Evolving role of gold in crisis with special reference to India: evidence from assets linkage and policy interventions

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1. Introduction

Long-term financial asset investors seek to optimize their portfolios to improve risk-adjusted return or lower portfolio volatility. They decide to incorporate assets in their investment portfolios that offer them diversification. Some investors want to safeguard their investments from extreme market declines, but others may choose to hedge their portfolios even during normal market conditions. (Manuj, 2021). The desire to include an asset in one's portfolio is heavily dependent on the asset's features and market conditions. (Goodell, 2020). Gold has long been a popular investment option for investors. The global appeal of gold is very explicit. Several distinguishing aspects make gold an appealing investment option around the world. It has been seen as a value store, portfolio stabilizer, liquid asset, and valued money. (Chemkhaa et al., 2021). The commodity is well-known for its potential to hedge against inflation because it moves in tandem with inflation (McCown and Zimmerman, 2016). It protects investors from the loss of buying power caused by inflation or currency devaluation. Given these characteristics, investors and policymakers are keen to understand the viability of gold as an investment asset, especially in uncertain and risky financial market conditions. The current study is an attempt to understand the role of gold during crisis.

2. Background of the study

Over the past several decades, India's financial markets have changed in parallel with the world economy's increasing globalisation, both in terms of value and volume. Risk premiums in emerging markets are twice as high as in mature markets. (Madhur, 2008).. excessive risk premiums encourage risky investments from mature markets to the portfolios of emerging markets, resulting in excessive volatility. Investors are looking for opportunities to participate in financial markets and commodity-related financial products. (Nquyn et al., 2020). As a result, the massive influx of investors into the commodity sector leads to financialization of the industry. The scale and volume of the commodity market rose as a consequence of financialization. This

will leads to a change in conventional role of gold in the financial system. Apart from this, the co-movement of gold with equity market is greatly been affected by the economic and financial crises. The flight to gold phenomenon leads to negative relationship between gold and stock during adverse market conditions. This will make gold as a potential safe haven candidate. Investor sentiments were highly affected during each crisis and their behaviour towards so called safe haven assets can change in such uncertain environment. This in turn, changes the role of gold as an investment asset. The past few decades has been witnessing a sequence of crisis such as dotcom bubble of 2000, Global financial crisis of 2007-09, Covid 19 crisis etc which can change the gold's role as investment asset. Hence the present study is an attempt to understand the changes in role of gold as a result of crisis and financialisation in gold market.

3. Statement of the problem

The choice of assets towards which the investors tilt their portfolio depends on the interdependence between each asset in the financial system. According to modern portfolio theory, this interdependence is measured in terms of the correlation structure between assets. The portfolio strategy of investors is crucial especially when the correlation between assets is time varying. Over last few decades, the financial markets have evolved in tandem with growing globalisation of the world economy; both in value as well as in volumes. The process of financialisation can change the role of many traditional assets. This has also brings greater market risks and volatility. Along with this, the Indian equity market has withnessed severe crises and turbulence times during the past few decades like Dot com bubble in 2000, European debt crisis in 2009-12, global financial crisis in 2007-09, and Covid 19 pandemic etc. Thus, it has never been more important for investors to come up with a quick risk-minimized investment strategy (Ji et al., 2020). Among many, gold is unique asset with distinct characteristics and historical performance of gold created a belief in the mind of investors about its potential to protect the wealth of investors during adverse market conditions (Drake,2021). According to behavioral finance studies (Kahneman 2003), some investors are not entirely rational, and their demands for risky assets are influenced by their views or feelings that are not entirely supported by fundamental facts. Also dynamic market conditions due to the frequent occurrence of crises during the last two decades and the financialisation of commodity market will leads to the movement of markets in tandem with each other. Hence motivated by the elevated market

uncertainty and to substantiate the belief of the investors, it is imperative to test gold's role. The study also examines how far crises and financialisation policies have changed the role of gold in India. The effectiveness of financialisation policies during crisis is also subject of interest of the present study.

4. Review of literature

Researchers have different conceptualizations about gold's role as an investment asset. Generally, the role of gold was classified into hedge, safe haven, and diversifier in the literature (Baur and Lucey,2010). Initially, the role of gold was identified based on its characteristics. Upper (2000), one of the pioneers, described a safe haven asset as an instrument seen as having low risk and being highly liquid. Ronaldo and Soderline (2007) referred a safe haven asset as asset that provides negative risk premium. there was pieces of literature that mainly focused on the safe haven role of gold and defined it as the movement of one asset in the opposite direction of another. For instance, Gulko (2002) defined safe haven assets as those that rally during stock market crashes, exhibiting a negative correlation at those times. A testable scientific definition for the various role of gold was introduced by Baur and Lucey (2010). A safe haven, according to them, is "an asset that is unco-orelated or negatively co-orelated with another asset or portfolio in times of market stress or turmoil." A hedge is "an asset that is unco-orelated or negatively co-orelated with another asset or portfolio on an average." Diversifier is "an asset that is positively co-orelated (but not perfectly co-orelated) with another asset or portfolio on an average." Several authors havvve followed this definition for their study (Ciner et al., 2013; Areal, 2013; Lucey and Li, 2015, Hunt et al., 2018; Bulut and Rizvanoghlu, 2019).

The earlier literature mainly focused on gold's role as a portfolio diversifier since gold is traditionally presumed to provide diversification benefits in portfolio allocation. This long stand belief of the investors is mainly due to the ability of gold to surpass inflation in the long run (Ghosh, 2004). The difference in underlying factors determining the price of gold and other assets strengthened the belief that gold can protect the downside risk of the portfolio (Hoang, 2011). Hood and Malik (2013) opined that adding gold to a stock portfolio significantly improves the return and reduces the portfolio's standard deviation. On the other hand, Aboura et al. (2016) reported that commodities, especially precious metals, reduce the portfolio's risk while offering less return. Ali et al. (2020) opined that compared to a 20% gold-stock portfolio, equally

weighted portfolios considerably provide better diversification. Hoang et al. (2019) added that risk-averse investors prefer stocks with gold in the portfolio, whereas risk seekers construct stock-only portfolios. Aftab et al.(2019) focused on major Asian stock markets. They identified gold's role as a diversifier in normal fluctuation and turmoil periods except in countries such as Thailand, Singapore, and South Korea. They explained that the high volatility of emerging stock markets might be the reason behind the role of gold as a diversifier against Asian stock markets. Dey and Sampath (2018) found that prudent investors should allocate 41% of gold to financial services and information technology stock portfolios in the case of a country like India.

The traditional belief of the investors about gold is rooted in its distinct characteristics and historical performance (Miyazaki et al., 2012). One of the pioneers, Baur and Lucey (2010) highlighted the safe haven property of gold in advanced countries as short lived and contingent upon the severity of shock as represented by the quantiles. Baur and Mcdermott (2010) explicitly analyzed the role of gold during three crises, the 1987 stock market crash, the Asian crisis of 1997, and the Global Financial Crisis of 2007-09. They highlighted that gold was a strong safe haven in the 1987 stock market crash and GFC while gold lost the risk reduction ability in the Asian crisis in all of the markets tested. Miyazaki et al., 2012 found evidence of gold as a refugee asset during the global financial crisis, followed by a structural break in the dynamic conditional correlation. According to the study by Chiang et al., (2013), gold lost its protection against stock market fall during the financial crisis episodes of 2008 due to downside risk during the turmoil period. Baur and Mcdermott (2016) explained the behavior interpretation of safe haven purchases during financial stress and explicitly analyzed gold's role. It was found that gold responds to large economic shocks as a safe haven asset, and the response is short-lived. They argued that there was no negative feedback mechanism from gold to stock during the study period. The behavioral explanation of the safe haven property is based on local thinking, prospect theory, disposition effects, etc. Chkili (2016) analyzed the role of gold as a safe haven against BRICS stock markets in three popular crises, namely, september11/9 terrorist attack, the Global financial crisis, and the European debt crisis. It was concluded that gold acts as a safe haven during crises, but the effects vary depending on the nature of the crises and the reaction of stock market shocks to the crises. Ghazil et al., (2016) are of the opinion that the currency denomination of gold is a factor that determines the safe haven property of gold in Malaysia. They highlighted that gold denominated in local currency is a weak safe haven, whereas gold in

international currency is a strong safe haven. According to them, gold bullion is best investment option than gold account due to the compensating ability of gold bullion during extreme market conditions. Klein (2017) found that safe haven property dissipated in recent years after GFC.

Through the review of existing literature, the following research gaps were identified. Firstly, most studies are carried out in markets where gold is viewed as an investment asset. The studies in the consumption oriented market are emerging. Secondly, the existing empirical evidences are mixed and contradictory in nature and the mixed results can be attributed to the various ways of testing the role of gold. The existing literature employed traditional correlation based methods to ascertain the role of gold during crisis which has limitations thereby leading to an urge of employing other novel methods. Thirdly, though there are theoretical evidences on the importance of financialisation on changes in role of gold during crises, empirical evidences are sparse in this regards. Fourthly, there is lack of studies that taken into account an array of recent crisis to identify the role of gold.

5. Objectives of the study

1. To ascertain the role of gold during crises
2. To examine the impact of crises in changing the role of gold in India
3. To examine the impact of financialisation policies in changing the role of gold in India

6. Theoretical framework of the study

The theoretical foundation of the relationship between financial assets instigates from Modern Portfolio Theory advocated by Markowitz (1952, 1959).The theory uses a mean-variance or return-risk framework to examine the decision related to portfolio choices and diversification. According to the theory, “investors can maximize their wealth by combining risky assets with low risky investments or risk-free assets in the portfolio” (Markowitz, 1952 and Tobin, 1958). The modern theory of optimal asset allocation advocated by Markowitz (1952) states that the portfolio's expected return and variance of return are the criteria to choose an efficient portfolio. “The expected return of a portfolio means the weighted average return of individual securities. The variance of return on portfolio means the variance of and the covariance between individual securities and their weight in the portfolio”. **(**Adewuyi et al., 2019). Covariance is the co-

movement of return of two assets. Covariance used squared deviation and hence the number can not be explained. Moreover, covariance and correlation are related to each other as per the theory. Covariance is the product of correlation between securities and the standard deviation of each of the securities. Therefore, correlation is a used to measure the relationship between two returns. It means that a portfolio must be a combination of financial assets that are less perfectly correlated.The basic idea behind the theory is not to "put all your eggs in one basket.". (Rahim et al., 2015).

Based on this concept, Baur and Lucey (2010) provided traditional definition for the role of gold as hedge, safe haven and diversifier. According to them, A hedge is defined as "an asset that is uncorrelated or negatively correlated with another asset or portfolio on average" It means that the asset is having the hedge property on an average and it does not necessarily hold this property during turmoil period. Similarly, a diversifier assets is "an asset that is positively (but not perfectly correlated) with another asset or portfolio on average". Hence the diversifier asset will not mitigate the losses in adverse turmoil periods, but hold the property on an average. On the other hand, a safe haven is "an asset that is uncorrelated or negatively correlated with another asset or portfolio in times of market stress or turmoil". It means that opposite relationship between safe haven asset and other assets helps the investors compensating for the loss in one market by gain in other market. This is possible by a rise in price of safe haven assets when other market falls during extreme market conditions. Theoretically, an asset that is negatively correlated with other assets on an average (hedge) can co-move with the other assets during turmoil periods (not a safe haven). On the other hand, an asset that is negatively correlated with other assets during extreme market conditions (safe haven) can co-move with other assets on an average (Hedge).The above theoretical model is further extended by Baur and Mcdermott (2010). They have distinguished the hedge and safe haven assets based on the length of the effect. "A strong (weak) hedge is defined as an asset that is negatively correlated (uncorrelated) with another asset or portfolio on average". "A strong (weak) safe haven is defined as an asset that is negatively correlated (uncorrelated) with another asset or portfolio in certain periods only, e.g. in times of falling stock markets."

Followed by Baur-Lucey-Mcdermott paradigm, a plethora of literature employed linear threshold regression framework for the identification role of gold against stock markets. The regression

method assumes theoretical relationship between the variables and determine the endogeneous and exogeneous variable at the beginning of the study. Here comes the importance of time series analysis where instead of assuming the relationship, it determines the relationship between variables theoretically (Hamzah,2018). Also the relationship of variables will change according to market heterogeneity hypothesis of Muller et al., 1997. Hence to account for all these, the study redefines the role of gold based on the literature of Gomis-Porgueras et al.,2021, and Dimitrio et al.,2020.

- Gold is said to be a strong (weak) hedge against stock market if there significant (insignificant) negative or zero correlation between gold and stock on average in the short run /long run
- Gold is said to be a strong (weak) market follower against stock market if there significant (insignificant) positive correlation between gold and stock on average in the short run /long run
- Gold is said to be a strong (weak) safe haven against stock market if there significant (insignificant) negative or zero correlation between stock and gold during specific crisis period in the short run /long run
- Gold is said to be a strong (weak) contagious against stock market if there significant (insignificant) positive correlation between stock and gold during specific crisis period in the short run /long run

7. Research methodology

7.1 Data and variables of the study

The research design is quantitative. The study is descriptive and analytical in nature**.** Data chosen for the study include prices of gold and stock in India. The daily observations for a period of 22 years from 1st January 2000 to 31st March 2022 were taken for the purpose of analysis. The daily closing prices will help to obtain fast response of investors to shocks and investors seek a safe haven for a short period of time (Baur and Lucey,2010). The selection of the study period is based on the availability of data and to accommodate major political, financial and pandemic crises during the last two decades. The aforesaid period is dominated by four major crises namely, Dotcom bubble of 2000, Global Financial Crisis of 2007-09, European Sovereign Debt

Crisis of 2009-2012 and the Covid 19 crisis. The gold price and stock prices are taken in local currencies to get the perspective of local investors. The proxies for gold price in London based gold per troy ounce gold expressed in Rupees for India. The daily prices are retrieved from the website of World Gold Council. The proxies for stock market in India is BSE Sensex. The selection of index is based on the availability of data, its relevance in the economy and significance among the stock markets of the country. The stock prices data were collected from the Thomson's Reuters DataStream. Brent crude oil price and US dollar Indian rupee exchange rate were added as control variables by considering the relationship of gold price with these variables.

7.2 Method of analysis

To determine gold's role in India during crises, the research used an up-to-date and new Autoregressive Distributed Lag model (ARDL). Pesaran and Shin (1999) invented the ARDL limits test, which was later expanded by Pesaran, et al., (2001). The advantage of this model is that it is better when dealing with variables of different order, I(0), I(1), or a mix of both, and it is solid if there is a single long-term connection between each of the variables in a sample of small size. (Nkoro and Uko, 2016). The calculation of an Unrestricted Error Correction Model (UECM) was the focus of this model's approach. The ARDL bounds test is an important component of this analysis because it determines whether variables have a long-run relationship. According to Pesaran et al., the bounds test depends upon the Wald test, resulting in an F-statistic that relates to the asymptotic crucial values. (2001).

For research, the study makes use of Eviews software. The data was checked for stationarity using standard pre-stationarity tests such as the Augmented Dickey Fuller test. Furthermore, the optimum lag duration that minimises the information criteria is chosen by setting the maximum lag to six. Authors such as Anari and Kolari take this strategy. (2002). Using F bound tests, the research determined the long run connection between gold and stock. In the instance of the ARDL model, both the long- and short run values were interpreted in accordance with the study's operational definition. Diagnostic tests were conducted, including the Jarque-Bera test for normality, the test developed by Breusch and Pagan for serial auto correlation, the ARCH test for heteroscedasticity, and RAMSEY's RESET, test for misspecification.

8. Results and discussion

8.1. Identification of crisis period

The current study operationally defined crisis as the period of extreme stock market falls as identified by the Pagan and Sossonov (2003) algorithm. Fig.1 represent the crisis period as identified by the algorithm. Such periods are named based on various references from the literature. Table 1 shows the major crises identified for the study.

Fig.1 Bear markets of BSE SENSEX from 2000 to 2022

Table 1: Major crises between 2000-2022

SL. No	Crisis	Period of crisis	Source
1	Dotcom bubble crisis	13th March 2000t o 9th October, 2002	National Beuro of Economic Research, USA, Kim et al., 2011
2	Global financial crisis	1st August 2007 to 30th June 2009	Federal reserve board of St.Louis(2009), Dimitriou and Kenourgios,2013
3	European debt crisis	5th November 2009 to 31st December 2011	Dimitriou and Kenourgios,2013 and European central bank
4	Chinese stock market crash	15th June 2015 to 30th June 2016	US-china economic and security review commission and and Chen and Wang 2017
5	Covid 19 crisis	31st December 2019 to 31st December 2020	World health organization and Tachibana,2022

8.2. Role of gold during crisis in India

Table 2 Role of gold during crisis in India (Short run)

Crisis Country	Normal period	Dotcom bubble	Global financial crisis	European debt crisis	Chinese stock market crash	Covid 19
India	Strong hedge	Weak safe haven	Weak safe haven	Weak safe haven	Weak safe haven	Strong contagious
Global	Weak hedge	Weak safe haven	Weak contagious	Weak safe haven	Strong safe haven	Weak safe haven

Table 3 Role of gold during crisis in India (Long run)

Crisis Country	Normal period	Dotcom bubble	Global financial crisis	European debt crisis	Chinese stock market crash	Covid 19
India	Weak Hedge	Weak safe haven	Weak safe haven	Weak contagious	Weak safe haven	Strong contagious
Global	Weak hedge	Weak safe haven	Weak contagious	Weak safe haven	Strong safe haven	Weak safe haven

Table 2 depicts the function of gold in India during crises. It can be seen that gold plays a minor part as a safe haven in India. According to the literature, gold plays a small role as a safe haven in emerging markets because investors are going to change their portfolio to a typical portfolio of developed markets rather than buying safe haven assets during a crisis. (Baur and Mcdermott, 2010). During normal fluctuations, gold serves as a powerful hedge in India, and its hedging role is comparable to that of the global market. Gold's strong hedging function demonstrates its risk-mitigation ability throughout normal equity market fluctuations. This implies that gold is being used as an alternative financial asset in India. Except for Covid19, gold serves as a weak secure haven in India during crises. Except in Covid 19, gold compensates investors for losses in the financial markets during big crises. This finding is consistent with the findings of Chkili (2016), who discovered that gold can serve as a safe haven toward extreme BRICS market swings during significant crises. This indicates a significant positive correlation between gold and the stock market. According to earlier research, the flight to gold occurrence during crises can be explained by gold's safe haven property. (Baur and Mcdermott, 2016). The safe haven nature of precious metals towards volatile markets may be due to a significant rise in demand for investments compensating for a decrease in other demand during market disruption times. The total desire for gold is divided into three categories: jewelry, industry, and investment. (Baur and McDermott, 2010). Although the first two gold demands are primarily determined by how much consumers spend and thus associated with the business cycle, the final one frequently functions as a counter-cyclical characteristic (Baur and McDermott, 2010), which may be caused by the time-dependent investment demand for gold. (Hoang et al., 2016). The strong contagious characteristics of gold during the Covid 19 pandemic can be explained by the abundance of alternative sources of refuge during that time, the rapid response from the government during Covid19, and the positive behaviour of investors as well. When assessing the role of gold with the world's markets, there is a difference in function of gold during the financial crisis of 2008 and Cov id 19. Due to the fact that the global financial crisis originated in the United States, excess demand for gold during the crisis can destroy gold's safe haven property due to the liquidity shock effect, wealth effect, portfolio rebalancing effect, and disposition effect (Baur and Glover, 2012). Except for the European debt crisis, gold's role has not altered significantly in the long run. Brunnermeier and Pedersen's loss spiral theory was used to explain the long-run interactions of gold and the stock market's returns during the European debt crisis. (2009).

According to the theory, during an economic downturn, financial intermediaries suffer from wealth effects, which reduce their risk ability to bear and force them to sell all kinds of assets. This common impact intensifies connections between gold and the stock market. This is consistent with Buyuksahin et al., (2010)'s concept of a market of one, which postulates a rise in interactions among unconnected types of assets during turbulent periods, particularly following the global financial crisis.

8.3. Impact of crises in changing the role of gold

It is vital to analyse the impact of crisis in changing the role of gold. The impact is measured through changes in role of gold based on severity of crisis and changes in role of gold based on phases of crisis.

8.3.1 Changes in role of gold based on severity of crisis

Severity of crisis is defined based on arbitrary quantiles of stock market return distribution as proposed by Baur and Lucey (2010). The quantiles 10%, 5% and 1% represent severe, moderately severe and extremely severe markets.

Table 4. Changes in role of gold based on severity of crisis (Short run)

Crisis & severity	10% level	5% level	1% level
Dotcom bubble	Weak safe haven	Weak safe haven	Weak contagious
Global Financial Crisis	Weak safe haven	Weak contagious	Weak contagious
European debt crisis	Weak contagious	Weak safe haven	Weak safe haven
Chinese stock market crash	Weak safe haven	Weak contagious	Weak contagious
Covid 19	Weak contagious	Weak contagious	Weak safe haven

Table 4. Changes in role of gold based on severity of crisis (Long run)

Crisis & severity	10% level	5% level	1% level
Dotcom bubble	Weak safe haven	Weak safe haven	Weak contagious
Global Financial Crisis	Weak safe haven	Weak contagious	Weak contagious
European debt crisis	Weak safe haven	Weak safe haven	Weak safe haven

Chinese stock market crash	Weak contagious	Weak contagious	Weak contagious
Covid 19	Weak contagious	Weak contagious	Weak safe haven

Table 4 demonstrates that gold's role as a weak safe haven has deteriorated to that of a weak contagious instrument during the Dotcom bubble, the Global Financial Crisis, and the Chinese stock market collapse, both in the long and short run. In the instance of Covid 19 and the European debt crisis, gold serves as a refuge as the severity of the crisis grows. This is in line with Baur and Lucey's results. (2010). The explanation for the decline of secured property in extreme circumstances is that the original negative market shock triggers a chain reaction of major and similar shocks, causing investors to sell gold. This, in turn, puts a downward impact on the gold price, diminishing gold's safe haven reputation (Ghazil et al.).

8.3.2 Changes in role of gold based on phases of crisis

Wang et al. (2016) contend that severe risks are more rapidly transmitted in the post-crisis period than in prior to the crisis, an effect linked to gold's refuge or hedging property. For each crisis, the research period is divided into pre-crisis, crisis, and post-crisis periods, with changes in the role of gold found in each period.

Table 5 Changes in role of gold based on phases of crisis (short run)

Crisis	Role of gold during pre crisis	Role of gold during crisis	Role of gold during post crisis
Dotcom bubble	Weak market follower	Weak safe haven	Weak hedge
Global financial crisis	Weak hedge	Weak safe haven	Weak hedge
European debt crisis	Weak hedge	Weak contagious	Weak hedge
Chinese stock market crash	Weak hedge	Weak safe haven	Weak hedge
Covid 19	Weak hedge	Strong contagious	Weak hedge

Table 6. Changes in role of gold based on phases of crisis (long run)

Crisis	Role of gold during pre crisis	Role of gold during crisis	Role of gold during post crisis
Dotcom bubble	Weak market follower	Weak safe haven	Weak hedge
Global financial crisis	Weak market follower	Weak safe haven	Weak hedge
European debt crisis	Weak hedge	Weak contagious	Weak hedge
Chinese stock market crash	Weak hedge	Weak safe haven	Weak hedge
Covid 19	Weak hedge	Strong contagious	Weak hedge

The major change in role of gold happened during dotcom bubble, European debt crisis and covid 19 crisis. The reason for this can be attributed to changes in investor behaviour and sentiments. According to Baur and McDermott (2010) investor buys gold in days of extreme negative return and sell it when market participants regain confidence and volatility is lower

Gold is primarily a weak hedge asset during pre and post crisis and a weak contagious asset during crisis in India during short run as evident from the correspondent analysis shown in figure 2. In the long run gold is a weak safe haven during crisis and a weak market follower during precrisis and a weak hedge during post crisis as evident from figure 3. The role change is more apparent in long run than short run.

Figure 2 Correspondent analysis (short run)

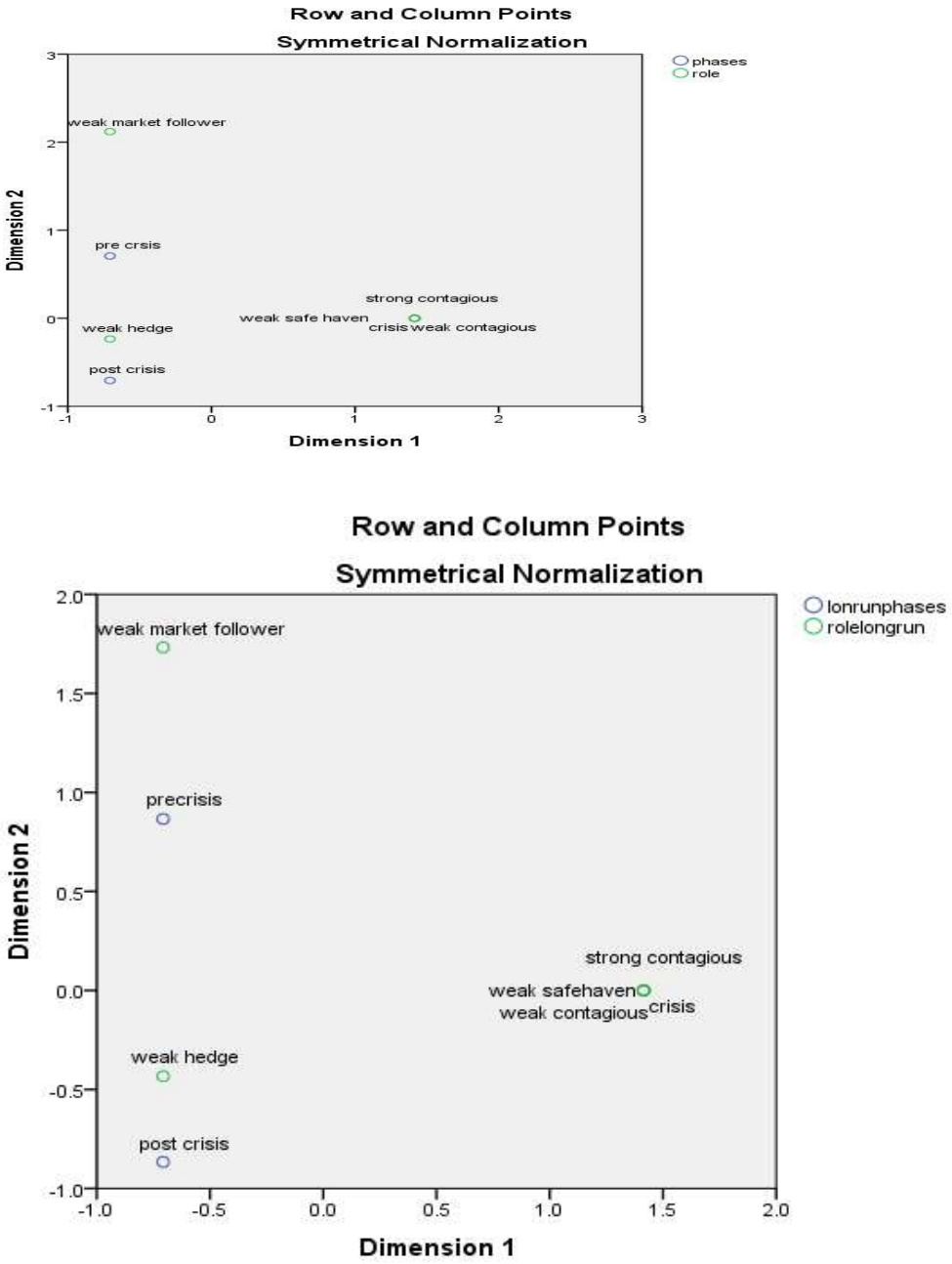

Figure 3. Correspondent analysis (long run)

8.4. Effect of financialisation in changing the role of gold

During the 2000's, commodity market have been chaaracterised by and explosion of various commodity vehicles and huge inflow of money into the market. This process was later described as financialisation (Domanski and Heath, 2007). The theoretical evidence says that the finacialisation process has intensified the correlation between the asset classes and changes the

role of gold. The financialisation process usually referred to an increase in correlation coefficient between asset classes resulting in decrease in diversification benefits. The changes in role of gold as a result of financialisation process is depicted in Table 6

Table 6 Effect of financialisation in changing the role of gold

Event	Effect
Introduction of Gold Futures	Increases the negative co-movement
Introduction of Gold ETF	Decreases the negative co-movement
Introduction of Gold Monetization scheme	Increase of the negative co-movement
Introduction of gold options	Increases the negative co-movement

It was found that introduction of gold derivatives such as gold futures and options have increased the financialisation in gold market as evident from the increase in negative co-movement and thereby a decrease in diversification benefits. Because of the soaring correlations, the inclusion of the gold derivatives in the traditional gold-equity portfolio appears to be no longer reasonable. In other word, the better investment choice would be gold ETF and gold monetization scheme. The mechanism which may leads to soar in correlation related to strategic asset allocation level.. When the increasing number of investors has similar portfolio allocated to stock and gold, and investors try to keep more or less stable asset allocation structure, then the external shocks resulting in capital outflows will enforce selling of all assets classes in a portfolio (Zaremba, 2015). The role of gold will change due to the financilasation process brought by the gold derivatives.

9. Conclusion and implication of the study

The present study identified the role of gold in major gold consuming country, India. The study also attempted to identify impact of crises and financilisation in changing the role of gold. It was found that gold acts as weak safe haven in India for all crises except Covid 19. The study also found that role of gold varies across market conditions (quantiles). The role of gold is relatively stable in India except in Covid 19 where there is unusual behaviour exhibited by gold. Hence Covid19 pandemic itself can be considered as an unusual crisis. As the Covid 19 crises is for a prolonged long period, investors may introduce gold in their portfolios to diversify their

portfolios' risk to a greater extent for value protection. The excess investment demand for gold will destroy its safe haven property as evident from role of gold in the nearby crises (Global financial crises and European debt crisis). The investors must be very prudent in allocating gold to the portfolio. The role of gold as safe haven may not be always holding during extreme stock market conditions. The crises have much impact in changing the role of gold in long run than short run. Investors must take in to account the changing role of gold during long run in different phases of crisis. Also the financialisation brought out by the gold derivatives can change the traditional role of gold. It is advisable to allocate gold ETF and Gold Monetisation schemes to the portfolio because these instruments did not intensified the correlation between gold and stock. Overall, events like crises and financialisation can change the role of gold in India.

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Appendix

Table 1. Descriptive statistics

	Gold return (Rs)	**Stock return (BSE)**
Mean	0.0215	0.0217
Std.Dev.	0.3057	0.3947
Skewness	0.007856	-0.116397
Kurtosis	2.654742	2.677937
Jarque-Bera	26.39371	34.89326
Probability	0.000002	0.000000
Observation	5303	5303

Table 2. Unit root test

Variable	**ADF test**	**Level of integration**	**PP test**	**Level of integration**	**KPSS test**	**Level of integration**
Gold Return	-66.09(0.00)*	1(0)	-66.18(0.00)*	1(0)	0.1819 (0.463)	1(0)
BSE return	-60.29(0.00)*	1(0)	-60.97(0.00)*	1(0)	0.1436(0.739)	1(0)

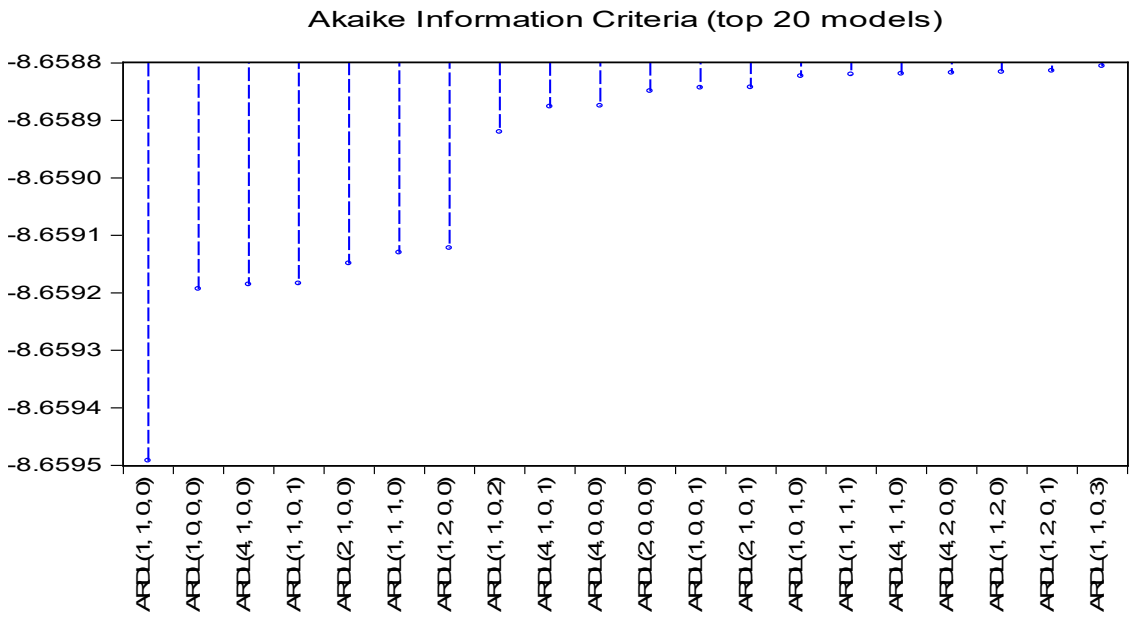

Table 3 Results of ARDL Bound co-integration test

Model	ARDL equation	Optimal lag	F statistic (F_{PSS})	Decision	ARCH	SERIAL	RESET
1	F statistic	(1,1,1,0)	1103.895	Co-integration	1.6145 (0.095)	0.2331 (0.7921)	0.3494 (0.1772)

*** Critical value bounds**

Significance	1(0) Bound	1(1) Bound
10% level	2.72	3.77
5% level	3.23	4.35
1% level	4.29	5.61

Table 4 Role of gold during crisis in the long run

Variable	**coefficient**	**Std.error**	**t statistics**	**Probabilities**	**Role of gold**
STOCK	-0.022351	0.019606	-1.140001	0.2543	Weak Hedge
DB	0.011622	0.036454	0.318827	0.7499	Weak safe haven
GFC	-0.067501	0.039132	-1.724958	0.0846	Weak safe haven

EDC	0.064309	0.038877	1.654144	0.0982	Weak contagious
CSC	-0.049628	0.057123	-0.868789	0.3850	Weak safe haven
COVID	0.127906	0.053846	2.375394	0.0176	Strong contagious
C	0.000206	0.000046	4.472260	0.0000	

Table 5 Role of gold against stock in short run

Variable	coefficient	Std.error	t statistics	Prob.	Role of gold
Gold (-1)	0.086922	0.013494	6.441619	0.0000	
STOCK	-0.042259	0.015106	-2.797400	0.0052	Strong hedge
STOCK(-1)	0.021851	0.011314	1.931407	0.0535	Weak diversifier
DB	0.010612	0.033286	0.318816	0.7499	Weak safe haven
GFC	-0.061633	0.035761	-1.723472	0.0849	Weak safe haven
EDC	0.032944	0.037423	0.880305	0.3787	Weak safehaven
CSC	-0.060738	0.054077	-1.123195	0.2614	Weak safe haven
COVID	0.140323	0.052119	2.692343	0.0071	Strong contagious
ECM(-1)	-0.913078	0.013494	-67.666786	0.0000	
C	0.000198	0.0000	4.517225	0.0000	

Adjusted R square: 0.023516
F statistic: 11.58144 (0.000

Table 6 Changes in role of gold based on severity of crises (Short run)

Crisis	$q_{(0.05)}$ (b0+b2)	Role of gold	$q_{(0.01)}$ (b0+b3)	Role of gold
Dotcom bubble	0.05854 (0.4171)	Weak contagious	0.006 (0.7415)	Weak contagious
Global financial crisis	0.0953 (0.2697)	Weak contagious	0.3621 (0.0373)	Strong contagious
European debt crisis	-0.1360 (0.640)	Weak safe haven	-0.2519 (0.3956)	Weak safehaven

Chinese stock market crash	-0.1413 (0.892)	Weak safehaven	0.2409 (0.3757)	Weak contagious
Covid 19 crisis	0.3980 (0.0875)	Weak contagious	-0.2387 (0.2547)	Weak safehaven

Table 7 Changes in role of gold based on severity of crises (Long run)

Crisis	$q_{(0.05)}$ (b0+b2)	Role of gold	$q_{(0.01)}$ (b0+b3)	Role of gold
Dotcom bubble	0.04017 (0.4185)	Weak diversifier	-0.0167 (0.7413)	Weak safe haven
Global financial crisis	0.3210 (0.2751)	Weak diversifier	0.6632 (0.040)	Strong contagious
European debt crisis	-0.2059 (0.642)	Weak safe haven	-0.3059 (0.3975)	Weak safe haven
Chinese stock market crash	0.2763 (0.892)	Weak contagious	0.7115 (0.369)	Weak contagious
Covid 19 crisis	0.3738 (0.0893)	Weak contagious	-0.2949 (0.2955)	Weak safe haven

Table 8 Changes in role of gold based on phases of crisis (Short run)

Crisis	Pre crisis period	Role of gold	Role of gold during crisis	Post crisis period	Role of gold
Dotcom bubble	0.3059 (0.9505)	Weak market follower	Weak safe haven	-0.0469 (0.1492)	Weak hedge
Global financial crisis	-0.0129 (0.5591)	Weak hedge	Weak safe haven	-0.07594 (0.2961)	Weak hedge
European debt crisis	-0.0131 (0.6136)	Weak hedge	Weak contagious	-1.4108 (0.6684)	Weak hedge
Chinese stock market crash	-0.03541 (0.3576)	Weak hedge	Weak safe haven	-0.0867 (0.8677)	Weak hedge
Covid 19	-0.0573(0.9185)	Weak hedge	Strong contagious	-0.0214 (0.9499)	Weak hedge

Table 9 Changes in role of gold based on phases of crisis (Long run)

Crisis	Pre crisis period	Role of gold	Role of gold during crisis	Post crisis period	Role of gold
Dotcom bubble	0.3563 (0.9505)	Weak market follower	Weak safe haven	-0.03426 (0.1482)	Weak hedge
Global financial crisis	0.00073 (0.5591)	Weak market follower	Weak safe haven	-0.06891 (0.2962)	Weak hedge
European debt crisis	-0.00041(0.6137)	Weak hedge	Weak contagious	-0.08314(0.6654)	Weak hedge
Chinese stock market crash	-0.0226(0.3576)	Weak hedge	Weak safe haven	-0.0794 (0.8677)	Weak hedge
Covid 19	-0.0474(0.9185)	Weak hedge	Strong contagious	-0.0077 (0.9499)	Weak hedge

Table10. Effect of financialisation in changing the role of gold

variables	Coefficient	T statistics	Remarks
GOLD(-1)	0.087112	6.458639*	
STOCK	-0.041072	-3.604126*	
Gold futures	0.000331	2.186467 *	Significant impact
Gold ETF	-0.000153	-1.172959	Weak impact
Gold Monetisation Scheme	-0.000194	-1.223859	Weak impact
Gold options	0.000198	1.154869	weak impact
C	0.00000	0.44516*	

* Significant at 1% level