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## **INVESTIGATION OF THE CO-MOVEMENT TRENDS IN THE PRICE DYNAMICS IN THE PRECIOUS METALS MARKET**

### **Abstract**

Current trends in developing global economic emphasize the unresolved issues of financial activity. In the modern world the economic situation increasingly depends on the market of precious metals, which in fact becomes an alternative to currency reserves. The market of precious metals occupies one of the leading places in the global economy, because possession of such resources is a significant advantage for any country. The conditions of the constant dynamic development of the global economic situation have a significant impact on the constant changes in the international market of precious metals, where global factors only strengthen fluctuations in the main segments of the market, including the gold market, which has a multi-faceted purpose from monetary, which is a part of the gold and foreign exchange reserves of the world's countries, to the esthetic.

Trading of futures of precious metals grows in popularity among investors every year. This is a separate independent area of economic activity, which allows, taking into account the high volatility in the segment of precious metals, to multiply the deposited money. These arguments explain the increasing interest of equity investors in precious metals commodities during crisis periods especially such as the recent one induced by the global outbreak of coronavirus (COVID-19).

**Keywords:** precious metals market, market relations, economic assets, wavelet analysis, economic development.

### **Introduction**

The market of precious metals is an important factor for efficient functioning of the global economy. The modern world market of precious metals is a developed structure

of global constant trade in physical metal and its alloys. The market uncertainty induced by COVID-19 pandemic made investors and portfolio managers search for safe-haven assets, such as precious metals, to include in their portfolios.

The precious metals exchange is a segment of the market that trades by means of open sale and purchase, regulates and unifies the resources market, and is also a certain indicator of the economy. International markets of given metals are a set of separate trading points, which are specialized on making agreements on purchase and sale of precious metals. In order for all participants of the precious metals market to be comfortable, they are quoted in several currencies, but mainly in U.S. dollars.

### **Literature review**

One of the widest and most important areas of research in economic practice is the analysis of various time series. A characteristic feature of such series is the sequence of observations on the studied objects in time. Such time series can be the annual inflation rate, the annual volume of fuel sales or other types of goods, currency exchange rates.

The notion of wavelets can be meaningfully translated as "splash", "small (short) twist", similar to the French word "ondelette". Research with the help of wavelets has appeared recently - in the 80s of the last century. The term itself was introduced by A.Grossman & J.Morlet in their article published in 1984. They investigated seismic signals using a wavelet basis. This work laid the foundation for further research and future use of wavelet analysis. Later this method of analysis was used in the processing of numerical series of physical and geophysical observations. Wavelet analysis is also widely used in processing of large amounts of information and digital signal processing, stock market forecasting, filtration of electrocardiographic data, synthesis of signals of different structures. Wavelet analysis significantly expands the instrumental nature of information processing technologies.

### **Purpose**

The purpose of this work is to explore dependency between different precious metals, such as gold, platinum, silver and US dollar index, their impact on each other market with the help of different methods of wavelet-analysis.

## **Methodological approach and discussion**

Using wavelet analysis, it is possible to find out regularities between the time series chosen for research, as well as to study in details how these indicators at different frequencies and how this this interaction changes over the studied period and at different time scales.

The database consists of four time series of 529 observations:

- Gold futures prices in USD (U.S. dollar for tr.ounce);
- Platinum futures prices in USD (U.S. dollar for tr.ounce);
- Silver futures prices in USD (U.S. dollar for tr.ounce);
- U.S. dollar index value at points.

Monitors start on March 1, 2019, last monitored on March 19,2021.

To calculate statistical indicators (mean value, mode, median, coefficient of asymmetry, process, Pearson statistics) we used MS Excel office program.

To implement the methodology of wavelet analysis we used RStudio software environment, which is designed for statistical data processing and graphing. This study was carried out using the WaveletComp library from the CRAN repository. It contains the necessary functions for calculating and creating graphical images, such as `analyze.coherency`, `wt.image`.

The final version of observation shows that the greatest coherency is observed at medium scales (16-32 days, 32-64 days). At low scales (2-4 days, 4-8 days), unstable coherent motion is observed in all cases, where during several periods of time and for some scales the series go from antiphase to phase, proceeding in a binary connection. Therefore, analyzing the market of prices for gold, platinum, silver and the U.S, dollar index, it can be argued that in most cases, the gold market and the U.S. dollar index lead to the formation of the price at the market of another indicators. Analyzing the interplay of the platinum and silver market, in this situation the prices for platinum are the main one. If we study the pair of platinum and gold markets, the gold market prevails over the platinum market; for platinum and the U.S. dollar index - platinum.

## **Conclusions**

The world market of precious metals grows day by day, because the demand for such metals as gold, platinum and precious metals will remain high for a long time, due to the liquidity and universality in the use of these metals. Due to the use of wavelet

analysis, the study revealed certain patterns of evolutionary path between the selected time series, and also revealed how these changes interact at different frequencies, and how this interaction evolves with time and at different time scales.

In general, four powerful markets show a similar behavior in terms of the cross-wavelet spectrum, which is confirmed by a high level of pairwise dependence on a medium scale (16-32 days). Thus, when the gold market and the U.S. dollar index interact, the U.S. dollar index is the leading one. Their coherence is strong on a medium scale (16-32 days, 32-64 days) in February - June 2019, as well as on a high scale (64-128 days). For its part, the gold market outweighs the silver market. Also, the price setting in the gold market is influenced by the leadership of the platinum market. Despite being the safe-haven asset, gold, like everything else, eventually took a hit to the downside on the realization that COVID-19 would become a global pandemic. Silver's effectiveness as a superpowered version of gold is due in part to the fact that, unlike gold, it has a strong industrial base that could benefit from greater physical absorption during the coronavirus - for example, its use as a key ingredient in many plastics used in everything from masks and gloves to protective shields. So according to those factors its prices remains strong in the past year.

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