

GLOBAL EFFECTS OF COVID-19 PANDEMIC ON THE FINANCIAL MARKETS: IS GOLD HEDGE OR SAFE HAVEN FOR STOCKS?

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Abstract

This study investigates whether gold is hedge or safe haven for stocks for a sample of 14 countries (7 developed and 7 emerging markets), using regression methods with GARCH(1,1) errors. The analysis is based on daily frequency observations of a period of nearly 20 years, ranging from September 17, 2001 to September 10, 2021. The data are split into two sub-samples on December 30, 2019 to diversify the effects of the COVID-19 crisis on global investor behavior. Different currency denominations are considered for gold and stock prices both in terms of national currencies and the U.S. dollar to distinguish between the behaviors of domestic and foreign investors. The results indicate that gold is hedge and safe haven especially for the emerging markets during the COVID-19 pandemic when market falls become more severe in the aftermath of the worldwide economic turmoil. The number of countries where gold acts as hedge and safe haven increases when the market prices are in terms of national currencies.

Keywords: Gold, Stock Market, COVID-19 Effects, Hedge, Safe Haven.

COVID-19 PANDEMİSİNİN FİNANSAL PİYASALARA GLOBAL ETKİSİ: ALTIN HİSSELER İÇİN HEDGE VEYA GÜVENLİ LİMAN MIDIR?

Öz

Bu çalışma altının, 14 ülkede (7 gelişmiş ve 7 gelişmekte olan) hisse senedi yatırımlarına karşı güvenli liman ve hedge özelliğini GARCH (1,1) hata terimleri varsayımıyla regresyon metodları kullanılarak araştırmaktadır. Verilerimiz günlük frekansta olup 17 Eylül 2001 tarihinden 10 Eylül 2021 tarihine kadar uzanan yaklaşık 20 yıllık bir periyodu kapsamaktadır. COVID-19 krizinin global yatırımcı davranışını nasıl değiştirdiğinin araştırılmasına yönelik olarak, 30 Aralık 2019 tarihi itibarıyla örneklem iki alt gruba ayrılmıştır. Yerli ve yabancı yatırımcıların farklı davranışlarını ortaya çıkarabilmek için tüm fiyatlar hem yerel para birimleri hem de A.B.D. doları olarak analiz edilmiştir. Altın, özellikle de gelişmekte olan

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piyasalar için COVID-19 kriz döneminde hedge ve güvenli liman olarak öne çıkmaktadır. COVID-19 döneminde, dünya çapındaki ekonomik çalkantının ardından piyasa düşüşleri daha şiddetli hale gelmiştir. Yerli yatırımcı davranışını anlayabilmek için A.B.D. doları yerine yerel para birimi cinsinden piyasa fiyatlarına odaklandığımızda da altının riskten korunma aracı ve güvenli liman işlevi gördüğü ülke sayısının arttığı görülmektedir.

Anahtar Kelimeler: Altın, Hisse Senetleri, COVID-19 Etkileri, Hedge, Güvenli Liman.

Introduction

World financial markets have experienced their worst downfall during the COVID-19 pandemic period since the 1930s. This severe health crisis quickly transformed into a worldwide economic crisis causing a global economic slowdown of 2.8% on average (Jambotkar and Guntur, 2021: 233). The economic crisis also impacted financial markets causing severe losses. During extreme periods, risks associated with the financial system create the need for a safe haven for investors. Gold can be identified as a good investment choice in times of financial distress to protect wealth. Gold is a store of value that can be a good hedge asset or a safe haven tool for investors in stock markets; when in times of extreme financial losses investors sell their stocks and buy gold to avoid loss of wealth. This, in turn, causes rising prices and returns in the gold market.

The respective definitions of a hedge asset and a safe haven (port/harbor) asset are given in Baur and Lucey (2010). The correlation between a hedge asset and another asset is zero or negative on average, whereas the correlation between a safe haven asset and another asset is zero or negative during times of *market stress or turmoil*.

This paper aims to examine the hedge and safe haven properties of gold for the stocks of seven developed and seven emerging markets. Regression estimations under the assumption of GARCH (1,1) errors are analyzed. In the analysis, to account for the effects of the COVID-19 pandemic on investor behavior, two different sub-samples are considered by splitting the data into two: one for the pre-COVID-19 period and one for the COVID-19 period. Additionally, two different currency denominations of gold and stock prices are used for estimations, namely one in terms of the countries' own national currencies and the other in terms of the U.S. dollar. Different currency denominations are analyzed to account for the difference between investor behaviors of nationwide and international investors (Gürgün and Ünalımış, 2014: 343). The paper structure is organized as follows: in Section 1, a brief related literature review is presented on the subject matter; Section 2 provides details on the data and the econometric method; Section 3 presents and discusses the empirical results. The last section concludes the paper.

1. RELATED LITERATURE

In this study, the methodology of Baur and Lucey (2010) and Baur and McDermott (2010) is followed and the GARCH (1,1) heteroskedastic error assumption is used. Their regression-based method has been used extensively in literature to test for the hedge and safe haven properties of gold in different markets. Baur and Lucey (2010) and Ciner, Gurdgiev, Lucey (2013) focused on developed markets, whereas Gürgün and Ünalmiş (2014) focused on emerging and developing markets to test for the hedge and/or safe haven properties of gold using the method described in Baur and Lucey (2010). Baur and McDermott (2010) considered the global financial system. Bahloul, Mroua, Naifar (2021) used the same methodology of Baur and Lucey (2010) and Baur and McDermott (2010) to test whether the MSCI all country world index, the MSCI all country world Islamic index, gold, and bitcoin were safe havens for the world conventional stock markets and investigated the impact of the COVID-19 pandemic. Akhtaruzzaman, Boubaker, Lucey, Sensoy (2021) also used the method of Baur and Lucey (2010) in determining gold's ability of being hedge or safe haven against stock markets (S&P 500, Euro Stoxx 50, Nikkei 225, China FTSE A50). This study focuses on a set of 14 developed and emerging markets to identify the COVID-19 effects and whether the investors switch to gold as a safe haven instrument during times of financial turmoil.

The empirical investigation of the hedge and safe haven properties of gold has yielded mixed results in the literature. Different empirical methodologies have been used. A spectrum of empirical methods has been used in addition to the regression model of Baur and Lucey (2010) and Baur and McDermott (2010), such as the wavelet analysis method, the asymmetric GARCH method, the GARCH copula method, the volatility spillover analysis, and the VAR-DCC-GARCH method. Dyhrberg (2016), Bouri, Molnar, Azzi, Roubaud, Hagfors (2017), Bulut and Rizvanoglu (2020), Bouri, Shahzad, Roubaud, Kristoufek, Lucey (2020), Zhang and Wang (2021), and Ustaoglu (2022) are other empirical studies on hedge and safe haven analysis.

Gold's value is mainly determined through its shortage of supply and the supply of gold is not controlled by governments but by independent agents. Another important property of gold is its high price volatility (Dyhrberg, 2016: 140). Gold is an important asset, which is generally expected to be a safe haven asset in emerging markets. It is also shown to have safe haven properties in developed markets. Its safe haven property for stocks, especially during the COVID-19 pandemic crisis, has attracted attention and it has been analyzed in different studies including those of Ji, Zhang, Zhao (2020), Adekoya, Oliyide, Oduyemi (2021), Akhtaruzzaman et al. (2021), Bahloul et al. (2021), and Hong, Ma, Wang, Liang (2022).

Ji et al. (2020), considered gold with several other assets against MSCI equities and investigated whether gold was a safe haven, covering the period August 2019 to March 2020 while evaluating the effects of the

COVID-19 pandemic. Their results indicated that gold's safe haven property remained robust during the COVID-19 pandemic. The method they used was a sequential monitoring procedure that made use of the left-tail quantiles of the asset return distributions.

Adekoya et al. (2021) made use of threshold regression and Markov-switching models and showed that the risks of investing in stock markets could be effectively hedged by gold during the COVID-19 period.

Hong et al. (2022), provided evidence from an extreme Granger-causality test, analyzed the causality between the stock market and the gold market, and searched for any difference in their relationship before and after the COVID-19 pandemic crisis. They investigated the risk transmission between gold and stocks and found that the causality between gold and stock shocks was greatly promoted after the pandemic.

Baur and Lucey (2010)'s results showed that gold was as a safe haven asset for stocks in the U.S., the U.K. and Germany, and a hedge asset for stocks in the U.S. and the U.K. According to the results of the bond market, they found that gold was neither a safe haven nor a hedge asset for bonds in the U.S. or in the U.K. Baur and McDermott (2010) considered the financial system globally and analyzed the safe haven properties of gold for major European stock markets, the U.S., Australia, Canada, Japan and for major emerging markets of BRIC countries. There is evidence that gold generally represents safe haven properties in developed countries and not so much in emerging market economies. Even severe losses suffered in the emerging markets do not induce investors to switch to gold as a safe haven instrument. Ciner et al. (2013) compared gold returns against equity returns (S&P 500 and FTSE indices for the U.S. and the U.K.) and found that for U.S. data gold did not act as a safe haven. They also did not find gold as a safe haven for U.K. stocks during equity market turmoil periods. Gürgün and Ünalmiş (2014) also analyzed gold against equity market indices for all countries in the MSCI emerging markets index in addition to several other emerging markets. They distinguished between domestic and foreign investors. They also checked for the effects of the 2008 financial crisis by running separate regression analyses for the period of September 2008 to September 2013. Gold was mostly shown to be a hedge asset and a safe haven if prices were considered in terms of domestic currencies. This result also held during the 2008 crisis. During severe financial turmoil, gold started acting as a safe haven in a larger set of countries.

Due to recent financial crises related to the COVID-19 pandemic, it is useful to distinguish between the global investor behaviors in financial markets during the pre-COVID-19 and COVID-19 pandemic periods. Bahloul et al. (2021), for example, considered the MSCI ACWI, the MSCI all country Islamic index, bitcoin and gold data to determine gold's shelter ability. If gold is a safe haven, it provides shelter from turbulent events in conventional stock markets. The study by Bahloul et al. (2021) used daily

data from April 30, 2015 to March 27, 2020. The data were split into two sub-samples, namely during the COVID-19 period and during the pre-COVID-19 period. Their results showed gold as strong hedge but weak safe haven during the COVID-19 crisis. Akhtaruzzaman et al. (2021) focused on daily frequency data of gold and several stock market indexes (S&P 500, Euro Stoxx 50, Nikkei 225, China FTSE A50) from January 2, 2018 to April 24, 2020. They even extended their analysis to divide the COVID-19 pandemic period into two different phases: Phase I (December 31, 2019 - March 16, 2020) and Phase II (March 17, 2020 - April 24, 2020) to show that gold mainly lost its safe-haven property during the second phase of the pandemic.

This study considers the safe haven and hedge properties of gold with a relatively large set of countries to examine gold against stocks. An important feature of the regression method by Baur and Lucey (2010) and Baur and McDermott (2010) is that it allows an estimation of the individual coefficients and to make inference in determining whether a financial instrument is hedge or safe haven. One can test for the statistical significance of the parameters and estimate their signs and magnitudes. A detailed explanation of the regression method is given in the next section. As noted before in the text, the regression method by Baur and Lucey (2010) and Baur and McDermott (2010) has been used in the studies of Ciner et al. (2013), Gürgün and Ünalmiş (2014), Akhtaruzzaman et al. (2021), and Bahloul et al. (2021).

2. DATA AND METHODOLOGY

2.1. Data

Data of developed and emerging markets that were listed under MSCI all country world index (ACWI) were used. A group of seven countries of developed markets, namely Canada, the United States (Americas); France, Germany, Italy, United Kingdom (Europe); Japan (Pacific), and a group of seven countries from emerging markets, namely Brazil, Mexico (Americas), Russia, Turkey (Europe); China, India, Indonesia (Asia) were selected for analysis. Data on two indices were also taken: the MSCI world index (to account for developed markets) and the MSCI emerging markets index (to account for emerging markets). The daily frequency data of our analysis range between September 17, 2011 and September 10, 2021. All MSCI data were taken from the Thomson Reuters Eikon database, and gold spot prices were taken from the World Gold Council (World Gold Council, 2021). Stock and gold market prices were merged based on trading days as the trading days of the markets differ. The data merge and all operations related to estimations were done through the R software.

Since COVID-19 has important effects on world financial markets, the data were also split into two sub-groups to identify the pre-COVID-19 and

COVID-19 periods. The data were split on December 30, 2019 as by late December of 2019 the first case of COVID-19 was confirmed in China.

2.2. Research Methodology

Baur and McDermott (2010)'s approach is used in the study. It is assumed in the approach that, the changes in the gold price depend on the changes in the stock market price and the relationship is non-linear. The gold return series depend on the extreme stock market conditions:

$$r_{Gold,t} = a + b_t r_{Stock,t} + e_t \quad (1a)$$

$$b_t = c_0 + c_1 D(r_{Stock,q10}) + c_2 D(r_{Stock,q5}) + c_3 D(r_{Stock,q1}) \quad (1b)$$

$$h_t = \pi + \alpha e_{t-1}^2 + \beta h_{t-1} \quad (1c)$$

Equations (1a), (1b) and (1c) denote the system of equations of the regression model in this study. The system is a GARCH(1,1) model that accounts for heteroskedastic errors e_t . All equations are jointly estimated through maximum likelihood method.

In Equation (1b), $D(\dots)$ are the dummies and they represent turbulent market conditions. Dummies take the value of one if the return in market is in the 10%, 5% or 1% quantiles of the return distribution. In other words, dummies are equal to one if the stock market returns are lower than the 10%, 5%, or 1% quantiles of the return distribution and equal to zero otherwise. Daily returns (denoted by r_t , either r_{Stock} or r_{Gold}) of all studied assets are calculated by:

$$r_t = \ln(p_t/p_{t-1}) \quad (2)$$

where in Equation (2), p_t is the price of the asset at date t and \ln denotes the natural logarithm.

If the value of c_1 , c_2 or c_3 is found to be different from zero, there is a non-linear relationship between gold and the stock returns. It is assumed in Equation (1b) that investor behavior differs in extreme stock market conditions from normal stock market conditions.

The decision of whether gold is a safe haven and/or a hedge asset for stocks is made in the following way: Non-positive signs of c_0 , c_1 , c_2 or c_3 indicate that gold is a weak safe haven. Negative and statistically significant c_0 , c_1 , c_2 or c_3 values show that gold is strong safe haven. If c_0 is zero or negative and the sum of c_1 , c_2 and c_3 are not jointly positive exceeding the value of c_0 , then gold is a weak or a strong hedge asset (Baur and McDermott, 2010: 1893).

3. ESTIMATION RESULTS

Tables 1 through 6 present the results of the regression analyses of Equation (1) for the 14 countries. Table 1 and 4 contain full sample estimation results for gold and stock market returns in terms of national currency and the U.S. dollar respectively. The distinction is made between regressing gold returns on stock returns in terms of national currencies and the U.S. dollar to distinguish the behavior of nationwide and international

investors (Gürğün and Ünalnıř, 2014: 343). Focusing on the statistical significance of the c_1 , c_2 , c_3 parameters in all tables, it can be concluded that the non-linearity assumption made for the model was correct (Baur and McDermott, 2010: 1893).

If negative (zero) parameter estimates are found in the hedge columns, gold is indicated as a strong (weak) hedge asset against stocks. Similarly, if zero or negative parameter estimates are found for the extreme market conditions (coefficients of dummies for 10%, 5%, or 1% quantiles), gold is indicated as a weak or strong safe haven for stocks respectively (Baur and McDermott, 2010: 1893).

Table 1. Results of the Full Sample Period				
Prices in National Currency				
	Hedge	0.1	0.05	0.01
Canada	-0.092077*** (0.016927)	0.152525*** (0.041004)	0.078520** (0.044273)	-0.189560*** (0.037861)
France	-0.031482*** (0.010776)	-0.033088 (0.027668)	0.233643*** (0.031948)	-0.122547*** (0.032165)
Germany	-0.009423 (0.008568)	0.243303*** (0.027383)	-0.184457*** (0.030079)	-0.040530 (0.027798)
Italy	-0.060902*** (0.009692)	0.006725 (0.025168)	0.056228** (0.029287)	-0.076589*** (0.030595)
Japan	0.127395*** (0.012851)	0.051116* (0.030705)	0.062973* (0.032842)	0.271711*** (0.040647)
UK	-0.108512*** (0.014725)	0.275900*** (0.041570)	0.092501** (0.044749)	-0.248425*** (0.041327)
USA	0.111398*** (0.020868)	0.159427*** (0.039073)	-0.004667 (0.039934)	0.120219*** (0.041703)
Brazil	-0.014264 (0.014445)	-0.021812 (0.035124)	0.117613*** (0.034234)	0.031324 (0.028015)
China	0.132509*** (0.009726)	0.131564*** (0.027326)	-0.070492** (0.028441)	0.173749*** (0.019943)
India	-0.002293 (0.012156)	0.070894*** (0.023224)	0.136079*** (0.024809)	0.046713*** (0.022273)
Indonesia	-0.001515 (0.008312)	0.198508*** (0.025702)	-0.076722*** (0.028140)	-0.159342*** (0.031866)
Mexico	-0.003747 (0.018299)	0.018006 (0.038703)	-0.015166 (0.038913)	0.004863 (0.036191)
Russia	0.040887*** (0.010249)	0.089682*** (0.029496)	0.037807 (0.030215)	0.002314 (0.020279)
Turkey	0.052912*** (0.012207)	-0.117273*** (0.026590)	-0.034826 (0.025703)	-0.032480 (0.023116)

Standard errors are below in parantheses. *Significance at the 10% level. **Significance at the 5% level. ***Significance at the 1% level. Darker shade colors: strong hedge asset/safe haven. Lighter shade colors: weak hedge asset/safe haven. No shade: no hedge asset/safe haven properties.

	Hedge	0.1	0.05	0.01
Canada	-0.095237*** (0.017556)	0.104218** (0.043614)	0.253265*** (0.046688)	-0.273977*** (0.040601)
France	-0.019885* (0.011195)	-0.096337*** (0.030341)	0.347033*** (0.036451)	-0.095281** (0.038653)
Germany	-0.010519 (0.008868)	0.299522*** (0.029294)	-0.210669*** (0.032277)	-0.088869*** (0.030698)
Italy	-0.052689*** (0.010042)	-0.008009 (0.027216)	0.066521** (0.031948)	-0.118409*** (0.038143)
Japan	0.123867*** (0.013232)	0.077504*** (0.031770)	0.070609** (0.034158)	0.237266*** (0.041065)
UK	-0.071604*** (0.015298)	0.249575*** (0.043474)	0.175577*** (0.047619)	-0.212381*** (0.045723)
USA	0.086117*** (0.022362)	0.072784* (0.043568)	0.191640*** (0.043511)	0.134968*** (0.044841)
Brazil	0.269709*** (0.011539)	0.116027*** (0.027555)	0.056121** (0.028204)	-0.053212** (0.022210)
China	0.132392*** (0.010522)	0.114649*** (0.029345)	-0.047251 (0.030221)	0.167285*** (0.020578)
India	-0.015550 (0.012402)	0.099869*** (0.024718)	0.144580*** (0.025954)	0.031456 (0.022431)
Indonesia	0.030474*** (0.005188)	-0.009178 (0.013106)	-0.018073 (0.013329)	0.035735*** (0.013813)
Mexico	0.266466*** (0.014876)	-0.114397*** (0.037798)	0.260516*** (0.036205)	0.091371*** (0.025180)
Russia	0.052767*** (0.010481)	0.122761*** (0.030249)	0.031314 (0.030614)	-0.055573*** (0.021220)
Turkey	0.014949** (0.006778)	-0.038531*** (0.013947)	0.021120 (0.014855)	0.060244*** (0.015277)

Standard errors are below in parantheses. *Significance at the 10% level. **Significance at the 5% level. ***Significance at the 1% level. Darker shade colors: strong hedge asset/safe haven. Lighter shade colors: weak hedge asset/safe haven. No shade: no hedge asset/safe haven properties.

Table 1 incorporates the effects of both the pre-COVID-19 and COVID-19 periods. From Table 1, it can be deduced that Canada, France, Italy and U.K. are the countries where gold acts as a strong hedge asset for stocks on average, and Germany, Brazil, India, Indonesia and Mexico are the countries where gold is a weak hedge asset for stocks. Furthermore, gold shows strong safe haven properties for Canada, France, Italy, the U.K., and Indonesia at 1% quantiles or at extreme market falls. Gold shows safe haven properties for Germany, China, Indonesia and Turkey at the 5% and 10% quantiles. For Mexico, gold also satisfies the weak safe haven property.

Results in Table 2, which show investor behavior for pre-COVID-19 period, indicate that for Canada and Italy gold acts as a strong hedge asset and for Germany gold acts as a weak hedge asset. A weak safe haven property is detected for Italy. Focusing on the coefficient of the 1% quantile dummy, it is observed that, for Canada, France, Germany, Italy, the U.K.

and Russia gold is a strong safe haven for domestic investors. Focusing on the 5% and 10% quantile dummies, France, Germany, Mexico and Turkey are the countries in which gold appear to be a strong safe haven for domestic investors.

When the results from the COVID-19 period are analyzed in Table 3, gold appears a strong hedge asset for France, Italy, the U.K., Indonesia, Mexico, Russia and Turkey, which constitutes 7 of the 14 countries in the sample. During this period, Russia, Mexico and Indonesia show weak safe haven properties overall. Most of the strong safe haven properties are detected for the coefficients of the 10% quantile dummies (one for the 5% quantile dummy) for six countries including Canada, Germany, U.S.A., Brazil, India and Russia.

	Hedge	0.1	0.05	0.01
Canada	0.093430* (0.054406)	-0.398275*** (0.096902)	-0.004611 (0.094800)	0.203202** (0.102821)
France	-0.104382*** (0.036880)	0.052299 (0.060314)	-0.014864 (0.059618)	0.177600** (0.074181)
Germany	0.023004 (0.037869)	-0.162924** (0.078673)	0.058866 (0.076630)	0.208387*** (0.073820)
Italy	-0.182164*** (0.034482)	0.147886*** (0.060477)	-0.033102 (0.057403)	0.168549*** (0.062956)
Japan	0.172169*** (0.058074)	-0.151795 (0.119424)	-0.057301 (0.122546)	0.207351** (0.121023)
UK	-0.541038*** (0.040380)	0.236884*** (0.091237)	0.045463 (0.088398)	0.136435* (0.079195)
USA	0.497965*** (0.043337)	-0.699164*** (0.092493)	0.136733 (0.096911)	0.189692** (0.094485)
Brazil	0.327371*** (0.042372)	-0.412709*** (0.100463)	0.020462 (0.100665)	0.141875* (0.084260)
China	0.142316*** (0.025981)	0.271211*** (0.083702)	-0.159862 (0.100044)	0.162550 (0.147348)
India	0.355217*** (0.056418)	-0.489273*** (0.096571)	-0.098738 (0.089642)	0.093302 (0.104357)
Indonesia	-0.213435*** (0.010367)	-0.036709 (0.026235)	-0.046144* (0.027496)	0.035508 (0.023161)
Mexico	-0.182720*** (0.056414)	0.186483* (0.099639)	-0.007081 (0.111760)	-0.131386 (0.145386)
Russia	-0.299954*** (0.068910)	-0.041923 (0.112335)	-0.468215*** (0.152244)	0.328822 (0.234778)
Turkey	-0.635407*** (0.018450)	0.256378*** (0.046094)	0.073475 (0.056788)	0.022855 (0.079132)

Standard errors are below in parantheses. *Significance at the 10% level. **Significance at the 5% level. ***Significance at the 1% level. Darker shade colors: strong hedge asset/safe haven. Lighter shade colors: weak hedge asset/safe haven. No shade: no hedge asset/safe haven properties.

Table 4. Results of the Full Sample Period Prices in U.S. Dollar				
	Hedge	0.1	0.05	0.01
Canada	0.334541*** (0.013567)	0.110082*** (0.030737)	0.022185 (0.032278)	-0.085620*** (0.028235)
France	0.218932*** (0.013266)	-0.107900*** (0.032980)	0.143108*** (0.033968)	0.097452*** (0.030336)
Germany	0.209435*** (0.010830)	-0.027938 (0.026174)	0.129467*** (0.030749)	-0.040768 (0.028212)
Italy	0.149851*** (0.010435)	0.088421*** (0.026658)	-0.002430 (0.028221)	-0.043183 (0.032003)
Japan	0.206024*** (0.015824)	0.107964*** (0.042255)	0.042124 (0.045217)	0.105573 (0.038523)
UK	0.241873*** (0.014375)	0.036687 (0.036782)	0.064305 (0.041730)	0.026914 (0.037401)
Brazil	0.194047*** (0.007150)	-0.002115 (0.016918)	0.058206*** (0.017761)	0.008882 (0.015357)
China	0.199058*** (0.008862)	0.098653*** (0.027765)	-0.031411 (0.028103)	0.132688*** (0.018271)
India	0.195583*** (0.009325)	-0.071907*** (0.021997)	0.189488*** (0.022604)	0.013822 (0.017832)
Indonesia	0.236085*** (0.007858)	-0.027293 (0.020802)	0.098450*** (0.022005)	-0.050717*** (0.017584)
Mexico	0.175387*** (0.010820)	0.099323*** (0.025039)	0.093302*** (0.024892)	-0.092871*** (0.023476)
Russia	0.120308*** (0.007278)	0.124885*** (0.021601)	-0.013111 (0.021842)	0.019605 (0.016570)
Turkey	0.125021*** (0.004908)	0.026229*** (0.012004)	0.050910*** (0.014036)	0.030605* (0.015998)

Standard errors are below in parantheses. *Significance at the 10% level. **Significance at the 5% level. ***Significance at the 1% level. Darker shade colors: strong hedge asset/safe haven. Lighter shade colors: weak hedge asset/safe haven. No shade: no hedge asset/safe haven properties.

Table 5. Results (Pre-COVID-19 Sample)				
Prices in U.S. Dollar				
	Hedge	0.1	0.05	0.01
Canada	0.343313*** (0.013830)	0.150123*** (0.032316)	0.038848 (0.033809)	-0.118953*** (0.028989)
France	0.215229*** (0.013809)	-0.042985 (0.035825)	0.108386*** (0.037085)	0.137115*** (0.031355)
Germany	0.208717*** (0.011106)	-0.028076 (0.027015)	0.168449*** (0.031898)	-0.053845* (0.029402)
Italy	0.155984*** (0.010603)	0.095107*** (0.027598)	-0.005124 (0.029212)	0.049209 (0.033006)
Japan	0.205852*** (0.016219)	0.052230 (0.044105)	0.118628*** (0.046907)	0.123051*** (0.039333)
UK	0.271344*** (0.014750)	0.008207 (0.038878)	0.117861*** (0.044533)	0.050748 (0.038743)
Brazil	0.200742*** (0.007275)	-0.005646 (0.017539)	0.074170*** (0.018172)	0.004337 (0.015551)
China	0.208114*** (0.009227)	0.064482** (0.029108)	-0.019487 (0.029224)	0.136332*** (0.018631)
India	0.193898*** (0.009516)	-0.047192** (0.023138)	0.202797*** (0.023618)	-0.023819 (0.017971)
Indonesia	0.246260*** (0.008108)	-0.035067* (0.021631)	0.128455*** (0.022797)	-0.076391*** (0.017946)
Mexico	0.189134*** (0.011113)	0.106641*** (0.026449)	0.087113*** (0.026194)	-0.030052 (0.023977)
Russia	0.134356*** (0.007467)	0.127952*** (0.022190)	-0.011279 (0.022265)	0.003239 (0.016662)
Turkey	0.134338*** (0.004991)	0.024200*** (0.012090)	0.054216*** (0.014081)	0.021334 (0.016443)

Standard errors are below in parantheses. *Significance at the 10% level. **Significance at the 5% level. ***Significance at the 1% level. Darker shade colors: strong hedge asset/safe haven. Lighter shade colors: weak hedge asset/safe haven. No shade: no hedge asset/safe haven properties.

Applying the same analysis to Tables 4, 5 and 6 for foreign investor behavior, it can be seen that for the full sample period, none of the countries show evidence of gold as a hedge asset; and for only Canada, Indonesia and Mexico gold acts as a strong safe haven during extreme market conditions. Estimation results for France and India show evidence of a strong safe haven property of gold at only the 10% quantile. There are not many changes in Table 5 compared to Table 4. In Table 5, Mexico and France's dummy coefficients become insignificant.

Results of Table 6 indicate that the U.K., Mexico, Russia and Turkey are the countries where gold is a strong hedge asset for the equity market. Indonesia appears to be the country where gold is a weak hedge instrument on average. The foreign investors in Canada, France, Italy, Japan and India at 10% and 5% market losses, appear to switch to the gold market, making gold a safe haven asset against the stocks.

Table 6. Results (COVID-19 Sample)				
Prices in U.S. Dollar				
	Hedge	0.1	0.05	0.01
Canada	0.278448*** (0.049128)	-0.493288*** (0.095442)	0.138211 (0.088299)	0.172604** (0.084298)
France	0.186016*** (0.045945)	-0.330353*** (0.089980)	0.051712 (0.092043)	0.186037* (0.098703)
Germany	0.303003*** (0.046470)	-0.211009* (0.115667)	-0.169512 (0.115897)	0.192148** (0.089550)
Italy	0.086012** (0.047477)	-0.217320** (0.098379)	0.063682 (0.095154)	0.146649 (0.093423)
Japan	0.243975*** (0.066923)	0.355192*** (0.144647)	-0.525594*** (0.151685)	0.093957 (0.149266)
UK	-0.248458*** (0.051496)	0.059015 (0.113405)	0.128199 (0.108962)	0.184952** (0.091661)
Brazil	0.001762 (0.035192)	-0.031812 (0.067662)	-0.007948 (0.065123)	0.076445 (0.060599)
China	0.133662*** (0.027688)	0.616263*** (0.073115)	-0.057506 (0.085675)	-0.037599 (0.105567)
India	0.331629*** (0.047719)	-0.536460*** (0.088058)	0.151705* (0.079995)	0.061756 (0.078770)
Indonesia	0.025260 (0.034658)	-0.042688 (0.085729)	-0.047106 (0.089753)	0.133435** (0.068036)
Mexico	-0.147570*** (0.043298)	0.124246 (0.078009)	0.024488 (0.072912)	-0.070111 (0.073169)
Russia	-0.180854*** (0.028824)	0.082800 (0.076980)	0.045927 (0.079172)	0.157397** (0.074871)
Turkey	-0.254806*** (0.029308)	0.238630*** (0.065474)	0.034718 (0.070948)	-0.075636 (0.081969)

Standard errors are below in parantheses. *Significance at the 10% level. **Significance at the 5% level. ***Significance at the 1% level. Darker shade colors: strong hedge asset/safe haven. Lighter shade colors: weak hedge asset/safe haven. Unshaded: no hedge asset/safe haven properties.

China, Russia, U.S.A., Canada, Brazil, Mexico and Indonesia (in that order) were among the top 10 gold producers in the world according to a recent report by the World Gold Council (Holmes, 2021). It is reasonable to expect stock and gold returns to co-move for major gold producing countries (Gürgün and Ünalımsı, 2014). Our results show that in fact Chinese data, overall, do not show any hedge property of gold. Focusing on the safe haven property of gold for China, again nothing really stands out for the pre-COVID-19 or the COVID-19 periods. The same conclusion can be drawn for the U.S. in addition to being the third top gold producer. However, for Russia, Canada, Mexico, Brazil and Indonesia gold acts as a hedge asset and a safe haven asset for stocks. The estimation results for Indonesia, Mexico and Russia indicate significant differences of investor behaviors during the pre-COVID-19 and COVID-19 sub-samples. The COVID-19 sub-samples (both for domestic and foreign investors) show more evidence toward hedge and safe haven properties of gold against stocks for these countries.

The last three tables presented in this section (Tables 7 through 9), show the results of whether gold acts as hedge and/or safe haven during the pre-COVID-19 and COVID-19 periods for the MSCI world index (MSCI WI) of developed countries, and the MSCI index of emerging markets (MSCIEF). More than 50% of the weight of the MSCI WI belongs to the developed markets of U.S.A., Canada, Europe, and the Pacific (Morgan Stanley Capital International, 2021). MSCI indexes provide the researchers and investors worldwide with an overview of the global investment landscape. As a last step of this study's estimation analysis, Tables 7 through 9 were included to examine the difference of gold's ability to protect against stock market turmoils in developed markets versus emerging markets.

Table 7. Results of the Full Sample Period				
Prices in U.S. Dollar				
	Hedge	0.1	0.05	0.01
MSCI WI	0.256665*** (0.017670)	0.125880*** (0.044348)	-0.035365 (0.046090)	0.083972*** (0.036029)
MSCIEF	0.310133*** (0.010721)	0.029134 (0.027311)	0.077649*** (0.028378)	-0.041065* (0.023315)

Standard errors are below in parantheses. *Significance at the 10% level. **Significance at the 5% level. ***Significance at the 1% level. Darker shade colors: strong hedge asset/safe haven. Lighter shade colors: weak hedge asset/safe haven. No shade: no hedge asset/safe haven properties.

Table 8. Results (Pre-COVID-19 Sample)				
Prices in U.S. Dollar				
	Hedge	0.1	0.05	0.01
MSCI WI	0.242996*** (0.018600)	0.253870*** (0.047925)	-0.112256** (0.049617)	0.096801*** (0.037699)
MSCIEF	0.303900*** (0.011012)	0.032993 (0.028379)	0.103382*** (0.029288)	-0.058686** (0.023708)

Standard errors are below in parantheses. *Significance at the 10% level. **Significance at the 5% level. ***Significance at the 1% level. Darker shade colors: strong hedge asset/safe haven. Lighter shade colors: weak hedge asset/safe haven. No shade: no hedge asset/safe haven properties.

Table 9. Results (COVID-19 Sample)				
Prices in U.S. Dollar				
	Hedge	0.1	0.05	0.01
MSCI WI	0.488156*** (0.053325)	-0.507264*** (0.111154)	-0.116145 (0.112373)	0.264790 (0.101170)
MSCIEF	0.442656*** (0.045885)	0.092927 (0.106956)	-0.608493*** (0.111296)	0.190036* (0.107312)

Standard errors are below in parantheses. *Significance at the 10% level. **Significance at the 5% level. ***Significance at the 1% level. Darker shade colors: strong hedge asset/safe haven. Lighter shade colors: weak hedge asset/safe haven. No shade: no hedge asset/safe haven properties.

Table 7 of the full sample period does not show hedge or safe haven properties for gold except for the emerging markets; the 1% quantile dummy

is negative and significant only at the 10% level. It might indicate that for emerging markets over the entire sample period, gold is a safe haven asset for extreme market losses. Focusing on Tables 8 and 9, which have similar results, on average gold do not appear as a hedge asset. It rather appears to be a strong safe haven when it comes to extreme market loss periods (focusing on the significant and negative 10%, 5%, and 1% dummy coefficients). Specifically in Table 9 during the COVID-19 crisis period, significance levels and magnitudes of negative dummy coefficients stand out for the 10% (developed countries) and for the 5% (emerging markets) dummy coefficients, respectively. Overall, gold is a strong safe haven for the equity markets considering the MSCI world index and the emerging markets index both during the pre-COVID-19 and COVID-19 periods. However, this property was strongly emphasized for the COVID-19 pandemic period.

Conclusion

In this paper, estimations are applied to test and determine whether gold is a hedge and/or a safe haven instrument for the equity markets for a group of 7 developed and 7 emerging economies. The same analysis is re-applied for gold against the MSCI world index (developed markets) and the emerging market index. The results show that there are differences in the study's conclusions between the pre-pandemic and COVID-19 pandemic periods and between the investigations of domestic versus foreign investor behaviors in these 14 countries. Gold stands out as a hedge asset and safe haven asset during the COVID-19 period especially for emerging markets. The number of countries where gold acts as hedge and/or safe haven increases when the focus is on market prices in terms of domestic currency rather than in terms of the U.S. dollar to account for domestic investor behavior. In terms of domestic currencies, during the COVID-19 sub-sample, half of the sample countries (mostly emerging markets) show evidence of gold acting as a strong hedge asset against stocks, and this number decreases in U.S. dollar denominated market prices. When the MSCI all country world and MSCI emerging market indexes are considered, evidence is present that gold acts as a safe haven during market turmoil periods, during the COVID-19 period.

Focusing on the 7 developed and 7 emerging markets, gold is less of a hedge or a safe haven for U.S. dollar denominated equities compared to non-U.S. dollar denominated equities. This conclusion might arise because the results are affected by the changes in the exchange rate market if all prices are considered in terms of the U.S. dollar. The depreciation of the dollar causes an increase in the nominal value of stocks and at the same time it causes an increase in the nominal dollar price of gold. Therefore, it is likely that the changes in the dollar exchange rate directly causes a co-movement of gold and stock price series (Baur and McDermott, 2010: 1894). Also, Gürgün and Ünalmiş (2014) do not mostly find gold to be a hedge asset

and/or safe haven for stock markets when stock prices and gold prices are analyzed in terms of the U.S. dollar. Opposite results are obtained in their study when the stocks and gold prices are considered in terms of the countries' own currencies.

Since the sample countries in our study contain the major gold producing countries such as Russia, Mexico and Indonesia, it is reasonable to expect a positive correlation of gold returns with equity returns on average. However, it observed that, for Russia, Mexico and Indonesia gold becomes a strong hedge and a safe haven asset during the COVID-19 crisis. For other major gold producers like China, U.S.A, and Brazil, gold does not show significant hedge or safe haven properties. For Canada, gold mostly appears to be a strong hedge asset, a result which is consistent with the previous empirical studies.

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