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## Safe Haven and Hedge Properties of Gold: Implication for Risk Management

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Effat University

Collage of Business

Department of Finance

# **Safe Haven and Hedge Properties of Gold: Implication for Risk Management**

A Thesis Submitted in Partial Fulfillment of Requirements for the (Master)Degree in  
Islamic Financial Management

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كلية إدارة الأعمال

قسم المالية

# خصائص الملاذ الآمن والتحوط من الذهب: الآثار المرتتبة على إدارة المخاطر

رسالة مقدمة لاستكمال متطلبات الحصول على درجة الماجستير

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This thesis, written by Ghadeer Mohammed Haddash under the direction of his/her thesis supervisor and approved by his/her thesis committee, has been presented to and accepted by the Dean of Graduate Studies and Research on Business, in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE in Finance Management

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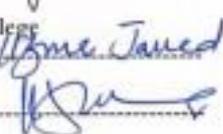
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## **Abstract**

In accordance with the timing of fiscal and monetary stimulus measures to help the faltering economy, this study investigates the function of gold as a hedge or safe-haven asset during various COVID-19 pandemic crisis phases. Empirical analyses are carried on gold and major stock indices for a period spanning from March 1, 2012, to January 28, 2022. The methodology employs a multiple linear regression model. The results suggest that gold was a safe-haven asset for stock markets during the pandemic, which may have been due to investors increasing their investment in gold as a "flight to safety asset" during the crisis. Additionally, a large increase in hedging expenses. These results shed light on how gold has changed over time as a hedge and safe-haven asset, and they offer direction to policymakers, regulators, and the media.

**Keywords:** Gold, safe-haven, hedge, COVID-19.

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## Table of Contents

Abstrac.....	v
Keywords.....	iv
Acknowledgements.....	خط
! الإشارة المرجعية غير معرفة.	
<b>Chapter 1:Introduction.....</b>	<b>1</b>
1.1 Background.....	8
1.2 Motivation.....	9
1.3 Main contributions of thesis.....	11
1.4 Organization of thesis .....	11
1.5. Definition.....	11
<b>Chapter 2: Literature Review.....</b>	<b>13</b>
2.1A brief history of gold .....	13
2.2 Gold is usually viewed as a safe asset.....	16
2.3. Gold market linkages around the world.....	17
2.4. Gold as an investment.....	18
2.5. Haven a safe haven? .....	19
2.6. Gold and currencies.....	21
2.7. The dynamic correlation between gold and some equity.....	23
2.8. Market conditions and gold.....	24
2.9. Physical gold demand and supply issues.....	24
2.10. The stock-gold relationship.....	25
2.11. What drives the volatility of gold?.....	26
2.12. Gold market efficiency.....	26
2.13. Gold and Inflation.....	27
2.14. Gold and interest rates.....	28
2.15. Behavioural aspects of gold investment.....	31
2.16.The performance of gold as a financial asset.....	34
2.17. The role of gold.....	34
2.18. Characteristics of gold as financial asset.....	35
2.19. The gold market.....	35

<b>Chapter 3 : Methodology and data.....</b>	<b>38</b>
<b>Chapter 4: Results and discussion.....</b>	<b>40</b>
<b>Chapter 5 : Conclusions.....</b>	<b>56</b>

## List of Figures

<b>1. Figures (1): Price S&amp;P 500 (US)</b> .....	<b>41</b>
<b>2. Figures (2): Price Nikkei 225 (JAPAN)</b> .....	<b>41</b>
<b>3. Figures (3): Price CAC 40 (France)</b> .....	<b>42</b>
<b>4. Figures (4): Price TASI (KSA) .....</b>	<b>42</b>
<b>5. Figures (5): Price DAX (Germany) .....</b>	<b>43</b>
<b>6. Figures (6): Price FTSE 100 (UK) .....</b>	<b>43</b>
<b>7. Figures (7): Price Gold</b> .....	<b>44</b>
<b>8. Figures (8): Return S&amp;P 500 (US) .....</b>	<b>45</b>
<b>9. Figures (9): Return Nikkei 225 (JAPAN) .....</b>	<b>46</b>
<b>10. Figures (10): Return CAC 40 (France) .....</b>	<b>47</b>
<b>11. Figures (11): Return TASI (KSA) .....</b>	<b>48</b>
<b>12. Figures (12): Return DAX (Germany) .....</b>	<b>49</b>
<b>13. Figures (13): Return FTSE 100 (UK) .....</b>	<b>50</b>
<b>14. Figures (14): Return Gold</b> .....	<b>51</b>

## List of Tables

<b>1. Table 1:</b> Normality test results.....	52
<b>2. Table 2:</b> Descriptive statistics.....	52
<b>3. Table 3:</b> Correlation matrix. ....	53
<b>4. Table 4:</b> Estimation results .....	54

## **Chapter 1**

### **Introduction**

Since ancient times, gold has been seen as a refuge of safety and as a durable object (Beckmann and Czudaj, 2012; Ghosh et al., 2004). According to Sujit and Kumar (2011), gold can be used as a means of wealth accumulation and as a means of payment that is accepted by all parties (universally). It can even be used as a hedging instrument (Capie et al., 2005).

When the market is experiencing significant levels of uncertainty or turmoil, Baur and Lucey (2010) define a safe haven as an asset that has no correlation or a negative correlation with other assets or portfolios. Baur and Lucey (2010) defined the hedge as assets that have a low correlation or a negative correlation with other assets or portfolios. There are no unique characteristics of this asset that can help minimize losses in a turbulent and selling-pressured market. As a result, an asset may correlate positively with other assets during market instability and negatively with other assets during calmer periods (Pangestuti et al., 2017).

Both the volume and value of the financial markets have been gradually increasing in recent decades. The same is true of the complexity and variety of financial products. The possible demand for a relatively straightforward and secure asset, such as a haven, is also brought on by the rising interdependence of markets and assets.

Concerning investors who hold gold during times of regular market activity and investors who only purchase gold during times of excessive market activity, we examine the role of gold. A safe haven is "the appropriate place to park money during moments of uncertainty," according to Kaul and Sapp (2007). The authors also mention that when uncertainty rises, investors buy safe haven assets.

Technically speaking, an asset that serves as a safe haven for another asset or a portfolio of assets is one that does not move in concert with the other asset under stressful situations. In other words, if a second asset has significant losses, it is

uncorrelated or negatively correlated with that asset. This definition also helps to distinguish between a safe haven and a hedge because a hedge is an asset that, on average, has no correlation or a negative correlation with another asset.

An asset that serves as a safe haven has no correlation or a negative correlation with another asset on average, but only when there is stress. If the haven (asset) and the other asset have a (strictly) negative correlation, the haven asset is compensating for losses because it increases in value when the value of the other asset decreases. Because it dampens negative shocks to an asset class through the gains made by the asset that serves as a safe haven, the presence of such an asset is likely to increase the stability and resilience of the financial system. Therefore, it is likely that the presence of a strictly negative correlated asset compensates for portfolio losses in volatile market conditions, serves to positively impact market sentiment, and lessens the severity of crisis situations.

To lessen the risk of loss, investors maintain asset portfolios. The advantages of diversification will be lessened when they are most required if this risk reduction is ineffective during financial crises. Such diminished diversification benefits are frequently linked to stock market financial contagion. On the other hand, if there are assets whose prices grow during times of crisis, the losses from investments in the (global) stock market are partially made up.

The range of financial products as well as the size and value of financial markets have grown steadily over the past few decades. This growth has increased the dangers to the financial system, which can mean that investors require a safe haven.

After precisely defining a safe haven, a hedge, and a diversifier, it is decided whether gold qualifies as a (safe) haven asset. Gold was chosen as a contender because both anecdotal evidence and financial media reports imply that it offers a safe haven in the financial markets.

Even though there is no formal model that explains this, one significant reason why gold is frequently referred to as a safe haven asset is the fact that it was one of the first forms of money and was traditionally employed as an inflation hedge. In the period of

globalization, when correlations between other asset classes significantly grew. The biggest UK index, the FTSE 100, plunged sharply by 24.80% in the first quarter of 2020. 2020 (The Guardian). Beginning in December 2019, the stock indices of the G7 countries experienced comparable, severe decreases. 2020a (Bloomberg). In view of the increased volatility in conventional assets, such as equities, commodities, and currencies, as well as the potential for greater losses due to the epidemic, we reevaluate gold's role as a hedge and safe-haven asset during the pandemic. Gold serves as a hedge and safe-haven asset, which should be known by investors seeking such an asset for their portfolios during various epidemic periods.

The COVID-19 pandemic had killed 1,848,704 individuals globally and infected 84,474,195 as of January 5, 2021. (WHO, 2021). The rapidly escalating health problem has resulted in a global economic catastrophe. The worst financial market volatility since the 1930s caused the S&P 500 Index to decline by one-third between late December 2019, when the Chinese government disclosed the first confirmed case of COVID-19 in Wuhan, and March 2020. (World Economic Forum, 2020). The Dow Jones Industrial Average experienced its third and sixth biggest day drops on March 16 and March 12, 2020, respectively.

There are different findings from studies on the characteristics of gold that made it a sanctuary during the COVID-19 epidemic (Bouri et al., 2020; Cheema et al., 2020; Ji et al., 2020). According to reports, the COVID-19 crisis influenced gold's ability to serve as a hedge and safe-haven asset. Our study's focus is the lack of consensus among academics and professionals on gold's attributes as a safe-haven asset. The intraday dataset used in this analysis extends until April 24, 2020, and includes the economic calamity brought on by the pandemic. Since stimulus packages were implemented globally in mid- to late March, financial market dynamics have changed significantly; in particular, financial assets have moved synchronously since that time.

The globe has been successfully looted and destabilized by the COVID-19 pandemic. In just a few months, it put lives, economic borders, international trade, and the fundamental foundation of the global financial system in peril. Due to this catastrophe, borders were closed, the world economy experienced a significant slowdown, and on March 11, 2020, the stock market crashed. To manage the crisis and aid the recovery, many investors diversified their portfolios with uncorrelated assets.

To ascertain if gold has served as a safe-haven asset during different pandemic phases, empirical study is necessary. Additionally, many studies on the financial impacts of COVID-19 have employed daily figures. Because the time periods for each stage of the pandemic are so confined, it is necessary to use data that are collected more frequently than once per day to make clear findings.

Gold maintains its value even when the prices of stock market indices fall. Numerous studies have amply demonstrated its efficiency as a hedge and safe haven against equities in various markets (e.g., Baur & Lucey, 2010; Beckmann, Berger, & Czudaj, 2015, among others).

Recently, attention has grown in the economic effects of the COVID-19 issue on financial markets. This has reopened the discussion about whether cryptocurrencies can rival or surpass gold hedging and safe-haven assets when compared to stocks. To the best of our knowledge, only a small number of research have examined the functions of Bitcoin and gold in relation to financial assets (Bouri et al., 2017; Corbet et al., 2018; Dyrberg, 2016).

Gold has always been seen as a store of wealth, portfolio stabilizer, and a source of liquidity during periods of financial upheaval. In the US and the UK, gold is regarded as a hedge against inflationary pressures (Hoang, Lahiani, & Heller, 2016). According to Elder, Miao, and Ramchander (2012).

However, Baur and Glover (2012) demonstrated that greater investment in the precious metal for hedging and speculating purposes can erode the hedging potential of gold. For instance, Klein (2017) demonstrated using a dynamic correlation model that precious metals had a hedging function for stock market indices in American and European nations, but that function had vanished by 2013.

Much research looks into whether gold is a safe haven asset during the times of economic unrest (Baur and Lucey, 2010; Baur and McDermott, 2010; Ciner et al., 2013; Reboredo, 2013). When one asset is uncorrelated or negatively correlated with another asset during a crisis, Baur and Lucey (2010) refer to it as a safe haven. They demonstrate that gold is a safe haven asset for stock markets, although a temporary

one. Gold is portrayed by Baur and McDermott (2010) as a secure investment for the US and European equity markets. Ciner and co.

In many nations, gold prices have traditionally developed into a potent leading indicator, and when compared to other inflation indicators, gold still has statistical significance (Tkacz, 2007). Academics and professionals were drawn to the U.S. financial market by the Bretton Woods system in 1971 and the country's conversion from a gold-linked currency to legal cash. Gold has historically been the commodity most strongly associated and connected with money, regardless of the Bretton Woods system. Even gold and money have frequently been thought of as being nearly identical. Gold continues to play a vital function as a real commodity and asset to influence macroeconomic indicators notwithstanding the collapse of the Bretton Woods System in 1971.

The potential of gold to defend the financial system and act as a hedge against inflation is still debatable. Studies like (Jastram, 1977) and (Jastram & Leyland, 2009) demonstrate that the price of gold has remained consistent over centuries. While (Chua & Woodward, 1982) examined Switzerland, the United States of America, Japan, the United Kingdom, Canada, and Germany between 1975 and 1980 to determine the long-term link between inflation (CPI) and the price of gold. According to the findings, gold served as an inflation hedge only in the United States of America. The findings of studies like (Baur & McDermott, 2010), (Narayan et al., 2013), and (Narayan et al., 2010) emphasize that gold is regarded as a profitable investment tool in the majority of nations. Gold would continue to be a significant component of the global system of monetary reserves, and this study predicts that its position will grow in importance in the future, according to research by Amundi Asset Management. This is because many central banks utilize gold as a reserve asset.

There are two primary schools of thought about the connection between gold and inflation, according to the literature study. The first approach examines how gold prices are impacted by inflation, while the second focuses on how gold prices are impacted by inflation or examines whether gold acts as an inflation hedge.

Study of one approach's initial example is (Batten et al., 2014). They demonstrate that there is no cointegration between gold and inflation (as measured by the CPI), and

their conclusion implies that gold's sensitivity to inflation is related to interest rates. (Sharma, 2016) discovered data suggesting that the CPI (consumer price index) has the capacity to forecast changes in gold prices in the UK, the US, and several other nations and areas. (Sharma, 2016) looked at how well the CPIs of 54 different nations could forecast the price of gold expressed in US dollars.

This analysis indicates that the UK's

Commodity flow demand is mostly influenced by exogenous factors that are cyclically dependent, such as GDP or absorption. Therefore, it stands to reason that, given all other factors being equal, a sudden, unanticipated increase in demand for a specific item that is not satisfied by an instant increase in supply should cause the price of the commodity to increase. However, it is our belief that buffer reserves can be supplied with complete flexibility in the case of gold. If this claim is true, there won't be any such upward price pressure in the gold market in the presence of a surge in demand.

The following "hard line" results from the fundamental differences between gold and other financial assets and commodities: the impact of cyclical demand on returns on gold is negligible, in contrast to the impact of cyclical demand on other commodities and financial assets (using as proxies GDP, inflation, nominal and real interest rates, and the term structure of interest rates).

In the past five years, numerous research has focused on the precious metals market. Numerous research, beginning with Jaffe (1989) and Chua et al., have focused on the use of gold as a hedge in portfolio diversification (1990). Another study that looked at gold as a safe haven came to the conclusion that it could be one (see Baur and Lucey (2010), Baur and McDermott (2010), Coudert and Raymond (2010), and Beckmann et al. (2015) as examples). Other precious metals' status as safe havens have received less research. Gold, silver, and platinum all show minimal correlations with stock index returns, especially during times of high stock market volatility; as a result, portfolios that incorporate precious metals outperform equities portfolios that do not, according to research by Hillier et al. (2006), for example.

During times of market stress, investors are advised to "park their money" in certain assets, which are referred to as safe havens. Many assets have been proposed as safe havens at various points in numerous studies (see Lucey and Li, 2015). The first operational definition of a safe haven is given by Baur and Lucey (2010), who define it as an asset (such as stocks) that is uncorrelated or negatively correlated with another asset or portfolio during times of market stress (e.g. stock market crash or political disturbance).

Gold is among the metals with the highest degree of malleability, ductility, density, conductivity, non-destructiveness, brilliance, and beauty. For most of the human history, gold has been a sought-after item in practically every culture, and there have been active gold markets for more than 6000 years Green (2007). Numerous academic articles have been written about gold as money, an investment, a source of value, and a store of value.

Gold frequently occupies a prominent position in discussions of investments and money according to the long and entwined histories of gold, financial markets, and money.

Since gold was permitted to trade freely in the late 1960s, there has been an increase in the number of scholarly research on the subject. After this time, gold prices increased, but academic researchers were also interested in the causes and mechanisms of price shifts.

The nominal gold price has increased 42% since the start of the financial crisis in July 2007.

Given the losses incurred in other asset classes during the current crisis, gold's performance is even more astounding. Although the term "safe haven asset" is frequently used in the financial media to describe gold, the assertion has rarely been proven in the literature. This essay investigates the potential use of gold as a shelter from financial market losses.

A location of safety or sanctuary is referred to as a haven. Therefore, an asset that maintains its value amid "stormy weather" or unfavorable market conditions qualifies as a safe haven asset. Investors have the chance to safeguard wealth with such an asset in the event of unfavorable market conditions. Several variables affect whether or if investors will look for a safe haven. According to our data, investors are more likely to seek refuge when they experience major market shocks quickly. Additionally, we discover proof that the haven effect typically only exists in mature countries and not in emerging markets. Even significant losses in emerging economies do not prompt foreign investors to relocate to safe havens. We investigate how uncertainty affects interest in safe-haven assets.

### **1.1. Background**

The nominal gold price has increased 42% since the start of the financial crisis in July 2007. Given the losses incurred in other asset classes during the current crisis, gold's performance is even more astounding. Although the term "safe haven asset" is frequently used in the financial media to describe gold, the assertion has rarely been proven in the literature. This essay looks into the potential use of gold as a shelter from financial market losses.

A location of safety or sanctuary is referred to as a haven. Ships seek the shelter of a port or harbor during stormy weather to ride out the storm. Therefore, an asset that maintains its value amid "stormy weather" or unfavorable market conditions qualifies as a safe haven asset. Investors have the chance to safeguard wealth with such an asset in the event of unfavorable market conditions. Several variables affect whether or if investors will look for a safe haven. According to our data, investors are more likely to seek refuge when they experience major market shocks quickly. Additionally, we discover proof that the haven effect typically only exists in mature countries and not in emerging markets.

## 1.2. Motivation

Testing gold's suitability as a safe haven against losses in financial markets is strongly motivated by the current and recent financial crisis, as well as the strength of the gold price that has followed. Baur and Lucey provided proof that gold could serve as a safe haven asset (forthcoming). According to their findings, gold typically maintains its value even when stock markets in Germany, the UK, and the US post extremely negative returns. In their 2006 study, McCown and Zimmerman looked at several aspects of gold as a financial asset. They discover proof of gold's ability to hedge against inflation. Additionally, according to their study, gold possesses the qualities of a "zero beta asset," meaning it is free from market risk. However, they also note that over a 33-year period (1970–2003), gold's returns were only marginally greater than the mean return on Treasury Bills.

In their 2005 analysis of the use of gold as a hedge against the dollar, Capie et al. discovered evidence of gold's ability to control exchange rates. Lucey et al. (2006), Faugere and Van Erlach (2006), and Sherman (2006) are further studies that look at the financial characteristics of gold (1982).

The literature on financial contagion studies how investors react to financial market shocks (e.g. Forbes and Rigobon, 2002)

Investors try to diversify their holdings in their portfolios to lessen the possibility of suffering significant losses.

The imperfect integration of foreign stock markets allows for international diversification (Bai and Green, 2010; Chandar et al., 2009; Francis et al., 2008)

Although macroeconomic principles would not predict great interconnection, contagion effects may cause markets to move together strongly during financial crises (Dornbusch et al., 2000; Hasman and Samartin, 2008)

Therefore, the potential for international diversification to lower risks for investors would seem to have certain upper bounds (see also Ibragimov and Walden, 2007)

According to Markwat et al. (2009), there is proof that local crises can spread to a regional or even global scale, endangering the stability of the financial system.

In times of financial crisis, such contagion dynamics provide a significant incentive for investors to seek out a safe haven asset.

Investors who experience losses in developing markets tend to rebalance their portfolios toward the average portfolio, according to Calvo and Mendoza (2000). This

behavior reflects investors' worries regarding both absolute returns and performance in comparison to other investors.

This could account for the qualitative difference between our findings for developed and emerging markets.

The flight to quality literature, a distinct body of literature, focuses on how investors (Gulko, 2002; Hartmann et al., 2004). We want to investigate gold's function as a switch from stocks to bonds in the wake of unfavorable market shocks (see for example different "quality" asset at periods of extreme market stress.

### **1.3. Main contributions of thesis**

All the literature—except for Baur and Lucey (forthcoming)—does not specifically address gold's function as a safe haven against losses in financial markets. The analysis in this thesis is extended in several significant ways, building on the work of Baur and Lucey (forthcoming). We examine how investors respond to different degrees of "stormy weather." With the use of our dataset, we can distinguish between "storms" of different sizes in terms of the financial system's shocks' severity<sup>2</sup> and duration<sup>3</sup>.

By analyzing two additional questions on the safe haven property and the function of gold in the international financial system, we also widen the scope of the research. I To what extent, if at all, does gold serve as a safe haven for wealth amid volatile market conditions? How do currency fluctuations affect gold's ability to serve as a safe haven or disguise it? For seven of the thirteen individual country stock indexes examined—Canada, France, Germany, Italy, Switzerland, the United Kingdom, and the United States—we find evidence of the strong-form safe haven using daily data. The fact that these markets have a strong safe haven shows that gold may have the ability to stabilize financial markets by limiting losses when they are most required.

## **1.4. Organization of thesis**

Following is a presentation of this study. A literature review is presented in Section 2. Section 3: Data and methodology. Results and analysis are in Section 4. Additionally, Section 5: conclusions and advice.

## **1.5. Definition**

The following can be used as the theoretical justification for the analysis that follows. If investors include an asset that expressly lowers losses in times of market stress or volatility by a greater percentage than hedge or diversifier assets, the severity of shocks is reduced, increasing the stability of capital markets. To identify a safe haven asset from a hedging asset and a diversifier asset, we must explicitly define each of the three types:

### **Safe Haven:**

Safe havens help to reduce risk during market turbulence, which raises return on investment and preserves investment value. When the market is shaky, safe havens are assets with minimal risk and great liquidity, according to Flavin et al. (2014). According to Baur & Lucey (2010), a safe haven asset is one that, while the economy is stable, has no correlation or a negative correlation with other assets in the portfolio. Because of this, safe haven serves as a resource that guarantees the protection of the portfolio throughout the economic crisis (Kaphang & Robiyanto, 2019). In times of stock market turbulence, uncorrelated or negatively correlated. The definition of a safe haven that was previously put forward is in line with those that Webster's dictionary offers.

The definition of "haven" includes a harbor or port, a safe area, and a place with good prospects or circumstances. Consequently, a safe haven is a location of safety that provides investors with protection (i.e., nonnegative returns) during volatile market situations.

**Hedge:**

Hedge is an investment that, on average, has no correlation with other assets in the portfolio or a negative correlation with them (Kopyl & Lee, 2016). Hedge can be divided into two groups. First, a strong hedge is defined as an asset that has a negative correlation to other assets. Second, weak hedges are assets that do not correlate with other assets (Nguyen et al., 2020). Investors employ hedges to protect their assets over a lengthy period of time, however Robiyanto et al. (2017) contend that hedges are also utilized to reduce portfolio risk. Therefore, investors must balance their portfolios, whether the market is in good shape or there is a crisis.

On average, uncorrelated or negatively correlate. That is typically uncorrelated or negatively associated with another asset or portfolio is referred to as a hedge. Since the asset may have a positive correlation at these times and a negative correlation in more typical circumstances with a negative correlation on average, a hedge does not have the (particular) property of minimizing losses during times of market stress or turmoil.

**Diversifier:**

An asset that, on average, has a positive (but not exact) correlation with another asset or portfolio is referred to as a diversifier.

Since the correlation feature is only required to hold on average, the diversifier, like the hedge, does not have the (particular) property of minimizing losses in extremely poor market conditions.

The theoretical justification for the analysis that follows can be stated as follows. The severity of shocks diminishes, strengthening the stability of capital markets, if investors add an asset that explicitly reduces losses in times of market stress or volatility by more than hedge or diversifier assets. We first expressly define all three types to distinguish a safe haven asset from a hedging asset and a diversifier asset. The employed data from investing. was used from Mar 2012 to Mar 2022 Take (S&P500, NIKKEI, CAC40, TASI, DAX, Gold, FTSE 100).

**The main problematic for this thesis can be described as follows: can gold be considered as a safe haven or hedge during financial crises.**

## **Chapter 2**

### **Literature Review**

#### **2.1. A brief history of gold**

One of the earliest methods of wealth storage is gold. Goldsmiths in Sumerian began incorporating gold into the several types of jewelry that are still in use as early as 3000 BC. Gold was already being used as a store of wealth and as currency by traders by the time of Ur's royal cemetery excavations (established around 2500 BC). Since at least Egypt in 1400 BC, where it was employed as a monetary standard, gold has had an impact on the regular economic activities of ordinary people.

The most well-known application of gold was probably as money under various gold standards.

According to estimates, 175,000 tons of gold have been extracted throughout history. This would value the overall gold stock at slightly under US\$6 trillion at average 2013 prices. Even though a large portion of this gold is not in circulation as an investment asset because central banks hold it in bars or because consumers wear it as jewelry, it is nevertheless a sizable and significant financial asset. Comparatively, the New York Stock Exchange was valued at slightly over US\$16 tn in December 2013, while the overall market capitalization of the London Stock Exchange was £4.23 trillion (US\$6.9 trillion).

The London gold market's continued prominence can be attributed to the UK's unintentional switch to the gold standard. Most of the gold produced in the Brazil gold rush, which was the largest producer prior to the Californian gold rush of the 1840s, was absorbed by this market in the 18th century and used to create new gold coins. London's dominance was unaffected even by the Bank of England's 1931 suspension of convergence.

Historically, at times of stock market stress, gold has been uncorrelated or negatively linked (Baur & Lucy, 2010). Due of this, it becomes an asset that investors frequently resort to when the stock market undergoes adverse shocks; as a result, it is frequently referred to as a "safe-haven asset" (Baur & McDermott, 2010). It does not preclude an asset from becoming a safe-haven asset if it is positively correlated during "normal" times. The sole criteria that distinguish a safe-haven asset is that it is negatively correlated or uncorrelated during times of stock market volatility. Bonds issued by the government and gold are two of the most well-known safe-haven investments. Treasury bonds have a fixed interest rate, but gold fluctuates, which distinguishes them from one another. During times of unrest, investors frequently "flee" to tangible assets like gold because they feel more secure knowing that it has historically performed well. Even though it is a volatile asset, it also gives investors a certain level of comfort in the fact that it is something physical. Gold acted as a safe-haven asset in comparison to the S&P 500 from the beginning of the pandemic on January 1 to March 16, 2020, according to Akhtaruzzaman et al. (2021). Gold was simply a diversifier during the second phase of the pandemic, which lasted from March 17 to April 24, 2020, because it did not negatively correlate with the stock market. Because governments engaged with monetary and fiscal stimulus packages to aid the stock market's recovery from the decline, there was no negative association during the second phase.

According to the literature, the relationship between oil and gold prices can be explained by three channels: the inflation channel (Aye et al., 2017; Narayan et al., 2010; Tiwari and Sahadudheen, 2015; Le and Chang, 2016); the portfolio allocation channel (Reboredo, 2013; Ewing and Malik, 2013; Kim and Dilts, 2011); and finally, the export channel (Melvin and Sultan, 1990). Cashin et al. (1999) conducted one of the pioneering studies in this field by attempting to ascertain whether the prices of the seven commodities, which initially appear to be unconnected, move in tandem. According to the study, the price of gold and oil are strongly correlated. The high correlation between oil and gold prices has been supported by numerous research in the literature (Hammoudeh and Yuan, 2008; Imáková, 2011; Lee et al., 2011). It has been determined that the gold price is an estimator of the oil price and that there is a unidirectional relationship between the two by Narayan et al. (2010), Zhang and Wei (2010), and Shahbaz et al. (2017). Several research have investigated whether variations in oil prices have an impact on stock returns. According to Huang et al.

(1996), there was no correlation between the US stock market and oil prices in the 1980s. Nevertheless, a separate analysis by Jones and Kaul (1996) in the same year showed a strong correlation between oil prices and stock returns for the UK, USA, Canada, and Japan in the postwar era. Boyer and Filion (2007) for Canada, Kang et al. (2015) for the United States, Arouri et al. (2011) for the Gulf region (excluding Saudi Arabia), and Bjornland (2009) for Norway report a favorable correlation between oil prices and stock market returns. ns. According to researchers (Sadorsky, 1999; Arouri and Nguyen, 2010; Chiou and Lee, 2009; Malik and Ewing, 2009; Khalfaoui et al., 2015; Fayyad and Daly, 2011; Cunado and de Gracia, 201), stocks are influenced by changes in oil prices.

Scholars have looked into the relationship between gold prices and stock market returns. ns. Whether gold is a safe haven from the perils of stock market volatility is a hot topic of discussion in the literature. Sreekanth and Veni (2014) and Güngür and Ünalıms (2014) for India; Baur and Lucey (2010) for the US, UK, and Germany; and Baur and McDermott (2010) for developing and developed countries have all shown that gold can be used as a hedge. According to Beckmann et al. (2015), the ability of gold to act as a hedge varies depending on the nation. The majority of empirical investigations demonstrate a one-way relationship between gold and stock market returns. Additionally, historical gold prices have been shown to be a reliable predictor of stock returns (Patel, 2013; Kumar, 2017; Mensi et al., 2014), and prices and volatility are interacting in the two markets (Arouri et al., 2015; Mensi et al., 2014). Using several assets to analyze the connection between commodities and stock markets improves the reliability of the results (, 2013). Results. Numerous studies in the literature have shown that the prices of both gold and oil have an impact on financial returns (Chang et al., 2013; Le and Chang, 2016), and that the volatilities in these markets interact. , 2016).

The long-term and causative relationship between oil, gold, stock return, and volatility was validated by Singhal and Ghosh (2016) in Greece. Bouri et al. (2017) and lities, Jain and Biswal (2016) explore volatility connections for India's stock market and commodity market are covered in literature. As noted by Ozturk and Acikalin (2008) and Soytaş et al. (2009), gold acts as a hedge against inflation in countries where it is rare. Turkey. Gencer and Musoglu (2014) and Contuk et al. (2013) discovered a

connection between the stock market and gold prices in Turkey. Turkey. Similarly, studies have explored the three-way relationship between stock prices, gold prices, and oil prices. In order to investigate the shock and volatility transmission mechanism between stock returns and a large collection of variables including oil, natural gas, platinum, silver, and a number of other commodities, Vardar et al. (2018) first examined ten nations, including Turkey. nd gold. The study demonstrated that the impact of commodities prices on stock market returns increased in the post-crisis period by employing the GARCH type model. Second, Turksoy and Faisal (2017) argued that oil and gold prices converge to the returns of the stock market in the post-crisis era by using the ARDL cointegration test to investigate the long-term relationship between these three variables.

## **2.2. Gold is usually viewed as a safe asset**

Gold has long been seen both a commodity and a safe-haven asset, in keeping with its nature (Robiyanto, 2015). For thousands of years, gold has been used as a medium of commerce and a store of value. Gold is more enduring, seen favorably by all parties, and is simple to exchange when compared to other tangible investment assets (Kumar, 2014). This is why gold is a precious metal that has drawn a lot of attention from academics and financial professionals (Arouri et al., 2014).

Because gold has been used as a financial or economic standard, as foreign exchange reserves, and even as the primary payment mechanism in some nations, it is also regarded as a financial asset (Dee et al., 2013).

Gold also becomes a substitute for investments during uncertain times when investors are reluctant to make commercial deals. Even Baur and McDermott (2009) asserted that gold would be a desirable investment option during times of market turbulence. According to Agyei- Ampomah et al. (2013), the 2008 financial crisis compelled investors to choose gold as a safe asset in their search for security.

Burr and Lucy (2010) contend that because gold was the first form of money and is employed as an inflation hedge, it is typically regarded as a safe asset. The fact that gold has no correlation with other asset classes is another explanation. Even though gold is typically priced in US dollars, it can also protect investors who own US

dollars against currency fluctuations. Some studies demonstrate that gold can function as a diversifier for the stock market in addition to serving as a safe haven and hedge, citing the work of Ibrahim (2012) and Ibrahim and Bahrum.

### **2.3. Gold market linkages around the world**

As mentioned, and more so in recent years, gold is a commodity that is traded widely worldwide. So, it only makes sense to wonder about the connection between market-to-market price and price information flow. In order to evaluate the three gold markets (London, New York, and Hong Kong) in terms of importance, Laulajainen (1990) builds a 24-hour trading day using the daily prices from each market. With the help of a VAR model with levels, it is demonstrated that New York has a greater impact on the other two markets than they do, which, in the author's opinion, makes it either dominant or independent. The use of the PM Fixings in this analysis may result in an underestimation of London's significance. In contrast to the AM Fixing, the PM Fixings price overlaps with US trading and may be more closely tied to the New York price because it uses the closing price from that city at 19.30 GMT.

Between 1994 and 2001, US and Japanese daily trading in gold, silver, and platinum are examined by Xu and Fung (2005). The US is shown to outperform Japan in terms of returns, but there is evidence of cross-market feedback. 6 times greater US gold returns than Japanese gold returns have an impact on TOCOM returns.

The role that various geographic markets for gold trading have in setting prices is examined by Lucey, Larkin, and O'Connor (2013). The two main markets for gold trading, according to Murray (2011) and GFMS (2014), are London Fixings and COMEX futures prices (86% and 10% volume, respectively). They discover that both have an equal impact on price discovery, which dominates the process at different points in time with no evident macroeconomic or political connections. This is expanded upon by Lucey, Larkin, and O'Connor (2014) by increasing the number of markets investigated to four to determine which market is dominant in determining the price of gold. To provide the first research of the four biggest gold markets, they consider both returns and volatility spillovers. Like past findings, it is discovered that London and New York continually dominate as the drivers of returns and volatility in the four markets throughout the sample, with each gaining the lead at different points.

It's interesting to note that the Shanghai gold market is remarkably isolated from the rest, with little spillover occurring within or outside of it over the course of the sample. The two big markets have an impact on Tokyo, although not in a significant or constant way. For the futures and spot contracts traded on the Multi Commodity Exchange of India, Pavabutr and Chaihetphon (2010) likewise show that changes in futures prices tend to influence changes in spot prices. Ivanov (2013) investigates the impact of gold and silver exchange traded funds on futures market price discovery. This article contends that the development of ETFs has diminished the significance of futures, with ETFs now serving as the primary means of price discovery for both markets.

#### **2.4. Gold as an investment**

Gold stands out among financial assets in a big way. It practically exists as a separate asset class from silver, platinum, and palladium, which are the other precious metals (Batten, Ciner, and Lucey (2010); Batten, Ciner, and Lucey (2014)). One factor is that relative to its uses in investments and jewelry, its usefulness as an industrial metal is tiny and in decline. However, the other precious metals continue to have significant industrial applications: silver can be used in the manufacturing of solar panels, palladium is now blended into many of the alloys that are replacing gold in dentistry, and platinum is frequently used in catalysts.

It is understandable that most of the discussion about gold prices before to the closure of the gold window in 1971 concentrated on gold's function as a monetary asset. When the price itself was considered, the debate focused on the level at which the price should be established in terms of macroeconomic policy rather than on the qualities of the asset.

For instance, Goodman (1956) highlights the ongoing debate over whether to raise the legally established price of gold during that time to increase global liquidity. The reasons for officially adjusting the price of gold were generally based on concerns around macroeconomic variables, such as trade imbalances and wages. However, the issue was by no means settled, with Busschau (1949) advocating a decrease in the value of all currencies relative to gold and Johnson (1950) advocating the opposite.

The potential of financial assets to hedge risks or diversify a portfolio, two topics on which current literature has concentrated, was not thoroughly researched.

## **2.5. Hedge or safe haven?**

A hedge may be a piece of property that, on average, offers security but falls apart under pressure. The financial press frequently mentions the appeal of gold to investors under panicky or extremely pressured market conditions (eg Sanderson, 2015). Numerous gold price models have taken this feature of gold into account, but how stress has been quantified in research and how gold responds to stress has evolved.

Political tensions' effects on the price of gold are discussed by Ariovich (1983), who separates them into those that have an impact on international finance.

Here are a few outcomes: In Europe, the proportion should be between 3-8%; in South America, Mexico should account for roughly 6% of the total; and in Asia, South Korea should account for 0.1% of the total due to its close cultural ties with India. The weight of gold, which is 12%, varies between 4% and 7% for the remaining nations.

From the works that emphasize political tension rather than the connection between the price of gold and the prices of other assets during periods of excessive market movement, Baur and Lucey (2010) create the fundamental concept of what constitutes a safe haven. They characterize it in terms of its capacity to safeguard wealth from the implosion of financial markets. When stock or bond indexes drop below 1%, 2.5%, or 5% of the yield distribution, they say the market is in distress. This also makes the distinction between safe haven and hedging strategies crystal clear. A strong (weak) safe harbor is described as an asset that is adversely associated (uncorrelated) to another asset or portfolio, sometimes only during periods, for example, during periods of downturn in the stock market, according to Baur and McDermott (2010:1890). Bohr and Lucy (2010) investigate the relationship between US, UK, and German stocks, bond yields, and gold yields on an empirical level, concluding that gold serves as a hedge and a safe haven for stocks rather than bonds. However, it was discovered that gold only served as a safe haven for 15 days following the market meltdown. In contrast, Bredin, Conlon, and Pot (2015) argue that it is a secure shelter for up to a year, in contrast to the 15-day gold findings from Baur and Lucey.

Cohen and Qadan (2010) link gold to risk-based market indicators and discover that during crises like 2008, gold outperforms or outperforms VIX, making it a superior safe asset. There is a two-way causal relationship between the two during normal times. Based on the same technique and terminology as Baur and McDermott, Hood and Malik (2013) examine whether gold may outperform VIX as a hedge or safe haven for US stocks between 1995 and 2010. (2010). Hood and Malik (2013), on the other hand, are based on much less recent data from Baur and McDermott (2010), which covers the years 1979 to 2009. According to Hood & Malik (2013), gold is a poor hedge and safe haven for stocks, being uncorrelated from the market in the event of a breakdown but not in a bad way. VIX, on the other hand, is a reliable haven. Interestingly, Sharia-compliant (Shariah-compliant) gold accounts in Malaysia may not offer safe havens, according to research by Ghazali, Hooi Lean, and Bahari (2014). Gürgün and Nalma (2014), however, found a safe haven across a variety of emerging nations, many of which had strong Islamic financial characteristics. This is in some ways in contradiction to that. It has been demonstrated that there is little association between the returns from the Malaysian stock market and those for gold that is priced locally.

According to Nelson (1966), the only formal bonds that have made gold regarded as a secure asset are those held by central banks. The questioning by Baur and Glover (2012a) over whether gold can remain a safe haven based on behavioral economic issues is related to this potential decline in safe haven status between the time periods examined in this thesis. They contend that because it is increasingly being held for purely speculative reasons, such as because gold ETFs have become more widely available and easier to buy and sell, they would suffer similarly to other assets during market panics. Coleman and Dark (2012) demonstrated that, rather than serving as a hedge, long-term drivers of gold's price are investors using the futures markets.

In reassessing this matter and highlighting gold's capacity to mitigate US dollar risk, Reboredo (2013) discovers that gold in tails continues to mitigate dollar risk across all currency pairs. This study also demonstrates how gold lowers VaR and projected deficit in currency portfolios based on the dollar.

Joy (2011) evaluates whether gold can serve as a safe haven against hazards associated with the US dollar and concludes that it cannot. The study concluded that gold does not serve as a safe haven during periods of sharp reductions in the value of the dollar

and that gold's correlations with most dollar pairs are less negative in the lower quintiles. This might be because the dollar and gold are both viewed as safe haven assets, occasionally cooperating during market turbulence.

The safe haven status of gold in respect to the US dollar and the British pound, as determined by trade-weighted values, between 1990 and 2010 is further examined by Ciner, Gurdgiev, and Lucey (2013) using dynamic conditional correlations. They have demonstrated that gold can be regarded as a safe haven for both the British pound and the US currency starting in 2000. This is referred to as gold's anti-dollar property. Since this analysis does not focus on the average relationship between gold and the dollar, as in many other studies (a concept that has been disputed by Pukthuanthong and Roll (2011) and O'Connor and Lucey (2012)), but rather on extreme points, this is an accurate use of data. This phrasing. This study also discovers gold to be a shelter against volatile oil prices, as demonstrated in Reboredo (2013).

Although further research is needed, gold may also serve as a safe haven for currencies such as the dollar and the Swiss franc that aren't generally thought of as safe havens. Theoretically, Bauer and Glover (2012a) look at these precious metals like gold.

## **2.6. Gold and currencies**

The US Dollar has long been cited as one of, if not the main, factors that influence the price of gold. This claim is supported by the fact that dollars are used to trade gold most frequently. Other countries' demand for gold rises as a result of a weaker Dollar (as indicated by the dollar's trade-weighted exchange rate). This raises the price of gold, which accounts for the apparent inverse link.

According to Tully and Lucey (2007), the trade-weighted US Dollar value is by far the most important component in explaining fluctuations in the price of gold using an APGARCH model. The findings of Sari, Hammoudeh, and Soytas (2010) are supported. By examining the effects of exchange rate fluctuations on the price of gold, Sjaastad and Scacciavillani (1996) discovered that Europe controlled the gold market. Sjaastad (2008) finds that the US Dollar is dominant, followed by the Yen, when looking at lengthier and more recent data from 1991 to 2004. The fact that gold stocks from investments are far greater than the annual flows from mining fits well with the

idea that the currencies of gold-producing nations don't appear to have a substantial impact on the price of gold.

Academics and practitioners have become more interested in researching the hedging and safe haven potential of different asset classes against market downturns after the global financial crisis of 2007–2009. In fact, investors look to sell their riskier assets during times of crisis in favor of other, more secure assets (flight-to-safety). This is specifically the case with gold, whose value is independent of both economic and political factors. As a result, one can always rely on gold because it can be quickly sold again as necessary when other assets crash.

An account of the development of the connection between the gold and stock markets is given by Lawrence (2003). According to the author, unlike other commodities, gold seems to be immune to the business cycle, which may make it more appealing as a diversifier or even a safe haven. There is evidence from earlier studies (Fleming, Kirby, & Ostdiek, 1998, among others) that government bonds offer equity investors a haven during times of crisis. According to Chan, Treepongkaruna, Brooks, and Gray (2011), U.S. Treasuries offer stock investors a sanctuary during volatile market conditions. According to Flavin.

Given its historical function as a natural currency and value storage, gold has naturally been regarded as a safe haven in contrast to risk-free assets. Due to its negative correlation with the financial cycle, it frequently generates profits when there are financial crises (Bouri, Lucey, & Roubaud, 2020). The potential of gold as a hedge and safe haven has been extensively studied, but the findings are conflicting. For instance, Baur and McDermott (2010) debate whether gold is safe based on data from significant emerging and developing nations. They found that for American and European stock indices but not for other markets, gold had this property. Gold is a hedge for the U.S. stock market, according to Hood and Malik (2013), although its safe haven property is weak in comparison to the volatility index. According to Beckmann et al. (2015), gold can be used as a safe haven and a hedge. Gold loses some of its appeal as a safe haven over time, according to Lucey and Li's (2015) analysis of the role of precious metals in a time-varying framework. Chkili (2016) looks at how gold and the stock markets of the BRICS nations relate to emerging markets and proposes that gold can act as a safe haven against wild fluctuations. The use of gold as

a sanctuary during the COVID-19 crisis is further examined by Akhtaruzzaman, Boubaker, Lucey, and Sensoy (2021). They discovered that gold was a powerful safe haven throughout phase I (before to March 16, 2020), but that during phase II, beginning on March 17, 2020, its property has diminished.

## **2.7. The dynamic correlation between gold and some equity**

Additionally, the COVID-19 pandemic has encouraged research into gold's capacity to continue playing its traditional role as a sanctuary during times of crisis (Akhtaruzzaman et al., 2021; Salisu et al., 2021; Drake, 2021). The dynamic link between gold and some stock returns is not stable over the course of the COVID-19 pandemic, according to Akhtaruzzaman et al. (2021). Their research indicates that gold serves as a safe haven asset for stock market indexes during Phase I of the pandemic because the correlation is negative during this time. A fiscal and monetary stimulus package was implemented by governments during Phase II, weakening gold's reputation as a safe haven. According to Salisu et al. (2021), the gold market is better able than other assets to protect investments during the pandemic.

Researchers have been prompted by the rapid growth of Islamic stock markets to examine gold's suitability as a hedge mechanism for Islamic financial assets. Most of the research' findings support gold's function as a haven under volatile Islamic stock market conditions (Chkili, 2017; Maghyereh et al., 2019). Additionally, Chkili (2017) Resources Policy 74 (2021) 102407 asserts that gold's value tends to rise over time, especially during economic downturns. As a result, gold can manage Islamic assets in a fundamental way. The dynamic interaction between gold, sukuk, and the Islamic stock market is studied by Maghyereh et al. (2019). On the one hand, they claim that the risk of sukuk is hedged by gold across short- and medium-term time frames. However, they also show that gold is the ideal hedging and diversification tool for all investment horizons.

## **2.8. Market conditions and gold**

market circumstances (Bohr and Lucy, 2010). Even if finding safe haven assets is crucial during a downturn in the market, the necessity to hedge or diversify an investing portfolio is constant (Baur and McDermott, 2010). Considering this, we make a distinction between diversification, hedging, and safe haven (Bohr and Lucy 2010; Ratner and Chiu 2013). A weak (strong) hedge is an asset that, on average, is not (negatively) linked with another asset, whereas diversification is an asset that, on average, has a weak positive correlation with another asset.

## **2.9. Physical gold demand and supply issues**

While gold is used in industry, most of its demand comes from jewelry and investments. It demonstrated the level of physical demand for gold from various industries, as the jewelry industry started in 1980 and all other industries started in 1986.

One of the earliest uses for gold was in the creation of jewelry, which provides the most reliable long-term source of demand for gold. Due to sociocultural factors, Asia, namely China and India, is where most of the world's desire for jewelry comes from. The East India Company's vessels were packed on their voyages from Europe in the late 17th and early 18th century because of this long-term need for precious metals in Asia. According to Fig. 6 below, since 2000, over 55% of all jewelry has been bought in Asia, and that percentage has increased to over 70% since 2010.

Electronics and dentistry are the two main industries driving demand for industrial fabrication, both of which are experiencing volume utilization declines. Given how much more expensive gold is today than it was ten years ago, there has been a strong motivation to develop less expensive alternatives in both fields that may replace gold. Although copper is gradually taking the role of gold in connecting wires in electronics, gold has historically been the preferred material. Gold is being replaced in dentistry by less expensive non-metallic substrates like plastic. The total demand for dental services in 2013 was 36.3 tones, which is the lowest amount ever noted by GFMS. Due to the slowing economy, gold use in electronics has also decreased, falling to 278 tones in 2013 from a prior high of 321 tones in 2005.

Consumption has increased due to retail investment as jewelry demand has remained consistent and industrial demand has decreased. The popularity of retail gold bar and coin investments skyrocketed in the years leading up to the financial crisis, tripling from 2006 to 2013 to reach 1377 tones. Since gold has historically flowed to Asia, a large portion of this investment has been made outside of western markets.

However, the western world also experienced a spike in demand due to the allure of rising prices and growing apprehensions about the riskiness of alternative assets in the wake of the 2008 financial crisis.

The introduction of the first gold Exchange Traded Fund (ETF), the Gold Bullion Securities ETF supported by the World Gold Council, was a significant development in 2003. According to Baur (2013b), this caused a fundamental change in the factors driving the demand for gold. This led to a new source of investment demand for gold, making it easier for smaller investors to do so. It appears to have contributed to the consistency, at least in part.

## **2.10. The stock-gold relationship**

More recent and rather scant academic research has been done on the connection between equity and gold. Couverte and Raymond (2011) describe the characteristics of gold that make it a viable safe haven despite its generally high volatility. They refer to gold's historical function as a medium of exchange in global financial transactions, implying that it might still be the ultimate haven. Additionally, Lawrence (2003) sheds light on how the bond between the stock market and gold has changed through time. He concludes that gold, unlike other commodities, seems to be immune to the business cycle, which may make it more appealing as a diversifier and even as a safe haven. According to Baur and McDermott (2010), gold serves as a shelter for most investors in established markets but has a far smaller role in emerging countries. They do, however, think that gold helps to stabilize the financial system after extremely negative shocks. Similar to this, Baur and Lucey (2010) discovered that gold operates as a safe haven during times of significant negative stock market returns, but they also shown experimentally that the safe haven qualities are transitory.

Numerous articles examine the results of including gold in a portfolio of financial assets without specifically addressing its function as a safe haven. According to Jaffe (1989), adding gold to a portfolio causes the frontier to move to the left, allowing investors to both lower risk and boost return. Due to these factors, gold is a particularly appealing investment option. Hillier et al. (2006) found the same thing, finding that any financial portfolio with a moderate weighting of gold tended to outperform those with purely financial assets.

### **2.11 What drives the volatility of gold?**

Byers and Peel (2001) use a data set spanning 2.5 years to examine the cause of gold volatility. Their key question is if gold has a long memory because it is being monitored as daily high/low ratios. It would follow that shocks to the variance would have a long memory. Along with the other assets they look at, they demonstrate that this is the case for gold.

Using intraday COMEX data between 1994 and 1997, Cai, Cheung, and Wong (2001) evaluate US news announcements on gold volatility. They discover a U shape, with considerable long-run autocorrelations present and increased volatility at session beginning and ending times, as in Byers and Peel's work (2001). Additionally, they demonstrate that, in decreasing order of significance, employment statistics, GDP, and CPI news announcements do have a major impact on the volatility of gold. It's surprising that the CPI is not the most crucial indicator because, at least in principle, gold's relationship to inflation has been considered as one of the key factors influencing gold prices.

### **2.12. Gold market efficiency**

The gold market could seem like one of the most competitively priced investments available to investors. First, it is a uniform commodity that is traded in many important markets across the world. This should make it possible for the gold price to continuously integrate new information. Additionally, since the gold leasing market did not start until 1989, there were no difficulties prior to that trying to analyze uncertain cash flows available from gold, as there would be with shares. Like shares in terms of corporate profitability or bonds in terms of coupon and principal payments,

gold does not have a performance to monitor. Due of this, gold is in some respects a simpler asset than most, but it also makes it much harder to pinpoint the actual source of its value.

### **2.13. Gold and Inflation**

With many of the studies concentrating on the US CPI and the US Dollar value of gold, the ability of gold to hedge inflation is a key theme in gold research. According to tradition, this link develops because of gold having monetary status, as was covered in earlier parts. Given that it takes time to increase production by putting new mines into production, gold has a finite supply and a short-term supply that is very inelastic. This indicates that, unlike a fiat currency, the supply of gold cannot be increased with the touch of a pen or keypad. As a result, it is regarded as a "hard currency," maintaining its value despite a generally positive inflation rate as the purchasing power of other currencies declines.

US Broad has expanded by about five times, growing at an average yearly growth rate of more than 6%. And even if the yearly mine production climbed 2.5 times during that time, the overall gold stock only saw an annual growth of 1 to 1.5% as a result. At current prices, the average global GDP growth over the same time was little over 6%. (source: IMF WEO Database 2014). This does not address the uncertainty around gold's velocity, but it does show that the supply of gold is far more constrained than that of conventional currencies.

Feldstein (1980) examines the theoretical explanations for the connection between projected inflation and reserves of value like gold. He contends that there is a relationship between the two because gold is analogous to a currency whose value cannot be reduced by abruptly increasing the quantity through printing, as is the case for fiat currencies like the US Dollar or the Euro. He predicts that rising nominal interest rates will result from higher anticipated inflation. If investors are sensible, then the necessary rate of return on holding gold will likewise rise, pushing up the price of the precious metal to make up for the elevated opportunity cost to investors.

Feldstein concludes that the price of gold will increase more quickly than anticipated inflation. This is since capital taxes will lower any net profit from selling gold,

requiring a gross profit to exceed inflation and a net profit to be equal. It is predicated that unlike other repositories of value like land, which generates revenue through rent, gold has no marginal output. This was accurate when the report was published, however because the London OTC gold leasing market has existed since 1989, this problem is no longer as serious.

Fortune (1987) elaborates on this by bringing up a specific mechanism—the substitution effect—through which inflation can have a direct impact on gold prices. This channel operates as follows: People are encouraged to exchange their assets with fixed nominal returns for gold now because they anticipate price increases in the future (inflation). By increasing the price of gold in that currency, this shields its citizens from inflation-related declines in their purchasing power. The research examines a model based on quarterly data from 1973 to 1980 using this and interest rate assumptions, and as predicted by theory, reveals that fluctuations in the price of gold have a positive connection with inflation.

Based on an arbitrage model created by Levin et al. (1994), which claims that gold lease rates are like global real interest rates, Levin, Montagnoli, and Wright (2006) present an alternative inflation-gold price channel. These studies assume that increases in gold extraction costs are influenced by the overall rate of inflation and that, over time, gold prices will increase to cover miners' rising expenses. This suggests that there is a causal chain connecting inflation, extraction costs, and gold prices.

#### **2.14. Gold and interest rates**

Many observers consider interest rates, independent of the currency, to be an opportunity cost of owning gold, a benefit that investors could have earned if they had chosen to buy a bond instead. The implication that there should be a bad link between the two is made in some ideas, however this is debatable. In the past, it has been a frequent variable to include in models of gold prices. In the sections that follow, we'll go through the possible correlations between gold and interest rates as well as the empirical data that may be used to determine if there is a positive or negative correlation.

For a specific level of anticipated future prices, Fortune (1987) proposes an asset substitution channel through which the relationship between nominal interest rates and

gold can be explained. Increases in anticipated interest rates, according to him, should deter investors from making new gold purchases by encouraging owners to sell their holdings because they don't generate any cash flow and buy assets that do. Given the anticipated inverse link, each of these factors should result in a drop in gold prices. This study estimates that the relationship between interest rates and inflation is negative and significant as expected using quarterly data from 1973 to 1980 and long-term US government bond yields.

Contrary to Fortune's assertion, Abken (1980) believes that the real cause of the correlation between gold interest rates and inflation is the relationship between gold and inflation. He contends that a rise in anticipated inflation will result in a commensurate increase in the current nominal interest rate. Bonds' higher rate of return will drive gold's price to climb at a similar rate, and a positive association between the two is projected. Although the Hotelling has been shown to be a poor predictor of changes in commodity prices, this accords with it.

The empirical model used by Abken (1980) is based on the monthly average of the one-month US T-bill rate from 1973 to 1979 and the beginning of the month PM fixings price (which are both fully detailed in Section 5.1 to follow). It was discovered that variations in nominal interest rates have a strong and favorable relationship to fluctuations in the price of gold. This can be understood by first presuming low storage costs and a hypothetical, but hypothetical still, negligible convenience yield from retaining gold. As a non-interest-bearing asset, short-term investors will only hold it if its price increases significantly enough to make up for the interest, they would have otherwise missed by holding risk-free T-bills. Koutsoyiannis (1983) established a very tenuous correlation between the price of gold in US dollars and the nominal interest rate on commercial paper denominated in US dollars from 1979 to 1981 using daily data (totalling 316 days). He discovers a tenuous but adverse correlation, although, like Abken (1980), there are unit root problems with the study. The impact of unexpected changes in interest rates is examined by Cai et al. (2001), who establishes that they do have an impact on gold prices. In fact, an unexpected interest rate change in Europe in 1997, which had a 5-minute return of 0.84%, was the second-largest return in their sample. use daily data from 1975 to 1983 once again Real interest rates on corporate paper in the US were linked, according to Diba & Grossman (1984). They

concluded that during this time, interest rates acted as an opportunity cost, which was a key factor in the underlying drivers of gold value.

However, not all research identifies a connection. Using ten years of analytical data, Silva (2014) finds no correlation between gold prices and interest rates, however there are still questions about whether their research contained unit root problems. Utilizing quarterly data between 1979 and 2001 According to Lawrence's 2003 research, there is no statistically significant correlation between gold and the rates on 3-month US Certificates of Deposit, as well as many other macroeconomic factors including inflation. There may have been some multi-collinearity in this equation because it included bond yields, interest rates on 3-month CDs, and the M2 measure of the money supply. Analysis of the interactions between two financial variables, which under most sets of assumptions would react to information considerably more quickly than this, is made more challenging by the low frequency of observations in both experiments. In a more recent study, Tully, and Lucey (2007) used an asymmetric power GARCH model to analyze daily gold prices in a model that also took inflation and the trade weighted dollar into account. They discovered that interest rates had little to no influence on gold prices. The only factor with significant explanatory power was the US Dollar.

According to Baur (2011), the link between gold and long-term interest rates and short-term interest rates is distinct. He shows that lower short-term rates have a beneficial impact on gold prices while long-term interest rates have a negative impact using monthly data collected over a 30-year period. This is consistent with both Abken's (1980) and Fortune's (1987) conclusions that gold and short-term interest rates have a negative association and that gold and long-term rates have a similar relationship. This apparent dichotomy suggests that while short-term interest rates are an opportunity cost to investors, long-term interest rates reflect inflation expectations, with higher expected inflation (and higher long-term interest rates as a result) encouraging gold investment and raising prices. This conclusion indicates the necessity of including short term interest rates in any short run modeling of gold prices, as long-term rates are linked to inflation, which is already typically employed in long run gold models (e.g. Levin et al., 2006). In their investigation of the gold and inflation time-varying hedge relationship, Batten et al. (2014) develop this problem. They demonstrate that

when interest rates are low, their significance diminishes and inflation rates resume their significance, as was mentioned in the preceding section.

Erb and Harvey (2013) point out the historically negative correlation between real interest rates and gold prices. This is true for both the UK (though less powerful) and the USA. They discover a negative correlation of  $-0.82$  for the USA over a period of 15 years, and  $-0.31$  for the UK over a period of 30 years. Despite their best efforts to emphasize the risk of "correlation as causality," they imply that the association is compelling. The Gibson's Paradox, as developed by Barsky and Summers (1988), is unlikely to hold in fiat money regimes and possibly did not even hold during the gold standard era. They also discount several other potential causal factors, including the opportunity cost argument and the difficulty of assessing the impact of central banks' lack of transparency regarding their gold leases.

### **2.15. Behavioral aspects of gold investment**

The fact that investor beliefs and perceptions about gold influence behavior in gold pricing must undoubtedly be the root of many of the investing qualities of gold, such as its capacity to serve as a safe haven, yet this subject is still sadly understudied. This is surprising because the financial press frequently associates the asset class gold with investor psychology.

Aggarwal and Lucey (2007) demonstrated psychological barriers in gold prices, demonstrating behaviorally driven inefficiency. They demonstrate that gold reaches a point at which it is less likely to continue an upward or downward price trend at the level of the 100s because traders see these numbers as being significant in some psychological aspect. It is specifically demonstrated that when gold's price is approaching or has just crossed a barrier, especially if the price is falling, the metal's volatility alters. Lucey and Dowling (2011) examine the relationship between mood and the price of precious metals. They make use of proxies like the weekdays, the weather, and biorhythms, all of which have been demonstrated to be effective explanatory variables in equity research. Only the proxy for SAD is demonstrated to be favorable and meaningful for gold. They concluded that mood has little bearing on equities pricing.

Evidence of initial overreactions to news can be seen in Smales (2014). When good and bad news are released to gauge whether the market's response is symmetric, it is discovered that bad news has twice the impact of good news. The study also reveals that news is assimilated differently during recessions. Positive news has a significant influence while negative news loses its relevance. It's interesting to note that the reaction to bad news intensifies as speculators increase their long bets. According to revisions to futures premia, Aggarwal, Lucey, and O'Connor (2014) also uncover evidence of gold's behavioral impacts, demonstrating that gold exhibits a range of overreaction and over optimistic indicators. Smales and Yang (2015) find that the dispersion, as opposed to the level, of beliefs about the course that gold will take in the future is significant. Positive news about the economy and wider dispersion have more of an impact than negative news and consensus.

In their definition of a hedge, Burr and Lucy (2010) said that a safe haven asset is "an asset that, on average, is not related to, or negatively associated to, another asset or portfolio in times of market stress or volatility." In addition, Baur and McDermott (2010) defined a strong (weak) hedging asset as "an asset that is negatively related (uncorrelated) to another asset or portfolio on average" and a strong (weak) safe-haven asset as "an asset that is negatively related (uncorrelated) to another asset or portfolio in certain periods, e.g., in times of falling stock markets." Numerous academics have empirically investigated whether precious metals in general, and gold in particular, function as safe havens or hedge assets by adhering to these operational definitions of safe haven and hedge asset (Agyei-Ampomah et al., 2014; Beckmann et al., 2015; Selmi et al., 2018). For example, Shahzad et al. discovered gold, which has historically been seen as a secure asset during crises (Bor and Lucy, 2010; Puri et al., 2020; Sener et al., 2013; Ji et al., 2020).

For the G7 stock markets, gold acts as a hedge and a secure asset. Gold serves as a secure weak asset for many developed and emerging markets, according to Shahzad et al. (2019a). According to Reza et al. (2018), gold is the greatest long-term hedge for US real estate stocks. In comparison to conventional portfolios, Rida et al. (2019) demonstrated that gold was more efficient at hedging Islamic equities portfolios.

According to its nature, gold is traditionally regarded as a commodity that provides a secure shelter for investors (Robiyanto, 2015). Since ancient times, gold has been used as a means of commerce and a store of wealth. Gold is regarded as being more

enduring, acceptable in all social groups, and easily transacted when compared to other tangible investment items (Kumar, 2014). Because of this, gold is a precious metal that has drawn a lot of interest from academics and financial professionals (Arouri et al., 2014).

Because gold has been used as a financial or economic standard, as foreign exchange reserves, and even as the primary payment mechanism in some nations, it is also regarded as a financial asset (Dee et al., 2013). Gold also becomes a substitute for investments during uncertain times when investors are reluctant to complete trade transactions. Even Baur and McDermott (2009) stated that gold would be a desirable investment option during periods of market volatility. According to Agyei- Ampomah et al. (2013), the 2008 financial crisis forced investors to adopt gold as a safe haven asset in their search for protection.

According to Baur and Lucey (2010), gold is typically regarded as a secure asset because it was the first form of money and is also used as an inflation hedge. The fact that gold does not connect with other kinds of assets is another argument. Even while gold is typically valued in US dollars, gold can also protect investors holding US dollars against currency fluctuations. Some studies, such as those by Ibrahim (2012) and Ibrahim and Baharom (2012), demonstrate that gold can also serve as a diversifier for the stock market in addition to acting as a safe haven and hedge because it has a negligible positive relationship with the stock market. This quality led some studies, like those by Do et al., (2009); Ratner and Klein, 2008; and Robiyanto et al. (2017b), to conclude that including gold in a stock portfolio could enhance the performance of the portfolio.

The fact that gold is a universally recognized currency that never loses purchasing power or value regardless of the state of monetary or financial institutions has raised interest in investing in gold as a risk-reduction strategy throughout the world. According to several research (Jain and Ghosh 2013, Jayasree and Jyothi 2019, and Pukthuanthong and Roll 2011), exchange rates and the volatility of the gold price are related. (Pukthuanthong and Roll 2011) discovered that US dollar gold prices increase as the USD depreciates against other currencies, showing a connection between currency appreciation and US dollar gold prices (Godil et al. 2020).

Using 5-minute returns between 1994 and 1997, Cai, Cheung, and Wong (2001) present a thorough characterisation of yield volatility in gold futures contracts. They discover that only four announcements—the jobs report, inflation, GDP, and personal income—have statistically significant influence on gold volatility, far less so than their effects on the Treasury or currency markets.

## **2.16. The performance of gold as a financial asset**

The appeal of gold is that it relishes bad news.

Gold is frequently referred to as a safe refuge and a store of wealth. This section looks at some of the qualities of gold that may help to explain why people think it is somehow unique from other assets. If gold does, in fact, embrace negative news, this would provide compelling proof that it can serve as a shelter for investors.

The co-movements of their prices determine how closely assets correlate. The three categories of hedge, safe-haven, and diversification that Baur & Lucy (2010) use to categorize asset correlation are described. By having a short position in one asset and a long one in the other, you can reduce risk by doing this with two positively linked assets.

## **2.17. The role of gold**

For thousands of years, gold has been used as a store of wealth and a medium of exchange. Sir William Petty, a British mercantilist from the 17th century, said that gold, silver, and gems were wealth "at all times and in all countries. Due to its long history with money, gold has acquired the culturally ingrained reputation of being an unchanging store of value. Under the gold standard system, the value of all currencies was directly correlated to the price of gold. One of the forms of reserves utilized by central banks around the world to protect the value of their currencies is still gold. In India, the country that consumes the most gold worldwide, the precious metal has a special sociocultural meaning as a representation of a family's riches and position.

## **2.18. Characteristics of gold as financial asset**

Gold has historically been used by investors as a hedge against inflation or a declining dollar. Since gold is valued in dollars, its nominal (dollar) price will typically increase if the value of the currency declines, protecting its true value. For investors holding dollar investments, gold can function as a hedge against exchange-rate risk in this way. In Cappie et al., evidence of this occurrence is offered (2005).

Due to the relative simplicity of the gold market, gold may become more alluring during uncertain periods when asset values become murky because of investors' reluctance to trade. If the factors that determine its value are simpler to comprehend and assess, gold might develop into a desirable alternative investment that provides investors with more assurance during times of financial market instability.

Gold has intrinsic worth since it is a physical asset. Although it is primarily used in jewelry, it also has uses in dentistry and industry. There is no default risk when investing in gold because its value is not based on projected earnings or debt. These characteristics may apply to other commodities as well. What distinguishes gold, though, is how it behaves when asset values are declining. In addition to its practical use, gold has a rather peculiar attribute that may contribute to its usefulness. Recent data reveals that, in contrast to other financial assets, gold's value tends to increase in response to negative market shocks.

## **2.19. The gold market**

In recent years, the price of gold has steadily increased, following the rise in other commodity classes. The Goldman Sachs Commodities Index (GSCI), which peaked in July of last year, rose 326% over the previous ten years (2008). But since then, the index's value has decreased by 70%. (July 2008 to March 2009). In a decade, the corresponding gold index increased 222%, reaching its peak in March of last year (2008). The gold index resumed its rising trend in the first half of 2009 after seeing a slight fall in the second part of 2008.

The duration of the current global financial crisis is depicted. In October 2008, concerns about a global recession caused stock prices to crash. The gold price index has increased significantly since October 2008, signaling a favorable reaction to the

worsening of the financial crisis. This stands in stark contrast to the commodity index returns' diminishing value throughout the same period.

Gold prices, in contrast to other assets, seem to respond favorably to negative market shocks. Real gold prices reached an all-time high in 1980, when the metal exceeded \$2000 per ounce (in 2008 dollars), amid a backdrop of raging inflation and the fear of a global recession in the wake of the 1970s oil shocks. More recently, during the biggest financial and economic crisis to hit the global economy since the Great Depression of the 1930s, gold prices have risen dramatically during the previous 18 months.

In light of the current state of the world economy, the makeup of gold demand is fast shifting while gold supply is essentially constant. Jewelry, industrial & dentistry, and investment demand are the three main subcategories of the total demand for gold. Gold demand from investors would appear to be counter-cyclical, rising when the global economy enters recession, in contrast to jewelry and industrial and dentistry demand, which tends to follow the business cycle (being mostly determined by consumer purchasing power).

Historically, the demand for gold jewelry has been the main driver of gold demand. The pattern of gold consumption, however, has drastically changed in recent months, with jewelry demand declining in reaction to a confluence of high prices and poor consumer purchasing power. In terms of volume, the demand for gold jewelry decreased by 11% in 2008, and year over year in the first quarter of 2009, it decreased by 24%.

On the other hand, the demand for gold as an investment has increased dramatically, with ETFs (and other products) for the first time becoming the single greatest category of demand. In 2008, gold investor demand increased by 64%. A record amount of gold investment activity was seen in the first quarter of 2009, with demand from ETFs rising 540% year over year to 465 tones for US\$13.6 billion.

Therefore, the sharp increases in gold's price during the previous 18 months might be attributed to increased investor interest in the pricey metal. According to "The Economist," Investors seeking to protect their capital are to blame for the recent increase in gold prices (since the beginning of 2009). The idea that gold is a safe investment for people who have something to lose is strengthened by this.

The employed data from investing. was used from Mar 2012 to Mar 2022 Take (S&P500, NIKKEI, CAC40, TASI, DAX, Gold, FTSE 100).

## Chapter 3

### Methodology

Our research is based on the ideas offered by Baur and Lucey (2010) to examine if gold might act as a safe haven or hedge for the primary traditional assets of developed markets. The techniques immediately gained popularity and were used in several studies, including those on credit default swaps, bonds, metals, and gold (Ciner, Gurdgiev, & Lucey, 2013; Li & Lucey, 2017; Lucey & Li, 2015).

Diversifier, hedge, and safe haven are defined clearly and are distinguished by Baur and Lucey (2010). If an asset has an average correlation with another asset or portfolio that is positive but weak, it is categorized as a diversifier. An asset is considered a hedge if it, on average, has little to no correlation with another asset or portfolio, or if it has a substantial correlation.

The main model to estimate is presented in the following equation:

$$R_{gold,t} = a + b_1 R_{CAC,t}^{FR} + b_2 R_{DAY,t}^D + b_3 R_{FTSE,t}^{UK} + b_4 R_{NIKKEI,t}^{JPN} + b_5 R_{SP,t}^{USA} + b_6 R_{TASI,t}^{KSA} + e_t$$

If the constant  $a$  in the above model is weakly positive, the gold is a weak diversifier against movements in the other asset  $i$ .

gold is a hedge against movements in the other asset if  $a$  is statistically not different from zero (weak hedge) or negative (strong hedge).

The gold is a weak safe haven for the other asset during the crisis period if  $b_2$  is not significantly different from zero, or a strong safe haven if  $b_2$  is significantly negative.

Diversifier, hedge, and safe haven are unique terms that are defined and differentiated in detail by Baur and Lucey (2010). When an asset has an average positive but low correlation with another asset or portfolio, it is referred to as a diversifier. A hedge is an asset that, on average, has little to no correlation and/or a large negative correlation with another asset or portfolio. The asset may have positive correlations with other

assets during some periods and negative correlations with other assets during other periods, resulting in an average negative correlation, hence a hedge may not be able to prevent losses during stressful or turbulent market times. In times of turbulence, a safe haven asset is one that is either uncorrelated (weak safe haven) or negatively correlated (strong safe haven) with another asset or portfolio.

It is possible to use gold as hedging assets during the stable era because the correlations between its return and those of other markets are negative and nearly nul during the pre-COVID-19 period (Baur & Lucey, 2010). The increase in positive correlations between gold and other financial assets suggests that the interconnectedness of the world's financial markets has increased. As a result, while gold may not possess any safe haven characteristics, they may nevertheless provide some hedging capabilities.

The sample spans the period from March 2012 to March 2022. The hedge ratios and the hedge effectiveness indices show the ability of gold to act as hedges in times of market stability and in times of stress. Moreover, the analysis provides evidence that during the COVID- 19 pandemic, gold maintains its role as a (weak) safe haven for the considered assets, except for Nikkei 225.

With the exception of the Nikkei 225, the coefficient  $\beta_2$  for gold is positive but statistically equal to zero for all other assets. This demonstrates that despite the recent pandemic, gold's long-standing safe-haven status was retained in some measure. In fact, financial market investors remain hesitant and display extreme fear as a result of the appearance of more dangerous variants of the virus SARS-CoV-2. This is true despite the gradual recovery of the world economies, the relief plans introduced by various governments to combat the global recession, and the advancements in various types of COVID-19 vaccines. Our findings support the safe haven property of the data reported by Dutta et al. (2020), Ji et al. (2020), Akhtaruzzaman, Boubaker, Lucey and Sensoy (2021), and Salisu, Raheem and Vo (2021).

## **Chapter 4**

### **Data and results:**

Data from investing. was used from Mar 2012 To Mar 2022 Take (S&P500, NIKKEI, CAC40, TASI, DAX, Gold, FTSE 100).

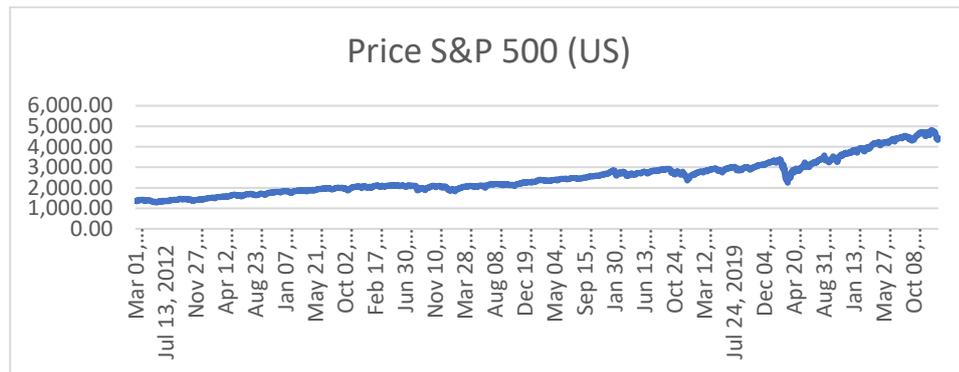
According to the timeframe supplied, gold markets were recognized as the first recorded cases of the COVID-2019 pandemic, and we are primarily looking at the consequences of contagion related to this. To establish dummy variables with which to examine the contagion effect on the center of price volatility, we employ these events for these markets we Take (S&P500, NIKKEI, CAC40, TASI, DAX, FTSE 100). According to Ramelli and Wagner (2020), as corporate investors become concerned about the accumulation of corporate debt and the significant liquidity shortage that has emerged, the COVID-19 pandemic has evolved into an economic crisis that has been amplified through financial channels. This is demonstrated by a steep curve pattern.

By including these financial markets, which have been dubbed the epicenter of the COVID-2019 pandemic, the Dow Jones Industrial Average as a gauge of global financial performance (Ekinici et al., 2019), WTI oil and gold as the global flight to safe assets (Akyildirim et al., 2020), and Bitcoin, which has shown inverse correlations with some global stock markets, we can achieve significant diversification benefits (Akhtaruzzaman et al., 2019; Akyildirim et al., 2019a).

## Price:

### 1.1 Price S&P 500 (US)

Price S&P 500 (US) averaged about 2,506.46 dollar from 2012 to 2022, with the lowest average price being in that year at 1,278.04 dollar The sample price began to progressively increase after this low point until it reached 4,796.56 dollar in 2021. Between 2012 to 2021, a ten-year period, the price rises progressively and considerably.



**Figures (1):** Price S&P 500 (US)

### 1.2 Price Nikkei 225 (JAPAN)

Price Nikkei 225 (Japan) averaged about 19,185.38 dollar from 2012 to 2022, with the lowest average price occurring in 2020 at 8,295.63 dollar Following this low point, the sample's price began to progressively increase until it eventually reached \$30,670.10 dollar in 2021.

Between 2012 to 2021, a ten-year period, the price rises progressively and considerably.

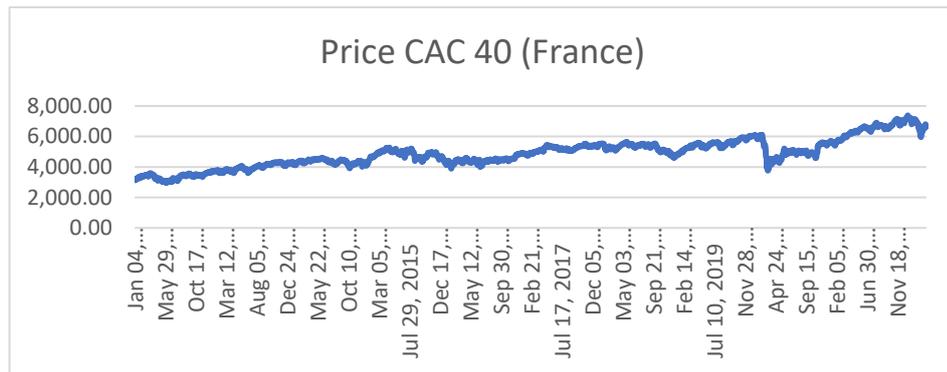


**Figures (2):** Price Nikkei 225 (JAPAN)

### 1.3 Price CAC 40 (France)

The Price CAC 40 (France) averaged around 4,882.66 dollar from 2012 to 2022, with the lowest average price occurring in 2020 at 2,950.47 dollar Following this low point, the sample's price began to progressively increase until it eventually hit 7,376.37 dollar in 2021.

Between 2012 to 2021, a ten-year period, the price rises progressively and considerably.



Figures (3): Price CAC 40 (France)

### 1.4 Price TASI (KSA):

Price TASI (KSA) averaged about 8,172.68 dollar from 2012 to 2022, with the lowest average price being in 2020 at 5,416.47 dollar The sample price began to progressively increase after this low point until it reached 13,101.36 dollar in 2021.

Between 2012 to 2021, a ten-year period, the price rises progressively and considerably.



Figures (4): Price TASI (KSA)

### 1.5 Price DAX (Germany):

Price DAX (Germany) experienced an average price increase of almost 1,442.02 dollar from 2012 to 2022, with the lowest average price being in 2020 at 1,049.70 dollar. Following this low point, the sample's price began to progressively increase until it eventually reached 2,054.60 dollar in 2021.

Between 2012 to 2021, a ten-year period, the price rises progressively and considerably.

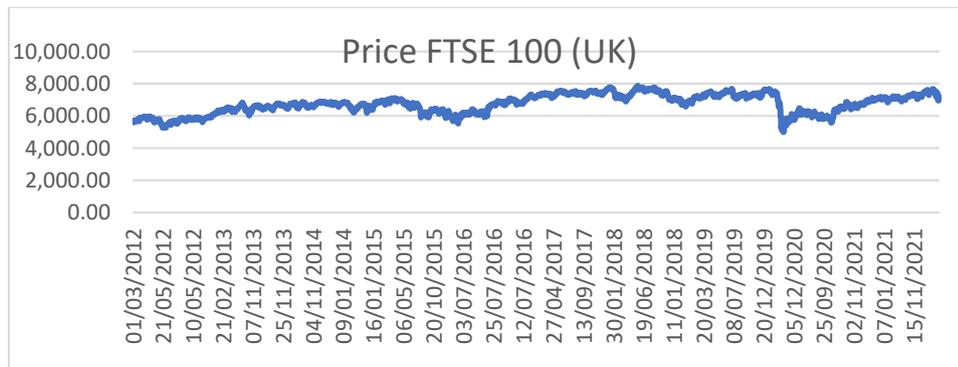


Figures (5): Price DAX (Germany)

### 1.6 Price FTSE 100 (UK):

The FTSE 100 (UK) price averaged around 6,739.61 dollar from 2012 to 2022, with the lowest average price being in 2020 at 4,993.89 dollar. The sample price began to progressively increase after this low point until it reached 7,877.45 dollar in 2021.

Between 2012 to 2021, a ten-year period, the price rises progressively and considerably.



Figures (6): Price FTSE 100 (UK)

## 1.7 Price of Gold:

The average price of gold was roughly 1,442.02 dollar from 2012 to 2022, with the lowest average price being in 2019 at 1,049.70 dollar Following this low point, the sample's price began to progressively increase until it eventually reached 2,054.60 dollar in 2021.

Between 2012 to 2021, a ten-year period, the price rises progressively and considerably.



**Figures (7): Price Gold**

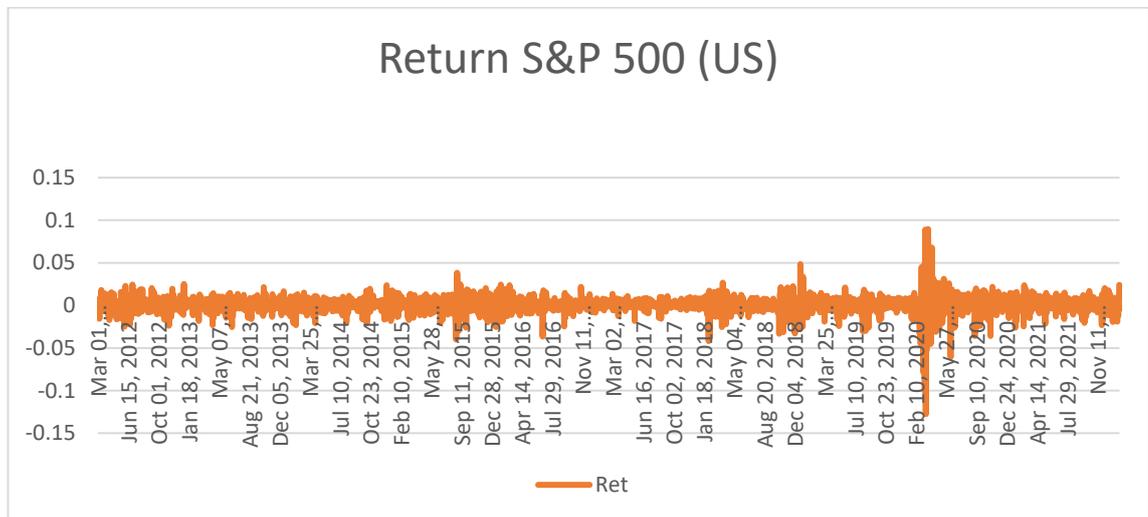
## Return:

### 1.8 Return S&P 500 (US):

The S&P 500's (US) average return from 2012 to 2022 was around 0.00046916 percent, with the year 2020 having the lowest average return of -0.128 percent.

Following this low point, the sample's return slowly began to increase until it reached 0.090 percent in 2020. Up until the end of the period in 2021, it then declined once more.

The return varied widely, but it climbed in 2020 before declining once more until the conclusion of the period in 2021.



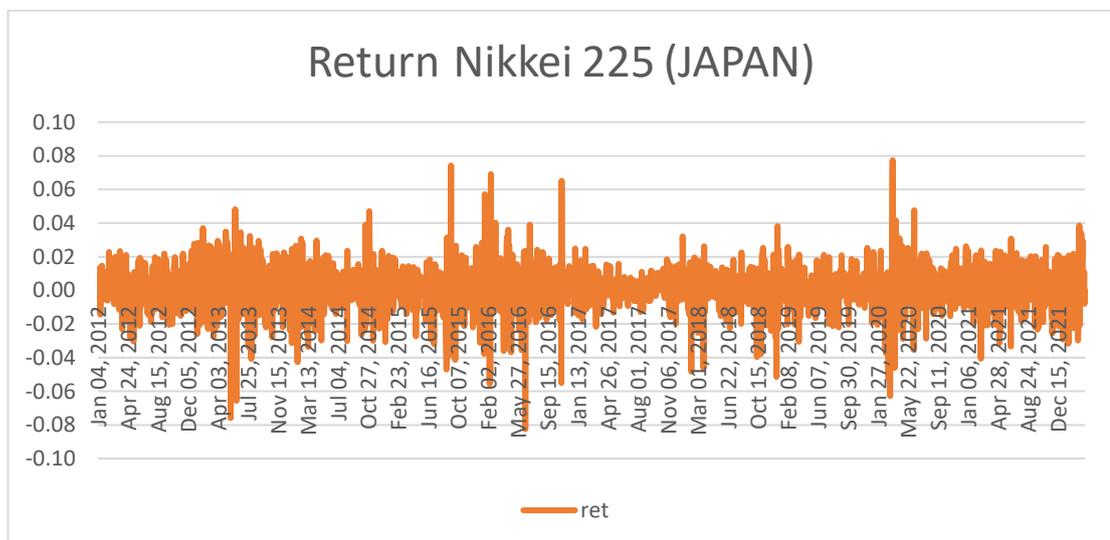
**Figures (8):** Return S&P 500 (US)

## 1.9 Return Nikkei 225 (JAPAN):

The Nikkei 225's (Japan's) average return from 2012 to 2021 was almost 0.00 percent.

with 2016 having the lowest average return of -0.083 percent Following this low point, the sample's return progressively increased until it reached 0.077 percent in 2020, after which it started to decline once more until the conclusion of the period in 2021.

The return fluctuates over the period, rising and falling.

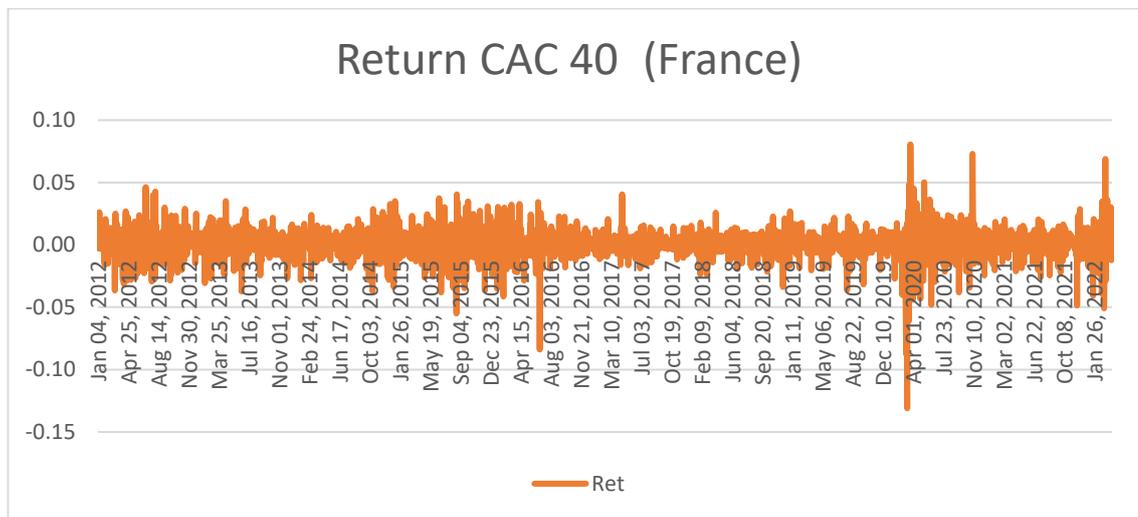


**Figures (9):** Return Nikkei 225 (JAPAN)

## 1.10 Return CAC 40 (France):

The Return CAC 40 (France) averaged around -0.01 percent from 2012 to 2021, with the lowest average return being in 2016 at -0.131 percent. Following this low point, the sample's return progressively increased until it reached 0.081 percent in 2020 before declining once again until the conclusion of the period in 2021.

The return fluctuates over the period, rising and falling.

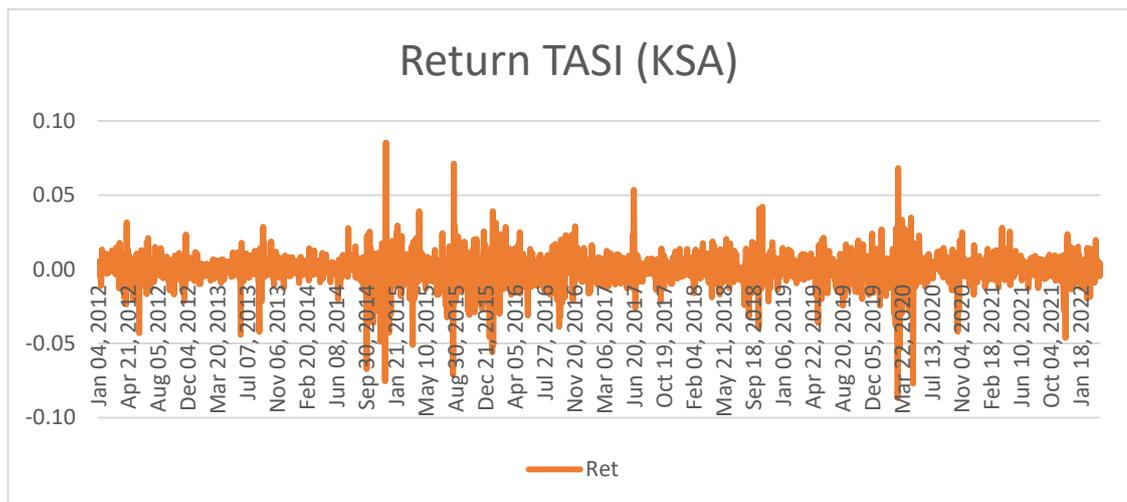


**Figures (10):** Return CAC 40 (France)

## 1.11 Return TASI (KSA)

The Return TASI (KSA) averaged about 0.00 percent from 2012 to 2021, with the lowest Average Return -0.087 percent occurring in 2016. Following this low point, the sample's return progressively increased until it reached 0.085 percent in 2020 before declining once again until the conclusion of the period in 2021.

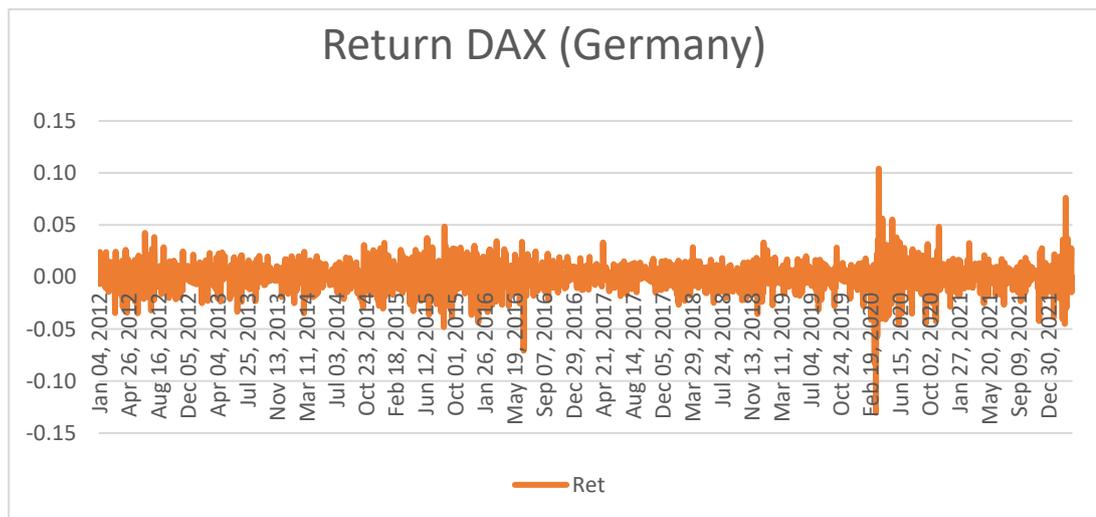
The return fluctuates over the period, rising and falling.



**Figures (11):** Return TASI (KSA)

## 1.12 Return DAX (Germany)

The Return DAX (Germany) averaged roughly 0.00 percent from 2012 to 2021, with the lowest average return being in 2021 at -0.131 percent. Following this low point, the sample's return progressively increased until it reached 0.104 percent in 2020, after which it started to decline once more until the conclusion of the period in 2021. The return fluctuates over the period, rising and falling.

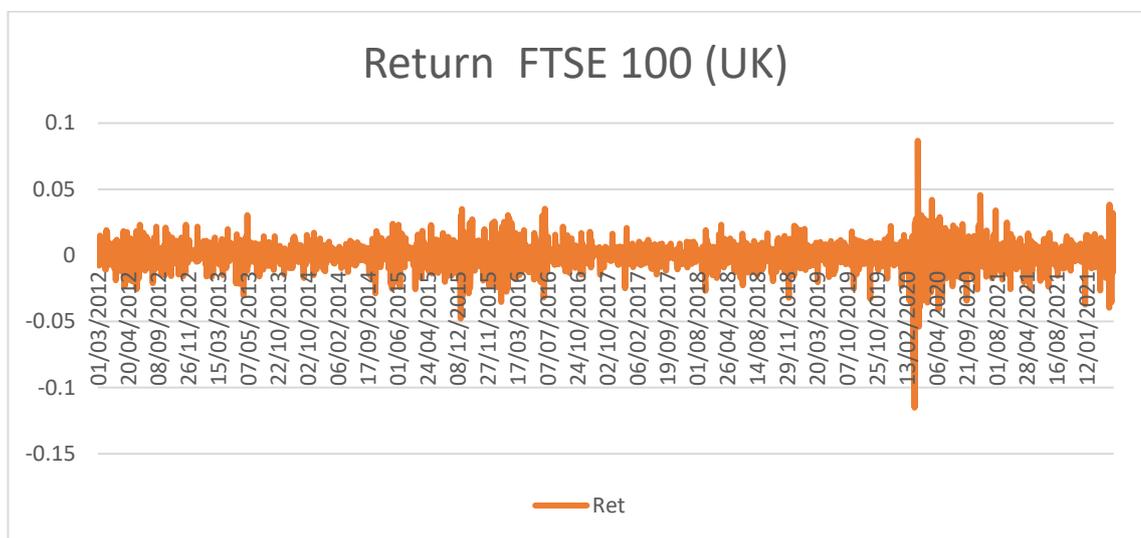


**Figures (12):** Return DAX (Germany)

### 1.13 Return FTSE 100 (UK):

The average return for the FTSE 100 (UK) from 2012 to 2021 was roughly 0.00 percent, with the lowest average return being in 2022 at -0.115 percent. Following this low point, the sample's return progressively increased until it reached 0.087 percent in 2020 before declining once again until the conclusion of the period in 2021.

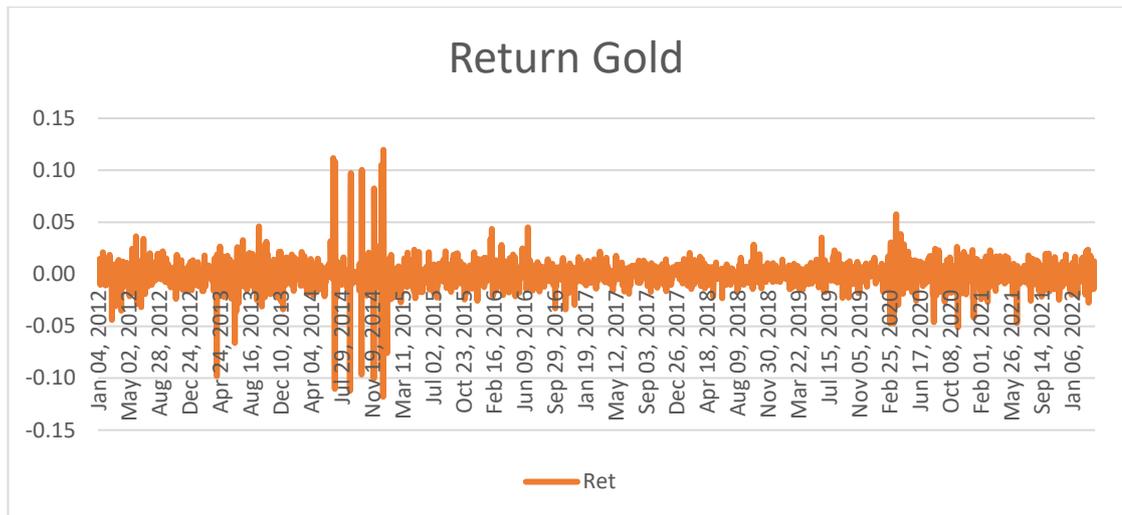
The return fluctuates over the time rising and falling.



**Figures (13):** Return FTSE 100 (UK)

## 1.14 Return Gold:

From 2012 through 2021, the average of Return Gold was around 0.00 percent, with the lowest average return being -0.118 percent in 2015. After this low point, the return in the sample started to rise gradually until it reached 0.120 in 2015 percent. And it decreased again until the end of the period 2021. The return is unstable, it rises and falls over the period.



**Figures (14):** Return Gold

**Table 1:** Normality test results

<b>JB Test</b>	532.23	420.77	444.34	451.31	443.06	632.45	461.13
<b>p-value</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

**Table 2:** Descriptive statistics

	<b>S&amp;P500</b>	<b>NIKKEI</b>	<b>CAC40</b>	<b>TASI</b>	<b>DAX</b>	<b>GOLD</b>	<b>FTSE 100</b>
<b>Mean</b>	0.00046935	0.00047161	0.00029467	0.00022572	0.00039046	4.4576E-05	9.8196E-05
<b>Median</b>	0.00064262	0.000676	0.00070592	0.00082035	0.00089049	0.00015223	0.001
<b>Standard Deviation</b>	0.01041205	0.01302454	0.01203528	0.010789	0.01209857	0.01237925	0.00988383
<b>Sample Variance</b>	0.00010841	0.00016964	0.00014485	0.0001164	0.00014638	0.00015325	9.769E-05
<b>Kurtosis</b>	21.4880176	4.4094551	10.5487981	11.7459971	10.3471105	29.4336354	13.3550328
<b>Skewness</b>	-0.9802972	-0.2750333	-0.8318292	-0.9899888	-0.6793534	-0.1702851	-0.8394667
<b>Range</b>	0.2173353	0.15984302	0.21154428	0.17232057	0.23469149	0.23766137	0.202
<b>Minimum</b>	-0.1276521	-0.0825293	-0.1309835	-0.0868458	-0.1305486	-0.1179703	-0.115
<b>Maximum</b>	0.08968316	0.0773137	0.08056079	0.08547474	0.10414289	0.11969111	0.087
<b>Sum</b>	1.17102541	1.17667003	0.73520381	0.56317358	0.97420466	0.11121588	0.245
<b>Count</b>	2495	2495	2495	2495	2495	2495	2495

**Table 3:** Correlation matrix

	Ret S&P500	Ret NIKKEI	Ret CAC40	Ret TASI	Ret DAX	Ret Gold	Ret FTSE 100
Ret S&P500	1						
Ret NIKKEI	0.02045652	1					
Ret CAC40	-0.0017718	-0.0207731	1				
Ret TASI	-0.0061834	0.03200828	0.02467989	1			
Ret DAX	-0.0169562	-0.0028438	0.10220737	-0.0084975	1		
Ret Gold	0.00954061	-0.0355806	0.00123948	0.02192291	-0.0237528	1	
Ret FTSE 100	-0.002557	-0.0018956	0.06358486	-0.0257888	0.16092153	-0.002521	1

## Table 4: Estimation results

Dependent Variable: R\_GOLD

Method: Least

Squares

Date: 06/25/22 Time: 08:47

Sample (adjusted): 3/02/2012 1/28/2022

Included observations: 2495 after adjustments.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.36E-05	0.000308	-0.109122	0.9131
R_CAC	<b>-0.002066</b>	0.020749	-0.099571	0.9207
R_DAX	<b>-0.026423</b>	0.020554	-1.285544	0.1987
R_FTSE	0.016307	0.025161	0.648084	0.517
R_NIKKEI	<b>-0.034815</b>	0.018896	-1.842493	0.0655
R_SP	<b>-0.002906</b>	0.02387	-0.121731	0.9031
R_TASI	0.026569	0.023022	1.154048	0.2486
<b>D_CAC</b>	0.000256	0.000839	0.304934	0.7604
<b>D_DAX</b>	<b>-0.000622</b>	0.000849	-0.732897	0.4637
<b>D_FTSE</b>	0.001394	0.000829	1.681167	0.0929
<b>D_NIKKEI</b>	<b>-0.000478</b>	0.000827	-0.57756	0.5636
<b>D_SP</b>	<b>-0.000525</b>	0.000841	-0.624524	0.5323
<b>D_TASI</b>	0.000739	0.000834	0.886661	0.3753
R-squared	0.004467	Mean dependent var		2.49E-05
Adjusted R-squared	-0.000346	S.D. dependent var		0.012347
S.E. of regression	0.012349	Akaike info criterion		-5.94531
Sum squared resid	0.378493	Schwarz criterion		-5.91497
Log likelihood	7429.768	Hannan-Quinn criter.		-5.93429
F-statistic	0.928062	Durbin-Watson stat		2.308515
Prob(F-statistic)	0.517454			

From the estimation results, we notice that the coefficients of CAC 40, DAX, Nikkei 225, S&P 500 are negative. Therefore, Gold is a hedge during the investigated period. Moreover, during the COVID-19 crisis, only the coefficients relative to DAX, Nikkei, and S&P 500 are negative. Consequently, Gold is a safe refuge during the pandemic, i.e., safe haven.

Finally, Gold is a safe-haven for the German, Japanese and US markets during the COVID-19 period, and simply a hedge for the French market during the entire period. For the Saudi and UK markets, however, the precious metal is neither a hedge nor a safe haven.

## **Chapter 5**

### **Conclusions**

The main problematic for this thesis can be described as follows: can gold be considered as a safe haven or hedge during financial crises.

The globe has been successfully looted and destabilized by the COVID-19 pandemic. In just a few months, it put lives, economic borders, international trade, and the fundamental foundation of the global financial system in peril. Due to this catastrophe, borders were closed, the world economy experienced a significant slowdown, and on March 11, 2020, the stock market crashed. In order to manage the crisis and aid the recovery, many investors diversified their portfolios with uncorrelated assets.

After precisely defining a safe haven, a hedge, and a diversifier, it is decided whether gold qualifies as a (safe) haven asset. Gold was chosen as a contender because both anecdotal evidence and financial media reports imply that it offers a safe haven in the financial markets.

Even though there is no formal model that explains this, one significant reason why gold is frequently referred to as a safe haven asset is the fact that it was one of the first forms of money and was traditionally employed as an inflation hedge. In the period of globalization, when correlations between other asset classes significantly grew. The biggest UK index, the FTSE 100, plunged sharply by 24.80% in the first quarter of 2020. 2020 (The Guardian). Beginning in December 2019, the stock indices of the G7 countries experienced comparable, severe decreases. 2020a (Bloomberg). In view of the increased volatility in conventional assets, such as equities, commodities, and currencies, as well as the potential for greater losses due to the epidemic, we reevaluate gold's role as a hedge and safe-haven asset during the pandemic. Gold serves as a hedge and safe-haven asset, which should be known by investors seeking such an asset for their portfolios during various epidemic periods.

To ascertain if gold has served as a safe-haven asset during different pandemic phases, empirical study is necessary. Additionally, many studies on the financial impacts of COVID-19 have employed daily figures. Because the time periods for each stage of

the pandemic are so confined, it is necessary to use data that are collected more frequently than once per day to make clear findings.

Gold maintains its value even when the prices of stock market indices fall. Numerous studies have amply demonstrated its efficiency as a hedge and safe haven against equities in various markets (e.g., Baur & Lucey, 2010; Beckmann, Berger, & Czudaj, 2015, among others).

Recently, attention has grown in the economic effects of the COVID-19 issue on financial markets. This has reopened the discussion about whether cryptocurrencies can rival or surpass gold hedging and safe-haven assets when compared to stocks. To the best of our knowledge, only a small number of research have examined the functions of Bitcoin and gold in relation to financial assets (Bouri et al., 2017; Corbet et al., 2018; Dyrberg, 2016).

Gold has always been seen as a store of wealth, portfolio stabilizer, and a source of liquidity during periods of financial upheaval. In the US and the UK, gold is regarded as a hedge against inflationary pressures (Hoang, Lahiani, & Heller, 2016). According to Elder, Miao, and Ramchander (2012).

In many nations, gold prices have traditionally developed into a potent leading indicator, and when compared to other inflation indicators, gold still has statistical significance (Tkacz, 2007).

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