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## **Are Gold and Bitcoin a Safe Haven for European Indices?**

**Abstract:** Numerous turbulent events in the recent past have raised the issue of an asset that could play the role of safe haven. Although for many years it was considered that gold has the role of a safe haven, an increasing number of recent works challenge such a point of view. The emergence of cryptocurrencies after the Global financial crisis has opened up numerous questions, one of them being whether cryptocurrencies, as an asset (money) independent of governments, can play the role of safe haven. Therefore, the paper examines whether gold and bitcoin, the latter as the best representative of cryptocurrencies, can play the role of safe haven in relation to European indices. In the paper, this hypothesis was confirmed for gold and rejected for bitcoin.

**Keywords:** Safe Haven, Gold, Bitcoin, European indices.

**JEL Classification:** C58, G11.

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### **1. Introduction**

In recent years, there has been an increasing number of studies in the literature dealing with the issue of safe haven. This had been driven by numerous crisis periods in a relatively short period of time: the Global financial crisis, the Covid-19 pandemic, and the Russian-Ukrainian conflict. The role of gold and cryptocurrencies attract special attention when it comes to this topic.

During the times of uncertainties and turbulences, a safe haven is often sought in order to protect and possibly in-

crease assets. Some assets, in addition to being a safe haven, can also be a hedge or a diversifier. A safe haven is usually defined as an asset that is not correlated or is negatively correlated with other assets during volatile market conditions. A hedge is an asset that is uncorrelated or negatively correlated with another asset or portfolio on average. A diversifier is defined as an asset that is positively (but not perfectly correlated) with another asset or portfolio on average.

The traditional view is that gold represents a safe haven in periods of economic and political crises, as well as inflation. However, there has been an increasing number of papers that question this traditional point of view. Gold took on the role of a safe haven in the 1970s during the period of oil shocks. In the period between 1973 and 1974, the stock market index S&P 500 lost about 40% of its value and the value of gold increased sevenfold during that period. The average annual rate of inflation in the period from 1969 to 1981 in the USA was 7.7%, but the price of gold increased 15 times over the same period. Today, many refer to this experience, while on the other hand, critics point out that the role of gold as a safe haven cannot be generalized based on this episode and cite numerous episodes when this was not the case.

The advantage of gold over securities is that there is no risk of bankruptcy or default by the issuer, but on the other hand, it does not bear any yield (interest or dividend). The traditional point of view is that the value of gold increases in periods of global inflation and in periods of global interest rates decline, that is, when the economy falls into recession. Therefore, gold is usually treated as a hedge against uncertainty, especially when it comes to major political upheavals. The explanation for this gold price trend is very simple because in conditions of uncertainty, investors become more inclined towards safer investments, i.e. gold. This leads to an increase in demand and gold acts like any other commodity and its price increases with a growing demand. Gold also plays a major role as an instrument for diversifying the investment portfolio and as collateral.

The price of gold has fluctuated significantly throughout history.<sup>1</sup> For example, in the early 1970s, it amounted to 35 US dollars per fine ounce, and after the oil shocks and the collapse of the Bretton Woods system in 1973, it reached a value of 80 US dollars. Gold grew in the following period, and a drastic jump in value was registered in September 1980, when it reached 686.5 US dollars. Then comes a decline and years of mild oscillations when gold mostly moved within the range of 300-400 US dollars per fine ounce. This period ended in 2003, when

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<sup>1</sup> In the hundred-year period from 1830 until 1930, the price of gold had only risen marginally, from \$19/oz to \$21/oz (Astrow, 2012).

the gold price uptrend began, accelerating under the influence of the Global financial crisis and reaching the value of 1,791.6 US dollars in November 2011. With the weakening of the crisis effects in the period from 2013 to 2018, the price was on a downtrend and it mostly moved in the range of 1,000-1,300 US dollars. The COVID-19 pandemic led to another jump in the price of gold. Also, the Russian-Ukrainian conflict was another trigger because after the start of the conflict, the price of gold jumped 6% in just one day. It had reached its maximum of 2,074.88 US dollars on 18 August 2020 and then reached an almost identical value of 2,074.68 US dollars again on 8 March 2022, before dropping to a level below 1,700 US dollars in the third quarter of 2022.

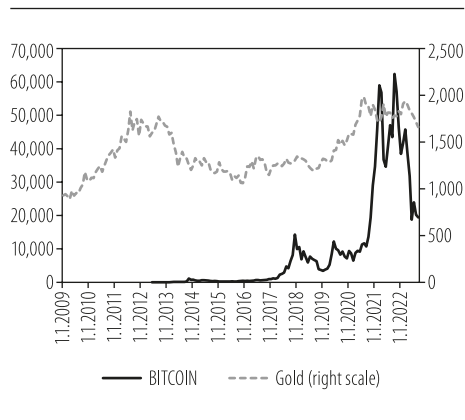
One of the biggest innovations in the financial system in the last fifty years has been the emergence of private cryptocurrencies. The share of cash in total payments is systematically decreasing, which poses the risk of being supplanted by other instruments, including cryptocurrencies (Kaczmarek, 2022). They appeared during the Global financial crisis, as a result of distrust in the existing financial system and the search for alternative ways of investment. The first Bitcoin investment occurred in 2009 (Kaygin, Zengin, Topcuoglu and Ozkes 2021). In 2012, there were only 6 cryptocurrencies, while today there are over 20,000 (Howarth, 2022) and they keep growing.

Also, it should be noted that the cryptocurrency market is small on a global scale. Total market capitalisation of this market is \$ 1,025 trillion US dollars, and the daily trading volume is currently \$107 billion (Howarth, 2022). For the sake of comparison, only U.S. hedge funds have assets worth 16 trillion US dollars in their portfolios (OMFIF, 2018).

Ideas of private money are not new and they date back to Hayek, who wrote about forty years ago that the exclusive right to issue money and regulate monetary flows by the state had not produced any better money than the one that would exist if there were no such thing (Lukić, 2017). Many investors have looked for a safe haven in cryptocurrencies, primarily because they are completely independent of economic policies of governments.

Unfortunately, cryptocurrencies do not have the basic functions of money (Fabris, 2022a) and their trends are subject to numerous speculations, which is why they have more of the characteristics of speculative securities. The fact that no monetary authority and no country stands behind Bitcoin and other digital currencies, that there is no protection in the event of a failure of the technological platform, that payments with these currencies are minor, and that there is no real coverage behind these currencies also suggests great caution. Therefore, Vučinić

**Figure 1: Gold and Bitcoin price movements (in USD)**



Note: end-month data

and Luburić (2022) rightfully warn that cryptocurrencies pose potential threats to financial systems.

Figure 1 shows the movement of the price of gold and Bitcoin since the latter's appearance, indicating that in the last 5 years, the Bitcoin fluctuations have been much greater than those of gold.

The aim of the paper is to answer whether gold and/or bitcoin represent a safe haven in relation to European indices. Two indices were used as representatives of European indices: DAX 40 and EURONEXT 100.

The paper consists of five parts. After the introduction, an overview of the relevant literature is presented in section 2. The research methodology is presented in the third section, while the results are presented in the fourth part of the paper. The paper ends with concluding considerations.

## 2. Literature review

Three lines of research usually dominate the literature. The first one covers the role of gold as a safe haven, the second one refers to the role of bitcoin, and the third one presents a comparative analysis of gold and bitcoin. Therefore, this literature review will analyse these three lines of research.

The traditional and most extensive line of research refers to the role of gold, and this should not be surprising because unlike cryptoassets, which are more recent, gold has been considered as a safe haven throughout a long historical period. It is most often observed in relation to three categories: stock market indices (trends of shares and securities), interest rates, and inflation. Therefore, the following will provide an overview of the literature in relation to these three categories.

Ciner, Gurdgiev and Luce (2013) found that gold plays the role of a safe haven for American and European investors during periods of inflation. While Iacurci (2021) comes to a completely opposite conclusion and points out that gold does

not represent adequate protection against inflation. He points out that in the period 1980-1984, gold had lost 10% of its value whilst inflation had been 6.4%, then in the period from 1988 until 1991, gold lost 7.6% of its value and inflation stood at 4.6%, whereas the period during which investors in gold made profit was the period from 1973 to 1979. Therefore, in his opinion, investing in gold as a hedge against inflation is tantamount to gambling. Joachim (2015) found that when inflation increased, the price of gold increased in 69% of cases and decreased in 31% of cases, and when inflation decreased, the price of gold increased in 45% of cases and decreased in 55% of cases. Fabris (2022) established on the example of Serbia that gold can act as a hedge against inflation only in the long term. A view that is often presented in literature is that gold only offers a good hedge against inflation over a fairly long term spanning centuries, and the average investor does not really benefit from it. Aggarwal (1992), Ghosh, Levin, Macmillan and Wright (2001), Aye, Chang and Gupta (2016), and Shafiee and Topal (2010) also advocate a similar view that gold provides hedge against inflation only in the long term.

Summers (1998) points out that gold is a long-term asset that moves in the opposite direction to the real interest rate. Frankel (2014) came to a similar conclusion and found that the prices of gold, oil and mineral ores move inversely in relation to interest rates. Choudhry, Hassan and Shabi (2015) found that expectations about future movements in interest rates determine portfolio strategies and thus investment in gold. Joachim (2015) established that in periods of high real interest rates, there is a negative change in gold prices. On the other hand, in their work, Tully and Lucey (2007) did not establish any relationship between the movement of interest rates and the price of gold.

Wagstyl (2021) points out that the price of gold significantly lags behind the movement of shares with the intention of indicating that it is more profitable to invest in shares than in gold. Drake (2022) found that despite the common belief that there is a negative correlation between gold returns and stocks, this was not confirmed either during the Global financial crisis or during the COVID-19 pandemic. However, she confirmed this relationship during the 1990-1991 recession and the 2001 recession. In their research, Levin and Wright (2006) found that gold is traditionally used by investors as an instrument for the diversification of their portfolios and risk reduction during crisis periods. Dempster and Artigas (2010) found that gold has the best performance as a hedge instrument compared to all traditional forms of assets. Coudert and Raymond (2011) showed that in crisis periods, risky assets decline in value and this leads to resorting to “higher-quality assets”, which further leads to an increase in the prices of safer assets, especially gold. Gatara (2022) points out that in the last three decades there has

only been a sporadic miscorrelation between the gold price and the S&P500 stock market index, only during a couple of crisis periods.

An increasingly popular line of research tackles the issue of the role of cryptoassets (bitcoin) as a safe haven. Bank of America analysts point out that Bitcoin may eventually become an inflation hedge (Partz, 2022). Bouri, Jalkh, Molnár and Roubaud (2017) found that an equity portfolio that includes Bitcoin may improve risk return. The same conclusion was reached by Briere, Oosterlinck and Szafaraz (2015). Fang, Bouri, Gupta and Roubaud (2017) found that Bitcoin can be considered as a safe haven against stock risk in some points of time. Gil-Alana, Abakah and Rojo (2020) point out that Bitcoin in particular is very useful in times of crisis because it is decoupled from the traditional assets. Corbet, Katsiampa and Lau (2020) found that Bitcoin is a strong safe haven for oil and weak for the stock market. According to Dyhrberg (2016), cryptoassets are also useful as a hedge against US dollar fluctuations, euro indices, equity market, or ETFs. Partz (2022) points out that Bitcoin's growing correlations with gold, S&P 500 and Nasdaq 100 indicate that investors see BTC as a relative safe haven. Nagy and Benedek (2021) consider Bitcoin the most a weak safe-haven. Vukovic, Maiti, Grubisic, Grigorieva and Frömmel (2021) came to the conclusion that only Tether might present a safe haven within the crypto market, while other crypto currencies have spillovers from risky assets (S&P 500) on the crypto market. However, there are also a large number of studies that deny the role of safe haven for cryptocurrencies, such as that by Goodel and Goutte (2021). Klein, Thu and Walther (2018) found that bitcoin has no hedging capabilities. Rai (2022) believes that cryptocurrencies are not a safe haven because they “have shown lower correlations with equity markets in times of stable and high economic growth and low interest rates, but in more precarious and uncertain economic times, such as the present, they have moved in the same direction as the stock market.” Conlon and McGee (2020) came to a similar conclusion. Yatie (2022) points out that Bitcoin was just diversifiers for the European indices. Al-Khazali, Bouri and Roubaud (2018) are even more critical and point out that cryptocurrencies can even be risky in a portfolio. Guesmi, Saadi, Abid, and Ftiti (2019) believe that Bitcoin can only be used as a portfolio diversifier. Syuhada, Suprijanto and Hakim (2021) show in their work that bitcoin did not play the role of a safe haven during the COVID-19 crisis.

Lately, an increasingly common line of research deals with the comparative observation of gold and cryptocurrencies (bitcoin) as a safe haven. Dyhrberg (2016) established that Bitcoin has a safe haven properties similar to gold. Selmi, Mensi, Hammoudeh and Bouoiyour (2018) came to the conclusion that Bitcoin has better safe haven properties, but that both gold and Bitcoin are safe havens for oil price shocks. Shahzad, Bouri, Roubaud, Kristoufek and Luceyf (2019) conclude

that gold and Bitcoin represent a safe haven for extreme stock markets. Key (2022) points to Shah and Moss from Bank of America Securities (BofAS) who argue that Bitcoin has a high correlation with gold prices, suggesting it is being used as a hedge against market uncertainty. Yatie (2022) found that gold has not been more efficient than cryptoassets. Wen, Cao, Liu and Wang (2018) showed that before the coronavirus crisis, both gold and Bitcoin had played the role of excellent hedging tools for oil, and after the pandemic only gold played that role. Pho, Ly, Lu, Hoang and Wong (2021) conclude that gold is a better portfolio diversifier than Bitcoin for risk averse investors, but not for risk seeking investors. Kumar and Padakandla (2022) showed that gold exhibited both short-run and long-run safe haven properties, while in contrast, Bitcoin exhibited short-run and long-run safe-haven properties only for NASDAQ, EUROSTOXX, and short-run safe haven property for NSE50. Paulus (2020) determined that gold and bitcoin did not play the role of safe haven for the Indonesian capital market, but could serve as a diversifier. Yue (2022) points out that although some bitcoin supporters have touted the cryptocurrency as a hedge against inflation and as "digital gold," the two assets have been largely uncorrelated.

### 3. Methodology and data

In order to examine the possible properties of bitcoin and gold as a safe haven asset we opted for the use of quantile regression method. Our decision is grounded on many reasons. First, the definition of safe haven asset which emphasizes the condition that asset has to be uncorrelated or negatively correlated with another asset or portfolio in times of market stress or turmoil gives incentive to use this method, since it can be used to discriminate between "normal times" and market stress conditions. Second, since the quantile regression approach does not require strong distributional assumptions, it offers a robust method of modelling these relationships. This method is designed to account for outliers in the data and due to the fact that we want to examine what is the property of these kinds of the assets in specific turmoil periods, it is more robust to the particular data features than other estimation methods. Since the median is not affected by the presence of outliers, different from the mean, median regression models are found to be very useful when there are extreme observations. Third, our choice is based on the expected fact that most of the papers that investigate similar problems in the empirical economics literature use this method, although some of them use other ones such as GARCH, ARDL, OLS, and the like.

Quantile regression models are used to estimate the percentiles of the dependent variable, conditional to the values of the explanatory variables. This technique

was initially proposed by Koenker and Bassett (1978). While the median regression expresses the median (50th percentile) of the conditional distribution of the dependent variable as a linear function of the explanatory variables, the other quantile regressions estimate the parameters of a model based on any other percentile of this conditional distribution. The process of estimation is quite similar to the estimation by OLS, with difference that the OLS minimizes the sum of the squares of the residuals, and the quantile regression minimizes the weighted sum of the absolute residuals.

Basically, the equation that has to be estimated can be expressed as following, where  $Perc_{\theta}(Y_i|X_i)$  represents the percentile of the dependent variable conditional to the vector of explanatory variable(s). Of course, parameter  $\theta$  ranges from 0 to 1, meaning that for  $\theta = 0.5$  median regression is estimated.

$$Perc_{\theta}(Y_i|X_i) = X_i' * b_{\theta} \quad (1)$$

Our explanatory variable is the percentage change on the previous period of stock market index prices. We opted to investigate two stock market indices in Europe, i.e. DAX 40 and EURONEXT 100. DAX 40 includes the 40 largest companies listed on the regulated market of the Frankfurt Stock Exchange that satisfy certain minimum quality and profitability requirements. The number of DAX listed companies was increased from 30 to 40 effective from September 20, 2021. In addition to the DAX Index, we use the Euronext 100 Index which consists of companies admitted to listing on the main markets of the Euronext, which is the pan-European Stock Exchange. This index consists of the 100 highest ranking full market capitalization companies. The composition of the index is made by companies from the following countries<sup>2</sup>: France 53.9%, Netherlands 29.6%, Norway 6.3%, Belgium 5.6%, Ireland 2.8%, and Portugal 1.8%.

The returns on gold and bitcoin are dependent variables in our regression specifications. The returns are calculated as percentage change compared to previous period. We assume that there is no reverse influence from gold or Bitcoin returns to stock market return.

We estimated every model specification based on daily and weekly data. Data cover the period from December 19, 2014 to August 31, 2022 (September 2, 2022 in weekly data sample). The majority of papers in the field use daily data, assuming the very fast adjustment of investors. We also treat this as our baseline analysis but, additionally, for the sake of robustness we use weekly data as well.

<sup>2</sup> [https://live.euronext.com/sites/default/files/documentation/index-fact-sheets/Euronext\\_100\\_Index\\_Factsheet.pdf](https://live.euronext.com/sites/default/files/documentation/index-fact-sheets/Euronext_100_Index_Factsheet.pdf)



One important advantage of weekly data is that the concerns of nonsynchronous trading bias and too much noise associated with higher frequency data for less frequently traded companies are considerably minimized (Hoque and Low, 2022). Tables 1 and 2 give brief descriptive statistics of the daily and weekly data. As can be seen from the tables, gold returns scored lowest volatility, as expected. The highest volatility in returns is performed in the case of Bitcoin.

**Table 1: Descriptive statistics of the daily data**

	DAX	EURONEXT	gold	Bitcoin
Mean	0.0222	0.0254	0.0279	0.2399
Median	0.0692	0.0712	0.0342	0.1674
Maximum	10.9759	8.1760	7.3711	25.5876
Minimum	-12.2386	-11.9722	-5.7060	-36.7353
Std. Dev.	1.2955	1.1783	0.8348	4.1816

Source: Authors' calculations

**Table 2: Descriptive statistics of the weekly data**

	DAX	EURONEXT	GOLD	BTC
Mean	0.1178	0.1326	0.1552	1.5631
Median	0.3176	0.2999	0.1979	0.9801
Maximum	10.9069	9.0825	7.5583	44.5614
Minimum	-20.0123	-19.5040	-7.1632	-39.5671
Std. Dev.	2.8517	2.5710	1.7752	10.0670

Source: Authors' calculations

## 4. Results

In Tables 3 and 4 we presented the results derived from the employment of quantile regression estimation method based on daily and weekly data, respectively. In accordance with the standard choice in the literature in this field, we analyse the lower quantiles of the distribution that correspond to bearish market conditions. Model 1 regresses the gold return on return on the DAX 40 Index. Model 2 deals with the effects of return on the DAX 40 Index on return on Bitcoin. Model 3 and 4 use the logic, but instead of the DAX 40, we use return on the EURONEXT 100 Index.

**Table 3: Estimations based on the daily data**

			τ				
			0.01	0.025	0.05	0.1	0.5
model 1	gold	c	-2.1688***	-1.6701***	-1.3055***	-0.8955***	0.0402**
		DAX	-0.0143	0.0023	-0.0216	-0.0153	-0.0304
model 2	Bitcoin	c	-11.9260***	-8.4388***	-6.4045***	-4.1899***	0.1604***
		DAX	1.5081***	1.2857***	1.0050***	0.7727***	0.2990***
model 3	gold	c	-2.1684***	-1.6730***	-1.3034***	-0.8976***	0.0438**
		EURONEXT	-0.0153	0.0135	0.0002	0.0012	-0.0320
model 4	Bitcoin	c	-11.9511***	-8.3354***	-6.4553***	-4.1413***	0.1723***
		EURONEXT	2.0276***	1.5854***	1.2004***	0.7831***	0.2835***

Source: Authors' calculations

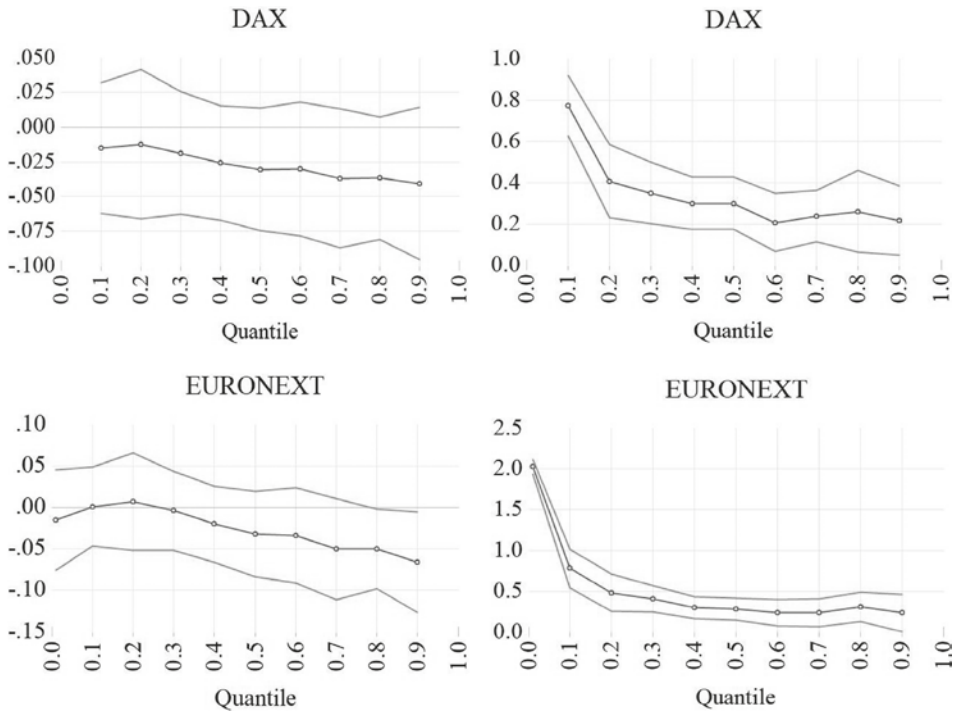
**Table 4: Estimations based on the weekly data**

			τ				
			0.01	0.025	0.05	0.1	0.5
model 1	gold	c	-5.0622***	-3.9537***	-2.8273***	-2.0708***	0.2094**
		DAX	0.1050***	0.0993*	0.0583	0.0266	-0.0320
model 2	Bitcoin	c	-21.9406***	-18.8992***	-14.3487***	-10.3414***	1.0189**
		DAX	0.8808***	1.0328***	1.2601***	1.1381***	0.5462**
model 3	gold	c	-5.0345***	-3.9702***	-2.8659***	-2.0639***	0.2106**
		EURONEXT	0.1091***	0.1567***	0.0571	0.0197	-0.0372
model 4	Bitcoin	c	-21.4742***	-18.9926***	-13.9944***	-10.3365***	0.8851*
		EURONEXT	0.9276***	1.0549***	1.3112***	1.4987***	0.5322**

Source: Authors' calculations

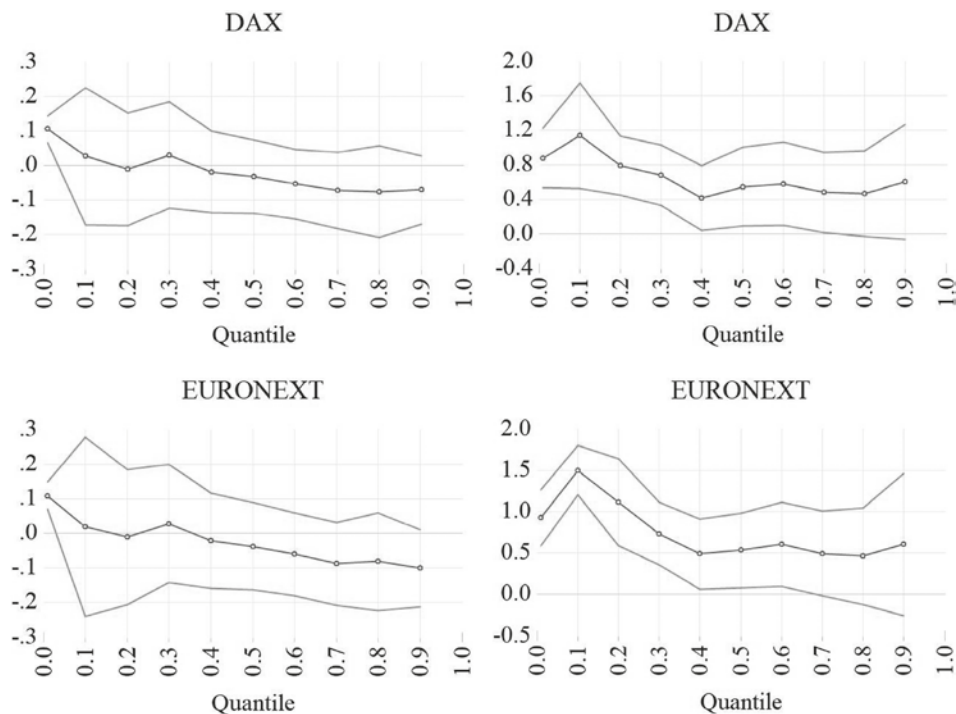
The results of interest can be graphically depicted, as shown in Figures 2-3 that present the dynamics of estimated coefficient in different quantiles with confidence interval of 95%.

Figure 2: Dynamics of estimated coefficient in different quantiles: daily data



Note: Top panels correspond to Model 1 and Model 2, respectively. Bottom panels correspond to Model 3 and Model 4, respectively.

Source: Authors' calculations

**Figure 3: Dynamics of estimated coefficient in different quantiles: weekly data**

Note: Top panels correspond to Model 5 and Model 6, respectively. Bottom panels correspond to Model 7 and Model 8, respectively.

Source: Authors' calculations

As it was previously stated, the property of a safe asset is that return on that asset is non-correlated or negatively correlated with a portfolio or another asset in extreme market conditions. Therefore, we are not interested in the correlation on average which relates to the properties of hedge or diversifier asset, rather in correlation in specific periods. These periods correspond to extreme adverse conditions in financial markets when safe haven asset guarantees the compensation for the losses of investors in financial markets. In particular, we are interested in the possibilities that gold and/or Bitcoin serve as a safe haven asset in the periods of stress in the stock markets. Following the paper of Baur and Lucey (2010), we include the regressors that contain stocks returns that are in  $q$  lower quantile, such as 0.05, 0.025 and 0.01. In addition to this, we add two more thresholds of 0.1 and 0.5 quantile (median).

Looking at daily data, we can conclude that gold can be perceived as a safe haven asset for the DAX 40 Index since the correlation between the returns is negative in the most quantiles, albeit insignificant. Similar holds to the EURONEXT 100 Index. Although coefficients in some quantiles are positive, they are insignificant. Contrary to this, Bitcoin cannot serve as a safe haven for the DAX 40 or EURONEXT 100 indices since the coefficients are significantly positive in all quantiles. If we look at the weekly data, the conclusions are similar, except for the role of gold in lower quantiles that cannot be a safe haven asset due to the significant positive correlation.

## 5. Conclusion

In the last fifteen years, numerous turbulent periods such as the Global financial crisis, the COVID-19 pandemic, and the Russian-Ukrainian conflict have led to inflation, significant fluctuations in stock market indices and the prices of various assets. In such conditions, more and more investors are looking for a safe haven.

The traditional point of view is that gold represents a safe haven in periods of economic and political crises, as well as inflation, and it took on this role in the 1970s. However, in recent years, there has been an increasing number of studies that challenge this traditional point of view and cast doubt on it.

After the Global financial crisis, cryptocurrencies have emerged with the idea of being money independent of governments and their economic policies. These days we have been witnessing a kind of expansion of cryptocurrencies and estimates indicate that there are over 20,000 of them. Although cryptocurrencies do not have the basic functions of money but more of the features of speculative securities, a significant number of investors have turned to them as a safe haven. However, there is a large number of papers that challenge this point of view.

Therefore, we decided to examine the role of gold and Bitcoin (as the best representative of cryptocurrencies), whether they can play the role of a safe haven in relation to European indices. In order to examine the possible properties of these two as a safe haven asset, we opted for the quantile regression method.

Looking at daily data, we can conclude that gold can be perceived as safe haven asset for DAX 40 Index, since the correlation between the returns is negative in the most quantiles, however insignificant. We came to the same conclusion in the case of the EURONEXT 100 Index. Although coefficients in some quantiles are positive, they are insignificant. On the other hand, Bitcoin cannot serve as a

safe haven for the DAX 40 or EURONEXT 100 indices, since the coefficients are significantly positive in all quantiles. If we look at the weekly data, the conclusions are similar, except for the role of gold in lower quantiles that cannot be a safe haven asset due to the significant positive correlation.

## 6. References

1. Aggarwal, R. (1992). "Gold Markets". in: *The New Palgrave Dictionary of Money and Finance*, Newman P., Milgate M. and Eatwell J; (eds.), 257-258, Macmillan, Basingstoke.
2. Al-Khazali, O., Bouri, E. & Roubaud, D. (2018). The Impact of Positive and Negative Macroeconomic News Surprises: Gold versus Bitcoin. *Economics Bulletin*, 38(1), 373–382.
3. Astrow A. (2012). Gold and the International Monetary System. A Report by the Chatham House Gold Taskforce, London.
4. Aye, G. C., Chang, T. and Gupta, R. (2016). Is Gold an Inflation-Hedge? Evidence from an Interrupted Markov-Switching Co-integration Model. *Resources Policy*, 48(C), 77-84.
5. Baur, D. G. and Lucey, B. M. (2010). Is Gold a Hedge or a Safe Haven? An Analysis of Stocks, Bonds and Gold. *The Financial Review*, 45(2), 217-229.
6. Bouri, E., Jalkh, N. P., Molnár, P. and Roubaud, D. (2017). Bitcoin for Energy Commodities Before and after the December 2013 Crash: Diversifier, Hedge or safe haven? *Applied Economics*, 49(50), 5063–5073.
7. Briere, M. Oosterlinck, K. and Szafaraz, A. (2015). Virtual Currency, Tangible Return: Portfolio Diversification with Bitcoin. *Journal of Asset Management*, 16(6), pp. 365-373.
8. Choudhry, T., Hassan, S. and Shabi, S. (2015). Relationship Between Gold and Stock Markets During the Global Financial Crisis: Evidence from Nonlinear Causality Tests. *International Review of Financial Analysis*, 41(1), 1-31.
9. Ciner, C., Gurdgiev, C. and Luce, B. (2013). Hedges and Safe Havens: An Examination of Stocks, Bonds, Gold, Oil and Exchange Rates. *International Review of Financial Analysis*, 29, 202-211.
10. Conlon, T. and McGee, R. (2020). Safe-Haven or Risky Hazard? Bitcoin During the COVID-19 Bear market. *Finance Research Letters*, 35(July), 1–5.
11. Corbet S., Katsiampa, P. and Lau, C. K. M. (2020). Measuring Quantile Dependence and Testing Directional Predictability Between Bitcoin, Altcoins and Traditional Financial Assets. *International Review of Financial Analysis*, 71(October), 16-32.
12. Coudert, V. and Raymond, H. (2011). Gold and Financial Assets: Are There any Safe Havens in Bear Markets? *Economics Bulletin*, 31(2), 1613-1622.
13. Dempster, N. and Artigas, J. (2010). Gold: Inflation Hedge and Long-Term Strategic Asset. *The Journal of Wealth Management*, 13(2), 69–75.
14. Drake, P. (2022). The Gold-Stock Market Relationship during COVID-19. *Finance Research*

15. Dyhrberg, A. H. (2016) Bitcoin, Gold and the Dollar—a GARCH Volatility Analysis. *Finance Research Letters*,16 (February), 85–92.
16. Fabris, N. (2022). Da li zlato predstavlja efikasnu zaštitu od inflacije: primer Srbije. *Revija kopaonické škole prirodnog prava*, 2, 117-134.
17. Fabris, N. (2022a). Impact of Covid-19 Pandemic on Financial Innovation, Cashless Society, and Cyber Risk. *Economics - Innovative and Economics Research Journal*, 10(1), 73-86.
18. Fang, L., Bouri, E., Gupta, R. and Roubaud, D. (2019). Does Global Economic Uncertainty Matter for the Volatility and Hedging Effectiveness of Bitcoin? *International Review of Financial Analysis*, 61 (January), 29–36.
19. Frankel, J. (2014). Effects of Speculation and Interest Rates in a “Carry Trade” Model of Commodity Prices. *Journal of International Money and Finance*, 42, 88-112.
20. Gatar, M. (2022). Štiti li zlato zaista od inflacije. Retrieved from: [www.novaczasutra.hr/Article/analiza-marija-gatare-stiti-li-zlato-zaista-od-inflacije/2274](http://www.novaczasutra.hr/Article/analiza-marija-gatare-stiti-li-zlato-zaista-od-inflacije/2274)
21. Ghosh, D., Levin, E. J., Macmillan, P. and Wright, R.E. (2001). Gold as an Inflation Hedge. Retrieved from: [https://www.researchgate.net/publication/24126838\\_Gold\\_as\\_an\\_Inflation\\_Hedge/link/0912f509cd3d768b70000000/download](https://www.researchgate.net/publication/24126838_Gold_as_an_Inflation_Hedge/link/0912f509cd3d768b70000000/download)
22. Gil-Alana, L .A., Abakah, E. J. A. and Rojo, M. F .R. (2020). Cryptocurrencies and Stock Market Indices. Are they related? *Research in International Business and Finance* 51 (January)
23. Goodell, J.W. and Goutte, S. (2021). Co-movement of COVID-19 and Bitcoin: Evidence from Wavelet Coherence Analysis. *Finance Research Letters*, 38(C), 1-7.
24. Guesmi, K., Saadi, S., Abid, I. and Ftiti, Z. (2019). Portfolio Diversification with Digital Currencies: Evidence from Bitcoin. *International Review of Financial Analysis*, 63(May), 431-437.
25. Hoque, M.E. & Low, S.W. (2022). Reactions of Bitcoin and Gold to Categorical Financial Stress: New Evidence from Quantile Estimation. *Risks*, 10(136), 1-11.
26. Howarth, J. (2022). How Many Cryptocurrencies are There In 2022? Retrieved from: <https://explodingtopics.com/blog/number-of-cryptocurrencies>
27. Iacurci G. (2021). Gold as an inflation Hedge? History Suggests Otherwise. Retrieved from: <https://www.cnn.com/2021/06/08/gold-as-an-inflation-hedge-history-suggests-otherwise.html>
28. Joachim, K. (2015). Facts and Fantasies about Gold. MPRA Paper No. 64590, Munich.



29. Kaczmarek, P. (2022). Central Bank Digital Currency: Scenarios of Implementation and Potential Consequences for Monetary System. *Journal of Central Banking Theory and Practice*, 11(3) 137-154.
30. Kaygin, E., Zengin, Y., Topcuoglu, E. and Ozkes, S. (2021). The Evaluation of Block Chain Technology within the Scope of Ripple and Banking Activities. *Journal of Central Banking Theory and Practice*, 10(3) 153-167.
31. Key, A. (2022). Bitcoin Eyes Safe-Haven Status as Gold Correlation Returns. Retrieved from: <https://decrypt.co/112742/bitcoin-eyes-safe-haven-status-gold-correlation-returns-says-bank-america>.
32. Klein T., Thu H .P. and Walther T. (2018). Bitcoin is not the New Gold—a Comparison of Volatility, Correlation, and Portfolio Performance. *International Review of Financial Analysis*, 59 (October), 105–116.
33. Koenker, R. and Bassett, G. (1978). Regression Quantiles. *Econometrica*, 46(1), 33–50.
34. Kumar, A. S. and Padakandla, S. R. (2022). Testing the Safe-Haven Properties of Gold and Bitcoin in the Backdrop of COVID-19: A Wavelet Quantile Correlation Approach. *Finance Research Letters*, 47, 1-8.
35. Levin, E. and Wright, R. (2006). Short-Run and Long-Run Determinants of the Price of Gold. World Gold Council, Research Study No. 32, London.
36. Lukić, V. (2017) "Potentials and limits of private digital currencies", Seminar katedre za ekonomsku politiku, Ekonomski fakultet, Beograd.
37. Nagy, B. Z. and Benedek, B. (2021). Higher Co-moments and Adjusted Sharpe Ratios for Cryptocurrencies. *Finance Research Letters*, 39(C).
38. OMFIF (2018). Global Crypto-Asset regulatory landscape. London & Oxford Group, London.
39. Partz, H. (2022). Gold vs BTC Correlation Signals Bitcoin Becoming Safe Haven: BofA. Retrieved from: <https://cointelegraph.com/news/gold-vs-btc-correlation-signals-bitcoin-becoming-safe-haven-bofa>.
40. Paulus, H. R. (2020). Can Cryptocurrency, Gold and Bonds Serve as Safe Haven for the Indonesian Capital Market. Retrieved from <https://Downloads/60856-493-200264-6-10-20210416.pdf>.
41. Pho K. H., Ly, S., Lu, R., Hoang, T. H. V. and Wong, W-K. (2021). Is Bitcoin a Better Portfolio Diversifier than Gold? A Copula and Sectoral Analysis for China. *International Review of Financial Analysis*, 74(March), 21-35.
42. Rai, V. (2022). Cryptocurrency: Not a Safe Haven in 2022. Retrieved from: <https://economics.td.com/ca-cryptocurrency-not-safe-haven>.
43. Selmi, R., Mensi, W. Hammoudeh, S. and Bouoiyour, J. (2018). Is Bitcoin a Hedge, a Safe haven or a Diversifier for Oil Price Movements? A Comparison with Gold. *Energy Economics*, 74(August), 787–801.

44. Shafiee, S. and Topal E, (2010). An Overview of Global Gold Market and Gold Price Forecasting. *Resources Policy*, Vol 35, 178-189.
45. Shahzad S. J. H., Bourri, E., Roubaud, D., Kristoufek, L. and Luceyf, B. (2019) Is Bitcoin a Better Safe-Haven Investment than Gold and Commodities? *International Review of Financial Analysis*, 63 (C), 322–330.
46. Summers, L. (1998). Gibson's Paradox and the Gold Standard. *Journal of Political Economy*, 96(3), 528-50.
47. Syuhada, K., Suprijanto, Dj. and Hakim, A. (2021). Comparing Gold's and Bitcoin's Safe Haven Rules Against Energy Commodities During the Covid-19 Outbreak: a Vine Copula Approach. *Finance Research Letters*, 46(b).
48. Tully, E. and Lucey, B. (2007). A Power GARCH Examination of the Gold Market. *Research in International Business and Finance*, 21(2), 316-325.
49. Vučinić, M. and Luburić, L. (2022). Fintech, Risk-Based Thinking and Cyber Risk. *Journal of Central Banking Theory and Practice*, 11(2) 27-53.
50. Vukovic, D., Maiti, M., Grubisic, Z., Grigorieva, E. M. and Frömmel, M. (2021) COVID-19 Pandemic: Is the Crypto Market a Safe Haven? The Impact of the First Wave. *Sustainability*, 13(15), 1-17.
51. Wagstyl, S. (2021). Will Gold Have its Day as a Crisis Hedge? Retrieved from: [www-ft-com.ezp-prod1.hul.harvard.edu/content/c48cfd1b-8d99-4f02-be3a-d5917f3b3802](http://www-ft-com.ezp-prod1.hul.harvard.edu/content/c48cfd1b-8d99-4f02-be3a-d5917f3b3802).
52. Wen, F., Cao, J., Liu, Z. and Wang, X. (2021). Dynamic Volatility Spillovers and Investment Strategies Between the Chinese Stock Market and Commodity markets. *International Review of Financial Analysis*, 76(July), 24-47.
53. Yatie, A. (2022). Crypto-Assets Better Safe-Havens than Gold during Covid-19: The Case of European indices. Retrieved from: <https://arxiv.org/pdf/2202.10760>.
54. Yue, F. (2022). Gold and Bitcoin were Touted as Safe Havens: Both Cases are Falling Apart. Retrieved from: <https://www.marketwatch.com/story/gold-and-bitcoin-were-touted-as-safe-havens-both-cases-are-falling-apart-11664826613>