitcoin is minimal, it is advisable to choose bitcoin as an investment vehicle. This is completely determined by what was discussed above, in particular, see the data in Figure 5 and Figure 4.

Conclusion

The paper considers various aspects of the mutual dynamics of the price of gold and the price of bitcoin. First of all, the work focuses on the choice of an investment instrument and investment strategy. We are looking at the development period of the current COVID-19 pandemic. For the analysis we use statistical data visualization methods and wavelet coherence methodology. The expediency of using wavelet coherence for analyzing the joint dynamics of prices for gold and bitcoin is shown. Real data considered. Conclusions are made about the choice of investment strategy.

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