CRISIS SITUATIONS IN THE WORLD AND THEIR IMPACT ON STOCK MARKET INVESTMENTS

ªROBERT KUCHÁR, ᵇJIŘÍ KUČERA, ᶜLENKA DIVOKÁ

Institute of Technology and Business in České Budějovice, School of Expertness and Valuation, Okružní 517/10, České Budějovice 37001, Czech Republic
email: ªkuchar@mail.vstecb.cz, ᵇkuceraj@mail.vstecb.cz, ᶜ29474@mail.vstecb.cz

Abstract: The paper examines the behavior of investors in times of economic crises when investing in the S&P 500 Index, gold and the cryptocurrency Bitcoin. The results of the descriptive analysis show that the decision-making of investors in times of economic crises is reflected in the development of the S&P 500 Index by a decrease in average annual prices, the opposite is the case with gold, where there is a significant increase in the market price in times of crisis. This means that investors in crisis situations consider gold to protect their capital. An analysis of the tightness of the relationship between the S&P 500 Index and the price of gold based on monthly data by Pearson correlation confirmed a moderate inverse relationship. The cryptocurrency Bitcoin has seen a massive increase in market value during the Covid-19 pandemic due to the shift of business to the online world. As in the case of gold, from the perspective of investors, this cryptocurrency was seen as a way of protecting their investments and, in addition, the possibility of maintaining solvency even in a period of restrictions. Bitcoin and other virtual financial instruments seem to be a suitable alternative to gold investments in the 21st century during the crisis.

Keywords: Prediction, investments, economic crises, correlation analysis

1 Introduction

The cyclicality of the economy includes periods of prosperity and periods of crisis. A period of prosperity is characterized by stable economic structures in society and a gradual increase in the wealth of all market participants. Conversely, a period of crisis is manifested by a reduction in production, an increase in unemployment and a significant reduction in investment activity. This restriction applies to investments in tangible, intangible and financial assets.

When investing in financial assets such as shares, bonds, but also, for example, popular cryptocurrencies these days, these are investments in stock markets that have a great influence on the global economic situation and are also able to reflect a possible crisis economic situation. Just like financial assets, commodity markets are also affected by the current global economic situation (Aliu et al., 2022). Investments in commodities, which include gold and other precious metals, can serve as a substitute for investments in riskier standard financial assets in a world crisis.

All financial products can be described as established in the financial world since they are freely tradable for physical persons and the evolution of their value can be monitored using time series. All financial instruments have a so-called duality that is specific to them. Positive market growth acts as a preventive measure against the risk of an economic crisis. Conversely, negative market growth increases the risk of an economic crisis. This is usually caused by speculative massification, which is influenced by the public state policies (Ion, 2021).

Economic growth, inflation and financial development are very important drivers of the economy (Clark et al., 2021). The stock market is one of the most important indicators of financial market development (Hajilee et al., 2014). Investors' interest in relevant financial information is due to the development of financial markets and the growing importance of financial instruments. Thanks to this, the importance of financial statements and financial instruments in the decision-making of individual investors continues to grow (Pawlowski, 2020). Over the past two decades, the financial world has been marked by several crisis situations that had a major impact on the behavior and decision-making of investors. In this time period, the so-called "dot-com bubble" collapsed in 2001, in the years 2007 to 2009 the world economy struggled with the effects of the financial crisis, and in the years 2020 and 2021 with the

consequences of the Covid-19 epidemic. The world economy is currently affected by the military conflict between Russia and Ukraine, which began at the beginning of 2022.

The aim of the presented contribution is to establish the existence of relationships between economic crisis situations and the behavior of investors on the stock market. To that end, we ask what the role of gold as an investment commodity in times of economic crisis is in the 21st century compared to the riskier but investor-sought after investments in the Standard & Poor's 500 (S&P 500) Index and the cryptocurrency Bitcoin.

2 Literary research

Financial development has a significant role from many perspectives. According to Gur (2022), society's norms, behaviors, beliefs, and economic preferences have been accepted as some of the most important determinants of financial development. Falk et al. (2018), however, reminds that an individual's economic preferences differ depending on the way they perceive risk, age, and level of cognitive abilities. Another important aspect that supports the development of financial markets is patience. Patience has a direct and fundamental influence on the development of stock markets. However, financial markets can be affected by many internal and external factors, such as the financial crisis (Gur, 2022). In the last two decades, the biggest economic shocks were the global financial crisis between 2007 and 2009 and the Covid-19 virus pandemic between 2020 and 2021 (Hašková & Fiala, 2019).

Slimane et al. (2017) analyzed the impact of the global financial crisis on systematic beta and the subsequent influence on investor decision-making. The variation of volatility in the financial markets was modeled using the bivariate GARCH model. An increase in systematic beta has been found to influence investor behavior and decision making. The increase in systematic beta was the denominator during the crisis for many companies that faced the financial crisis that arose at that time. In a period of global economic crisis, investors begin to understand investment risk in a different way than in a period of economic stability and begin to attach more weight to it. In the crises period, according to Guiso et al. (2008), the investor's behaviour is greatly influenced by the subjective assessment of the degree of risk and the individual approach to risk. The common state is, according to Dias et al. (2020), that stock index prices do not fully reflect available information. Archibugi et al. (2013) noted a decline in research and development investment activities during the global economic crisis. However, they state that, during the period of the global financial crisis, companies that dampen their investment activities in research and development deal with the consequences of the crisis much worse than companies that strengthen them during this period and deliver new and innovative types of goods to the market. The same results were also reached by Brzozowski et al. (2019). Zarska and Sochulakova (2020) looked at the impact of the Covid-19 pandemic on SMEs. They concluded that moving activities online was crucial for businesses. Horak et al. (2021) states that businesses in the tertiary sector have struggled with uncertainty related to the measures and their financial consequences during the Covid-19 pandemic. The most common solution to compensate for the financial loss was to lay off employees. Haluszczynski et al. (2017) evaluated the interrelationship between the returns of the S&P 500 stock index and the turbulent conditions of the global economic environment. For this, they used the Pearson correlation method. They found that the turbulent conditions of the global economic environment very significantly affect the return of the S&P 500 stock index. This result was confirmed for the period of the global economic crisis, which peaked in 2008. They propose the implementation of the Pearson correlation to predict upcoming turbulence in the economy. Vochozka et al. (2021) points out that most macroeconomic predictions depend on changes in oil

prices, which affect developments in many areas of the world economy. However, these changes are difficult to predict due to the high volatility of oil prices.

Ferreuela and Mallor (2021) dealt with the analysis of investor behavior during periods of unfavorable development of financial markets. They primarily dealt with the analysis of investor behavior during the financial crisis in 2008 and during the Covid-19 pandemic in 2020-2021. According to the results achieved, investors behaved differently on the days when the value of the given financial instruments decreased and differently on the days when the value of the given financial instruments increased. After the end of the given crisis, these fluctuations also appear, but to a lesser extent. Mason and Botelho (2021) analysed the activity of so-called angel investors during the Covid-19 pandemic. This extraordinary situation caused considerable concern among angel investors, and that is why at the beginning of it they very significantly dampened their investment activities. Subsequently, when the pandemic receded, their investment activity increased again. Currently, the investment activity of angel investors is at a higher level than before the Covid-19 pandemic. According to Palma-Ruiz et al. (2020), the social responsibility of the company is important in times of economic crisis caused by the pandemic. Using descriptive analysis, they found that companies that made a financial donation during the pandemic to help fight this difficult time were better able to maintain the value of their shares and thereby contributed to the stabilization of stock indices. In a period of financial crisis caused by an extraordinary pandemic situation, every report of the re-spread of the disease has a significant impact on the world's economies. Rehan et al. (2022) conducted a correlation analysis between the number of reported positive Covid-19 cases and stock market volatility. They concluded that even during the outbreak, all stock markets on all continents were still highly volatile. The war in Ukraine showed that the European financial system is very fragile to external shocks as Aliu at al. state in (2023) where they examine the consequences of the Russian invasion of Ukraine on five Euro exchange rates.

Galvani (2020) used correlation analysis to determine the relationship between an investor's investment style and the amount of return from a given investment activity. The amount of returns generated by a particular investment style varies based on the size of the chosen investment market. Investment returns in smaller markets are more influenced by the chosen investment style than in the case of larger investment markets. Currently, the preferred investment style is diversification of investments due to the reduction of investment risk. Chen et al. (2018) used correlation analysis to find the relationship between the stock indices S&P 500, FTSE 100 and EURO STOXX 50. Based on this correlation analysis, it was revealed that in periods of uncertainty or periods of high volatility caused by political shocks, fluctuations in the mutual correlation of these stock indices occur.

Based on the literature search, it is appropriate to use descriptive and correlational analysis to find answers to the set research questions.

3 Materials and Methods

The analysis is based on data obtained from the Kurzy.cz and Patria.cz websites, etc. The data is used to determine the volatility of selected financial instruments, which are the S&P 500 Index, gold and Bitcoin. For the S&P 500 Index and gold, average monthly closing prices for the period 2000 to 2022 are used for calculation. Graphs 1 and 2 show the price development for this period.

Graph 1 Development of average annual prices of the S&P 500 Index

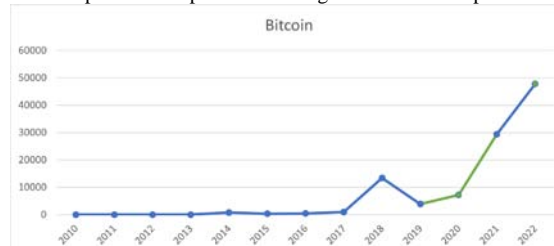Source: multpl.com, 2022 [online], own source/work.

Graph 2 Development of average annual gold prices
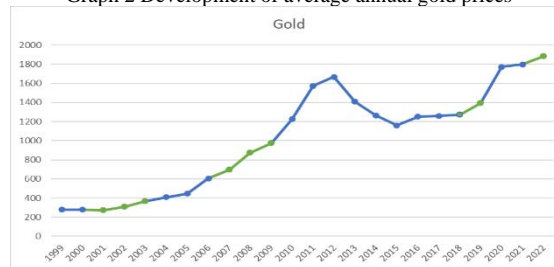
Source: mactrotrends.net, 2022 [online], own source/work

For the statistical model of the time series, data on the price development of the cryptocurrency Bitcoin, which first appeared on the market in 2010, is also used - see graph 3.

Graph 3 Development of average annual Bitcoin prices

Source: in2013dollars.com, 2022 [online], own source/work.

All values and results are rounded to two decimal places. It is worked with the nominal price of financial instruments since the sales closing prices obtained are not adjusted for inflation. All prices are in US dollars (USD).

The research is primarily focused on the identification of correlation dependencies between gold and S□P 500 instruments in crisis conditions. Research methods are statistical procedures based on monitoring time series and their changes during the period under investigation. According to Beard et al. (2019) by time series analysis we mean a set of methods that serve to construct and select a suitable prediction model. Time series are based on historical price development. Time series models are created with the aim of describing the historical behavior of the prices of financial instruments. According to Wang et al. (2009) is based on a one-dimensional time series model in the following form:

$$y_t = f(t, E_t) \tag{1}$$

for t = 1, 2,...., n; n ∈ N, where y_t corresponds to the value of the modeled indicator in the series and E_t is the value of the random component at time t. This is the most elementary time series model where real numbers are collected periodically based on the time factor and each single number is assigned a single value.

The article confronts the crisis situations of the world and the prices of the examined financial instruments. Data for the

investigated periods are compared with periods of world crises and it is determined whether the resulting situation affects the price of the selected instruments. The development of instrument prices is subsequently compared, and it is determined whether or not they are linked to each other during the crisis period.

Further, the correlation dependence between the two compared quantities is investigated through correlation analysis. Asuero et al. (2006) states that correlation can be understood as a formal positive or negative relationship between comparable phenomena. When individual variables increase or decrease, the degree of dependence between them can be identified, or independence, which does not necessarily imply causality. Correlation is measured using the correlation coefficient, which takes values from the interval $\langle -1,1 \rangle$. If the correlation coefficient approaches 0, it means that the studied quantities are independent of each other. The closer the correlation coefficient is to +1, the stronger the relationship of direct proportionality, a value closer to -1 defines the dependence of indirect proportionality. Two sets of values are available for the calculation, where gold has a value Y, and the S&P 500 Index will correspond to an value X. The Pearson correlation coefficient model will be used to achieve the result:

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - y)}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}} \qquad (2)$$

which can also be expressed as

$$r = \frac{\sum_{i=1}^{n} x_i y_i - n\bar{x}\bar{y}}{(n-1)s_x s_y} \qquad (3)$$

where

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad (4)$$

is the arithmetic mean of the prices found for the S&P 500 Index and $\bar{y}$ is the arithmetic mean of the gold prices and

$$s_x = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2} \qquad (5)$$

is the standard deviation of S&P 500 Index prices and $\bar{y}$ is the standard deviation of gold prices.

4 Results

The research focuses on the 2000-2003 crisis known as the "Dot-com bubble", the 2007-2009 global economic crisis and the 2020-2021 Covid-19 crisis. On graph 1 (see the Data method section), the periods related to the crisis states of the world are marked in red. In case of price development of the S&P 500 index; every crisis resulted in a decrease in the value of this index. On graph 2 (see section Data and methods) showing the development of the gold price, periods of crisis are marked in green. There is a noticeable growth trend in the crisis periods mapped by us. In the case of Bitcoin price development, which can be assessed in the last two crisis states (see graph 3 Data and methods), the changes in these periods are shown in green. We can see from the price development that Bitcoin experienced a sharp increase especially in the crisis related to Covid-19 in 2020.

A comparison of the price development of the monitored financial instruments with the red-framed crisis states of the world in the period 1999-2022 is illustrated in graph 4.

Graph 4 Development of average annual prices of monitored financial instruments
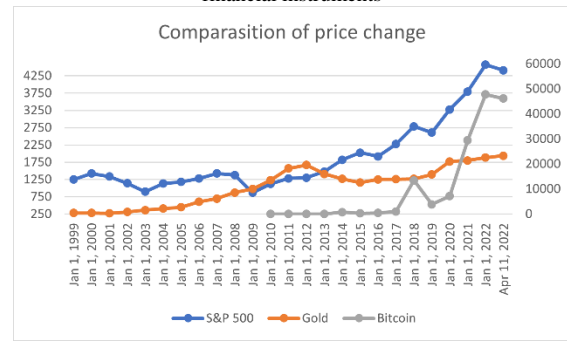
Source: Own source/work

By simple comparison from graph 4, we can see that financial instruments do not show clear signs of dependence among themselves during the examined period. A closer look at the red-framed S&P 500 and gold price values shows that gold tends to increase its market price during the crisis period, while the S&P 500 market price always falls during the examined crisis states. This indicates an indirect dependence of the price development of these instruments. A more accurate view of the degree of dependence between the development of the S&P 500 Index and the price of gold can be achieved by calculating the Pearsonv correlation (see Graph 5), which can be used when meeting the data normality test. Since the calculated p-value of 0.26 is greater than the chosen value of α = 0.05, we do not reject the normality of the data at the 0.05 level.

Graph 5 Correlation dependence between the price of gold and the price of the S&P 500 Index
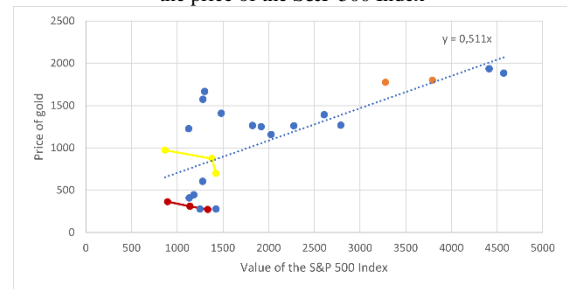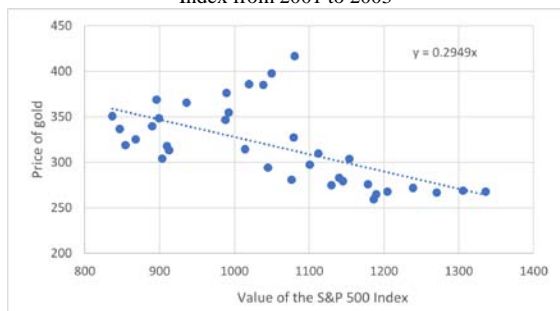

Source: Own source/work.

The correlation dependence result shows that there is a significant tightness and at the same time an average direct correlation dependence between the S&P 500 Index and gold. The result contradicts the knowledge about the crisis state of the world and the behavior of these instruments observed and shown in graph 4. For this reason, in graph 5 the red points indicating the crisis in the years 2001 to 2003, the yellow points relating to the crisis in the years 2007 to 2009 and the crisis in 2020-2021 is marked with orange points. Looking at the red and yellow course of the point values, a trend of indirect correlation dependence is evident, the position of the orange points implies a zero correlation.

These conclusions are confirmed by a more detailed analysis of correlation dependence based on average monthly prices in the examined crisis periods.

Graph 6 Correlation between the price of gold and the S&P 500 Index from 2001 to 2003
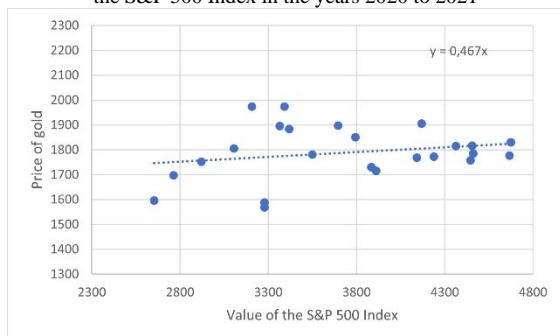

Source: Investing.com and multpl.com, 2022 [online], own source/work.

Graph 7 Correlation dependence between the price of gold and the S&P 500 Index from 2007 to 2009
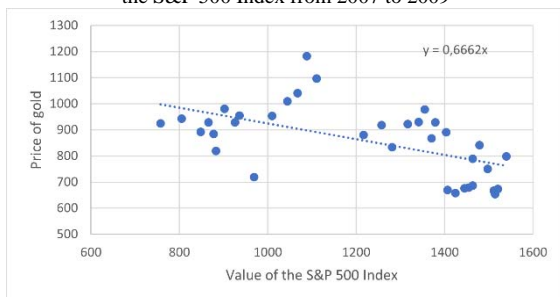
Source: Investing.com and multpl.com, 2022 [online], own source/work.

Graph 8 Correlation dependence between the price of gold and the S&P 500 Index in the years 2020 to 2021

Source: Investing.com and multpl.com, 2022 [online], own source/work.

It is evident from the calculations that in the crisis of 2001-2003 and 2007-2009 there was an indirect correlation dependence of medium strength between financial instruments (see Graphs 6 and 7). In the years 2001-2003, the correlation coefficient for the confidence level of 95% reaches the value of 0.604, and for the crisis period of 2007-2009, the correlation coefficient acquires the value of 0.572. This suggests that in times of crisis, gold can act as a substitute for the S&P 500 Index. During the Covid-19 crisis (see Graph 8), there was a very low correlation between financial instruments. The correlation coefficient at the 95% confidence level reached a value of 0.217.

5 Discussion

The analyzes carried out make it possible to provide a clear answer to the question set out in the goal. Descriptive analysis proved that the behavior of investors during the economic crisis is reflected in the development of the S&P 500 Index by a decrease in average annual prices. In the context of this, Haluszczynski et al. (2017) drew attention to the adverse effect of economic crises on the price development of the S&P 500 Index and recommend continuous prediction of the development

of this index. The results of prediction methods contain information about changes in investor behavior in different economic periods. During the global economic crisis in 2007-2009, there was a sharp increase in the market price of gold, as investors saw the possibility of protecting their capital in this commodity, and thus the growth in the volume of business transactions increased its market price (Wu and Chiu, 2017). The market price of gold also increased during the Covid-19 pandemic for the same reason. The same result was also reached by Sumer and Ozorhon (2020).

A more accurate view of the degree of dependence between the development of the S&P 500 Index and the price of gold was achieved using correlation analysis, where it is evident that there is a significant tightness and direct correlation dependence between financial instruments during the observed period. This is due to the length of the time series of 23 years covering mostly non-crisis states of the world. For that reason, the correlation dependence result is biased. A closer look at the individual crises in the years 2001-2003 and 2007-2009 shows a trend of indirect correlation dependence between the value of the S&P 500 Index and the price of gold. A similar conclusion was reached by Tuysuz (2013) and Miyazaki et al. (2012). In the Covid-19 crisis, there is a very low dependence between the chosen financial instruments. According to Akhtaruzzaman et al. (2021) this was caused by the monetary and fiscal measures of central banks stimulating the economy. Regarding the possibility of predicting crises, Caballero (2010) adds that crises with a significant impact cannot be predicted. This statement is contradicted by Laborda and Olmo (2021), who state that upcoming crises can be identified using sector volatility spillovers. This was confirmed during the Covid-19 pandemic, when extreme volatility in the S&P 500 Index was likely to occur.

During the economic crisis caused by the Covid-19 pandemic, there was a massive increase in the market value of the Bitcoin cryptocurrency. As in the case of gold, this cryptocurrency was seen by investors to quickly appreciate and protect their capital. Hanifi Ayboga and Ganii (2022) attribute the rise in the price of the cryptocurrency Bitcoin mainly to the government's anti-epidemiological measures. Zhao (2022) adds to this that Bitcoin cryptocurrency is still considered a speculative asset, and even though its market price has increased during the crisis caused by the Covid-19 pandemic, it cannot be considered a safe asset in cases of long-lasting economic crises.

In the crises before the Covid-19 pandemic, gold was characterized as a safe haven. Its market price rose while share prices lost value. Investors considered it a suitable tool for portfolio diversification. An analysis of the correlation between gold and the largest stock index, the S&P 500, during the Covid-19 crisis suggests that gold's role as a substitute for the riskier investment in the S&P 500 is declining during the crisis. Drake (2022) came to a similar conclusion. Unlike past crises, when the relationship between gold returns and the S&P 500 Index was inverse, during the Covid-19 crisis it is the opposite. The generally accepted theory that gold serves as a hedge in a stock portfolio in times of crisis does not apply in this case.

6 Conclusion

In the 21st century, the crisis conditions of the world had a great influence on investment products of global dimensions. Above all, it was the bursting of the so-called "dot-com bubble" in 2001, the global financial crisis in the years 2007 to 2009, where descriptive analysis indicated that investors see gold as an opportunity to protect their capital during the crisis and turn away from investing in stocks. The analysis found that the average annual closing prices of the S&P 500 Index decline during the crisis. Gold showed the opposite trend. Descriptive analysis indicated that investors see gold as an opportunity to protect their capital in times of crisis and turn away from investing in stocks. On the contrary, during the Covid-19 crisis, both gold and the S&P 500 Index and Bitcoin gained in value.

This could indicate that investors are partly turning away from gold as a hedge for their capital.

To obtain a more accurate view of the dependence between the prices of the examined instruments, a correlation analysis was used first on the entire examined period, where a direct correlation dependence between financial instruments caused by the prevailing period of non-crisis states of the world was found. In a detailed analysis of the crises in the years 2001-2003 and 2007-2009, the correlation analysis showed that there is a trend of indirect correlation dependence between financial instruments. At the time of the Covid-19 pandemic, a very low correlation dependence between financial instruments was evident, which could have been caused by the monetary and fiscal measures of central banks. Another financial instrument examined was Bitcoin. It saw a boom especially during the Covid-19 crisis, when investors saw it as another way to protect their capital and the possibility of its rapid appreciation.

The aim of the presented contribution was to establish the existence of mutual relations between economic crisis situations and the behavior of investors on stock exchanges. Based on the results achieved, it can be deduced that the role of gold as a safe haven for investments in times of economic crises worked in the years 2001-2003 and 2007-2009, when, unlike the S&P 500 Index, its value grew. The change occurred during the Covid-19 pandemic, when there was a very low correlation between the S&P 500 and gold. This may indicate that the role of gold as a safe haven for investment in times of economic crisis in the 21st century is gradually declining and it is possible that it will be replaced by other financial instruments, which may be, for example, the speculative Bitcoin, which has seen a massive increase in value during the pandemic. The established goal of the contribution was thus fulfilled. From the point of view of investors, this contribution can serve as a basis for further research in the field of prevention or at least possible options for mitigating the effects of economic crisis situations. Bitcoin and other financial instruments, which seem to be a suitable alternative to gold investments in the crisis period of the 21st century, can also be the subject of further research.

Literature:

1. Akhtaruzzaman, M., Boubaker, S., Lucey, B. M. & Sensoy, A., 2021. Is gold a hedge or a safe-haven asset in the COVID–19 crisis? *Economic Modelling*, 102, Art. No. 105588. ISSN 0264-9993.

2. Aliu, F., Hašková, S., & Bajra, U. Q. (2023). Consequences of Russian invasion on Ukraine: evidence from foreign exchange rates. *The Journal of Risk Finance*, 24(1), 40-58.

3. Aliu, F., Hašková, S., & Šuleř, P. (2022). Sustainability of electricity prices and the consequences for the Prague Stock Exchange. *Entrepreneurship and Sustainability Issues*, 10(2), 473.

4. Archibugi, D., Filippetti, A. & Frenz, M., 2013. Economic crisis and innovation: is destruction prevailing over accumulation? *Research Policy*, 42(2), 303-314. ISSN 0048-7333.

5. Asuero, A.G., Sayago, A. & González, A.G., 2006. The correlation coefficient: An overview. *Critical reviews in analytical chemistry*, 36(1), 41-59. ISSN 1040-8347.

6. Beard, E., Marsden, J., Brown, J., Tombor, I., Stapleton, J., Michie, S. & West, R., 2019. Understanding and using time series analyses in addiction research. *Addiction*, 114(10), 1866-1884. ISSN 0965-2140.

7. Brzozowski, J., Cucculelli, M. & Peruzzi, V., 2019. Firms' proactiveness during the crisis: Evidence from European data. *Entrepreneurship Research Journal*, 9(3), Art. No. 20170215. ISSN 2194-6175.

8. Caballero, R.J., 2010. Macroeconomics after the crisis: Time to deal with the pretense-of-knowledge syndrome. *Journal of Economic Perspectives*, 24(4), pp.85-102. ISSN 0895-3309.

9. Clark, E. & Qiao, Z., 2021. Stock exchange efficiency and .convergence: international evidence. *Annals of Operations Research*, 313(2), 855-875. ISSN 0254-5330.

10. Dias, R., Teixeira, N., Machova, V., Pardal, P., Horak, J. & Vochozka, M., 2020. Random walks and market efficiency tests: evidence on US, Chinese and European capital markets within the context of the global Covid-19 pandemic. *Oeconomia Copernicana*, 11(4), pp.585-608. ISSN 2083-1277.

11. Drake, P.P., 2022. The gold-stock market relationship during COVID-19. *Finance Research Letters*, *44*, p.102111. ISSN 1544-6123.

12. Falk, A., Becker, A., Dohmen, T., Enke, B., Huffman, D. & Sunde, U., 2018. Global evidence on economic preferences. *The Quarterly Journal of Economics*, 133(4), 1645-1692. ISSN 0033-5533.

13. Ferreruela, S. & Mallor, T., 2021. Herding in the bad times: The 2008 and COVID-19 crises. *The North American Journal of Economics and Finance*, 58, Art. No. 101531. ISSN 1062-9408.

14. Galvani, V., 2020. Does style investing uniformly affect correlations in small and large markets? *Heliyon*, 6(9), Art. No. e04881. ISSN 2405-8440.

15. Guiso, L., Sapienza, P. & Zingales, L., 2008. Trusting the stock market. *Journal of Finance*, 63(6), 2557-2600. ISSN 0022-1082.

16. Gur, N., 2022. Patience and financial development. *Finance Research Letters*, 44, Art. No. 102045. ISSN 1544-6123.

17. Hajilee, M. & Al Nasser, O. M., 2014. Exchange rate volatility and stock market development in emerging economies. *Journal of Post Keynesian Economics*, 37(1), 163-180. ISSN 0160-3477.

18. Haluszczynski, A., Laut, I., Modest, H. & Räth, C., 2017. Linear and nonlinear market correlations: Characterizing financial crises and portfolio optimization. *Physical Review E*, 96(6), Art. No. 062315. ISSN 2470-0045.

19. Hanifi Ayboga, M. & Ganii, F., 2022. The Covid 19 Crisis and the Future of Bitcoin in E-commerce. *Journal of Organizational Behavior Research*, 7(2), 203-213. ISSN 2528-9705.

20. Horak, J., Mlsova K. & Machova, V., 2021. Impact of coronavirus pandemic on the tertiary sector. *Littera Scripta*, 14, 28-39. ISSN 1805-9112.

21. Hašková, S., & Fiala, P. (2019). A fuzzy approach for the estimation of foreign investment risk based on values of rating indices. *Risk Management*, 21, 183-199.

22. Chen, Y., Mantegna, R. N., Pantelous, A. A. & Zuev, K. M., 2018. A dynamic analysis of S&P 500, FTSE 100 and EURO STOXX 50 indices under different exchange rates. *PloS one*, 13(3), Art. No. e0194067. ISSN 1932-6203.

23. in2013dollars.com, 2022. Bitcoin Price Chart, 2010-2022. [online] Available at: https://www.in2013dollars.com/bitcoin-price (online: 20.10.2022).

24. Investing.com, 2022. Gold historical data, 2000-2022. [online] Available at: https://www.investing.com/commod ities/gold-historical-data (online 19.12. 2022).

25. Ion, A. I., 2021. Financial instruments' duality and public policies–The Tulipmania case. In *Proceedings of the International Conference on Business Excellence*, 15(1), 1000-1009. ISSN 2502-0226.

26. Laborda, R. and Olmo, J., 2021. Volatility spillover between economic sectors in financial crisis prediction: Evidence spanning the great financial crisis and Covid-19 pandemic. *Research in International Business and Finance*, *57*, p.101402. ISSN 0275-5319.

27. Macrotrends.net, 2022. Gold Price Chart, 2022-1999. [online] Available at: https://www.macrotrends.net/1333/histor ical-gold-prices-100-year-chart (online 20.10.2022).

28. Mason, C. & Botelho, T., 2021. Business angel investing during the covid-19 economic crisis: evidence from Scotland. *Venture Capital*, 23(4), 321-343. ISSN 1369-1066.

29. Miyazaki, T., Toyoshima, Y. and Hamori, S., 2012. Exploring the dynamic interdependence between gold and other financial markets. *Economics Bulletin*, *32*(1), pp.37-50. 1545-2921.

30. Multpl.com, 2022. S&P 500 Historical Prices by Year. [online] Available at: https://www.multpl.com/s-p-500-histori cal-prices/table/by-year (online: 20.10.2022).

31. Palma-Ruiz, J. M., Castillo-Apraiz, J. & Gómez-Martínez, R., 2020. Socially responsible investing as a competitive strategy for trading companies in times of upheaval amid COVID-19:

Evidence from Spain. *International Journal of Financial Studies*, 8(3), Art. No. 41. ISSN 2227-7072.

32. Pawlowski, J., 2020. Financial Reporting for Instruments in Individual Investors´Decisions. In Soliman, K. S. (Ed.) *35th International-Business-Information-Management-Association Conference (IBIMA)*, Seville, Spain, 1. – 2.4.2022.

33. Rehan, M., Alvi, J. & Karaca, S. S., 2022. Short term stress of COVID-19 on world major stock indices. *Asia-Pacific Financial Markets*, 29(3), 527-568. ISSN 1387-2834.

34. Slimane, I. B., Bellalah, M. & Rjiba, H., 2017. Time-varying beta during the 2008 financial crisis–evidence from North America and Western Europe. *The Journal of Risk Finance*, 18(4), 398-431. ISSN 1526-5943.

35. Sumer, L. & Ozorhon, B., 2020. Investing in gold or REIT index in Turkey: evidence from global financial crisis, 2018 Turkish currency crisis and COVID-19 crisis. *Journal of European Real Estate Research*, 14(1), 84-99. ISSN 1753-9269.

36. Tuysuz, S., 2013. Conditional correlations between stock index, investment grade yield, high yield and commodities (gold and oil) during stable and crisis periods. *International Journal of Economics and Finance*, 5(9), p.28. ISSN 1916-9728.

37. Vochozka, M., Horak, J., Krulický, T. and Pardal, P., 2020. Predicting future Brent oil price on global markets. *Acta Montanistica Slovaca*, 25(3). ISSN 1335-1788.

38. Wang, X., Smith-Miles, K. & Hyndman, R., 2009. Rule induction for forecasting method selection: Meta-learning the characteristics of univariate time series. *Neurocomputing*, 72(10-12), 2581-2594. ISSN 0925-2312.

39. Wu, C. C. & Chiu, J., 2017. Economic evaluation of asymmetric and price range information in gold and general financial markets. *Journal of International Money and Finance*, 74, 53-68. ISSN 0261-5606.

40. Zarska, V. & Sochulakova J., 2022. Impact of the Covid-19 pandemic on the operation of small and medium-sized enterprises. *Littera Scripta,* 15(2), 45-57. ISSN 1805-9112.

41. Zhao, J., 2022. Do economic crises cause trading in Bitcoin? *Review of Behavioral Finance*, 14(4), 465-490. ISSN 1940-5979.

Primary Paper Section: A

Secondary Paper Section: AH