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Impact of COVID-19 Pandemic on Gold Price Volatility: Evidence from Indian Gold Market

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Abstract: ***The outbreak of COVID-19 had an adverse impact on the stock markets across the globe. Indian financial market has also witnessed a major setback with fall in the value of the investor's holdings. Gold has always been considered as the safe heaven for investment even in the times of crisis. With this idea, the paper aims to identify the impact of COVID-19 pandemic on Gold Price Returns in Indian Market. The study takes into account the daily closing Gold Price data from 1st July 2019 to 31st August 2020 in order to compare the Pre-COVID and During-COVID Gold Price and to assess the impact of COVID 19 on Gold Price fluctuations. The study used GARCH (1,1) Approach to estimate volatility due to COVID. The results revealed that there is a higher persistence of volatility shock/ volatility clustering in gold price return during COVID-19 Pandemic.***

Keywords: COVID-19 Impact, Gold Market, Fluctuations, GARCH

1. Introduction

The COVID-19 pandemic is the biggest economic shock the world has witnessed in decades. Its continued spread has devastated the world economy and has reduced the economic activity in most of the countries. Though the first case of COVID-19 was reported in India towards the end of January 2020, the adverse effects emanating from the pandemic was already pulsating in the Indian economy. Undoubtedly, the pandemic has worsened the economic problems in the country with a daunting impact on human lives and also on all sectors of the economy including stock market. Many researchers have tried to analyze the impact of the pandemic on the stock market returns pertaining to different economies worldwide.

Traditionally, people used to invest in Gold as a hedge against inflation and other financial crisis. Even experts opine that investors should invest a portion of their funds in gold not only as hedge against inflation but also during the time of financial crisis and occurrence of catastrophic events. Therefore, the present study attempts to understand the impact of COVID-19 pandemic on Indian Gold Market, specifically to understand the volatility in Gold Price returns before and during the pandemic.

2. Literature Survey

Ever since the outbreak of the COVID-19 pandemic, numerous research and arguments are being carried out to understand the cause and effect of COVID-19 on all segments of the economy. Due to the inter-dependencies of the stock markets worldwide, the stock markets are susceptible to to economic tremors, which has been precisely highlighted by Chen et al. (2007, 2009) mentioning about the impact of severe acute respiratory syndrome (SARS) on stock markets. COVID-19 has created substantial confusion and mayhem in global economics (Baldwin & Di Mauro, 2020) The unprecedented crisis could mainly affect stockholders' wealth due to the bank-run effect (the public to lose confidence in solvent banks) and the informational effect (the information about asset quality could lead investigators to revise their valuation of other banks; Aharony & Swary, 1983).

Due to the nervous stock price responses to COVID-19, the cumulative stock market chopped down sharply and resulted in the health crisis being transformed into a financial and economic crisis (Ramelli& Wagner, 2020). The Dow Jones and S&P share prices in the United States have dropped by over 20%. It had a significant impact on the financial markets in China and USA, evidence from Shanghai stock exchange and New York Dow Jones share markets (Sansa, 2020). Behavior of stock market is an early and visible evidence of the recent COVID-19 pandemic. It has adversely impacted the stock market (Baker et al., 2020; Ichino et al., 2020).

In this context it can be observed that Choudhry (2000) studied the day-of-the-week consequence on seven developing Asian stock market returns and volatility. This study used the GARCH model and daily returns data from India, Indonesia, India, Malaysia, South Korea, Thailand, Philippines, and Taiwan for the time frame of January 1990 to June 1995. It found the presence of the day-of-the-week effect on both the parameters. Although both return and volatility were not alike in all the cases, the result could have resulted from a spill-over effect from Japanese stock market.

Dutta et al. (2017) inspected the impact of the oil market uncertainties in the African and Middle East markets the stock market fluctuations. Using the extended version of the GARCH and the GARCH-jump models, the authors concluded that oil market uncertainties have a massive impact on the volatility of stock markets. Raza et al.

(2018) in their study confirmed the positive association exists between worldwide economic uncertainties and gold. Further, Ichev and Marinč (2018) discovered that the effect on stock prices of US corporations, which were exposed to the Ebola virus pandemic, was sturdiest when compared with other unexposed stock prices.

Applying the Wavelet Method to daily data of COVID-19 deaths and Bitcoin prices from 31st December, 2019 to 29th April, 2020, Goodell and Goutte (2020) deciphered that the increase in COVID-19 cases across the globe gave rise to an increase in the prices of Bitcoin.

There is a measured scale up with a strong underpinning of increasingly relevant studies directing to the impact of health pandemics on stock across the world. Al-Awadhi et al. (2020) critically examined the impact of COVID-19 on the Chinese stock market with the help of Panel Testing Analysis and concluded that returns across all sectors and corporations were undesirably impacted by the pandemic.

Sharif et al. (2020) applying the Coherence Wavelet Method to daily data on COVID-19 and US stock price index (Dow Jones 30 Index) among other markers, found an unparalleled sensitivity of the stock market to COVID-19. Further, Albulescu (2020) using a Simple Ordinary Least Squares (OLS) Regression Model to COVID-19 numbers on the global indices examined that the pandemic caused a turbulent increase in the volatility of the US financial markets. Cox et al. (2020) using the Dynamic Asset Pricing Model found noteworthy variations in the pricing of US stocks, which was ascribed to COVID-19 induced responses of the Federal Reserve. Likewise, Baek et al. (2020) relying on daily macroeconomic pointers, US stock index values, and COVID-19, confirmed that the COVID-19 outbreak impacted the US stock market volatility.

Significantly, a study by Ali et al. (2020) uses daily prices and returns of Morgan Stanley Capital international indices of the top nine countries with COVID-19 confirmed cases along with some regional indices and applied the EGARCH model in their empirical analysis. The results show a inverse effect of the COVID-19 crisis on the returns of most financial securities while noting that securities became more volatile as a result of the COVID-19 deaths. Moreover, Papadamou et al. (2020) assessed how the use of Google Tend Synthetic Index regarding coronavirus affects the implied volatilities of 13 main stock markets in Europe, Asia, USA and Australia using panel data analysis and deciphered that increased search queries for COVID-19 had a direct impact on unpredictability and the pandemic had an incidental effect, which was guided through stock returns due to risk-aversion with Europe recording a stronger effect. Furthermore, Gunay (2020) examined how the stock markets in the US, UK, China, Italy, Spain and Turkey have been impacted by COVID-19 using the Iterative Cumulative Sum Of Squares Test, Dynamic Conditional Correlation – Multivariate Generalized Autoregressive Conditional Heteroscedasticity And Dynamic Conditional Correlation indicated that the stock markets exhibited structural breaks in the volatility of their indexes. Undoubtedly, the global financial architecture has not been spared the rippling effects of the novel COVID-19 pandemic.

3. Problem Definition

The emergence of COVID-19 had a negative influence on stock markets around the world. The Indian financial market is also badly hit due to a drop in the value of investor holdings. Even in times of crisis, gold has always been seen as a safe haven for investment. The current study seeks to comprehend the influence of the COVID-19 pandemic on the Indian gold market, especially the volatility in gold price returns prior to and during the epidemic.

4. Methodology/Approach

The study used GARCH (1,1) model by using daily time series data of gold price from July 2019 to August 2020. The total sample period was divided into two parts namely, Pre-COVID Period (July19 to Jan 20) and COVID Period (Feb 20 to Aug 20) with a total of 306 observations. To test the stationarity of the time series data Augmented Dickey Fuller (ADF) Test and Phillips Perron (PP) Test is used. The data was tested for heteroscedasticity and GARCH (1,1) model is then applied to estimate the volatility of the Indian Gold Market for different sample period namely, Pre-COVID Period; COVID Period and for the entire sample period in order to identify if COVID has any impact on the Gold Market/ Gold Price Volatility.

5. Results and Discussions

Empirical Results

The descriptive statistics and the empirical results of the study is presented below;

Descriptive Statistics:

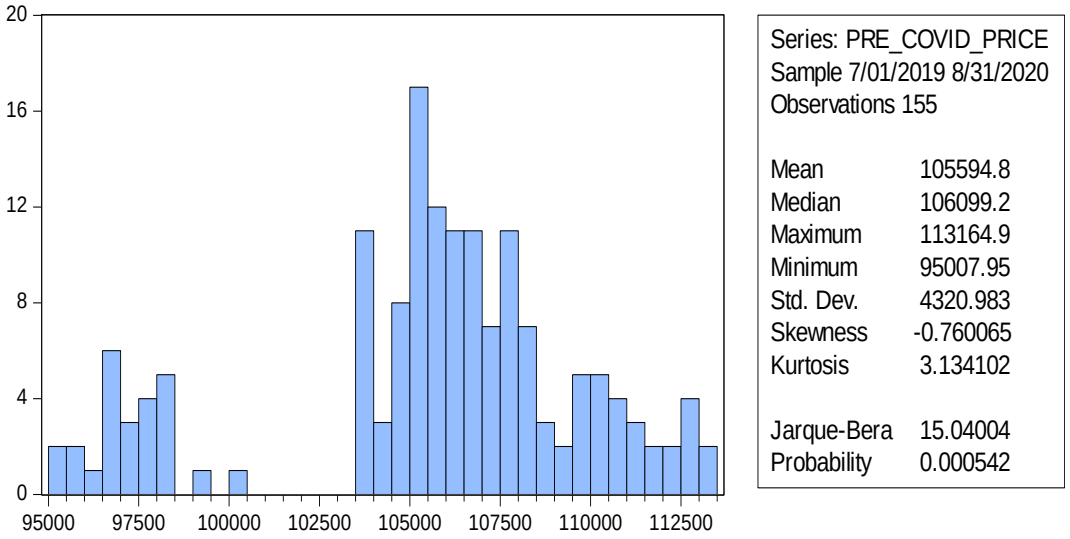
Table 1: Showing Descriptive Statistics of Daily Gold Price

Descriptive Statistics	Pre COVID-19 Period	COVID-19 Period	Full Sample Period
Mean	105594.8	129737.6	117508.4
Median	106099.2	130182.7	111565
Maximum	113164.9	154901.9	154901.9
Minimum	95007.95	110494.3	95007.95
Std. Dev.	4320.983	10729.09	14567.51
Skewness	-0.760065	0.107172	0.589762
Kurtosis	3.134102	2.51179	2.263305
Jarque-Bera	15.04004	1.788673	24.65846
Probability	0.000542	0.408879	0.000004
Sum	16367194	19590384	35957578
Sum Sq. Dev.	2.88E+09	1.73E+10	6.47E+10
Mean Return	11.56651	11.76986	11.66686
SD of Return	0.041643	0.082902	0.120937
Observations	155	151	306

It is evident from the above Table No:1 that the gold price has increase during the COVID period as compared to Pre-COVID period. The mean returns were also higher during the COVID period i.e 11.77 as against 11.57 pre-COVID and 11.67 for the full sample period. The standard deviation of return was also higher during COVID and for the full sample period as compared to pre-COVID period. From

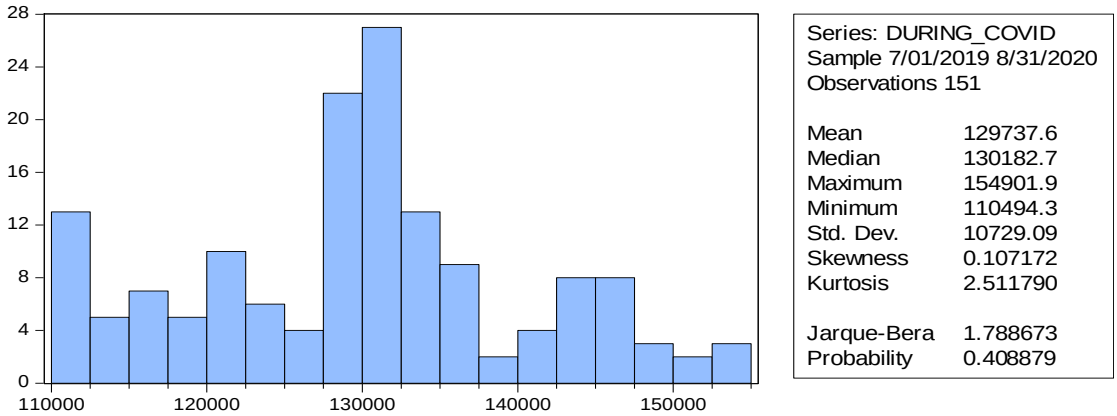
these statistics it is clear that COVID had definitely impacted the Gold Price and its return.

The Normal Distribution of the Gold Price Data Pre-COVID, During COVID and for the full sample period are presented in the Graph Below.



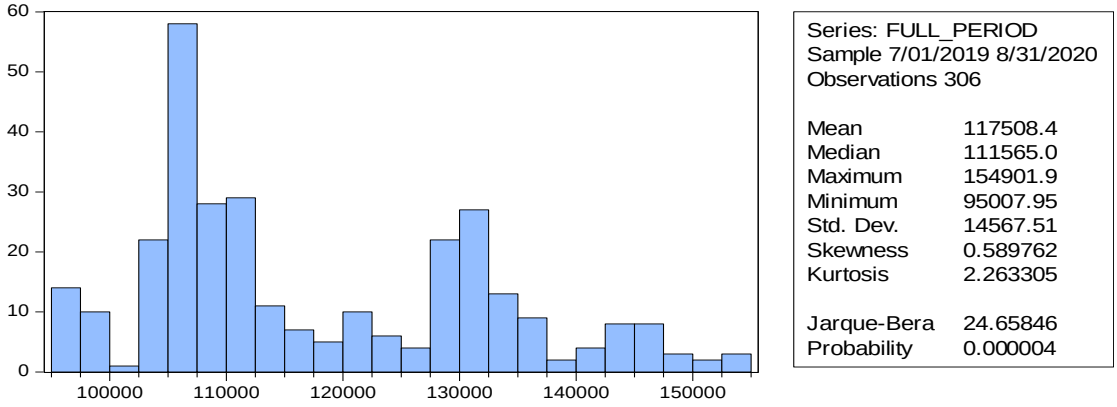
Graph 1: Showing Normal Distribution Curve of Pre-COVID Gold Prices

The normal distribution curve for Closing Gold Prices before COVID Period is negatively skewed with a value of -0.760065. The Kurtosis vale is 3.134102 which signifies that the distribution is Mesokurtic. All the descriptive statistics for the distribution is highly significant with a p-value of 0.000.



Graph 2: Showing Normal Distribution Curve of Gold Prices during COVID

The normal distribution curve for Closing Gold Prices during COVID Period is positively skewed with a value of 0.107172. The Kurtosis vale is 2.5117902 which signifies that the distribution is Platykurtic. All the descriptive statistics for the distribution is not significant as the p-value is greater than 0.05.



Graph 3: Showing Normal Distribution Curve of Gold Prices for Full Sample Period

he normal distribution curve for Closing Gold Prices for the entire sample period is positively skewed with a value of 0.589762. The Kurtosis vale is 2.263305 which signifies that the distribution is Platykurtic. All the descriptive statistics for the distribution is highly significant as the p-value of 0.000.

As far the distribution of sample is concerned it is found that the Kurtosis is more flatter during COVID period and for the entire sample as compared to pre-COVID period. The distribution was negatively skewed before COVID period as compared to positive skewness during COVID and for entire sample. The standard deviation was lower in the pre COVID period which has increased during COVID and for also for the entire sample period. Therefore, from the above graph and descriptive statistics it is clear that there is an impact of COVID 19 pandemic on Gold Price.

Stationarity Test:

Stationarity of the series implies that the mean, variance and the covariance are constant over a time period and do not vary with time. If the mean, variance and covariance vary with time then the series is said to have unit root or non-stationary. In the present study the stationary test is done in order to evaluate the behaviour of gold price before and during COVID outbreak with a view to assess the trend and predictability of the series. The stationarity test also helps to understand if the COVID shocks on gold market will be permanent or very brief. Accordingly, two Stationarity tests namely, Augmented Dickey Fuller (ADF) Test and Phillips Perron (PP) Test is done on three different samples pre-COVID-19 Period, COVID-19 Period and Full Sample Period to check if there is any difference in the stationarity of the different series.

Table No: 2 Showing Phillips-Perron Test (PP) for Closing Gold Price

Null Hypothesis: Closing Gold Price has a unit root

Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Pre COVID-19 Period				COVID-19 Period				Full Sample Period			
		At Level		At First Difference		At Level		At First Difference		At Level		At First Difference	
		Adj. t-Stat	Prob.*	Adj. t-Stat	Prob.*	Adj. t-Stat	Prob.*	Adj. t-Stat	Prob.*	Adj. t-Stat	Prob.*	Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.740		-11.697		-1.189		-11.778		-0.401		-16.769	
Test critical values:	1% level	-3.473	0.409	-3.473	0.000	-3.474	0.679	-3.475	0.000	-3.452	0.906	-3.452	0.000
	5% level	-2.880		-2.880		-2.881		-2.881		-2.871		-2.871	
	10% level	-2.577		-2.577		-2.577		-2.577		-2.572		-2.572	

*MacKinnon (1996) one-sided p-values.

Table No:3 represents the Augmented Dickey Fuller Test at Level and at First difference for all the three sample sets. From the table it is clear that all the samples were non-stationary at level and stationary at their first difference with p-value close to Zero respectively. Table No:3 represents the Phillips-Perron Test (PP) at Level and at First difference for all the three sample sets which is found significant at first difference with p-value close to Zero

Table No: 3 Showing Augmented Dickey Fuller Test (ADF) for Closing Gold Price

Null Hypothesis: Closing Gold Price has a unit root

Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		Pre COVID-19 Period				COVID-19 Period				Full Sample Period			
		At Level		At First Difference		At Level		At First Difference		At Level		At First Difference	
		t-Statistic	Prob.*	t-Statistic	Prob.*	Adj. t-Stat	Prob.*	Adj. t-Stat	Prob.*	Adj. t-Stat	Prob.*	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic		-1.734		-11.712		-1.237	0.658	-11.724		-0.520		-16.670	
	1% level	-3.473	0.411	-3.473	0.000	-3.474		-3.475	0.000	-3.452	0.884	-3.452	0.000
	5% level	-2.880		-2.880		-2.881		-2.881		-2.871		-2.871	
Test critical values:	10% level	-2.577		-2.577		-2.577		-2.577		-2.572		-2.572	

*MacKinnon (1996) one-sided p-values.

Gold Price Return:

The study focused on the logarithmic return rate of gold price rather than the gold price, because the rate of return can nullify the effect of unit root in the time series data to some extent and satisfy the weak stationary requirements. The Gold Price Return is calculated as follows;

$rt = \ln(Pt) - \ln(Pt-1)$

Where, Pt be the daily closing gold price.

GARCH Model:

Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) is an econometric model used in analyze time-series data where the series is heteroskedastic or the variance error are serially auto-correlated. GARCH models assume that the variance errors follow an auto regressive moving average. From the gold price data, it is found that there is heteroskedastity or ARCH effect. There for GARCH(1,1) model is applied to

predict the volatility of Gold Price returns. The GARCH (1,1) Model estimated is presented below.

Table 4: Showing GARCH(1,1) Model for Pre-COVID Period

	Variable	Coefficient	Std. Error	z-Statistic	Prob.
Variance Equation					
Pre-COVID	C	0.255374	0.111189	2.296762	0.0216
	RESID(-1)^2	0.205919	0.090483	2.27577	0.0229
	GARCH(-1)	0.441626	0.186757	2.364707	0.0180
During COVID	C	0.087428	0.055693	1.56982	0.0505
	RESID(-1)^2	0.180747	0.063794	2.833308	0.0046
	GARCH(-1)	0.798277	0.068824	11.59878	0.0000
Full Sample	C	0.100016	0.035271	2.835621	0.0046
	RESID(-1)^2	0.185698	0.049683	3.737682	0.0002
	GARCH(-1)	0.746097	0.060198	12.39409	0.0000

The above table shows the variance equation of GARCH (1,1) model. It is clear from the model that all the coefficients are positive less than 1 and also the sum of the coefficients is also positive and less than 1 which is very significant at 5% levels. The model clearly establishes the presence of time varying conditional volatility in the returns of gold price. The result also indicates that there is a higher persistence of volatility shock in gold price return during COVID and in the entire sample period as compared to pre-COVID period as the sum of the coefficients are higher in COVID and full sample GARCH model.

3. Conclusion

The key object of the present study is to examine the impact of COVID -19 Pandemic on Indian Gold Market. The descriptive statistics revealed that the gold price has increase during the COVID period as compared to pre-COVID period with a comparatively higher return during the COVID period. The Pre-estimation tests to confirm the presence of unit root in the gold price data found to non-stationary at level and stationary at first difference. The GARCH (1,1) model is applied to test the impact of COVID shocks on the Gold Price Pre-COVID and during the COVID period and found that the presence of time varying conditional volatility in the returns of gold price. It is also observed that there is a higher persistence of volatility shock/ volatility clustering in gold price return during COVID.

4. Future Scope

This study has only focused on the impact of Covid-19 on Indian Gold Market. There is a lot of scope for future researchers to make a comparative study of Covid-19 impact on different financial markets as well.

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