RELATIONSHIP BETWEEN GOLD AND STOCK MARKET POST-2008 CRISIS: A STUDY IN INDIAN CONTEXT

Aanya Jain

Sarla Anil Modi School of Economics, NMIMS University, India

ABSTRACT

Despite being the second-largest consumer of gold in 2020, the true characteristics of gold remain in question in India. Does gold truly act as a safe haven? What is the current relationship between gold and the stock market? How does this relationship change pre-crisis and post-crisis? The year 2020 has seen gold price reach an all-time high of INR 57,008 per 10 grams with the recent COVID- 19 outbreak. The importance of education in investing is enormous. The study examines the dynamic relationship between gold prices and the stock market index in India for the period between 1 February 2009 and 1 February 2021. Secondary data is obtained from World Gold Council and Yahoo Finance. Karl Pearson's correlation coefficient suggests a significantly positive correlation between the variables. Being integrated of order 1 as per Augmented Dickey-Fuller Test, Johansen's cointegration test and Granger Causality test are applied. It is observed that there exists a long-run relationship between the variables with stock market returns causing the gold returns. Sub-dividing the period under study into pre- and post-crisis period concerning the COVID-19 crisis, it is inferred that gold does act as a safe haven in times of uncertainty and market downfall.

Keywords: Gold prices, Crisis, Safe haven, Stock market returns, India

Introduction

In India, gold has always been considered to be of great value. Even though gold isn't used as a monetary standard anymore, it continues to be in high demand. It is consumed as jewellery and as a vehicle of wealth accumulation by a large fraction of low and middle-income households in both urban and rural areas. A growing working population and a developing economy have led to an increase in household income and demand. In 2020, India became the second-largest consumer of gold.

Under British rule, gold inflows and outflows were unrestricted. After independence, things changed as the Government of India started viewing saving and investment as a loss of foreign exchange resources. Efforts were done to reduce domestic demand, control supply, and curb smuggling. Foreign Exchange Regulation Act (FERA) and Gold Control Act were introduced to restrict the import and export of gold. This, however, led to the black market being extremely active. In 1990, the abovementioned acts were repealed and a quota of 5kg in 6 months along with import duty was imposed. Then came liberation in 1991. Economists realized that since Indian and International prices weren't much different now and opening up of the economy was important, free import of gold was allowed by banks. In 2004, gold futures became permitted. Until this time, even though the Indian economy was highly dependent on imports for gold, the current account deficit was in control. However, in 2012- 13, the gold current account deficit increased to Rs 4,976 billion from less than Rs 116 billion in 2001-2. The government realized the need to reduce dependence on the external market for gold. Subsequently, the import duty was increased to 10% from 2% and the 80:20 rule was introduced under which jewellery of 20% of the imported value of gold imported must be exported. The local market was majorly pushed up in the years of 2015 and 2016. Gold monetization scheme, sovereign bond scheme, and Indian Gold Coin Scheme encouraged the buyers to be interested in gold by increasing their value, formalizing the gold market, and assuring quality.

Determinants of gold demand

As per the theory, various factors can explain the demand for gold. Gold's unique physical attributes are a major factor too. It is scarce due to limited underground stock and mining capacity. It is uniform and it cannot be destroyed. Further, the universal acceptability of gold makes it liquid.

The second factor is Income. Classical economists view gold demand to be directly related to real income. Keynes on the other hand viewed an increase in gold consumption as a sign of socio-economic backwardness. Empirical studies show mixed evidence. Next comes the price of gold. Since gold is a luxurious good, Veblen's effect should apply to it which says that the higher the price, the higher the value and demand. However, empirical data shows an inverse relationship between price and demand for gold. When its price is low, it is expected to rise in near future. This causes the current gold demand to increase.

Like any other asset, return on gold is a factor determining it's demand too. There is an opportunity cost of holding gold, i.e., real interest on risk free instruments. Therefore, a high real interest on risk free instruments leads to reduction in demand of gold. In the case of low real interest rates, people believe that inflation is bound to come up due to an increase in aggregate

demand. Here it must be noted that gold is seen as a hedge against inflation primarily because its price has been constantly increasing for the last 30 years. An increase in inflation decreases the purchasing power of a given amount of money. People, thus, may use gold as a store of value. However, studies in context to India give ambiguous results.
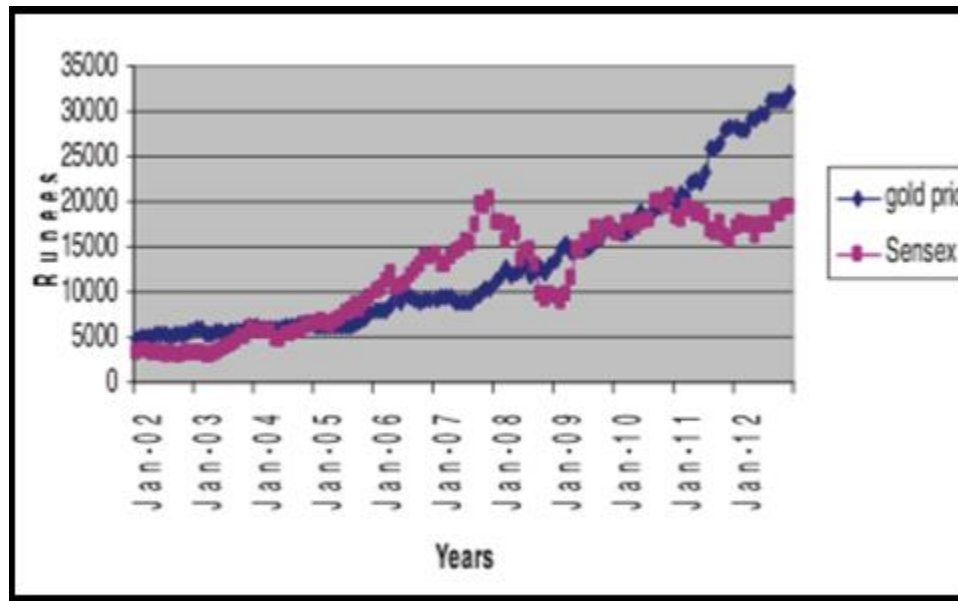

Figure 1: Movement of gold price and inflation rate
Source: Bloomberg

Since gold is a commodity and commodity prices are mostly stated in terms of the US dollar, the exchange rate affects the price of gold in domestic currency. Thus, gold serves as a hedge internally against inflation and externally against other currencies. A hedge is a term given to an asset that is negatively correlated to another asset or portfolio of assets on an average.

Another variable is equity prices. Gold and equity share a positive relationship in the sense that both are investment assets. An increase in equity prices leads to an increase in capital gains for existing holders. They might want to transfer their gains to a less risky asset, such as gold. This can be observed between the years of 2002 and 2007 in figure 2.
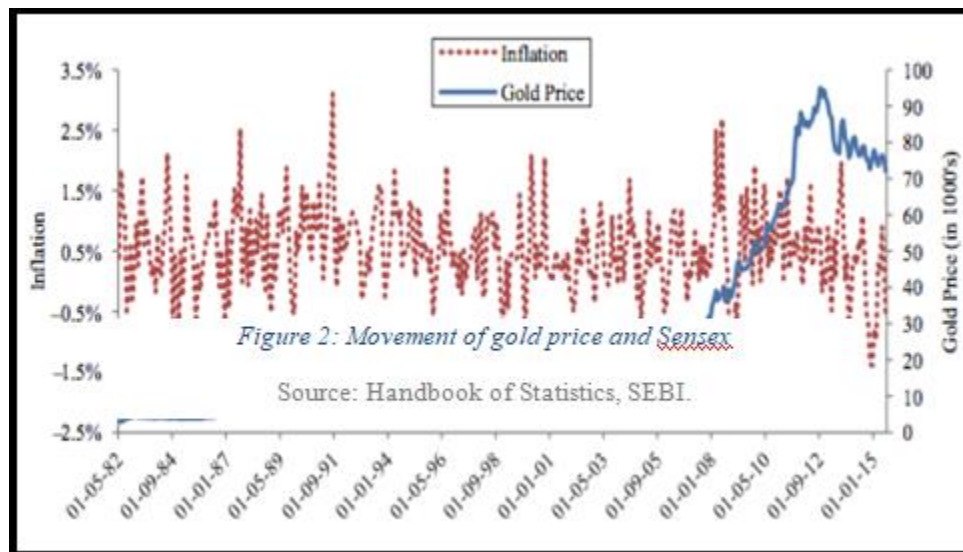
Figure 2: Movement of gold price and Sensex
Source: Handbook of Statistics, SEBI.

However, after the 2008 US financial crisis, the price of gold kept on increasing consistently while the market crashed. The same happened when the market crashed in 2011. It must also be noted that in these two instances, gold prices not just increased, but boomed. This suggests the existence of an inverse relationship, popularly called the safe haven characteristic of gold. A safe haven is a term given to an asset that is negatively correlated with another asset or portfolio of assets in certain periods only, like in times of crisis or uncertainty.

The seventh factor identified is uncertainty. Government's capital expenditure and expenditure on social security are used as an indicator of uncertainty in many pieces of research. Higher the uncertainty, higher the government expenditure and lower the private saving and corresponding investment. Financial savings are highly correlated to income, wealth, and interest rate. Thus, it is also a determinant of gold demand. Lastly price of substitutes, commodities, and assets in this scenario, can affect demand of gold too.

Investment Demand of Gold

As a precious metal gold has been used for jewellery, coins, and other art forms. The cultural and traditional value of gold is immense. In the last 10 years, however, gold's asset demand is taking over. Gold is available in a wide array of investment avenues, such as:

(a) Physical gold metal in the form of bars and coins.

(b) Derivatives, namely forward and option selling, that allow betting on the price of gold being traded on MCX, NCDEX in India.

(c) Gold ETFs which are shares listed on the exchanges that are backed by gold bullions.

(d) Stocks, i.e. shares of gold mining companies and shares of jewellers.

(e) Certificates, like bank depository certificates and sovereign bond schemes, allow the investors to avoid the risk and cost associated with physically holding and transferring gold.

In the last 10 years, economic downfalls, competitive pressures, and balance of payment deficits have made many major economies, like the US, devaluate their currencies. Since gold price is usually measured in dollars, depreciation of the dollar reduces the domestic price of gold in India leading to an increase in its demand. Moreover, during any geopolitical shift, turbulence, or crisis, the government usually reacts by reducing the interest rate which would further lead to an increase in investments and increase in demand. This would further lead to inflation. Gold is considered to be a good tool to fight inflation, i.e. act as an inflation hedge. With all other assets giving reducing returns and expectation of rising prices in the future, gold makes a safe bet during uncertain conditions. Post-2008 crisis period, Brexit 2016, instances of increase in the price of crude oil, and periods of stock market crash support gold's status as a "crisis commodity". The graph below shows the growth in investment demand of gold in comparison avenues.

The table shows the investment demand of gold as a percentage of total demand and year-by-year prices of gold. There has been an increase in the investment demand for gold since the year 2015.
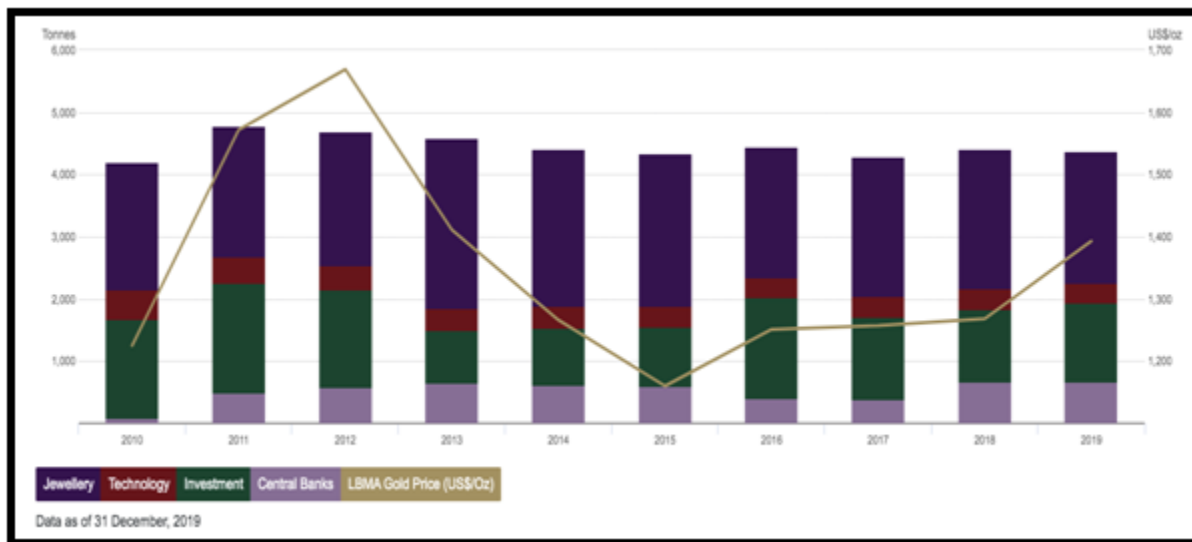
Figure 3: Rising Investment Demand of Gold

Source: ICE Benchmark Administration on Metals Focus, World Gold Council

Table 1:Components of Gold Demand and Their Growth

Data highlights	Year 2015 Weight in tonnes	Year2016	Year-on-year % change
Gold demand	4215.818	4308.732	2.203954
Jewelry	2388.6	2041.554	-14.5292
Technology	331.9746	322.4833	-2.85905
Investment	918.7063	1561.068	69.92028
Total bar and coin	1047.049	1029.182	-1.70647
ETFs and similar products	128.343	531.8867	-
Central banks & other inst.	576.5371	383.6266	-33.4602

Source: Metals Focus, World Gold Council

Literature Review

Kannan and Dhal (2008) derived India's demand function of gold for the period 1985 to 2005 using empirical and analytical perspectives. Their demand function expresses gold as a function of income (y), relative gold price (p), and a set of policy variables such as interest rate (r), equity price (s), exchange rate (e), taxes (t), and government expenditure (e). Further, an error correction model was formed. Augmented-Dickey Fuller and Phillips-Perron Unit Root Tests were conducted.

It was observed that in the short run, the price of gold seems to be a major determinant of gold demand. Income and financial wealth do have a positive effect but that's moderated by the tax and government capital expenditure's negative effect. In the long run, the price of gold remains more or less stable. Thus, it doesn't contribute much to the actual change in gold demand in the long run. Financial wealth and income dominate as determinants. Hence, the price of gold influences the demand for gold only in the short run. This is because, in the long run, the price of gold remains mostly stable. Overall, risk-free real interest rate shares a higher negative relationship with demand in urban areas than in rural areas due to less dependence on the banking sector there. The exchange rate is observed not to affect the asset demand of gold but it does hold a significant negative relationship with the overall demand of gold due to its safe haven property. As supply conditions improve, gold demand increases due to its scarcity. Silver prices and the difference between Indian and global prices do not have a significant impact.

Parimi (2008) attempted to find the short-run relationship of gold prices with stock market returns, oil prices, and exchange rate in India. SAS statistical package is used to conduct multilinear regression with gold price as the dependent variable and NIFTY, crude oil price, Indian rupee rate, BSE, Sensex, and S & P 500 as the independent variable.

With 95% significance, the model determines that gold prices share a low negative relationship with S&P 500 and currency, a high negative relationship with Sensex, a low positive relationship with the crude oil price, and a high positive relationship with NIFTY. These variables together explain 60% of the variation in the gold price.

Baur and McDermott (2009) tested the safe haven characteristic of gold against stocks in major developed and developing economies for the period between 1979 and 2009. Secondary data comprises daily, weekly, and monthly compounded stock returns of 53 constituents of countries belonging to G7, BRIC countries, Australia, and Switzerland. Gold data was collected from Datastream as Gold Bullion in USD per Troy ounce. First, descriptive analysis of each variable was conducted to understand the volatility and mean returns of each. Second, econometric analysis is undertaken. Regression with gold prices as the dependent variable and return on stocks as the independent variable. Moreover, an additional dummy variable, equal to 1 in case

of uncertainty, was introduced to check for the relationship in times of uncertainty. GARCH volatility model was used to compare the performance of gold and stock indices against the global uncertainty index (conditional volatility of world stock index). Graphical analysis was also used for an overview.

The results showed that gold prices share a statistically significant relationship with stock indices of the US, France, Germany, Italy, Switzerland, and the UK during extreme conditions and on average too. However, no statistically significant relationship was seen amongst other countries. It must be noted that gold demand was observed to be increasing during times of uncertainty in the developed countries, but it was seen to remain constant during situations of extreme uncertainty. Gold is a strong safe haven and hedge for most developed countries. However, it doesn't display these characteristics in emerging countries.

Fang, Fan and Lu (2012) proved the contribution of commodity value, currency value, and risk premium value of gold in its pricing. Descriptive statistics of gold, crude oil, and copper were conducted. EGARCH model was used to test asset volatility. Commodity Research Bureau Futures Price Index indicates the average commodity price level, USDX index indicates the average US dollar exchange rate, and US treasury CDS spreads were used to measure sovereign debt risk premium. Augmented Dickey-Fuller test, Johansen's cointegration test, and vector autoregression model are applied.

There exists a significant relationship between gold price and the one lagged CRB index, the one lagged USDX index and the two lagged US treasury CDS spreads. Therefore, gold's commodity, currency, and hedging properties are significant. Moreover, the effect of lending rates is seen on gold's in 2-3 days because of delay in the price transmission mechanism. Appreciation of dollar leads to depreciation of gold price indicating gold being an external hedge. Inflation and lending rates are positively related to gold price as an increase in the former variables indicate low liquidity. Also, post-crisis the commodity value of gold increased in comparison to the others. During a crisis, volatility in gold prices remained less than the others too. Hence, a crisis strengthens the commodity value and currency value of gold.

Patel (2013) examined the role of gold as a strategic prophecy against inflation and exchange rate in the context of 1991- 2012 India. Secondary data of CPI, rupee per US dollar, and rupee per 10 grams Mumbai gold is collected from RBI. Augmented Dicker Fuller unit root test, Johansen's cointegration test, and Granger causality test have been applied in an error correction framework. ARCH- LM test was done to detect heteroskedasticity and finally GARCH volatility model is formed. Next, descriptive statistics of all three variables were calculated.

All three variables are integrated of first order. Gold and inflation are strongly positively correlated. Gold and exchange rate are also positively related. Moreover, there exists a long run of gold with both, inflation and exchange rate.There isn't any causality between them. Results of GARCH model showed that volatility of price's independent variable, inflation, holds a negative sign. The study suggests that gold acts as an internal hedge against inflation for India.

Parikh and Vaish (2013) analysed the impact of different inflationary conditions on gold with respect to other investment options during the period 2011 to 2015. The market reactions to different asset classes during different market conditions of deflation, baseline inflation, stagflation, and inflation have been understood through data from a World Gold Council report.

The study observed that investor's asset choice changes with different market conditions due to change in perceived risk and risk tolerance. During baseline inflation, gold prices fall, and gold underperforms other assets. Equity and cash reserves are the top performers. During deflation, gold outperforms real estate prices and equity prices but is beaten by bond prices and cash. During stagflation, gold's performance is better than its performance during baseline inflation but less than its performance during deflation. Equity, real estate, and cash investment are preferred over gold. Lastly, during high inflation, gold is preferred over all other asset classes.

Hood and Malik (2013) evaluated the role of gold as a hedge against stock market volatility and safe haven for the US for the period from November 1995 to November 2010. Secondary data, which includes daily closing spot prices for gold, silver, platinum, S&P index, and VIX for the period under study, is collected from Bloomberg. Descriptive statistics of each variable is done. Next, a general regression equation with the variables previously mentioned as dependent variables and stock returns as the independent variable is performed. GARCH model is used to check heteroscedasticity in the time series data. Finally, descriptive statistics of portfolios consisting of S&P 500 with gold or VIX is done.

Gold and VIX have a greater daily average return than S&P 500. Amongst precious metals, gold's standard deviation is the lowest and unlike the others, it shows a positive skewness. VIX has more than 3 times more standard deviation than gold. Gold is the only variable strongly negatively related to S&P 500 and VIX also slightly. Regression coefficients show that gold and VIX are a strong hedge against inflation while silver is unrelated and platinum is positively related. During periods of low or high volatility, gold doesn't have a negative correlation with the US stock market. VIX, on the other hand, remains negatively correlated at all times. Hence, VIX is a better hedge against stock market volatility than gold; though gold does possess the characteristics too.

Ghazali (2013) investigated the characteristics of gold in the context of Malaysia 2001- 2013. Data on the price of KijangEmasis per Troy ounce, representing domestic gold price, and Kuala Lumpur Composite index, representing stock price, are collected from Central Bank of Malaysia and Datastream respectively. Descriptive statistics and correlation analysis of computed compounded return is carried out. The study used the autoregressive distributed lag model to check the average relationship between gold returns and stock returns. Next, a conditional term was also introduced to check the relationship during stock market shocks.

The average daily return for gold is more than that for stocks. Even though the range of stock returns is more than the range of gold returns, for standard deviation it's the other way around. Also, a significant negative relationship between gold and stock returns highlights the potential of gold as a hedge. However, this characteristic is short-lived as the contemporaneous effect is positive while one lagged and two lagged effects are negative. Moreover, positive stock market conditions make people withdraw from gold more rapidly than negative stock market conditions make them invest in gold.

Next, during extreme market conditions, gold gave a higher average return and lesser standard deviation. Furthermore, the negative coefficient increased during these periods. However, gold is a weak safe haven as regression results are ambiguous. There are negative coefficients for 1% and 5% quantiles and positive coefficients for 2.5% and 10% quantiles. This suggests that gold can act as a safe haven if stock returns fall, however, if the severity increases, gold returns fall too. Also, for 2.5% quantile, one and two lagged coefficients are negative. This suggests that buying gold a day or two after the market shock can prove to be beneficial. The key takeaway is that gold acts as a hedge in Malaysia but its safe haven characteristic is yet to be proven in the economy.

In his paper, Singh (2013) talks about the behaviour of gold in the Indian market. He provides a theoretical analysis on factors causing volatility in gold prices and increasing demand for gold. He believes that exposure to the global economy has led to volatility in gold prices. Political and economic instability anywhere in the world has a direct impact on gold prices. They further comment that this impact is usually positive due to the gold's role as a safe haven and hedge. It must be noted that during such tough times, the investment demand for gold increases but the jewellery demand for gold falls because of a fall in disposable income and consumer confidence.

Hemavathy and Gurusamy (2014) studied and compared the growth pattern of Retail Gold consumption in India, China, and the United States. Quarterly gold consumption demand of India, the US, and China for the years 1996 to 2013 was taken. Box- Jenkins's time-series

autoregression integrates moving average model was used to predict the growth. Prediction is made through historical time series data of gold demand.

They found that China and India share an emotional link with Gold. Persistent innovation in gold-related innovations and demographic shifts in favour of middle-class urban consumers leads to the creation of healthy gold demand in the future.

Karmarkar and Vani (2014) used a probit regression model to find the threshold values of indicators that prove to be efficient in signalling an economic crisis for India, the USA, and the European Union. The binary dependent variable was equal to 1 in case of occurrence of a crisis and 0 in case of no occurrence of a crisis. Indecent variables were inflation, real effective exchange rate index, Total reserves, Domestic credit provided by the banking sector, CPI, GDP growth, good exports, WPI, Money and quasi money to reserves ratio, Cash Surplus, broad money growth, lending interest rate, goods import, FDI, and Gross domestic savings. The period studies was 1991 to 2011.

Results showed goods export (BOP, current USD), WPI (2005 as the base), real effective exchange rate index, and broad money growth (annual %) to be significant in signalling a crisis.

Beckmann, Berger and Czudaj (2015) analysed the relation of gold with stocks during normal conditions and extreme conditions separately, thereby commenting on the safe haven characteristic. The period studied is from January 1970 to March 2012 using monthly data and countries undertaken are Australia, British, Canada, China, Egypt, India, Indonesia, Japan, Korea, Russia, South Africa, Switzerland, Thai, Turkey, and the US. Hence, a wide range of countries was studied to observe relationships in different market conditions. Moreover, the period was chosen to include several crises. Secondary data on gold prices was collected from World Gold council in the domestic currency of all the countries studied. Data on stock indices in the domestic denomination of each was collected from Morgan Stanley Capital International. Two equations were tested; one expressing gold returns as a non-linear function of stock market returns and the second expressing the relationship under a GARCH model to account for heteroscedasticity. The two equations comprised a unique bounded continuous exponential transition function based on a threshold value indicating normal times. High volatility from the threshold indicated extreme conditions. Based on the results of the qualities gold holds for a particular country, each country was allotted a sample portfolio consisting of gold and stocks. The sharpe ratio of this portfolio was compared to a benchmark sharpe ratio of a portfolio consisting of 25% gold and 75% stocks. Hence, the risk adjusted performance of portfolios was analysed.

The key finding is that information about the market conditions and transition of market conditions can help people in developing more efficient portfolios with increased average return and decreased standard deviation. For example, gold acts both as a safe haven and hedge in the US. Therefore, a portfolio consisting of 50% gold, 20% as a hedge, and 30% as a safe haven, can deliver better expected returns. While EMU, Indonesia, Russia, and Turkey show strong hedging quality but no safe haven quality, China and Germany show the opposite. Results have been insignificant for other countries. Hence, information about market conditions and transmission mechanisms is important. Thus, gold can act as a hedge and safe haven, however, things are different for different economies. It must be noted that no generalized conclusion can be made on

Gokmenoglu and Fazlollahi (2015) studied the relationship between gold price, gold price volatility, oil price, and oil price volatility on the stock market for the US. It aims to find how the price of oil and gold act as indicators of business cycles and general economic scenario. Data used is secondary. Euro Brent crude oil spot price in US dollars per share collected from the US Energy Information Administration, daily adjusted close price for S&P500 from Yahoo Finance, gold historical spot prices from London PM fix in US dollars per ounce, and volatility indexes for gold and oil from CBOE website. The duration studied is January 2013 to November 2014. Descriptive statistics of log of variables and correlation analysis is performed to analyse the average returns and volatility. Next, the log of stock market price is expressed as a log function of the other variables. Lastly Augmented Dickey-Fuller test, Philips and Peron stationarity test, unit root test, cointegration test, and error correction mechanism have been performed.

The average gold price has been decreasing while the average stock price has been increasing. Moreover, volatility in gold prices is twice that of stock prices. There's a strong negative relationship between the two. All variables share a significant long-run relationship. A 1% increase in gold prices leads to a 74% decrease in stock market prices and a 1% increase in gold price volatility leads to an 8.7% increase in stock market volatility, in the long run. This is because an increase in gold price suggests an increase in the demand for gold. This is supported by uncertainty in the economy, thereby signalling people to withdraw from the stock market. On the other hand, an increase in volatility makes people shift their investment to the stock market.

The relationship with oil is different with negative relationships between oil prices and stock market prices and oil price volatility and stock market prices. An increase in oil prices suggests an increase in the cost of production of a major number of companies. This suggests a decrease in future profits and makes people withdraw from the stock market. An increase in oil price volatility has the same impact. A bilateral relationship between the prices of all the variables was observed. The above result shows that gold is seen as a substitute for stock market investments. They are both assets with different risks.

AnjanaRaju and Marathe (2016) used monthly CPI and gold price data between 1996 and 2016 to study the impact of inflation on gold price volatility in India, China, and the USA. Cointegration test, vector autoregression, and granger causality were performed.

The results differed for each country. In India, gold prices and inflation are cointegrated and co-dependent. They have a significant long-run relationship. When inflation increases, the purchasing power of money decreases. People see gold as an alternative store of value and start investing in it in the short run leading to an increase in its price. However, in the long run, people will look forward to selling it. An increase in its supply would decrease its price. In China, gold prices and inflation share a significant negative relationship in the short run. However, Gold proves to be a good inflation hedge in the long run. In the USA, no significant relationship is observed.

Abraham (2016) evaluated the influence of changing investment scenarios on the demand for gold through a research based on Ernakulam District, Kerala. Primary data is collected by a questionnaire survey conducted in Ernakulam District of Kerala. 250 households are involved in the survey. The households of the district are characterized as low- middle-income conservative households. It was found that the majority invests in gold jewellery, bars, and coins due to the sentimental value involved. People invest in gold due to the liquidity, safety, price stability, convenience, and returns. Gold reduces the expected risk of a portfolio during extreme market conditions because of the price stability and liquidity it offers.

Kumar (2017) determined the relationship between gold price and inflation in the long run in the context of India between 1982 and 2015. Month on month change in Wholesale price index (WPI) is used as a measure of inflation and its data is collected from RBI. Monthly gold prices are measured through per troy ounce price of gold in the Indian market, collected through World Gold Council. Three cointegration tests are conducted: Johansen's, ARDL approach based on single equation model, and Saikkonen and Lutkepohl approach (estimating the deterministic terms from the observations through Generalized Least Squares and subtracting those from the observations). To determine the gold's WPI beta value the 3-month T- bill rate, the 10 year T-bond rate, the REER index (measures gold as a hedge against a basket of currencies), and the index of industrial production are taken as macroeconomic variables that could be used to estimate the explainable part of the beta. This was done through Granger Causality within the bivariate vector autoregression framework.

As per the estimations, the gold prices were very sensitive to inflation in the early 1980s with gold's WPI beta as 2.87. Beta started falling then and reached its all-time lowest in April 2000 at almost 0. It started increasing again in mid-2000 and increased at a slow rate till 2007. It then

started increasing rapidly and reached 2.68 in May 2015. It was found that Gold's WPI beta is significantly explained by short-term T- bill rates and long-term T- bond rates at 5 and 1 percent level of significance respectively and they both share a negative relationship. Though REER index also explains beta, but at a 10 percent level of significance. Their study suggests that a fall in interest rates increases the significance of inflation for the gold prices. A monetary easing induces fear of expected inflation and thus affects the gold prices. During the 2008 financial crisis, India increased its gold holdings as a reserve asset with the view that gold would protect its purchasing power parity, at the same time acting as a hedge against inflation.

Narang and Raman (2017) investigated the relationship between gold prices and stock market returns in India for the period 2002 to 2012. The correlation was calculated between the monthly stock returns, based on BSE Sensex, and domestic gold prices. T test was done to find the standard error. Further, the Granger causality test was done to identify the co-dependency and the Augmented Dickey-Fuller test was done to find whether the two series are stationary or not. Finally, to test the long-run relation, Johansen's cointegration test has been done.

Results tell that the two series are integrated of first order. There is a positive correlation between the price of gold and stock returns between 2002 and 2007. However, this positive relationship was weak during the years of 2008- 11 due to the 2008- 9 financial crisis. Johansen's cointegration test declared no relation between the two in the long run. Further, Granger causality test proves that an increase in price of gold doesn't lead to an increase in Sensex and vice versa. Hence, between 2002 and 2007, there was a positive relationship between the price of gold and stock returns. However, after the 2008 recession, no relationship is observed.

Shobha (2017) conducted a study based on primary data to understand the perception of gold amongst small and medium investors. Her motive was three-fold. (a) To find whether gold is safer than other assets in different economic scenarios or not, (b) To determine the factors influencing small and medium investors' decisions to invest in gold, and (c) To determine the factors determining the final choice of type of gold investment made. A questionnaire was given to a random sample of 100 people from Kozhikode district. GARCH model was used to estimate the daily volatility between gold price, stock index, and bond yield. Chi-square test was used to estimate the impact of age, gender, employment, income level, and marital status on the investor's decision to invest in gold and the type of gold investment. She also analysed secondary data; gold daily prices, NIFTY stock index, and Indian government bond yields for the period between 2002 and 2017.

She observed the daily volatility of gold prices to be less in comparison to stock index and bond yield (despite being risk-free). Also, it must be noted that age, gender, educational qualification,

marital status, income level play no major role in determining the decision to invest in gold and determining the type of investment in gold.

Afham, Law and Saini (2017) checked whether gold acts as a hedge against inflation in Malaysia for the period from 1971 to 2011, both in the long run and in the short-run or not. Secondary data has been used for research: data of gold price per ounce in RM from the World Gold Council and monthly rate of inflation data from the International Financial Statistics. Unit root tests are used to determine whether the variables are stationary. To check for cointegration, Engle-Granger cointegration test and Johansen cointegration test are used. Tsay's test is used to check the linear relationship between the two. TVECM is used to estimate the short-term non-linear relationship. The final hedging ability and causality between the variables is estimated through asymmetric causality test done through Wald coefficient test.

The study concluded that the two variables are stationary and there is a long-term relationship between them. For every 1% increase in Malaysian CPI, gold prices increase by 1.7615%. It was also found that gold price is the dependent variable. It was also noted that gold and inflation have a non-linear positive relation in the short run. Gold's hedging abilities are stronger in times of high inflation in comparison to times of low momentum. Thus, gold acts as a hedge against inflation due to a real increase in its price even in times of high inflation.

Singh and Joshi (2018) investigated gold as an inflation hedge. There are few studies on this topic in context to India and this one is one of them. The period taken is March 2011 to March 2017. Johansen's cointegration test was conducted between gold prices and CPI. Further, the error correction model and wale test were carried out to check the long-run and short-run relationship. The findings suggest only a long-run causality and no short-run causality. The study infers that gold investment can be used as an inflation hedge in the long run.

Conlon, Lucey and Uddin (2018) undertook a study with two motives. First, to check whether gold works as a hedge against expected and unexpected inflation or not, both in the short run and in the long run. The countries chosen are the US, UK, Switzerland, and Japan. The time studied is from January 1968 to December 2014. Second, to check whether gold futures and stocks also act as an inflation hedge in the same way as physical gold does. Secondary data is used which includes monthly CPI data taken from OECD of the countries chosen and monthly gold returns in each chosen country's currency taken as log difference between the monthly price of gold bullion from the London Bullion Market. Differentiation between expected and unexpected inflation was made possible by finding out the expected component through ARMA approach and a survey conducted by the University of Michigan. The dynamic conditional correlation was used to find the relationship between gold and inflation. Continuous Wavelet transformation was

used to find the use of gold as a hedge at different calendar points and finding its relevance in the short-run and in the long-run separately.

Gold is found to be a strong hedge against realized inflation in each economy, in short-run and long-run. The relationship between unexpected inflation and gold is different in different economies. In the US they have a positive relationship in both long and short-run. In UK and Japan, however, negative relations are also seen. Furthermore, gold stock and gold investments are as good a hedge against inflation as physical gold.

Singh and Kishor (2019) investigated the relationship between gold price, exchange rate, and current account deficit. Secondary data has been used in this study. Quarterly data for the period 2002 first quarter to 2016 second quarter on domestic gold prices, exchange rates, and CAD in India is collected from RBI's database. Augmented Dickey-Fuller Unit root test, Johansen's cointegration test and Granger causality with VECM were conducted to test the stationary nature of these variables and the cointegration between them. The years studied are from 2002 to 2016.

Estimates suggest that gold prices, CAD, and exchange rate are all stationary at the first difference. Gold prices and CAD share a bilateral positive relationship, both in the long run and in the short run. Exchange rate and CAD, surprisingly, aren't correlated at all.

Beckmann, Berger and Czudaj (2019) attempted to understand the impact of uncertainty in the market and economy on the gold prices for the US, Germany, Japan, the UK, Canada, India, China, South Africa, and Australia for the period from 1985 to 2014. They also analysed the relationship between gold and stock returns, bond rates, and foreign exchange rates. Secondary data is used which includes gold prices in different currencies, exchange rate against the US dollar, stock, and 10-year bond indices for each chosen country collected from the Thomson Reuters DataStream. Three measures of uncertainty are used. Jurado Et Al. (2015) who determined common volatility in the unpredicted component of 132 macroeconomic time series, Baker Et Al. (2016) uncertainty index based on text searching of newspapers, and Baker Et Al. (2016) measure based on differences in expected and actual CPI. The period of study is divided into 3 parts: 1985-2000 (low volatility), 2001- 2008 (high volatility and upward trend), and 2008- 2014 (after the collapse of Lehman Brothers). The relationship of gold with each of the other variables has been estimated through copula wavelet approach.

Four key observations are as follows. (1) Between stocks and gold, there was a positive relationship between 1985 and 2000 which weakened in all economies except the US, South Africa, and Japan in the second time phase. It becomes negative in the third time phase. (2) Gold has shown an increasingly strong relationship with bonds from 1984 to 2014. (3) A depreciation of the domestic currency against the dollar increases the price of gold in domestic currency. (4)

After 2008, the relationship becomes positive for all economies. Before 2008, the relationship was small and negative. Also, as inflation becomes more and more unpredictable, gold price increases.

Thus, gold acts as a hedge against stock returns in the long run but not in the short run. Gold's demand increases due to uncertainty as people see it as a safe haven. Lastly, Gold acts as a hedge against inflation when people expect an increase in prices in the future.

Problem Statement

A study of the existing literature on this topic indicated that research in the context of India is scarce. Moreover, though few, there are still studies about the demand for gold, factors affecting gold price, and gold as a hedge against inflation and the stock market. However, there is no India-specific study confirming the existence of gold's safe haven characteristic.

The COVID- 19 crisis has led to an economic fallout in 2020. Macro-economic indicators like real GDP growth, inflation, and unemployment have deteriorated. As mentioned before, the pandemic made people realize the importance of saving and investing more than ever before. We also saw gold reach an all-time high. Since this crisis is a recent occurrence, a study explaining a part of it will be interesting and untapped. This study will attempt to answer whether this increase in gold price is justified or not.

Since the dynamics of gold, stock market relationship, and macroeconomic parameters changed after the 2008 US financial crisis, it's essential to conduct a study that focuses on the period after 2008. This will allow us to make a more realistic observation of the current position as it won't be affected by pre-2008 views. A comprehensive analysis using the latest data will be useful.

We are home to a growing young population that is technologically advanced and socially aware. The recent pandemic has made people realize the importance of smart investing. With e- trading becoming popular, through platforms like Zerodha, Upstox, through your bank applications, etc, it is common to find youngsters trading and trying to grow rich. Observing the kind of digital exposure, they have, providing them with true information online is essential. This study will not only add to the existing literature by covering an untapped area but also help Indians safeguard their funds during a crisis.

Research Objective

To evaluate the relationship between gold and the stock market in India during the period between 2009 and 2021.

Data

Monthly and weekly data of price in rupees per 10 grams of gold is collected from World Gold Council. BSE Sensex is used as an indicator of stock market prices. Data on adjusted closing prices is collected from Yahoo Finance. Wherever data is missing, the averages of the data of the previous period and next period is taken. Since the return on stock market and gold can be calculated as the logarithmic difference in the prices, i.e. Return= Ln(Pt/Pt-1), where Ln is the natural log of the price for period t divided by the price of period t-1. Therefore, natural log of the weekly and monthly data was taken, and returns were computed accordingly. This will allow the application of econometrics tests as the logarithmic difference of prices gives the continuous return.

Methodology

The period of study is 1 February 2008 to 1 February 2021. To test the dynamic relationship between monthly gold prices and monthly stock market prices, three null hypotheses are tested:

H_{01} : Gold prices and BSE Sensex are not stationary

H_{02} : Gold prices and BSE Sensex are not co-integrated

H_{03} : There is no cause and effect relationship between gold prices and BSE Sensex

H_{04} : There is no long-run relationship between gold prices and BSE Sensex

Firstly, Karl Pearson's correlation coefficient (r) is calculated using the formula:

$$r = \frac{\sum XY - \sum X \sum Y}{(\sqrt{\sum X^2} - (\sum X)^2)(\sqrt{\sum Y^2} - (\sum Y)^2)}$$

The significance of the correlation coefficient has been tested using t-test where the t-statistic has Ho: p =0 and H1: p ≠0 with n-2 degrees of freedom. If the calculated value of t is greater than the critical value of t, we reject our null that there is no linear relationship between the variables. Here, calculated t is computed using the formula:

$$t_{n-2} = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

Two or more time series are considered co-integrated in the long run, if the linear combination between them is stationary. Therefore, Augmented Dickey-Fuller test is conducted to check for the presence of a unit root, to determine if the time series is non-stationary. It's equation is:

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum \gamma_j \Delta Y_{t-j} + \varepsilon_t$$

The null hypothesis, H_0, is thatthere is a unit root for the series, and the alternative hypothesis, H_1, is that there is no unit root for the series and the series is stationary. If the observed ADF statistic exceeds the critical value, the null hypothesis is rejected which means that the variable is stationary. In case a variable is stationary at level, it is called to be integrated of order 0. If a variable is nonstationary, we can get the stationary counterpart of the variable by differencing them once, in many instances. Such a variable is said to be co-integrated of order 1. In the present case, since the natural log of gold prices and stock market prices are our variables, differencing them once would give us their continuous returns.

If both the time series are non-stationary and integrated of the same order, Johansen's cointegration test can be used to study the long-run relationship between the endogenous variables. Johansen (1980) and Johansen and Juselius (1990) test for the presence of a long-run equilibrium between time series variables, despite short-run deviations. Two likelihood tests- Trace test statistic with the null hypothesis that the number of co-integrating relationships (r) is equal to 0, and Max-Eigen Statistic with the null hypothesis that the number of co-integrating relationships (r) is less than or equal to 1- can be used to estimate the number of cointegrating vectors. The null hypothesis, no cointegration between the variables, is rejected if the test statistics are greater than the critical values. The presence of cointegration allows for error model specification.

Granger Causality Test is conducted to find out whether one series is useful in forecasting the other series. It indicates short-run causality. The null hypothesis that the lagged x-values do not explain the variation in y is checked.

In case Johansen's cointegration test suggests cointegration, error model specification can be performed. The corresponding error correction model is:

$$\Delta Y_{1,t} = \alpha_0 + \alpha_1 \Delta Y_{2,t} + \alpha_2 u_{t-1} + \varepsilon_t$$

Here, Δ denotes the first difference operator, ε_t denotes the random error term, and $u_{t-1} = Y_{1,t-1} - \beta_1 - \beta_2 Y_{2,t-1}$ denotes the one-period lagged value of the error term (also called the equilibrium error). α_2 measures the speed of adjustment of the endogenous variable towards the long-run equilibrium, in case of deviation. A negative and significant coefficient of the error term is indicative of a long-run causal relationship.

Considering the first COVID-19 case of India was detected on 30 January 2020 with global fear playing an impact since the first week of January 2020, the sample has been further divided into

a pre-crisis and post-crisis period, i.e. from 23 July 2018 to 3 Jan 2020, and 10 Jan 2020 to 1 February 2021 respectively. Descriptive statistics of the weekly gold prices and weekly stock market prices are conducted to examine the volatility and average movement of the two variables pre- and post-crisis.

Empirical Analysis

Karl Pearson's Correlation Coefficient:

Karl Pearson's correlation coefficient (r) between log of gold prices and log of stock market prices came out to be 0.048645189. Since the calculated value of t (0.582401348) is less than the critical value of t (0.960192159), we fail to reject our null that r = 0. This suggests that there doesn't exist a statistically significant linear relationship between the two variables. However, the correlation coefficient between gold prices and BSE SENSEX closing prices came out to be statistically significant at 0.7216. This is indicative of a significant positive co-movement between the variables.

Figure 4: Graphical Presentation of price of gold per 10 grams and BSE Sensex adjusted closing price

Augmented Dickey Fuller Test:

Table 2: Results of Augmented Dickey Fuller Test

Variables at level	ADF Statistic	Critical Values at 5%	Decision
Log of Gold Prices	-2.200	-3.419	Accept null hypothesis of no unit root
Log of Stock Market Prices	-2.812	-3.419	Accept null hypothesis of no unit root
Variables in their First Differences	**ADF Statistic**	**Critical Values at 5%**	**Decision**
Gold Returns	-3.921	-3.419	Reject Null hypothesis of no unit root
Stock Market Returns	-5.256	-3.419	Reject Null hypothesis of no unit root

It is clear from Table 2 indicate that the null hypothesis of no unit roots for both the time series is accepted for log of gold prices and log of stock market prices. However, the null is rejected at 5% significance for their first difference. Thus, log of gold prices and log of stock market prices are integrated of order 1, i.e., I(1). Thus, Granger Causality Test and Johansen's Cointegration test can be conducted.

The graphical presentations of time series of log of gold prices, log of stock market prices, gold returns, and stock market returns in figures 5-8 also support the results of the Augmented Dickey-Fuller test.
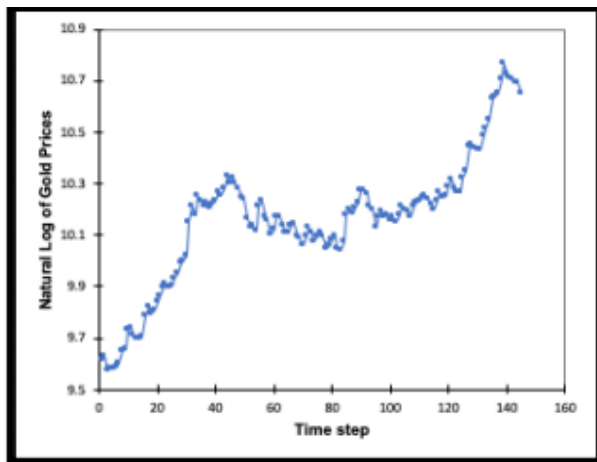
Figure 5: Log Values of Gold Price Series
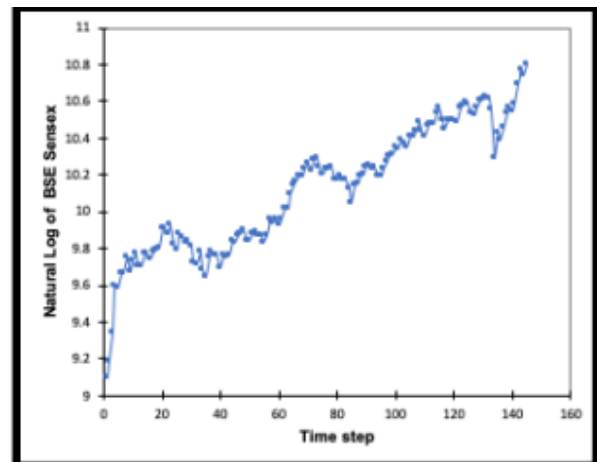
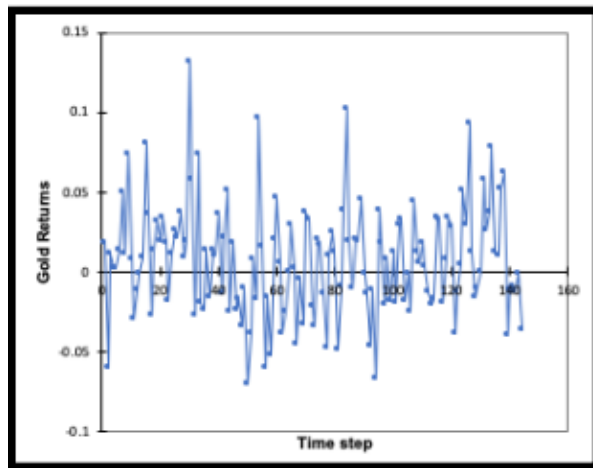
Figure 6: Log values of BSE Sensex
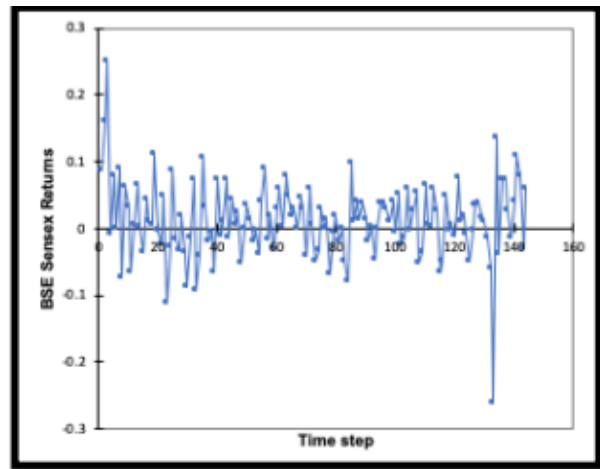
Figure 7:Gold Returns

Figure 8:BSE Sensex Returns

Johansen's Cointegration Test:

Table 3:Results of Johansen's Cointegration Test

Time Period: February 2009 to February Lags interval (in first differences):1 to 3			No. of observations after adjustment: 144	
Unrestricted Cointegration Rank Test (Trace)				
H0 (No. of cointegrating equations)	**Eigenvalue**	**Trace Statistic**	**Critical value**	**p-value**
None	0.095	19.491	12.321	0.003
At most 1	0.036	5.254	4.130	0.026
Trace test indicates 1 cointegrating relation(s) at the 0.05 level.				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
H0 (No. of cointegrating equations)	**Eigenvalue**	**Max-Eigen Statistic**	**Critical value**	**p-value**
None	0.095	14.237	11.225	0.014
At most 1	0.036	5.254	4.130	0.026
Max-eigenvalue test indicates 1 cointegrating relation(s) at the 0.05 level.				

Table 3 summarises the results of the Johansen's Trace and Maximum Eigenvalue tests between the two time series variables. As the test statistics are greater than the critical values at 5% significance, the null hypothesis that there is no cointegration between gold prices and stock market returns is rejected. Therefore, there is a long-run or equilibrium association between these two variables.

Granger Causality Test:

Table 4: Results of Granger Causality Test

Null Hypothesis	F-Statistic	Probability	Decision
Gold Prices do not Granger Cause Stock Market Prices	1.1394	0.2876033	Reject
Stock Market Prices do not Granger Cause Gold Prices	0.743836	0.3898993	Reject

The results of the Granger Causality Test presented in table 4 confirm the rejection of the null hypothesis. Therefore, it may be inferred that both the variables contain some significant information such that they cause and effect each other in the short run.

Error Correction Model:

Model 1:

The error correction model for gold price as the dependent variable is as follows:

$$\Delta Log\ of\ Gold\ Price_t = 0.0083296 - 0.094904 \Delta Log\ of\ Stock\ Market\ Price_t - 0.019179 u_{t-1}$$

Model 2:

The error correction model for stock market price as the dependent variable is as follows:

$$\Delta Log\ of\ Stock\ Market\ Price_t = 0.0135787 - 0.245773 \Delta Log\ of\ Gold\ Price_t - 0.04373 u_{t-1}$$

Table 5: Results of Error Correction Model

	Coefficients	Standard Error	t Stat	P-value
Model 1, ΔLog of Stock Market Price (t)	-0.094904	0.050805008	-1.868004	0.0638369
Model 1, u(t-1)	-0.019179	0.016131363	-1.188937	0.2364628
Model 2, ΔLog of Gold Price (t)	-0.245773	0.133710723	-1.838097	0.0681526
Model 2, u(t-1)	-0.04373	0.019460306	-2.247124	0.0261853

From table 5, it is inferred that in model 1 the coefficient of the error term is negative but insignificant. This reveals that the stock market price doesn't have any long-run causality on the gold price. However, in model 2 the coefficient of the error term is negative and significant at 5%. This implies that gold prices have long-run causality on stock market prices. This indicates that rational investors sense uncertainty before it is reflected on the stock market prices.

Descriptive Statistics:

Table 6: Results of Descriptive Statistics

Statistic	Total Period Gold Price	Total Period Stock Market Price	Total Period Gold Return	Total Period Stock Market Return Return	Pre Crisis Gold Price	Post Crisis Gold Price	Pre Crisis Stock Market Price	Post Crisis Stock Market Price	Pre Crisis Gold Return	Post Crisis Gold Return	Pre Crisis Stock Market Return	Post Crisis Stock Market Return
No. of observations	145	145	144	144	80	53	80	53	79	52	79	52
Minimum	14347.573	8891.610	-0.070699	-0.262058	26632.743	36098.649	33349.310	27590.950	-0.024654	-0.072453	-0.052421	-0.131007
Maximum	47268.437	49099.990	0.131099	0.248851	35874.317	48932.340	41945.370	50731.630	0.054976	0.074401	0.048644	0.121635
1st Quartile	23773.117	18505.380	-0.017186	-0.017975	28572.775	41392.559	36346.743	34287.240	-0.007754	-0.010847	-0.008267	-0.013770
Median	26376.942	26154.830	0.008385	0.009322	29500.371	43593.818	37981.250	38357.180	0.001217	0.001885	0.003010	0.010763
3rd Quartile	28464.118	33213.130	0.026766	0.041375	33771.179	44924.454	39322.445	41893.060	0.012473	0.017240	0.010364	0.022743
Mean	26603.780	26229.399	0.007220	0.011866	30650.785	42793.276	37969.637	38764.966	0.003492	0.003553	0.001099	0.004029
Variance (n-1)	47215627.706	76662777.245	0.001195	0.003189	7782078.466	9699195.548	3992662.177	33410047.192	0.000236	0.000791	0.000292	0.001915
Standard deviation	6871.363	8755.728	0.034569	0.056474	2789.638	3114.353	1998.165	5780.142	0.015374	0.028125	0.017101	0.043766

Table 6 shows the results of the descriptive statistics conducted of 4 variables- gold price, stock market price, return on gold, and return on stock market- for the total period under study and two sub-time periods (before and after the COVID-19 crisis). It can be inferred that the gold market offers a higher minimum return and a lower standard deviation in all time frames: on an average, before the crisis, and after the crisis. This suggests that gold market involves less risk than stock market. It can be seen that while the minimum, maximum, 1st quartile, median, and 3rd quartile price of gold increased post-crisis, the values decreased for stock market price. The mean gold price also increased relatively more than the mean stock market price, while the variance of the former reduced. We can infer that gold acts as a safe haven. People realize this due to which an increase in gold price is seen during such periods. A higher maximum return post-crisis is observed for the stock market. This might be because the post-crisis period involves instances such as fiscal and monetary expansion, uplifting of lockdown, and recovery period.

Major Findings

This paper investigates the dynamic relationship between gold and stock market in India over the 2009-2021 period. The Augmented Dickey-Fuller test shows that the log of gold prices and log of stock market prices are non-stationary and integrated of order 1. Moreover, their first difference directly gives the values of gold returns and stock market returns. Johansen's cointegration test reveals that there exists a long-run relationship between gold prices and stock market prices in India. The Granger Causality test suggests the evidence of feedback causality running between gold prices and BSE Sensex-based stock market prices in India in the short run.

However, as per the error correction model, gold prices have long-run causality on stock market prices. Descriptive statistics helped us infer that the price of gold increased while the stock market fell during COVID-19, and the standard deviation of return of gold is lower than the standard deviation of return of the stock market through all time frames.

Conclusion

The study indicates that after the 2008 crisis, a significantly positive long-run relationship is observed between gold prices and stock market prices. The extent of gold consumption in India is widespread. Pre-2008 the traditional demand for gold dominated. However, in recent years Indians have also started considering it an important mode of investment. Innovative financial products like Gold Bullion Securities, gold exchange traded funds, gold ETF's are attracting investors. In fact, the number of Gold ETF's increased by 57% between March 2009 and September 2009 in India. Traditional demand, inflation-proof, no liability on investors, low-interest rate on most of the saving schemes, and safety offered are some factors ensuring its continuous demand. We have also seen an increase in retailer participation in the stock market. An increase in global exposure and uncertainty increased the importance of saving and investment amongst Indians. This can explain the co-movement between stock market price and gold price.

However, in times of crisis, the stock market falls while the price of gold continues to increase as people realise the importance of golf as a safe haven. Though Baur and McDermott (2009) pointed out that gold doesn't act as a safe haven for emerging counties like India, the 2008 crisis made people realise the importance of safeguarding their investments. The existing literature, like Parimi (2008) and Narang and Raman (2017), believed that in pre-2008 India, a positive relationship between the stock market and gold was observed. However, the 2008 crisis highlighted the safe haven characteristic of gold for the first time and a negative relationship between the two was observed; the stock market crashed but the price of gold continued to rise in India. Ghazali (2013) pointed out that positive stock market conditions make people withdraw from gold more rapidly than negative stock market conditions make them invest in gold. However, the recent COVID-19 pandemic saw gold prices reach an all-time high due to increased demand and value during uncertainty. Moreover, rational investors sense uncertainty before it is reflected on the stock market prices as indicated by the results of the error correction model. Gokmenoglu and Fazlollahi (2015) believe gold to be seen as a substitute for stock market investments as they are both assets with different risks. However, owing to the safe haven characteristic of gold proved in India, the view is changing from seeing gold as a substitute for equity investments to seeing it as a necessary component of one's portfolio depending on the investor's risk appetite.

Implications and Future Scope

The results of this study have implications for policy-makers, investors (existing and potential), financial analysts, and academia.

An individual can grow rich by earning income or by investing the income saved. Currently, our market offers us a wide variety of investment options. Gold, fixed deposits, recurring deposits, mutual funds, and pension schemes are some popular options. The decision of which of these to choose varies with age, risk tolerance, and income. Adequate research, putting an upper limit to greed, being within your limits, and playing it safe are keys to making successful investments. The present world has become globalized. Panic and instability in one part of the world spread to the rest too. Therefore, volatility in returns has increased. This makes making learned investments even more essential and highlights the importance of domestic stability.

Investors are recommended to consider the findings of this study to make learned investments. For risk-averse investors, investment in gold is a way to reduce the symmetric risk of their portfolio. Investing a proportion of your capital in gold can protect the investor from the uncertainty of the stock market. The study also implies that one should be quick in investing into gold when he/ she senses uncertainty. This is because rational investors have realised the safe haven characteristic of gold by now and in times of panic, they withdraw their funds from the stock market and invest them into gold. Thus, the findings of this research can help investors involved in portfolio management. Though gold and stock market are cointegrated, there are other variables impacting each of them too. Readers of this research must consider those variables when thinking about investing in gold and stock market.

Every research has its limitations. Even this study could have analysed the safe haven characteristic of gold during COVID-19 in-depth, however failed to do so due to limited data. Drawbacks of the Augmented Dickey-Fuller test, Johansen's cointegration test, Granger Causality test, and Error Correction model also apply.

Future studies could include macroeconomic variables and study their impact on the relationship between the stock market and gold price. Another direction may be to check the relationship of gold with small-cap, mid-cap, and large-cap stocks. The relationship between stock and each of the sectors in BSE Sensex, means on industry stock, energy stock, and transportation stock sector, can also be checked for valuable policy considerations. This study also lends support to the inclusion of uncertainty in the valuation of stocks which has huge implications for financial analysts and academia.

References

A. Patel, S. (2013). Gold as a Strategic Prophecy against Inflation and Exchange Rate. Business Perspectives and Research, 2(1), 59-68.

Abraham, S. (2016). Demand for Gold in a Changing Investment Scenario–A Study in Ernakulam District.

Baur, Dirk & McDermott, Thomas. (2009). Is Gold a Safe Haven? International Evidence. SSRN Electronic Journal. 10.2139/ssrn.1516838.

Beckmann, J., Berger, T., &Czudaj, R. (2019). Gold price dynamics and the role of uncertainty. Quantitative Finance, 19(4), 663-681.

Beckmann, Joscha& Berger, Theo &Czudaj, Robert. (2015). Does gold act as a hedge or a safe haven for stocks? A smooth transition approach. Economic Modelling. 48. 16-24. 10.1016/j.econmod.2014.10.044.

Conlon, T., Lucey, B. M., & Uddin, G. S. (2018). Is gold a hedge against inflation? A wavelet time-scale perspective. Review of Quantitative Finance and Accounting, 51(2), 317-345.

Fang, S., Fan, W., & Lu, T. (2012). Gold Pricing Model During the Financial Crisis. Macroeconomics: Prices.

Ghazali, Mohd Fahmi. (2013). Is Gold a Hedge or a Safe Haven? An Empirical Evidence of Gold and Stock in Malaysia. International Journal of Business and Society. 14. 428-443.

Gokmenoglu, K.K., &Fazlollahi, N. (2015). The Interactions among Gold, Oil, and Stock Market: Evidence from S&P500. Procedia. Economics and finance, 25, 478-488.

Hemavathy, P., &Gurusamy, S. (2014). Gold Mania-A Comparative Study of India, China and United States. Sumedha Journal of Management, 3(4), 88-102.

Hood, M., & Malik, F. (2013). Is gold the best hedge and a safe haven under changing stock market volatility?. Review of Financial Economics, 22(2), 47-52.

Kannan, R., & Dhal, S. (2008). India's demand for gold: some issues for economic development and macroeconomic policy. Indian Journal of Economics and Business, 7(1), 107.

Karmarkar, D.Y., & Vani, S. (2014). " Early Warning Signal System for Economic Crisis : A Threshold and Indicators Approach ".

Khair-Afham, M. S. M., Law, S. H., & Azman-Saini, W. N. W. (2017). Is Gold Investment a Safe Haven or a Hedge for the Malaysian Inflation?. International Journal of Business and Society, 18(1), 51.

Kumar, S. (2017). What determines the gold inflation relation in the long-run?. Studies in Economics and Finance.

Narang, S. P., & Singh, R. P. (2012). Causal relationship between gold price and Sensex: A study in Indian context. Vivekananda Journal of Research, 1(1), 33-37.

Önder, E., Taş, N., &Hepsen, A. (2015). Economic Performance Evaluation of Fragile 5 Countries after the Great Recession of 2008-2009 using Analytic Network Process and Topsis Methods. Journal of Applied Finance & Banking, 5(1), 1-17.

Parikh, P., &Vaish, A. (2013). Gold and investor's perspective in different market conditions. Global Journal of Management and Business Studies, 3(11), 1269-1278.

Parimi, S. (2018). Factor Influencing the Gold Prices: An Empirical Investigation in the Indian Context. Theoretical Economics Letters, 8(15), 3444-3456.

Raju, G. A., & Marathe, S. (2016). Impact of Inflation in India, China and USA on the Gold Prices. Splint International Journal of Professionals, 3(10), 7.

Shobba, C. V. (2017). A study on gold as a safer investment alternative among small and medium investors with special reference to Kozhikod district. International Journal of Research, 5(11), 27-45.

Singh, Narinder & Joshi, Navneet. (2018). Investigating Gold Investment as an Inflationary Hedge. Business Perspectives and Research. 7. 227853371880017. 10.1177/2278533718800178.

Singh, P. (2013). Gold Prices in India: Study of Trends and Patterns,". International Journal of Innovations in Engineering and Technology (IJIET), 2(4), 332.

Singh, R. P., & Kishor, N. (2019). Relationship among gold price, exchange rate and current account deficit-a study in Indian context. International Journal of Business and Globalisation, 23(1), 104-119.