

**The 2008 Global Financial Crisis and COVID-19 Pandemic: How
Safe are the Safe Haven Assets?**

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The 2008 Global Financial Crisis and COVID-19 Pandemic: How Safe are the Safe Haven Assets?

Abstract

We compare the performance of safe-haven assets during the Global Financial Crisis (GFC) and COVID-19 pandemic. First, with regard to the GFC, we find, intermediate (weak) safe haven evidence for US dollar and Swiss Franc (Gold, T-bills, T-bonds and AAA-bonds). Second, with regard to COVID, we find gold is quite risky in some settings, while silver has become very risky. Collectively, our findings suggest that the character of safe haven assets has changed between the crises. Therefore, investors should exercise extreme care (and hope for good luck) when investing in potential safe haven assets during times of market stress.

Keywords: COVID-19; 2008 GFC; safe haven assets

1. Introduction

In this paper, we examine the success of a wide array of claimed safe haven assets during two stressful stock market regimes – the 2008 Global Financial Crisis (GFC) versus COVID-19 pandemic. COVID provides an enticing research setting in which to examine whether the traditional safe assets¹ provide protection from stock market losses, given the unique nature of this twin health/economic crisis.² Indeed, we are motivated by an emerging pattern of conflicting statements in the financial press, along with a growing lack of consensus in the academic literature, regarding the performance of traditional safe havens such as gold and silver during COVID. For instance, several financial press articles claim gold and silver as safe havens during COVID (e.g. Fenton, 2020; Iyer, 2020; Tan, 2020); whereas, several others suggest the opposite (e.g. Mazneva, 2020; Vasquez, 2020).

Our basic research question is – do traditional assets that were safe havens during the GFC (e.g. Baur & McDermott, 2010; Low et al., 2016) maintain their safe haven status during the COVID-19 pandemic? Further, COVID-19 provides us the opportunity to examine whether high-rated US corporate bonds (AAA-grade) offer any type of safe haven shelter, since the largest multinational firms are hoarding almost three times more cash reserves in recent years relative to the 2001 levels (e.g. Faulkender et al., 2019) that could insulate them from the stock market crisis during COVID.

Unforeseen and unanticipated events such as the 1987 stock market crash and the 2008 Global Financial crisis (GFC), trigger flight to quality episodes where investors transfer their investments from risky to safe assets (e.g. Adrian et al., 2019; Baele et al., 2020; Caballero & Krishnamurthy, 2008). It is well claimed in the literature that gold (e.g. Baur & Lucey, 2010;

¹ The traditional safe havens are gold and silver, and to a lesser extent, US Treasury bills and bonds, the US dollar, and the Swiss Franc.

² The spread of COVID-19 – transforming from a regional crisis in China to a global pandemic within three months – has caused severe damage to human lives and the global economy. The stock markets around the world plummeted to their lowest levels since the 2008 Global Financial Crisis (GFC) (BBC, 2020). Further, COVID negatively impacted stock markets more than any previous infectious disease outbreak, including the 1918 Spanish Flu (Baker et al., 2020).

Hillier et al., 2006; Pullen et al., 2014); US Treasury bills and bonds (e.g. Chan et al., 2011; Fleming et al., 1998; Hartmann et al., 2004; Noeth & Sengupta, 2010); and currencies such as the US dollar and the Swiss Franc (e.g. Grisse & Nitschka, 2015; Kaul & Sapp, 2006; Rinaldo & Söderlind, 2010) act as safe havens during periods of stock market turmoil. However, Baur and Lucey (2010) and Chan, et al. (2011) suggest that Treasury bonds possess better properties than gold as a safe haven during stock market crises. Moreover, Brunnermeier et al. (2020) propose US Treasuries as a global safe asset in times of crisis.

Our empirical strategy on the efficacy of safe haven assets, meaningfully diverges from the existing literature in three ways. First, existing studies generally examine just one or two safe haven assets (e.g. Baur & McDermott, 2010). In contrast, we provide a comprehensive and comparative empirical scrutiny in one unified and integrated analysis, across seven alternative candidates.

Second, existing studies use an overly simple two-dimensional criteria (sign and statistical significance) to differentiate between “weak” and “strong” safe havens, [e.g. weak (strong) safe haven status is defined as an asset that is uncorrelated (significantly negatively correlated) with another asset during stock market crises]. Instead, we apply a three-dimensional criteria (by adding economic magnitude) to more meaningfully characterize a trichotomy of situations: “weak”, “intermediate” and “strong” safe havens. We argue that this alternative classification is much better aligned with the practical economic experience of safe haven assets from the perspective of investors.

Finally, existing studies (e.g. Baur & McDermott, 2010; Low, et al., 2016) commonly report the effect of stock market crises on safe haven assets with incremental *significance* which is prone to distorted conclusions. In contrast, we explicate the impact of such crises on candidate safe haven assets based on the significance of total effects.

A growing number of studies examine the impact of COVID-19 on the financial markets and financial assets (e.g. Al-Awadhi et al., 2020; Alfaro et al., 2020; Baker et al., 2020; Kristoufek, 2020; Ramelli & Wagner, 2020; Zhang et al., 2020). Further, several working papers and recent articles also focus on the safe haven assets during COVID and provide contrasting results (Conlon et al., 2020; Conlon & McGee, 2020; Corbet, Hou, et al., 2020; Corbet, Larkin, et al., 2020; Ji et al., 2020; Mariana et al., 2021). For instance, Conlon, et al. (2020) show that a portfolio consisting of Tether and a stock market index provides downside risk benefits to investors across all the countries in their sample (namely, the US; the UK, Italy, Spain and China), whereas, a portfolio consisting of Bitcoin and a stock market index only reduces the downside risk for Chinese investors. In contrast, Corbet, et al. (2020) suggest that large cryptocurrencies acted as a store of value during COVID.³ Furthermore, Ji, et al. (2020) compare the performance of safe haven assets between August–December 2019 and December 2019–March 2020, and find that gold and soybean futures remain as safe haven assets during COVID. Salisu et al. (2021) find that gold serves even as a better safe haven during the pandemic than before the pandemic. But, none of these studies compare the performance of safe haven assets between the GFC and COVID.

Accordingly, in this paper, we perform a coordinated comparative examination of the safe haven efficacy of: (a) precious metals (gold and silver); (b) currencies (US dollar and Swiss Franc); (c) US Treasuries (T-bills and T-bonds); and (d) US corporate bonds (AAA-grade) from stock market losses during the GFC and COVID. We select the stock markets from the world's ten largest economies; namely, the US, China, Japan, Germany, the UK, France, India, Italy, Brazil and Canada, since investors prefer to invest in these markets.

³ In an earlier version of this paper we also included two cryptocurrencies – namely, Bitcoin and Tether. Based on feedback received, together with our view that their inclusion is controversial, we decided to drop them from current manuscript.

Our main findings can be summarized as follows. First, with regard to the GFC crisis, we find intermediate (weak) safe haven status for the US dollar and the Swiss Franc (Gold, T-bills, T-bonds and AAA-bonds) during the 2008 GFC. Second, with regard to the COVID crisis, we find that gold is quite risky in some settings, especially in China and Japan. Further, silver is very risky right across the board, but especially in China, Japan, Germany, the UK, France & Canada. Third, we find general evidence of a weakening of safe-haven character during COVID (compared to the GFC), especially for the traditional safe-haven assets, gold and silver, but also in the case of the US dollar and the Swiss Franc.

Our primary contribution to knowledge is captured by the following collection of insights. Traditional safe haven assets, gold and silver are not reliable protectors of investor wealth in all stressful markets or settings. Instead, other alternatives like the Swiss Franc, and AAA-grade corporate bonds are candidates worthy of serious consideration. Collectively, our analysis shows that the character of safe haven assets has changed substantially between the two big crises of our time and, as such, there is a major diversity of experience possible across alternative candidates. Finally, in answering the question posed in our paper's title: while some safe haven assets provide some shelter during COVID (at least for now), others are definitely NOT really that safe – to the point where they are down-right dangerous. Our bottom line message is simple: investors should exercise extreme care (and hope for an element of good luck) when seeking to invest in safe haven assets during times of market stress.

2. Research Method and Preliminary Analysis

2.1 Data and sampling

The analysis includes stock market indices of the ten largest economies in the world, namely, S&P500 US index, SSE composite index China, NIKKEI 225 Index Japan, MSCI Germany Index, FTSE100 Index UK, CAC 40 Index France, NIFTY 500 Index India, FTSE MIB Index Italy, MSCI Brazil Index, and TSX composite index Canada. All variables are denominated in

US dollars, allowing a direct and fair comparison between stock market indices and safe haven assets.

Potential safe-haven assets include precious metals (gold and silver); currencies (US Dollar Index and Swiss Franc Index); Treasuries (S&P US Treasury bills index (T-bills) and S&P US Treasury bonds index (T-bonds)); and Corporate bonds (S&P 500 AAA-grade bonds index). US dollar index and Swiss Franc index represents the value of the US dollar and Swiss Franc relative to a basket of foreign currencies, respectively. DataStream International provides all data except data for the Swiss Franc index which is collected from the online database of Swiss National Bank. The sample period starts December 31, 2003 and ends July 31, 2020. We restrict the start date to December 31, 2003, since the aim of this study is to examine the role of safe-haven assets during the 2008 GFC and COVID-19 pandemic.

2.2 Basic safe-haven model

Following the literature (e.g. Baur & McDermott, 2010), we estimate the model,

$$RA_{i,t} = b_0 + b_1 \cdot RS_{j,t} + b_2 \cdot GFC \cdot RS_{j,t} + b_3 \cdot COVID \cdot RS_{j,t} + \varepsilon_t \quad (1)$$

$$\sigma_t^2 = \omega + (\alpha + \gamma I_{t-1}) \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2 \quad (2)$$

$$\text{where } I_t = \begin{cases} 1 & \text{if } \varepsilon_{t-1} < 0 \\ 0 & \text{otherwise} \end{cases}$$

where RA_i represents the log return of each given safe-haven asset i . RS_j denotes the daily log returns of a stock market index j , with j equal to a given one of the ten countries in our sample. GFC is a dummy variable, which takes the value one from the designated start date (explained shortly) until the beginning of a subsequent more tranquil 20-trading day period (defined as a period which contains none of the ten maximum daily losses, since the start of the GFC), and zero otherwise. The dummy variable, $COVID$, is similarly constructed to the GFC variable. The residual term ε_t is modelled as a GJR-GARCH process introduced by Glosten et al. (1993) as defined in Equation (2). Maximum log likelihood jointly estimates the parameters in (1) and

(2). The GJR-GARCH model accounts for the asymmetric effects where the stock market returns exhibit high volatility in response to bad news as opposed to good news.

The existing literature (e.g. Baur & McDermott, 2010) assumes that the primary adverse effect of a stock market crisis occurs in the first 20 trading days since the start of the crisis. However, for our main analysis we diverge from this narrow, uniform approach – based on a pragmatic stance which is more relevant to financial-market practitioners than the fulsome adverse effect of major crises such as the GFC and COVID plays out over a much longer period than 20 trading days.⁴ Figure 1 depicts the evolving stock market value, across our ten chosen markets, for both the GFC and COVID crises. Broadly, it is evident from Figure 1 that the GFC stock market crisis intensified in September 2008 (coinciding with the collapse of Lehman Brothers); whereas, the stock market crisis from COVID intensified in February 2020. In line with these observations, we deem the start date for GFC on September 12, 2008, and COVID on February 20, 2020.⁵

The interpretation of Equations (1) – (2) to see whether asset i serves as a safe haven during the GFC and COVID, is as follows. Parameter b_1 is the safe-haven asset's baseline “hedge” (i.e. “normal” times, excluding GFC and COVID) beta with respect to the market in question. Asset i is deemed as a weak, intermediate or a strong hedge for the stock market j if the parameter b_1 is economically “small” (zero or close to zero), negative and economically “moderate” (i.e. < -0.05 but > -0.20), or negative and economically “large” (i.e. < -0.20), respectively.⁶ Parameter b_2 (b_3) is the incremental safe-haven asset beta for the GFC (COVID)

⁴ The conclusion of our study remains intact if we follow (e.g. Baur & McDermott, 2010) and assume that the adverse effect of a stock market crisis occurs in the first 20 trading days since the start of the crisis. Moreover, we find similar results if we push this window out to 30 or 40 trading days since the start of the crisis. Details are available from the authors upon request.

⁵ Low, et al. (2016) use September 12, 2008 as a start date of the 2008 GFC. The 2020 stock market crash started in late February 2020 from the uncertainty and threat of COVID-19 (e.g. Baker, et al., 2020).

⁶ While arbitrarily chosen, the cut-off values that we select for “small”, “moderate” and “large” are designed to sensibly balance being conservative, realistic and meaningful. We are particularly keen to avoid a situation (typical in most prior literature) in which any estimate that is statistically significant and negative is “blindly” ascribed a “strong” safe haven asset.

and, therefore, the sum of the two parameters, $b_1 + b_2$ ($b_1 + b_3$), is the total safe-haven asset beta for the GFC (COVID). If the sum, $b_1 + b_2$, is economically “small”, negative and economically “moderate”, or negative and economically “large”, then asset i serves as a weak, intermediate or a strong safe haven from stock market losses during the GFC, respectively. Similar interpretations apply to b_3 and $b_1 + b_3$, with respect to COVID.⁷

2.3 Descriptive statistics

Panel A of Table 1 summarises the descriptive statistics of the daily log-returns of all assets in our study. The average returns (mean) of the safe haven assets varies between 0.001% to 0.036% per day. The T-bills shows the lowest standard deviation, whereas silver and gold show the highest standard deviation. Furthermore, the negative skewness and high excess kurtosis of AAA-grade bonds, silver and gold imply a significant crash risk that counters their effectiveness as a safe haven asset. The other safe haven assets show positive skewness and high excess kurtosis that indicates the possibility of having extreme positive returns instead of extreme negative returns. The descriptive statistics suggest that silver, AAA-grade bonds, and gold possess characteristics of risky assets rather than safe haven assets.

The average daily returns of stock market indices range between -0.009% (Italy) to 0.03% (India) per day. The standard deviation for each of the stock market indices is higher than all the safe-haven assets except silver. Furthermore, stock market indices of all countries exhibit negative skewness and high excess kurtosis, which indicate a significant crash risk. In sum, the descriptive statistics in Panel A suggest that the US Treasuries, US dollar, and Swiss Franc could act as better safe havens than gold and silver.

Panel B of Table 1 shows the correlations between the assets in our study. As expected, the correlation between gold and silver is positively correlated (0.66) and indicates that precious

⁷ We repeat the same cut-off values as for b_1 , following the same logic outlined in the previous footnote. We elaborate how we empirically operationalize these safe-haven interpretations later, in Section 3.

metals move in tandem. The correlation between gold and the US dollar is negatively correlated (-0.34) and indicates that these assets move in the opposite direction; thus, logically both assets cannot act as safe havens at the same time. The correlations between other candidate safe haven assets are generally not too distant from zero (with the exception between Treasuries and bonds), indicating that these assets do not have a tendency to move either in the same or in the opposite direction. Returns on the stock market indices for all ten countries are positively correlated to each other, with strong positive correlations between the US and Europe, and Canada and Brazil.

2.4 Maximum Losses during 2008 GFC and Covid-19 Pandemic

In this section, we examine the performance of safe haven assets during days of extreme stock market losses in the S&P500, during the GFC and COVID. We use the S&P 500 stock market index since it is the proxy of the largest economy in the world, the US. Nonetheless, we find similar results for the stock markets of the other nine countries as well.⁸ We expect assets to earn positive or, at worst, close to zero returns on the days of large stock market losses if they possess qualities of safe-haven assets.

Panel A of Table 2 reports the results of safe-haven assets on the ten days of the largest losses in the S&P 500 during the period of the GFC from September 12, 2008, to June 30, 2009. The results show that gold returns are positive for six of the 10 days; silver shows positive returns for only three days, the Swiss Franc for five days AAA-grade bonds for five days, and the remaining safe haven assets, Treasuries and the US dollar, are positive for at least seven out of ten days. These results imply that, with the exception of silver, the chosen candidate assets generally exhibit the characteristics of a safe haven during days of large stock market losses during the GFC.

⁸ We do not report the results of the other nine countries for the sake of brevity. However, those results are available upon request from the authors.

Panel B of Table 2 reports a counterpart analysis for candidate safe-haven assets across the ten days of largest losses in the S&P 500 during the COVID-19 pandemic period, covering February 20, 2020, to July 31, 2020, our current sample end date. The results show that gold returns generally move in tandem with the ten extreme stock market losses in the S&P 500 during the COVID-19 pandemic, with six negative gold returns. For instance, gold lost 4.90% of its value on March 12, 2020, when the S&P500 index incurred a 10% loss. Silver also moved in tandem with extreme stock market losses during COVID, with seven out of 10 negative silver returns. Four out of the ten US dollar returns were negative, but only two Swiss Franc returns were negative on the days of the largest 10 losses in the S&P500. Notably, the T-bills recorded all positive returns, while the T-bonds recorded seven positive returns. Seven out of ten AAA-grade bonds returns were positive on the days of the largest 10 losses in the S&P500. In sum, the results in Panel B imply that gold, and silver fail to protect the wealth of investors on those days when they needed it the most.

3. Main Results and Discussion

In this section, we examine the relationship between safe haven assets and stock market returns using the regression model in Equations (1) and (2). Tables 3, 4, 5, and 6, present the estimation results for precious metals, currencies, Treasuries, and corporate bonds, respectively. The tables include the parameter estimates of b_0 (constant), b_1 (hedge), the incremental GFC effect (b_2), and the incremental COVID effect (b_3). The total GFC effect is the sum of b_1 and b_2 , while the total COVID effect is the sum of b_1 and b_3 .

We empirically operationalise the “weak” vs. “intermediate” vs. “strong” safe-haven interpretations as follows (using statistical significance at the 5% level). Asset i is deemed a weak hedge for stock market j if the parameter b_1 is negative, statistically insignificant or significant of either sign, but economically “small”. Asset i is deemed an intermediate (strong) hedge for stock market j if the parameter b_1 is negative, significant and economically

“moderate” (“large”). We use the cutoff of 0.05 to assess whether an estimated coefficient is economically “small” – that is, an estimated coefficient lying in the range $[-0.05, +0.05]$. The estimated coefficient is deemed as economically “moderate” (“large”) if the estimated coefficient lies between -0.05 to -0.20 (is less than -0.20).⁹

Parameter b_2 is the incremental safe-haven asset beta for the GFC, with the incremental t -statistics in the parenthesis. Further, the sum of the two parameters, $b_1 + b_2$, is the total safe-haven asset beta for the GFC, with the respective t -statistics of the total effect in the parenthesis. The interpretation of this sum, follows the same cut-off values as above. If the sum, $b_1 + b_2$, is negative, statistically insignificant or significant of either sign, but economically “small”, then asset i serves as a weak safe haven from stock market losses during the GFC. If the sum, $b_1 + b_2$, is negative, statistically significant and economically “moderate” (“large”), then asset i serves as an intermediate (strong) safe haven from stock market losses during the GFC. Similar interpretations apply to b_3 and $b_1 + b_3$, with respect to COVID.

3.1 Precious Metals

Starting with gold, Panel A of Table 3 shows the parameter estimate, b_1 is positive, statistically significant and economically not small for eight countries, insignificant for the US, positive and significant but economically small for China, showing that it acts as a weak hedge only for the US and China. These results are generally consistent with Low, et al. (2016).

Most importantly, with no cases of positive and significant incremental betas, at a minimum, gold serves as an improved safe haven prospect across our sample countries during the GFC. Indeed, the improvement in gold as a safe haven is significant for three of them (China; Brazil and Canada), in which the incremental GFC betas are negative, significant and

⁹ While the guidelines outlined in this paragraph are based on arbitrarily chosen divisions, we argue that it is a more nuanced and intuitive characterization than the simple binary approach that currently exists in the literature. As such, the characterization provides more helpful indicative markers for investors, investment professionals and practitioners on how to approach the question of safe haven assets.

economically “moderate” (i.e. in the range -0.05 to -0.20). However, the total safe-haven gold GFC betas (i.e. sum of $b_1 + b_2$) are positive, significant and economically not small for five countries (Germany; the UK; France; Italy and Canada) indicating that gold does not even serve as a weak safe haven in these settings. For the other five countries, the total safe-haven gold GFC betas are insignificant showing them to be weak safe havens (the US; China; Japan; India and Brazil). These findings are generally consistent with the literature (e.g. Baur & McDermott, 2010; Low, et al., 2016).

As already tentatively signalled in the preliminary results in Table 2, gold fails to act as a COVID safe haven against the stock market losses from all countries, since the total safe-haven betas (i.e. sum of $b_1 + b_3$) across the sample countries are positive, statistically significant and not economically small. Indeed, it is particularly notable that the total gold betas for China and Japan during COVID are large at 0.24, and 0.22, respectively. While it is also true that even for India and Brazil, gold does not serve a compelling safe haven role during COVID, their total gold betas (at around 0.05) are not too different from zero. As such, for these countries gold is still offering some type of investment solace.

Panel B of Table 3 shows the counterpart analysis for silver. We see that all hedge coefficients, b_1 , are positive and significant, ranging from the smallest estimate of 0.10 for China, through to the highest of 0.69 for Canada. As such, these results indicate very strongly that silver does not act as a hedge for any of our sample countries, consistent with the findings of Low, et al. (2016). Moreover, all the total GFC betas except China are positive, significant and economically not small indicating that silver does not even serve as a weak safe haven in these settings during the GFC. Further, the incremental silver GFC betas are either positive or economically small (statistically insignificant or significant of either sign), which indicates no material improvement in silver as a safe haven for any of our sample countries during the GFC.

Much more telling are the counterpart silver results for COVID. The total safe-haven COVID betas are positive, significant at the 5% level and not economically small for nine of our sample countries which indicates that silver does not serve as a safe haven (not even weakly) against losses from stock markets during COVID. Only for Brazil, do the total safe-haven COVID betas suggest a weak-safe haven character for silver (though positive and significant, its silver beta is economically small). Of particular note is that for China, Japan, Germany, UK, France and Canada, the total silver safe-haven betas are all greater than 0.50 (e.g. China shows an estimate of 0.81). Hence, during COVID, investment in silver represents a systematic risk somewhat similar to the stock markets in these settings, let alone being seen as any sort of safe haven asset.

3.2 Currencies

Panel A of Table 4 reports results for the US dollar as a potential safe haven asset.¹⁰ The table shows that hedge coefficients, b_1 , are negative, significant and: (a) economically “moderate” for five countries (Germany, the UK; France; Italy and Canada); (b) economically “small” for the other four countries (China; Japan; India and Brazil); indicating that the US dollar serves as a hedge against the stock market indices, with China (hedge beta of -0.01) the weakest case. Furthermore, all the total safe-haven GFC betas (i.e. sum of $b_1 + b_2$) are negative, statistically significant and economically “moderate” (-0.05 to -0.20), indicating that the US dollar serves as an intermediate safe haven for stock markets in these countries during the GFC.

Interestingly, the safe haven efficacy of the US dollar is somewhat weakened during COVID. More specifically, the US dollar serves as an economically “moderate” (-0.05 to -0.20) safe haven in four (China; Japan; the UK and France) of the sample countries during the pandemic. For the other five countries (Germany; India; Italy, Brazil and Canada), the total

¹⁰ We do not examine the relationship between the US stock market and the US dollar since it is a domestic currency for US investors.

safe-haven COVID betas (i.e. sum of $b_1 + b_3$) are either insignificant or negative and economically small indicating the US dollar as a weak safe haven in these setting during the pandemic. Indeed, with the exception of China, Japan, India and Brazil, all the incremental COVID betas are positive, statistically significant (at the 5% level), and economically not small (above +0.05), thereby suggesting that there has been change in the baseline safe haven (b_1) relationship between the US dollar and these countries during COVID.

Panel B of Table 4 reports results for the Swiss Franc as a potential safe haven asset. At a very general level, collectively taking into account the sign, statistical significance and magnitude of the estimated coefficients, the Swiss Franc results have a similar flavour as for the US dollar. The table shows that the parameter estimate, b_1 is negative and statistically significant for five countries (Japan; the UK; Italy; Brazil and Canada) , but small in magnitude; and either insignificant or positive but economically small estimates for the remaining five countries (the US; China; Germany; France and India), thereby revealing a weak hedge in all cases. Further, the total safe-haven Franc GFC betas (i.e. sum of $b_1 + b_2$) are negative, significant (at the 5% level), and economically “moderate” (-0.05 to -0.20) for seven countries (China; Japan; the UK; France; India; Italy and Canada), indicating the Swiss Franc as an intermediate safe haven in these settings. The total safe-haven Franc GFC betas for the US, Germany and Brazil are also negative but economically “small”, suggesting only weak GFC safe havens for the Swiss Franc in these three countries.

The incremental Franc COVID betas are negative, significant and economically “moderate” (-0.05 to -0.20) for China and France, suggesting that the Swiss Franc offers a reasonable improvement in safe haven status in these settings during COVID. Moreover, the total safe-haven Franc COVID betas (i.e. sum of $b_1 + b_3$) are negative, significant and economically “moderate” (-0.05 to -0.20) for only China and the UK. Alternatively, the total safe-haven Franc COVID betas are negative, significant, but small for the remaining 8

countries: the US, Japan, Germany, France, India, Italy, Brazil and Canada, indicating only a weak safe haven for the Swiss Franc.

3.3 Treasuries

Panel A of Table 5 reports our results for T-bills as a potential safe haven asset. The table shows that hedge coefficients, b_1 , are negative, significant (insignificant) but very small for the US and the UK (China; Japan; Germany; France; India; Italy; Brazil; and Canada), indicating that the T-bill serves as a very weak hedge across the sample countries. While all the total safe-haven T-bill GFC betas (i.e. sum of $b_1 + b_2$) except for China and Japan are negative and statistically significant (at the 5% level), their minuscule size indicates that T-bills serve as a very weak safe haven in these settings during the GFC. The T-bills continue to serve as a very weak safe haven during COVID – the total safe-haven T-bill COVID betas are all insignificant.

Panel B of Table 5 reports results for T-bonds as a potential safe haven asset. Similar, to T-bills, Panel B shows that T-bonds serve as a weak hedge except for the US where it serves as an intermediate hedge. Furthermore, the total safe-haven T-bond GFC betas are negative, significant and economically “moderate” (-0.05 to -0.20) for the US and Canada, suggesting an intermediate safe haven status for T-bonds in these settings. The total safe-haven COVID betas are negative, significant and economically moderate (small) for the US, the UK and Canada (the remaining countries except Japan, where COVID beta is insignificant). As such, the overriding case for T-bonds is a weak safe haven asset during COVID. That said, if anything more definitive can be gleaned based on a comparison of magnitudes, the safe haven status of T-bonds is better than the T-bills.

3.4 Corporate Bonds

Table 6 reports results for AAA-grade corporate bonds as a potential safe haven asset. The hedge coefficients, b_1 , are negative (except for Japan), significant (except for China), but small for all the countries indicating that AAA-bonds act as a weak hedge in these settings.

Interestingly, the total safe-haven AAA-bond GFC beta for the US is significant and negative, showing corporate bonds to be a moderate (beta < -0.05) safe haven asset for the US. Furthermore, the total safe-haven AAA-bond GFC betas for the remaining countries (except for China and Japan) are either insignificant or economically small indicating that AAA-bonds serves as a weak safe haven in these settings during the GFC. However, the total safe-haven AAA-bond GFC betas are positive, statistically significant, and economically not small for China and Japan (above +0.05) showing that AAA-bonds do not serve (even as a weak) safe haven in these settings during the GFC. The total safe-haven AAA-bonds COVID betas for all the sample countries are either insignificant or economically small (either statistically positive or negative), showing it to be a generally weak safe haven during COVID.

3.5 Discussion

Table 7 presents a broad integrative summary of the performance of various potential safe-haven assets during the GFC and COVID pandemic financial crises, as analysed and reported in Tables 3-6. Three sets of interesting messages are evident in this table.

First, scanning down Column C1 relating to the GFC crisis, we observe that, intermediate (weak) [very weak] safe haven evidence is on display for the US dollar and somewhat for the Swiss Franc (Gold and AAA-bonds) [T-bills and T-bonds]. Silver is a standout failure in this regard, with most of its GFC safe-haven betas in the moderately risky range, above +0.3.

Second, scanning down Column C2 relating to the COVID crisis, we observe that gold is quite risky in some settings, especially in China and Japan. Notably, silver very risky, especially in China, Japan, Germany, the UK, France and Canada. Further, the currencies, treasuries and AAA-bonds still show mostly weak or very weak safe-haven benefits during COVID.

Third, scanning down Column C3 relating to whether the safe-haven character of different assets has changed during COVID compared to the GFC, we do observe general evidence of a

weakening in COVID (compared to the GFC). This weakening is evident especially for the traditional safe-haven assets, gold and silver, but also in the case of the US dollar and Swiss Franc. However, while AAA-grade corporate bonds have not changed greatly in character, if anything they have strengthened a little as a safe haven during COVID compared to the GFC.

4. Potential Explanations

The most surprising finding from Section 3 is that the gold has lost its safe haven status during COVID. Traditionally, gold is considered as one of the most effective safe haven assets, and it has exhibited safe haven characteristics during the previous crises such as the 1987 stock market crash and the 2008 GFC (e.g. Baur & Lucey, 2010; Baur & McDermott, 2010; Low, et al., 2016).

Figure 2 plots the gold price from January 1, 1990, to July 31, 2020. It is evident from Figure 2 that gold attained a maximum price of \$1898.25 on September 5, 2011 and then shed 45% of value by December 17, 2015. Therefore, investors might have lost trust in gold as a safe haven asset, in light of losing almost half its value in only four years. To the extent, gold has lost its status of a safe haven among investors due to the extreme losses between 2011 and 2015; we expect to observe that gold does not act at least as a strong safe haven during extreme stock market movements. Therefore, we examine the performance of gold as a safe haven asset during extreme stock market movements after September 5, 2011.

We define extreme stock market movements as situations in which stock market returns at time t are in a low quantile, such as the 5%, and 1% quantile. We estimate the following regression model first proposed and utilised by Baur and Lucey (2010):

$$RGold_t = b_0 + b_1 \cdot RS_{j,t} + b_2 \cdot D_{q5} \cdot RS_{j,t} + b_3 \cdot D_{q1} \cdot RS_{j,t} + \varepsilon_t \quad (3)$$

where $RGold$ represents the daily log return of gold. RS_j denotes the daily log returns in US dollars of a stock market index j , with j equal to one of the ten countries in our sample. The dummy variables, D , capture extreme stock market losses, taking a value of one if stock market

return at time t is in the low quantile, such as 5% or 1%, and zero otherwise. The residual term ε_t is modelled as a GJR-GARCH process introduced by Glosten, et al. (1993) as defined in Equation (2).

Gold is deemed a weak, intermediate or a strong hedge for the stock market j if the parameter b_1 is economically “small” (zero or close to zero), negative and economically “moderate”, or negative and economically “large”, respectively. We use the same cutoffs as in Section 3 to define a weak, intermediate and strong safe haven. Parameters, b_2 , and b_3 are the incremental safe-haven gold beta for the lowest 5%, and 1% for the stock market j returns, respectively. Further, the sum of the two parameters, $b_1 + b_2$, is the total safe-haven gold beta for the lowest 5% stock market returns. If the sum, $b_1 + b_2$, is non-positive, statistically insignificant or significant of either sign, but economically “small”, then gold serves as a weak safe haven for the lowest 5% stock market returns. If the sum, $b_1 + b_2$, is non-positive, statistically significant and economically “moderate” (“large”), then gold serves as an intermediate (strong) safe haven for the lowest 5% stock market returns. A similar interpretation applies to the sum $b_1+b_2+b_3$, with respect to the lowest 1% stock market returns.

Panel A of Table 8 presents the estimation results for gold against the lowest 5% and 1% stock market returns after reaching the maximum price on September 5, 2011.¹¹ The total safe-haven 5% quantile betas (i.e. sum of $b_1 + b_2$) are positive, significant, and economically not small for Japan, Germany, the UK and Canada, indicating that gold does not even serve as a weak safe haven in these settings, against the lowest 5% stock market returns. Gold does serve as a weak (intermediate) safe haven for all but one of the other six countries (the US) during the lowest 5% stock market returns, in which the total safe-haven 5% quantile betas are either insignificant or economically small (is negative, significant and not economically small). Further, gold does not serve even as a weak safe haven for five countries (Germany; France;

¹¹ For the sake of brevity, we do not discuss the hedge results since those are similar as in Section 3.1.

India; Brazil and Canada) during the lowest 1% stock market returns, in which the total safe-haven 1% quantile betas (i.e. sum of $b_1 + b_2 + b_3$) are positive, significant and economically not small. Gold serves as a weak safe haven for the other five countries where betas are either insignificant or significant but economically small.

In sum, the results in Table 8 suggest that gold serves as predominantly a weak safe haven during the lowest stock market returns. However, the efficacy of gold as a safe haven has weakened using the recent sample period covering 2011 to 2020, especially for the lowest 1% stock market returns. This weakening of gold is reflected by gold betas that are generally more significant and negative in the period prior to September 5, 2011, as reported in Panel B of Table 8. For example, the total safe-haven 1% quantile beta (i.e. sum of $b_1 + b_2 + b_3$) for the US (Italy) is -0.06 (-0.12) in Panel B versus +0.05 (+0.02) in Panel A.

5. Conclusion

In this paper, we perform a coordinated comparative examination of the safe haven efficacy of precious metals (gold and silver); currencies (US dollar and Swiss Franc); US Treasuries (T-bills and T-bonds); and corporate bonds (AAA-grade) from stock market losses during the 2008 GFC and COVID-19 pandemic. Regarding the GFC, our findings show that the US dollar and the Swiss Franc (Gold, T-bills, T-bonds and AAA-bonds) serve as an intermediate (weak) safe haven. Regarding COVID, we find that gold becomes quite risky in some settings, especially in China, and Japan, which indicates that gold could lose its safe haven status during a pandemic. Silver has become much riskier, especially in China, Japan, Germany, the UK, France and Canada during COVID. Interestingly, AAA-grade corporate bonds have largely maintained a weak safe haven status across both crises. In summary, our main findings indicate that the safe-haven character of traditional assets such as gold and silver; as well as for the US dollar and the Swiss Franc have all weakened during COVID compared to the GFC.

We also seek to shed light on why gold loses its “aura” as a safe haven asset during COVID when, traditionally, it acts as a safe haven asset – e.g. during the previous stock market crises of 1987 and the GFC. We suggest that investors might have lost trust in gold as a stable asset after it lost almost half of its value between 2011 to 2015. Furthermore, investors now have access to additional safe haven assets for financial shelter during crises, such as financial derivatives.

Our findings are useful for investors and fund managers searching for the best safe haven, across the potential choices of gold, silver, currencies, the US Treasuries, and corporate bonds to offset large stock market losses. Specifically, our results suggest that while no strong financial shelter seems to exist, investors seeking some form of safe haven during a pandemic should seriously consider liquid and stable assets such as currencies and Treasuries rather than the traditional choice of precious metals. Therefore, central banks, financial institutions and regulatory authorities should continue supporting such financial assets to remain liquid during stock market crises.

Table 1: Descriptive Statistics

Panel A summarises the descriptive statistics for the daily returns (%) denominated in US dollars of all assets, while Panel B shows correlations between all assets. The sample period starts on December 31, 2003, and ends July 31, 2020.

Panel A: Descriptive Statistics								
Variable	N	Mean	Median	Minimum	Maximum	Std Dev	Skewness	Kurtosis
Safe Haven Assets								
Gold	4327	0.0360	0.0380	-10.1620	6.8650	1.1100	-0.4667	5.7549
Silver	4327	0.0280	0.0320	-19.4890	12.4700	2.0440	-0.8986	7.2503
US Dollar Index	4155	0.0020	0.0000	-2.7170	2.5240	0.4950	0.0096	1.8905
Swiss Franc Index	4327	0.0100	-0.0010	-7.8070	14.9540	0.4500	7.1241	307.3475
T-bills	4327	0.0050	0.0020	-0.2000	0.1270	0.0110	0.7815	44.2723
T-bonds	4327	0.0100	0.0050	-1.6940	1.7830	0.2260	0.1116	5.5308
AAA-bonds	4327	0.0010	0.0010	-3.1900	1.8270	0.3070	-0.9278	11.3237
Stock Market Returns								
US	4327	0.0250	0.0410	-12.7650	10.9570	1.2050	-0.5660	15.2909
China	4327	0.0220	0.0010	-9.3850	9.0180	1.5710	-0.5674	4.9561
Japan	4327	0.0170	0.0390	-11.1860	11.6440	1.3840	-0.3166	6.3991
Germany	4327	0.0130	0.0470	-15.0940	11.5940	1.5080	-0.3034	8.8803
UK	4327	-0.0010	0.0430	-14.2140	12.2190	1.3810	-0.4410	13.3481
France	4327	0.0050	0.0450	-14.8510	12.1430	1.5540	-0.2732	9.5859
India	4327	0.0300	0.0810	-15.5830	18.1070	1.6020	-0.5595	11.1502
Italy	4327	-0.0090	0.0370	-20.2940	12.3810	1.7330	-0.6409	10.7370
Brazil	4327	0.0160	0.0730	-19.4330	16.6190	2.2610	-0.5963	9.5810
Canada	4327	0.0150	0.0730	-14.0670	11.6990	1.3900	-1.0177	15.1209

Panel B: correlation matrix

variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Gold (1)	1																
Silver (2)	0.6594	1															
Dollar (3)	-0.3400	-0.3840	1														
Franc (4)	0.1108	0.0364	-0.0759	1													
T-bills (5)	0.0600	-0.0007	-0.0410	0.0334	1												
T-bonds (6)	0.1089	0.0194	-0.1034	0.0966	0.2400	1											
AAA-bonds (7)	0.0928	0.0564	-0.1374	0.0475	0.0658	0.7401	1										
US (8)	-0.0009	0.1331	-0.1513	-0.0986	-0.1356	-0.4041	-0.2420	1									
China (9)	0.0573	0.0934	-0.0545	-0.0688	-0.0305	-0.0552	0.0237	0.1001	1								
Japan (10)	0.1629	0.1940	-0.1932	-0.1482	-0.0225	0.0509	0.1472	0.0532	0.2400	1							
Germany (11)	0.1681	0.3015	-0.4190	-0.0990	-0.0955	-0.2743	-0.1269	0.5801	0.1697	0.2396	1						
UK (12)	0.1717	0.3130	-0.3686	-0.1313	-0.1369	-0.2839	-0.1045	0.5607	0.1824	0.2597	0.8657	1					
France (13)	0.1534	0.2957	-0.4198	-0.1081	-0.1156	-0.2850	-0.1284	0.5700	0.1696	0.2365	0.9476	0.8965	1				
India (14)	0.1097	0.1863	-0.1177	-0.1506	-0.0652	-0.1230	-0.0041	0.2688	0.2479	0.2744	0.4162	0.4325	0.4130	1			
Italy (15)	0.1328	0.2643	-0.4114	-0.0992	-0.1000	-0.2759	-0.1247	0.5282	0.1460	0.1934	0.8803	0.8226	0.9160	0.3795	1		
Brazil (16)	0.1493	0.2719	-0.2557	-0.0931	-0.1076	-0.2530	-0.1067	0.6056	0.1747	0.1739	0.5892	0.6139	0.5990	0.3563	0.5442	1	
Canada (17)	0.2488	0.3792	-0.3478	-0.0989	-0.1175	-0.3082	-0.1257	0.7159	0.1536	0.2144	0.6689	0.7120	0.6833	0.3552	0.6337	0.6721	1

Table 2: Extreme Losses during the 2008 GFC and COVID-19 Pandemic

Panels A and B list the ten largest daily losses of S&P 500 returns and the respective returns of safe haven assets during the 2008 GFC and COVID-19 pandemic, respectively.

Panel A: Extreme losses of SP500 Index during 2008 GFC								
Date	SP500	Gold	Silver	Dollar	Franc	T-bills	T-bonds	AAA-bond
15/10/2008	-9.4700	0.9800	-8.2920	0.8445	-0.0750	0.0286	0.1388	-0.3869
01/12/2008	-9.3540	-4.9180	-8.6740	1.2182	0.6250	0.0206	1.0560	0.9829
29/09/2008	-9.2000	1.0180	-3.5920	0.6735	-0.0860	0.0383	1.0869	0.4401
09/10/2008	-7.9220	-1.7390	0.8720	0.3085	0.0840	-0.0022	-0.5696	-0.9821
20/11/2008	-6.9480	0.1400	-3.1430	0.7531	0.2270	0.0220	0.9695	-0.1312
19/11/2008	-6.3110	1.3450	-2.5470	-0.0687	-0.5900	0.0149	0.5529	0.2527
22/10/2008	-6.2950	-3.3520	-6.2930	1.6297	1.1690	0.0144	0.2709	0.6701
07/10/2008	-5.9110	1.6080	0.8400	-0.8730	0.3820	-0.0311	-0.3688	-0.0342
20/01/2009	-5.4260	3.1880	-0.3580	2.3589	-0.2490	0.0024	-0.1340	-0.2699
05/11/2008	-5.4120	-1.3490	3.1590	-0.2007	-0.5410	0.0212	0.2960	0.7306

Panel B: Extreme losses of SP500 Index during COVID-19 Pandemic								
Date	SP500	Gold	Silver	Dollar	Franc	T-bills	T-bonds	AAA-bond
16/03/2020	-12.7650	-1.8930	-12.3410	-0.6706	0.6620	0.0182	1.5320	0.9482
12/03/2020	-9.9940	-4.8790	-4.7040	0.9898	0.5350	0.0182	-0.2727	-1.7681
09/03/2020	-7.9010	-0.1390	-1.2090	-1.1003	0.7850	0.0219	0.7339	0.1704
11/06/2020	-6.0750	1.4110	0.4970	0.7992	0.6170	0.0014	0.3542	0.1615
18/03/2020	-5.3220	-3.2240	-5.9590	1.5742	0.0190	0.0309	-1.0667	-1.5504
11/03/2020	-5.0100	-0.3120	-1.0590	0.1037	-0.2040	0.0129	-0.3022	-1.3606
27/02/2020	-4.5170	0.5210	-0.9990	-0.5673	0.0710	0.0216	0.3694	0.1485
01/04/2020	-4.5150	-1.5180	-1.2220	0.7250	0.1800	0.0035	0.3140	0.5946
20/03/2020	-4.4330	0.7770	2.0490	0.0584	-0.7970	0.0037	1.7829	0.4484
05/03/2020	-3.4510	1.1760	0.8520	-0.5356	0.0460	0.0358	0.6498	1.1025

Table 3: Estimation results for gold and silver as safe haven assets during the 2008 GFC and Covid-19 pandemic

This table presents the estimation results of the role of gold and silver as a hedge and safe haven asset in the periods of stock market crises, such as the 2008 GFC and COVID-19 pandemic. The crisis period ends 20 trading days since the last date of maximum ten losses after the start of the crisis. The GFC starts on September 12, 2008, and ends February 17, 2009, while the COVID-19 pandemic starts on February 20, 2020, and ends July 09, 2020. Asset i is deemed a weak, intermediate or a strong hedge for the stock market j if the parameter b_1 is economically “small” (zero or close to zero), negative and economically intermediate, or negative and economically strong, respectively. We use the cutoff of 0.05 [-0.05, +0.05] to assess whether an estimated coefficient is economically “small”. The estimated coefficient is deemed as economically “moderate” (“large”) if the estimated coefficient is between -0.05 to -0.20 (lower than -0.20). Parameter b_2 is the incremental safe-haven asset beta for the GFC. Further, the sum of the two parameters, $b_1 + b_2$, is the total safe-haven asset beta for the GFC. If the sum, $b_1 + b_2$, is negative, statistically insignificant or significant of either sign, but economically “small”, then asset i serves as a weak safe haven from stock market losses during the GFC. If the sum, $b_1 + b_2$, is negative, statistically significant and economically “moderate” (“large”), then asset i serves as an intermediate (strong) safe haven from stock market losses during the GFC. Similar interpretations apply to b_3 and $b_1 + b_3$, with respect to COVID. The respective t -statistics are provided in the parentheses.

Panel A: Gold										
Coefficients	US	China	Japan	Germany	UK	France	India	Italy	Brazil	Canada
Const (b_0)	0.0003 (2.34)	0.0003 (2.28)	0.0003 (2.26)	0.0003 (2.31)	0.0003 (2.30)	0.0003 (2.27)	0.0003 (2.13)	0.0003 (2.41)	0.0003 (2.13)	0.0003 (1.93)
Hedge (b_1)	0.0039 (0.29)	0.0452 (5.35)	0.1195 (12.30)	0.1352 (14.24)	0.1693 (16.25)	0.1249 (13.44)	0.0811 (8.55)	0.0856 (10.66)	0.0891 (13.55)	0.2817 (23.32)
Δ GFC (b_2)	-0.0572 (-1.25)	-0.1515 (-2.22)	-0.0215 (-0.36)	-0.0107 (-0.23)	-0.0593 (-1.22)	-0.0336 (-0.77)	-0.0353 (-0.55)	0.0121 (0.28)	-0.0751 (-2.74)	-0.1665 (-3.80)
Total GFC ($b_1 + b_2$)	-0.0533 (-1.22)	-0.1063 (-1.57)	0.0980 (1.66)	0.1245 (2.73)	0.1100 (2.32)	0.0913 (2.13)	0.0458 (0.72)	0.0977 (2.26)	0.0140 (0.53)	0.1152 (2.73)
Δ COVID (b_3)	0.1024 (4.15)	0.1917 (4.04)	0.1029 (2.44)	0.0286 (1.15)	-0.0375 (-1.69)	0.0107 (0.47)	-0.0264 (-1.29)	0.0325 (1.69)	-0.0392 (-2.76)	-0.1652 (-7.37)
Total COVID ($b_1 + b_3$)	0.1063 (5.13)	0.2369 (5.07)	0.2224 (5.42)	0.1638 (7.14)	0.1318 (6.77)	0.1356 (6.63)	0.0547 (3.01)	0.1181 (6.79)	0.0499 (3.96)	0.1165 (6.15)

Panel B: Silver										
Coefficients	US	China	Japan	Germany	UK	France	India	Italy	Brazil	Canada
Const (b_0)	0.0002 (0.64)	0.0002 (0.73)	0.0002 (0.69)	0.0002 (0.94)	0.0003 (1.04)	0.0003 (0.99)	0.0001 (0.40)	0.0003 (1.26)	0.0002 (0.68)	0.0001 (0.47)
Hedge (b_1)	0.2242 (9.12)	0.0968 (6.15)	0.2173 (11.51)	0.3832 (24.18)	0.4505 (28.06)	0.3587 (24.19)	0.2008 (12.49)	0.2561 (19.76)	0.2413 (23.16)	0.6926 (36.55)
Δ GFC (b_2)	-0.0203 (-0.23)	0.0095 (0.08)	0.1236 (1.23)	0.0385 (0.50)	0.0859 (0.93)	0.1001 (1.22)	0.1153 (1.09)	0.2157 (2.77)	-0.0108 (-0.22)	-0.2766 (-3.95)
Total GFC ($b_1 + b_2$)	0.2039 (2.45)	0.1063 (0.93)	0.3409 (3.46)	0.4217 (5.60)	0.5364 (5.89)	0.4588 (5.71)	0.3161 (3.03)	0.4718 (6.17)	0.2305 (4.74)	0.4160 (6.15)
Δ COVID (b_3)	-0.0070 (-0.18)	0.7119 (8.64)	0.3085 (5.85)	0.2295 (6.99)	0.1332 (4.07)	0.2356 (7.33)	-0.0776 (-2.29)	0.2322 (8.36)	-0.1956 (-11.06)	-0.1150 (-3.50)
Total COVID ($b_1 + b_3$)	0.2172 (7.34)	0.8087 (9.97)	0.5258 (10.77)	0.6127 (21.27)	0.5837 (20.38)	0.5943 (20.75)	0.1232 (4.17)	0.4883 (19.92)	0.0457 (3.21)	0.5776 (21.16)

Table 4: Estimation results for US Dollars and Swiss Francs as safe haven assets during the 2008 GFC and Covid-19 pandemic

This table presents the estimation results of the role of US Dollar and Swiss Franc as a hedge and safe haven asset in the periods of stock market crises, such as the 2008 GFC and COVID-19 pandemic. The crisis period ends 20 trading days since the last date of maximum ten losses after the start of the crisis. The GFC starts on September 12, 2008, and ends February 17, 2009, while the COVID-19 pandemic starts on February 20, 2020, and ends July 09, 2020. Asset i is deemed a weak, intermediate or a strong hedge for the stock market j if the parameter b_j is economically “small” (zero or close to zero), negative and economically intermediate, or negative and economically strong, respectively. We use the cutoff of 0.05 [-0.05, +0.05] to assess whether an estimated coefficient is economically “small”. The estimated coefficient is deemed as economically “moderate” (“large”) if the estimated coefficient is between -0.05 to -0.20 (lower than -0.20). Parameter b_2 is the incremental safe-haven asset beta for the GFC. Further, the sum of the two parameters, $b_1 + b_2$, is the total safe-haven asset beta for the GFC. If the sum, $b_1 + b_2$, is negative, statistically insignificant or significant of either sign, but economically “small”, then asset i serves as a weak safe haven from stock market losses during the GFC. If the sum, $b_1 + b_2$, is negative, statistically significant and economically “moderate” (“large”), then asset i serves as an intermediate (strong) safe haven from stock market losses during the GFC. Similar interpretations apply to b_3 and $b_1 + b_3$, with respect to COVID. The respective t -statistics are provided in the parentheses.

Panel A: US Dollar Index									
Coefficients	China	Japan	Germany	UK	France	India	Italy	Brazil	Canada
Const (b_0)	0.0000 (0.13)	0.0000 (0.16)	0.0000 (0.43)	0.0000 (0.14)	0.0000 (0.22)	0.0000 (0.13)	0.0000 (-0.25)	0.0000 (0.22)	0.0000 (0.75)
Hedge (b_1)	-0.0084 (-2.03)	-0.0495 (-10.04)	-0.1351 (-30.97)	-0.1349 (-25.52)	-0.1330 (-32.18)	-0.0236 (-5.1)	-0.1122 (-31.32)	-0.0495 (-16.53)	-0.1535 (-27.61)
Δ GFC (b_2)	-0.0619 (-3.14)	-0.0650 (-3.43)	-0.0273 (-1.97)	-0.0119 (-0.68)	-0.0263 (-1.51)	-0.0544 (-2.56)	-0.0546 (-3.55)	-0.0187 (-1.85)	0.0460 (2.98)
Total GFC ($b_1 + b_2$)	-0.0703 (-3.64)	-0.1145 (-6.25)	-0.1624 (-6.24)	-0.1468 (-8.82)	-0.1593 (-9.44)	-0.0780 (-3.76)	-0.1668 (-11.16)	-0.0682 (-7.04)	-0.1075 (-7.45)
Δ COVID (b_3)	-0.0582 (-2.89)	-0.0480 (-2.78)	0.0702 (4.88)	0.0778 (5.75)	0.0714 (5.33)	-0.0207 (-1.59)	0.0682 (6.39)	0.0472 (7.71)	0.1383 (14.36)
Total COVID ($b_1 + b_3$)	-0.0666 (-3.38)	-0.0975 (-5.89)	-0.0649 (-0.33)	-0.0571 (-4.55)	-0.0616 (-4.81)	-0.0443 (-3.64)	-0.0440 (-4.33)	-0.0023 (-0.41)	-0.0152 (-1.92)

Panel B: Swiss Franc Index										
Coefficients	US	China	Japan	Germany	UK	France	India	Italy	Brazil	Canada
Const (b_0)	0.0000 (-0.45)	0.0000 (-0.23)	0.0000 (0.04)	0.0000 (-0.19)	0.0000 (0.32)	0.0000 (-0.36)	0.0000 (-0.26)	0.0000 (-0.01)	0.0000 (-0.04)	0.0000 (0.63)
Hedge (b_1)	0.0099 (2.22)	0.0022 (0.78)	-0.0089 (-2.42)	-0.0017 (-0.51)	-0.0223 (-6.50)	0.0050 (1.64)	-0.0014 (-0.55)	-0.0103 (-3.74)	-0.0056 (-2.42)	-0.0270 (-6.17)
Δ GFC (b_2)	-0.0465 (-2.41)	-0.1218 (-5.06)	-0.1009 (-4.50)	-0.0459 (-3.72)	-0.0512 (-3.10)	-0.0685 (-4.47)	-0.0865 (-5.80)	-0.0534 (-3.78)	-0.0288 (-2.84)	-0.0340 (-2.20)
Total GFC ($b_1 + b_2$)	-0.0366 (-1.96)	-0.1196 (-4.99)	-0.1098 (-5.01)	-0.0476 (-3.99)	-0.0735 (-4.57)	-0.0635 (-4.23)	-0.0879 (-5.91)	-0.0637 (-4.60)	-0.0344 (-3.47)	-0.0610 (-4.09)
Δ COVID (b_3)	-0.0487 (-4.60)	-0.1023 (-4.50)	-0.0294 (-2.20)	-0.0475 (-4.93)	-0.0294 (-3.14)	-0.0545 (-5.90)	-0.0463 (-4.68)	-0.0310 (-4.19)	-0.0202 (-3.43)	-0.0207 (-2.14)
Total COVID ($b_1 + b_3$)	-0.0388 (-3.97)	-0.1001 (-4.43)	-0.0383 (-2.99)	-0.0492 (-5.39)	-0.0517 (-5.89)	-0.0495 (-5.65)	-0.0477 (-5.00)	-0.0413 (-5.92)	-0.0258 (-4.76)	-0.0477 (-5.46)

Table 5: Estimation results for T-bills and T-bonds as safe haven assets during the 2008 GFC and Covid-19 pandemic

This table presents the estimation results of the role of T-bills and T-bonds as a hedge and safe haven asset in the periods of stock market crises, such as the 2008 GFC and COVID-19 pandemic. The crisis period ends 20 trading days since the last date of maximum ten losses after the start of the crisis. The GFC starts on September 12, 2008, and ends February 17, 2009, while the COVID-19 pandemic starts on February 20, 2020, and ends July 09, 2020. Asset i is deemed a weak, intermediate or a strong hedge for the stock market j if the parameter b_1 is economically “small” (zero or close to zero), negative and economically intermediate, or negative and economically strong, respectively. We use the cutoff of 0.05 [-0.05, +0.05 to assess whether an estimated coefficient is economically “small”. The estimated coefficient is deemed as economically “moderate” (“large”) if the estimated coefficient is between -0.05 to -0.20 (lower than -0.20). Parameter b_2 is the incremental safe-haven asset beta for the GFC. Further, the sum of the two parameters, $b_1 + b_2$, is the total safe-haven asset beta for the GFC. If the sum, $b_1 + b_2$, is negative, statistically insignificant or significant of either sign, but economically “small”, then asset i serves as a weak safe haven from stock market losses during the GFC. If the sum, $b_1 + b_2$, is negative, statistically significant and economically “moderate” (“large”), then asset i serves as an intermediate (strong) safe haven from stock market losses during the GFC. Similar interpretations apply to b_3 and $b_1 + b_3$, with respect to COVID. The respective t -statistics are provided in the parentheses.

Panel A: US Treasury Bills Index										
Coefficients	US	China	Japan	Germany	UK	France	India	Italy	Brazil	Canada
Const (b_0)	0.0000 (14.38)	0.0000 (13.87)	0.0000 (14.12)	0.0000 (14.82)	0.0000 (14.35)	0.0000 (14.23)	0.0000 (14.40)	0.0000 (14.70)	0.0000 (13.24)	0.0000 (14.90)
Hedge (b_1)	-0.0002 (-3.01)	0.0000 (-0.63)	0.0001 (1.29)	-0.0001 (-1.71)	-0.0001 (-2.32)	-0.0001 (-1.70)	0.0000 (-0.39)	0.0000 (-1.41)	0.0000 (0.49)	0.0000 (-1.08)
Δ GFC (b_2)	-0.0003 (-1.88)	-0.0004 (-1.72)	0.0001 (0.62)	-0.0004 (-3.02)	-0.0005 (-3.69)	-0.0004 (-2.84)	-0.0005 (-3.34)	-0.0004 (-3.11)	-0.0004 (-3.60)	-0.0006 (-4.79)
Total GFC ($b_1 + b_2$)	-0.0005 (-3.61)	-0.0004 (-1.86)	0.0002 (0.98)	-0.0004 (-3.88)	-0.0007 (-4.71)	-0.0004 (-3.72)	-0.0006 (-3.62)	-0.0004 (-3.63)	-0.0003 (-3.72)	-0.0006 (-5.63)
Δ COVID (b_3)	-0.0001 (-0.56)	0.0000 (-0.02)	-0.0003 (-0.97)	-0.0001 (-0.52)	-0.0001 (-0.43)	-0.0001 (-0.5)	0.0000 (0.03)	-0.0002 (-0.62)	-0.0002 (-1.11)	-0.0002 (-0.68)
Total COVID ($b_1 + b_3$)	-0.0003 (-1.70)	0.0000 (0.10)	-0.0002 (-0.72)	-0.0002 (-0.82)	-0.0002 (-0.84)	-0.0002 (-0.80)	0.0000 (0.10)	-0.0002 (-0.78)	-0.0002 (-1.02)	-0.0003 (-0.85)
Panel B: US Treasury Bonds Index										
Coefficients	US	China	Japan	Germany	UK	France	India	Italy	Brazil	Canada
Const (b_0)	0.0001 (3.90)	0.0001 (2.69)	0.0001 (2.44)	0.0001 (3.01)	0.0001 (2.83)	0.0001 (2.93)	0.0001 (2.85)	0.0001 (2.77)	0.0001 (2.69)	0.0001 (2.99)
Hedge (b_1)	-0.0842 (-30.30)	-0.0068 (-3.51)	0.0104 (4.84)	-0.0396 (-18.96)	-0.0443 (-18.12)	-0.0399 (-19.41)	-0.0137 (-6.51)	-0.0321 (-18.06)	-0.0158 (-11.38)	-0.0463 (-17.72)
Δ GFC (b_2)	0.0270 (4.13)	-0.0276 (-2.95)	-0.0031 (-0.29)	-0.0009 (-0.12)	-0.0021 (-0.33)	-0.0012 (-0.18)	-0.0166 (-2.29)	-0.0045 (-0.68)	-0.0196 (-5.49)	-0.0091 (-1.44)
Total GFC ($b_1 + b_2$)	-0.0572 (-9.70)	-0.0344 (-3.74)	0.0073 (0.67)	-0.0405 (-5.42)	-0.0464 (-7.67)	-0.0411 (-6.63)	-0.0303 (-4.37)	-0.0366 (-5.75)	-0.0354 (-10.69)	-0.0554 (-9.43)
Δ COVID (b_3)	0.0036 (0.42)	-0.0334 (-1.96)	-0.0363 (-1.87)	-0.0064 (-0.75)	-0.0110 (-1.38)	-0.0070 (-0.89)	-0.0104 (-1.02)	-0.0141 (-2.19)	-0.0175 (-3.12)	-0.0124 (-1.50)
Total COVID ($b_1 + b_3$)	-0.0806 (-10.02)	-0.0402 (-2.37)	-0.0259 (-1.35)	-0.0460 (-5.62)	-0.0553 (-7.30)	-0.0469 (-6.20)	-0.0241 (-2.42)	-0.0462 (-7.51)	-0.0333 (-6.13)	-0.0587 (-7.48)

Table 6: Estimation results for AAA-grade corporate bonds as safe haven assets during the 2008 GFC and Covid-19 pandemic

This table presents the estimation results of the role of S&P500 AAA-grade bonds as a hedge and safe haven asset in the periods of stock market crises, such as the 2008 GFC and COVID-19 pandemic. The crisis period ends 20 trading days since the last date of maximum ten losses after the start of the crisis. The GFC starts on September 12, 2008, and ends February 17, 2009, while the COVID-19 pandemic starts on February 20, 2020, and ends July 09, 2020. Asset i is deemed a weak, intermediate or a strong hedge for the stock market j if the parameter b_j is economically “small” (zero or close to zero), negative and economically intermediate, or negative and economically strong, respectively. We use the cutoff of 0.05 [-0.05, +0.05 to assess whether an estimated coefficient is economically “small”. The estimated coefficient is deemed as economically “moderate” (“large”) if the estimated coefficient is between -0.05 to -0.20 (lower than -0.20). Parameter b_2 is the incremental safe-haven asset beta for the GFC. Further, the sum of the two parameters, $b_1 + b_2$, is the total safe-haven asset beta for the GFC. If the sum, $b_1 + b_2$, is negative, statistically insignificant or significant of either sign, but economically “small”, then asset i serves as a weak safe haven from stock market losses during the GFC. If the sum, $b_1 + b_2$, is negative, statistically significant and economically “moderate” (“large”), then asset i serves as an intermediate (strong) safe haven from stock market losses during the GFC. Similar interpretations apply to b_3 and $b_1 + b_3$, with respect to COVID. The respective t -statistics are provided in the parentheses.

S&P500 AAA-Grade Bonds Index										
Coefficients	US	China	Japan	Germany	UK	France	India	Italy	Brazil	Canada
Const (b_0)	0.0000 (0.47)	0.0000 (0.11)	0.0000 (0.10)	0.0000 (0.70)	0.0000 (0.45)	0.0000 (0.45)	0.0000 (0.24)	0.0000 (0.17)	0.0000 (0.30)	0.0000 (0.53)
Hedge (b_1)	-0.0422 (-32.50)	-0.0005 (-0.27)	0.0106 (5.80)	-0.0178 (-10.73)	-0.0210 (-12.20)	-0.0172 (-11.40)	-0.0041 (-2.10)	-0.0156 (-11.66)	-0.0132 (-9.62)	-0.0214 (-11.12)
Δ GFC (b_2)	-0.0111 (-1.22)	0.0679 (6.86)	0.0748 (7.20)	0.0401 (3.85)	0.0534 (7.70)	0.0452 (5.17)	0.0290 (1.43)	0.0550 (6.61)	0.0007 (0.08)	0.0181 (1.24)
Total GFC ($b_1 + b_2$)	-0.0533 (-5.80)	0.0674 (6.75)	0.0854 (8.36)	0.0223 (2.15)	0.0324 (4.81)	0.0280 (3.24)	0.0249 (1.24)	0.0394 (4.77)	-0.0125 (-1.38)	-0.0033 (-0.22)
Δ COVID (b_3)	0.0124 (1.32)	0.0220 (0.76)	0.0330 (1.54)	0.0281 (2.64)	0.0188 (1.86)	0.0226 (2.22)	0.0294 (2.30)	0.0185 (2.39)	0.0089 (1.37)	0.0123 (1.29)
Total COVID ($b_1 + b_3$)	-0.0298 (-3.23)	0.0215 (0.75)	0.0436 (2.05)	0.0103 (0.97)	-0.0022 (-0.22)	0.0054 (0.54)	0.0253 (2.00)	0.0029 (0.37)	-0.0043 (-0.69)	-0.0091 (-0.98)

Table 7: Summary of estimation results for various potential safe haven assets during the GFC vs. COVID financial crises

This table presents a broad summary of the performance of various potential safe haven assets during the GFC and COVID-19 pandemic financial crises, as analysed and reported in Tables 3-6. There are three panels: Panel A – showing a summary of the total GFC safe-haven effect; Panel B – showing a summary of the total COVID safe-haven effect; and Panel C – providing a brief Commentary. Panels A and B contain four columns each. Column (1): “min” – the minimum statistically significant (at the 5% level) country-based estimate of the safe-haven beta for the asset in question. Column (2): “max” – the maximum statistically significant (at the 5% level) country-based estimate of the safe-haven beta for the asset in question. In the case of (1) and (2), “min” and “max” 0 reflects either the estimate of the safe-haven beta that is insignificant or a significant estimate that is close to zero. Column (3): “#0’s” – the number out of 10 cases (out of nine cases for the case of the US dollar), of effectively zero value estimates of country-based safe-haven betas for the asset in question. In the case of (3), “effectively zero” is taken to mean either an insignificant estimate or a significant estimate that is economically close to zero, deemed to be within the range [-0.05 to +0.05]. Column (4): “#int” – the number of statistically significant (at the 5% level) and negatively signed estimates of country-based intermediate safe-haven betas [-0.05 to -0.20] for the asset in question. Column (5): “#strong” – the number of statistically significant (at the 5% level) and negatively signed estimates of country-based strong safe-haven betas [< -0.20] for the asset in question. Panel C organises some brief commentary into three columns. Column (C1) gives an overall “call” on the safe-haven character for the asset in question during the GFC. Column (C2) gives an overall “call” on the safe-haven character for the asset in question during COVID. Column (C3) makes a “call” on whether the safe-haven character of the asset in question, has changed and, if so, how?, during COVID compared to the GFC.

S-H asset	(A) GFC: $b_1 + b_2$					(B) COVID: $b_1 + b_3$					(C) Commentary		
	(A1) min	(A2) max	(A3) #0's	(A4) #int	(A5) #strong	(B1) min	(B2) max	(B3) #0's	(B4) #int	(B5) #strong	(C1) Safe-haven in GFC?	(C2) Safe-haven in COVID?	(C3) Safe-haven change?
Gold	0	0.12	5	0	0	+0.05	+0.24	0	0	0	Yes, but mostly weak	No, some quite risky settings e.g. China & Japan	Yes, weakened
Silver	0	+0.54	1	0	0	+0.05	+0.81	1	0	0	No, most above +0.3	Definitely not , some very risky settings e.g. China, Japan, Germany, the UK, France & Canada	Yes, weakened
US Dollar	-0.17	-0.07	0	9	0	-0.10	0	5	4	0	Yes, all intermediate	Yes, weak to intermediate	Yes, weakened somewhat
Swiss Franc	-0.12	-0.03	3	7	0	-0.10	-0.03	8	2	0	Yes, mostly intermediate	Yes, mostly weak	Yes, weakened somewhat
T-bills	-0.00	0	10	0	0	-0.00	0	10	0	0	Yes, but very weak	Yes, but very weak	No change
T-bonds	-0.06	0	8	2	0	-0.08	0	7	3	0	Yes, mostly weak	Yes, mostly weak	No change
AAA-bonds	-0.05	+0.09	7	1	0	-0.03	+0.04	10	0	0	Yes, mostly weak	Yes, mostly weak	Little change
Overall	na	na	34	19	0	na	na	42	9	0	Gold, T-bill, T-bonds & AAA-bonds (USD, SwF) offer weak (intermediate) safe havens during GFC	SwF, T-bill, T-bonds & AAA-bonds (USD) offer weak (weak to intermediate) safe havens during COVID	General evidence of a weakening in COVID (cf GFC), esp. Gold, Silver, USD, SwF

Table 8: Estimation results for gold as a safe haven in extreme market conditions

Table presents the estimation results of the role of gold as a hedge and safe haven asset during the periods of extreme market conditions namely, quantile 5% (b_2), and 1% (b_3). Asset i is deemed a weak, intermediate or a strong hedge for the stock market j if the parameter b_1 is economically “small” (zero or close to zero), negative and economically intermediate, or negative and economically strong, respectively. We use the cutoff of 0.05 [-0.05, +0.05] to assess whether an estimated coefficient is economically “small”. The estimated coefficient is deemed as economically “moderate” (“large”) if the estimated coefficient is between -0.05 to -0.20 (lower than -0.20). Parameters, b_2 , and b_3 are the incremental safe-haven gold beta for the lowest 5%, and 1% for the stock market j returns, respectively. Further, the sum of the two parameters, $b_1 + b_2$, is the total safe-haven gold beta for the lowest 5% stock market returns. If the sum, $b_1 + b_2$, is negative, statistically insignificant or significant of either sign, but economically “small”, then asset i serves as a weak safe haven from stock market losses during the lowest 5% stock market returns. If the sum, $b_1 + b_2$, is negative, statistically significant and economically “moderate” (“large”), then asset i serves as an intermediate (strong) safe haven from stock market losses during the lowest 5% stock market returns. Similar interpretation applies to $b_1+b_2+b_3$, with respect to the lowest 1% stock market returns. The respective t -statistics are provided in the parentheses.

Panel A: Gold as a safe haven in extreme market conditions after reaching the maximum price on September 5, 2011										
Coefficients	US	China	Japan	Germany	UK	France	India	Italy	Brazil	Canada
Const (b_0)	-0.0001 (-0.65)	-0.0001 (-0.40)	-0.0001 (-0.39)	0.0000 (0.18)	0.0000 (-0.11)	0.0000 (-0.16)	0.0000 (-0.08)	0.0000 (0.06)	0.0000 (-0.03)	-0.0001 (-0.28)
Hedge (b_1)	0.0244 (1.23)	0.0636 (3.78)	0.1145 (7.10)	0.0667 (4.71)	0.1173 (6.50)	0.0737 (5.05)	0.0436 (2.84)	0.0439 (3.63)	0.0632 (6.59)	0.2231 (11.92)
Quantile $\Delta 5\%$ (b_2)	-0.1806 (-4.26)	-0.0268 (-0.94)	-0.0535 (-1.54)	-0.0114 (-0.45)	-0.0338 (-1.03)	-0.0755 (-2.98)	-0.0493 (-1.50)	-0.0042 (-0.18)	-0.0284 (-1.26)	-0.1062 (-3.28)
Total ($b_1 + b_2$)	-0.1562 (-4.23)	0.0368 (1.56)	0.0610 (2.02)	0.0553 (2.69)	0.0835 (3.01)	-0.0018 (-0.10)	-0.0057 (-0.20)	0.0397 (1.99)	0.0348 (1.71)	0.1169 (4.07)
Quantile $\Delta 1\%$ (b_3)	0.2024 (4.76)	-0.0847 (-2.82)	-0.0367 (-1.01)	0.0713 (2.90)	-0.0376 (-1.30)	0.1297 (5.45)	0.0864 (2.58)	-0.0199 (-0.96)	0.0492 (1.97)	0.1215 (3.28)
Total ($b_1 + b_2 + b_3$)	0.0462 (2.22)	-0.0479 (-2.75)	0.0243 (1.11)	0.1266 (8.35)	0.0459 (3.59)	0.1279 (9.00)	0.0807 (5.26)	0.0198 (2.04)	0.0840 (5.79)	0.2384 (9.65)

Panel B: Gold as a safe haven in extreme market conditions before reaching the maximum price on September 5, 2011										
Coefficients	US	China	Japan	Germany	UK	France	India	Italy	Brazil	Canada
Sample start date	1964	1992	1964	1970	1984	1987	1991	1980	1988	1964
Const (b_0)	0.0002 (2.81)	0.0002 (1.77)	0.0002 (1.81)	0.0002 (1.97)	0.0001 (1.51)	0.0001 (0.98)	0.0001 (1.14)	0.0004 (2.78)	0.0001 (1.04)	0.0002 (2.71)
Hedge (b_1)	-0.0425 (-4.33)	0.0010 (0.23)	0.0679 (10.15)	0.0682 (9.54)	0.0427 (4.96)	0.0115 (1.58)	0.0166 (2.52)	0.0831 (7.50)	0.0049 (1.30)	0.0879 (8.73)
Quantile $\Delta 5\%$ (b_2)	0.0124 (0.55)	0.0053 (0.58)	-0.0302 (-1.98)	-0.0120 (-0.78)	0.0953 (6.01)	0.0293 (1.87)	-0.0283 (-1.72)	-0.0385 (-1.96)	0.0129 (1.67)	0.0578 (2.85)
Total ($b_1 + b_2$)	-0.0301 (-1.51)	0.0063 (0.77)	0.0377 (2.85)	0.0562 (4.06)	0.1380 (10.44)	0.0408 (2.78)	-0.0117 (-0.78)	0.0446 (2.74)	0.0178 (2.58)	0.1457 (8.30)
Quantile $\Delta 1\%$ (b_3)	-0.0289 (-1.32)	-0.0002 (-0.01)	-0.0046 (-0.26)	-0.1123 (-6.98)	-0.2057 (-14.63)	-0.1297 (-7.19)	0.0246 (1.19)	-0.1664 (-7.72)	-0.0259 (-3.10)	-0.1312 (-6.81)
Total ($b_1 + b_2 + b_3$)	-0.0590 (-6.09)	0.0062 (0.78)	0.0331 (2.92)	-0.0561 (-6.15)	-0.0677 (-9.53)	-0.0889 (-9.95)	0.0129 (0.89)	-0.1218 (-8.21)	-0.0081 (-1.73)	0.0145 (1.62)

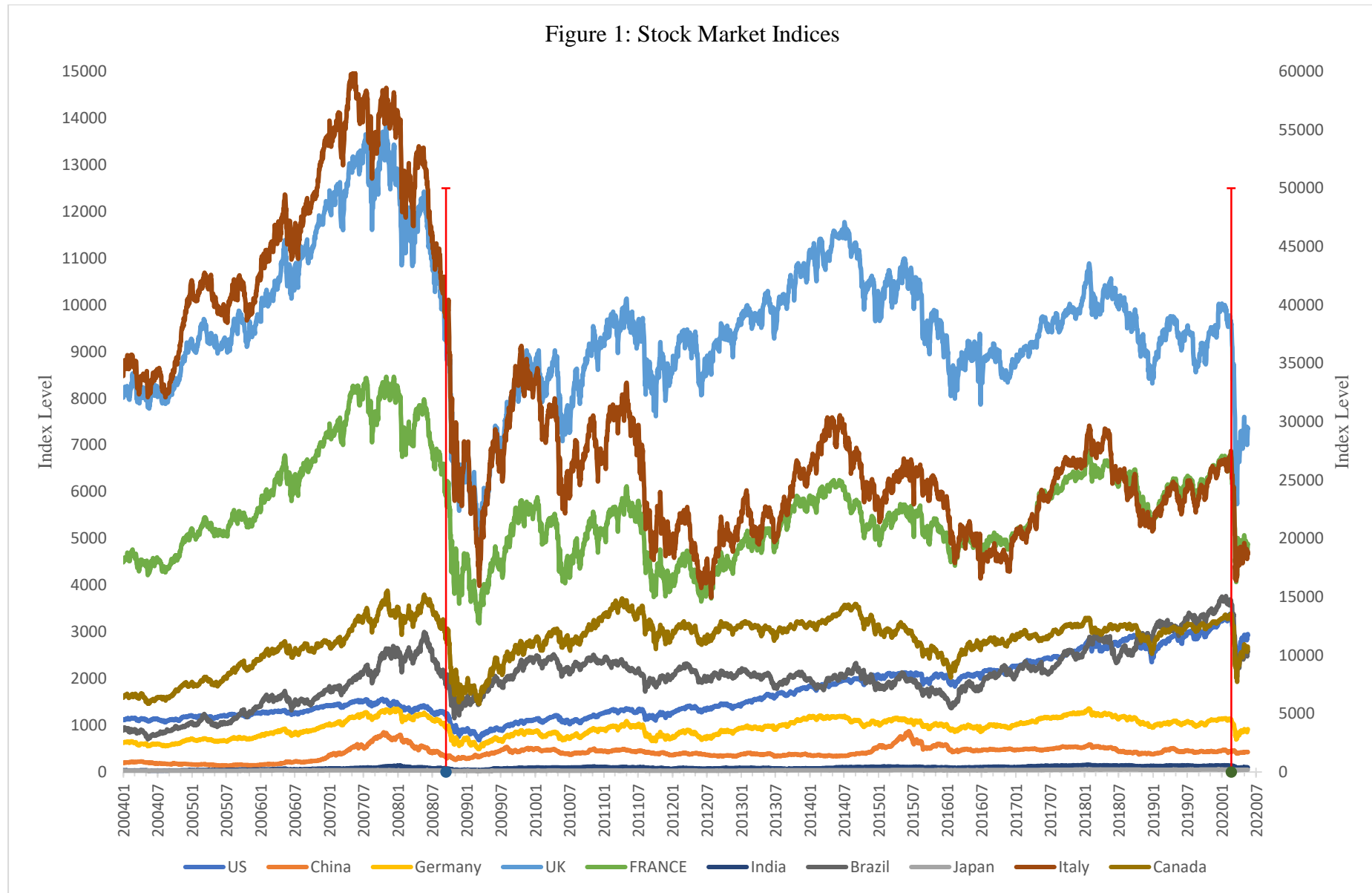


Figure 1: This figure displays the daily index level of the stock markets across the ten largest economies in the world over the sample period. For convenience, the index level of Japan, Italy and Canada is labelled on the right vertical axis, and the index level of other seven countries is labelled on the left vertical axis.

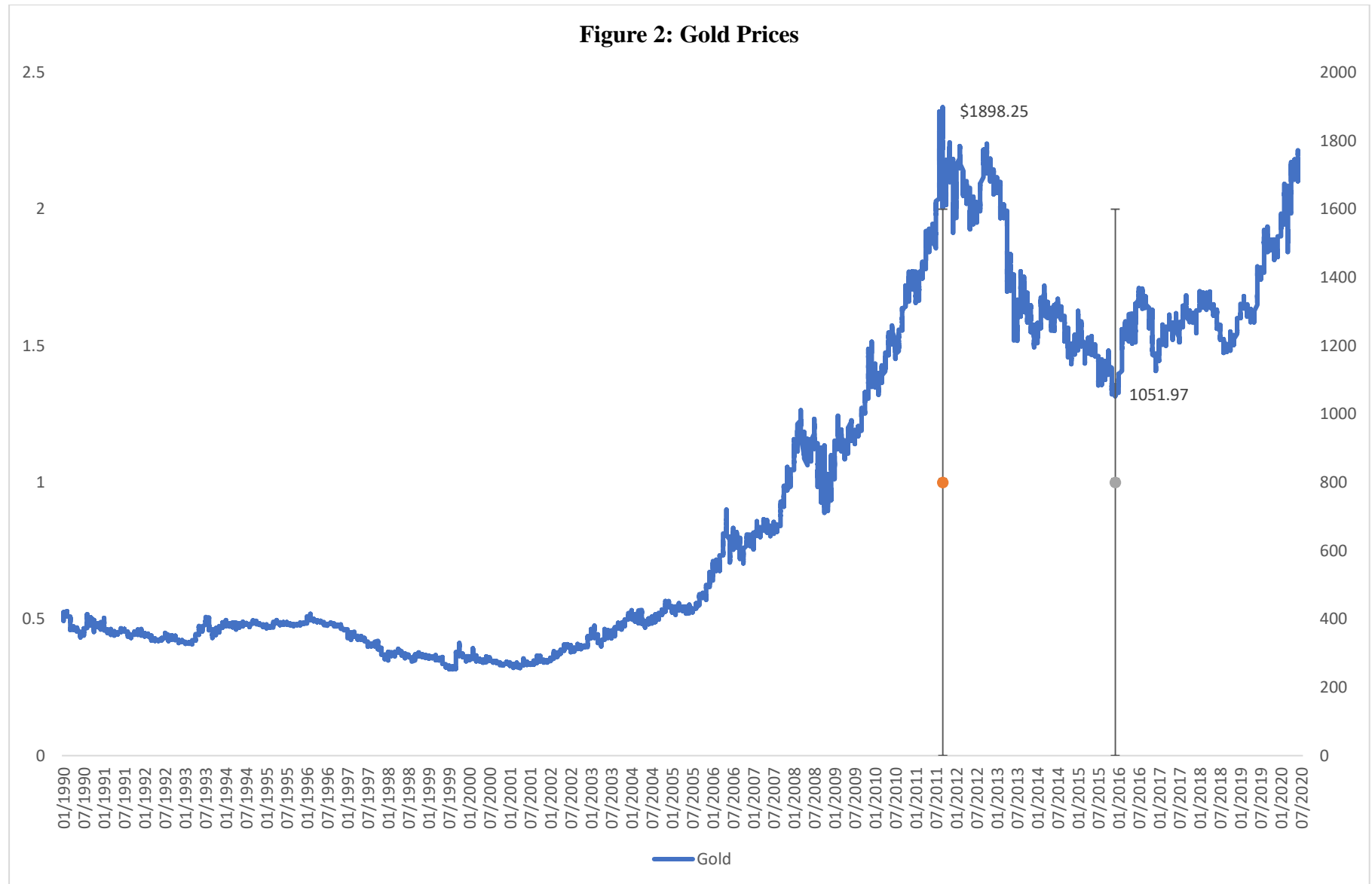


Figure 2: This figure displays the daily gold prices in US dollars from 1990 to 2020. The gold prices in USD are labelled on the vertical axis, and date on the horizontal axis.

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