A COMPARATIVE STUDY OF RELATIONSHIP OF GOLD ETFs WITH INDIAN CAPITAL MARKET INDEX AND EXCHANGE RATE

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ABSTRACT

The last few weeks have turned out to be a roller-coaster ride as we saw the COVID-19 pandemic intensify as it moved from China and engulfed most of the developed world. Apart from unprecedented policy actions like synchronized national lockdowns to counter the spread of the virus, and "do whatever it takes" monetary policies to cushion the economic disruption; we also witnessed global stock markets lost about a quarter of their value due to corona-driven panic selling. But Gold, like in past similar crises, had flourished. This paper empirically investigates the causal relationship of 3 Gold ETFs traded on NSE with Market Index (Nifty 200) and with the Exchange rate (USD to INR). An attempt has been made to study whether the relationship between variable change during the period of crisis. The period considered for the study is from January 2010 to September 2020 and this has been considered in 2 parts; the full period and during COVID-19 driven crises period. Techniques of time series analysis have been used to measure the causal relationship between the variables. The paper also tried to capture the performance trend of Gold ETFs in comparison to a stock market index and movement in the Exchange rate. Granger causality test applied on both the sub-periods provide reasonable evidence that indicates the existence of unidirectional causality running from INDEX and 3 Gold ETFs in the study during the crisis. However, no such causal relationship exists between the Gold ETFs and Exchange rate.

INTRODUCTION

Gold has a deep-rooted significance in Indian history. Over the years, India's passion for gold turned stronger, with Indians consuming the most gold globally. A majority of the Indian population survives on meager resources, yet they buy gold and make it an integral part, irrespective of gold rates prevailing in their area.

Recent weeks have turned out to be a roller-coaster ride as we saw the COVID-19 pandemic rapidly intensifying as it moved on from China and engulfed almost the entire world, with cases and fatalities rising across the world. As a result of this, unprecedented policy measures like synchronized national lockdowns to control the rapid spread of the virus and do whatever it takes monetary policies from the central bank to cushion the economic disruption were taken. We also witnessed stock markets worldwide lost about a quarter of their value due to virus-driven panic selling. Further, we all witnessed the health crisis snowball converting into an economic one with the world quickly moving from fears of a recession to indeed a recession. However, gold helped investors get through it. The following are a few reasons behind it:

1. During the recession, counterparty risks increase in paper assets like bonds. However, on the other hand, gold cannot default, go bankrupt, or fail to carry out its end of the deal. The value of gold sustains despite the recession as it is backed up not just by paper promises but by inherent value.
2. Gold does not require a business to keep it afloat, unlike equity-based securities. Gold's value does not seem dependent on profits and revenues. Gold is hence put in an advantageous position as losses hit stocks during an economic downturn.
3. To reignite economic activities, central banks cut rates to increase the economic system's money supply. As a result, fixed-income instruments will yield lower or re-price at a lower interest rate. This lowers the opportunity cost of holding gold, further increasing its attractiveness as an asset class in a low-yielding recessionary environment.
4. Central banks infuse money into the economy by bond-buying programs to dodge a system-wide collapse and boost economic activity. With excess money supply in the economy, there builds a probability of higher inflation over the next few years, lowering the purchasing power of the currency being held. On the contrary, gold has a reliable store of value as it cannot be printed or created at central banks' discretion.
5. The value of gold rises during economic distress and crisis as people escape from risky assets and invest in gold's safety. Thus, gold attracts more flows, and this momentum, in turn, ensures further gains.

Gold is thus proved to be an ideal asset class to hedge portfolio get through a recession. Because of the nationwide lockdown, there are restrictions on the movement of people and non-essential goods, making it difficult for investors to source physical gold coins and bars for their investment needs. This difficulty could be tackled by choosing to allocate their investment in gold via the gold fund route. Gold funds are well regulated and operate despite the lockdown. It has become a preferred way to invest in the precious metal as investors can sit in the safety and comfort at home and buy and sell it as and when they want.

It is important to understand the relationship between the Gold and Capital Market Index. The general established view is that they are negatively linked; when the stock goes up, the Gold dives, and vice versa. There could be two scenarios to explain the relationship. The first could be short-term, and the other could be long-term. Let us take an example for understanding these scenarios.

a. **Short-term:** A farmer has limited land on which he decides to grow 'Apples' and 'Oranges.' After some time, the price of 'Oranges' starts to fall. Being a businessman, the Farmer decides to increase the supply of 'Apples' and reduce 'Oranges' to ensure that he earns more or less the same. This way, a farmer is utilizing his limited land in a better manner. This same human behavior applies to Stock prices and gold. Both Equity and Gold are asset classes. People invest money in these two with the view of earning returns on their investments.

When there is a boom in the Stock Market, Equity as an Asset class becomes more attractive, and people try to invest more money in the Stock Market. People have limited resources. Thus, money here is a limited resource. With little money to invest in their hand, people will invest more in Equity, and less will be left to invest in gold.

However, if the Stock Market crashes, people will fear putting money in Equity. In such a case, they will find other Asset classes like gold, fixed deposits, amongst others, more attractive and put their money there. Hence, theoretically, there is an inverse relationship between gold and the stock market in the short term. This happens primarily due to psychological reasons.

b. **Long-term:** In the long term, all the Asset class (fundamentally strong) perform well. Figure 1 depicts how gold and the stock market has performed in the past 20 years.

Figure 1: Gold Vs. Nifty Chart
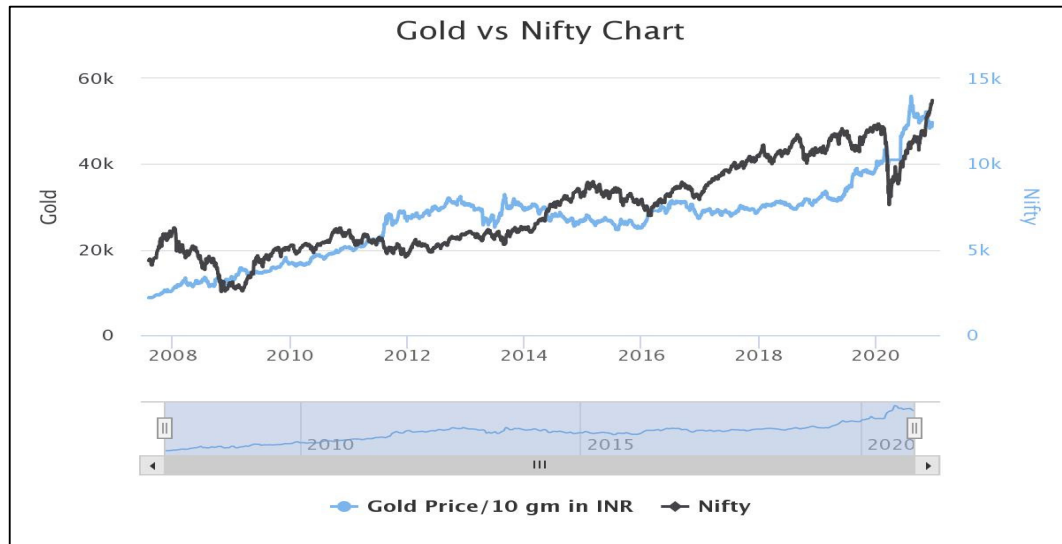
Source: equityfriend.com

LITERATURE REVIEW

There are various studies, technical papers, and articles expressing aspects that influence stock market prices and Gold prices at the global level, such as:

Ahmad Nawaz, Sara Moomal (2012) studied the volatility in gold price returns and their investigation. They used the standard deviation as a Descriptive Modeland GARCH as an Econometric Model to study volatility. They observed a mean reversion in their study, showing that the alpha and beta are far from 1, which made them conclude that gold prices have been volatile.

Mishra P.K (2010) analyzed the causality relation between domestic gold prices and India's stock market returns. Their study considered the domestic gold prices and stock market returns based on the BSE 100 index. They investigated the Granger causality in the Vector Error Correction Model for the period from 1991 to 2009. Their study provides evidence of feedback causality between the variables, which infers that the Gold prices Granger-causes stock market returns and the stock market also returns Granger-causes the gold prices in India during the sample period, which made them conclude that both the variables contain some significant information for the prediction of one in terms of another.

Qureshi Saba (2019) examined the asymmetric and spillover effects among gold, exchange rate, and Pakistan's sectoral stock returns. The Threshold GARCH model observed that both gold and exchange rates' volatilities transmit to each sectoral stock return in the overall sample period. The variations in gold returns lead to variation in the exchange rate and vice versa. They observed in their study that gold and exchange rate spillover effect on sectoral stock returns is significantly higher in times of pre-Asian financial crisis than other sub-periods, along with the bidirectional mechanism of volatility contagion between gold and exchange rate. Their findings provide weak evidence on volatility spread between gold and exchange rate in the course of a post-global financial crisis phase.

Tripathy Naliniprava (2016) performed a research study investigating the integration between Gold and Stock market prices (Nifty) using monthly time series data. This study uses the Unit root test, Correlation test, Granger causality test, and Johansson's co-integration test to evaluate their relationship. Her study found no causal relationship between the Gold Price and Stock market price in the short run. The CUSUM test also confirms that the long-run relationship is a presence in-between Gold and Stock market price and exhibits the stability of coefficient. The study concluded that the Stock market price could be used to predict the Gold price. Her study also recommended that integration between Gold and Stock market price necessitates global investors' need to follow the portfolio stock selection strategy to add value from investments in India. However, the scope of these opportunities is limited in the short-run.

Maryam Al-Ameer, Walaa Hammad, Arrej Ismail, Allam Hamdan (2018) considered the relationship between two main economic variables, namely, gold and the Stock market in Germany that is represented by the HDAX Index under the Frankfurt Stock Exchange. Their study used the Descriptive statistic tests, Pearson's correlation test, Unit root test to assure data are stationary for the Johansen's Co-integration test and the Granger Causality test. They divided the data were into three periods: Pre, during, and post to the financial crisis to measure the different effects in each period. The results showed that there is a correlation between gold and the stock market that differs in each period, there was a moderate positive correlation, before the financial crisis, there was a very strong positive correlation, during the financial crisis, the correlation was positive but weak and low which means it is insignificant, while during the period after the financial crisis a strong high negative correlation was observed. The co-integration test results were all the same for all three different periods (before, during, and after the financial crisis), and there is a long-run relationship between the gold and stock market (represented by the HDAX Index). The same observation applies to the Granger causality test, as there was no Granger causality (No Cause-effect relationship) between gold and the stock market.

Nawaz Nishad (2013) performed the study to understand investors' various investment options; factors need to be aware of and know-how of investing in gold; pros and cons of different forms of investments, and to assist investors in creating awareness about various gold

investment options. For the study, they collected primary data and Secondary data. Primary data consists of a questionnaire and secondary data through the website, research papers, and magazines. This study found that many investors still prefer jewelry, gold coins, and gold bullion bars forms of investment. They prefer to invest in ETF and Futures and options that give investors more returns/profit and an easy form of investment.

Lahoti Jyoti (2017), in her study, focused on various gold investment schemes available in the market and furthered the investor's attitude towards the investment. This study aimed at collecting investor's responses towards investment in gold. Pros and cons of investing in gold have been elicited. She threw light on the different avenues of gold investment available in the market. This study tried to ensure that gold becomes tradable and generates revenue rather than lying idle as a dead investment.

Choudhry Taufiq, Hassan Syed H., Shabihave Sarosh (2015) investigated the nonlinear dynamic co-movements between gold returns, stock market returns, and stock market volatility during the global financial crisis for the UK (FTSE 100), the US (S&P 500), and Japan (Nikkei 225). Initially, the bivariate dynamic relationships between i) gold returns and stock market return and ii) gold returns and stock market volatility are tested; both of these relationships were further investigated in the multivariate nonlinear settings by including changes in the three-month LIBOR rates. In this paper, correlation integrals based on the bivariate model show significant nonlinear feedback effects among the variables during the financial crisis period for all the countries under study. Minimal evidence of significant feedback is found during the pre-crisis period. The multivariate tests, including changes in the LIBOR rates, provide results similar to the bivariate results. These results imply that gold may not perform well as a safe-haven during the financial crisis period due to the bidirectional interdependence between gold returns and stock returns as well as stock market volatility. However, gold may be used as a hedge against stock market returns and volatility in stable financial conditions.

OBJECTIVES

1. To study the causal relationship of stock indices and exchange rate on Gold ETFs traded in the Indian capital market
2. To compare the trend of the gold returns vis a vis stock index return
3. To investigate the changes in the relationship between Gold ETFs and Index, Exchange rate during pandemic driven crises

DATA AND METHODOLOGY

This paper is structured to discuss the Gold ETFs & Market index's relationship and the Gold ETFs & Exchange rate for ten years and overlapping the pandemic period.

Data: The stock Index used in the study is Nifty 200, representing about 86.7% of the free-float market capitalization of the stocks listed on NSE as of March 29, 2019. Gold ETFs are taken as a proxy to study the change in the Gold asset. The three Gold ETFs considered for this paper are listed on NSE, the market leaders in India HDFC Gold ETF, UTI Gold ETF, and SBI Gold ETF. The exchange rate used in the study is USD-INR. The daily data from the year 2010 to September 2020 has been applied in the study. Data for the time series has been obtained from NSE records and records of respective Gold ETFs Mutual funds AMC to analyze the influence of the COVID-19 pandemic on Gold ETF's relationship Stock Index and Exchange rate. The period under study has been considered into 2 phases; the full period and during the crisis period (Jan 2020-Sept 2020). Table 1 shows the CAGR for all the variables under study.

Methodology

The return of the market index, Gold ETFs, and Exchange rate at time t is calculated by taking the natural logarithm using the closing price. $R_t = \ln(P_t / P_{t-1})$.

The Descriptive Statistics of the returns have been calculated to check the normality of the return time series. Jarque-Bera test (Table 2) was applied to check the normality. If the test statistics are greater than the critical value, the inference that returns are not normally distributed can be drawn.

Pearson's coefficient of correlation is calculated to study the strength and direction of the relationship between Gold ETFs with market index and Exchange rate.

ADF: Each financial time series is tested for stationary, the null hypothesis to check whether there exists unit root or not is tested by the most popular unit root test used in most of the causality test research Augmented Dickey fuller test. ADF test constructs a parametric correction by assuming that the time series y follows an AR(1) process and adding lagged difference terms of the dependent y variable. In this study, the ADF test has been applied, and the analysis is done by considering a lag of 1 variable. Test regression is as follows:

$$\Delta Y_t = \alpha + \beta_t + \gamma Y_{t-1} + \delta_1 \Delta Y_{t-1} + \ldots\ldots \delta_p \Delta Y_{t-p} + \mathcal{E}_t$$

where: α = constant, β = coefficient on a time trend,
p = the lag order of the autoregressive process

ADF statistics is a negative number and is compared with the calculated ADF critical values; the more negative a number, the stronger inferences can be drawn to reject the null hypothesis that at some significant level, there is a unit root /non-stationery.

To investigate the cause and impact relationship between Gold ETFs and Nifty 200/USD-INR, a globally accepted Granger Causality test has been applied. The test was performed on both the full sample period and the crisis sub-period. Granger Causality test is the statistical test to determine whether a one-time series is useful in forecasting another. The unidirectional and bidirectional relationship explain whether one variable can predict another. Its mathematical formulation is based on linear regression modeling of stochastic processes (Granger 1969).

To test the causality between variables following the bi-variant regression model is used.

$$\Delta X_t = \alpha_x + \sum_{i=1}^{k} \beta_{x,i} \Delta X_{t-i} + \sum_{i=1}^{k} \gamma_{x,i} \Delta Y_{t-i} + \mathcal{E}_{x,t}$$
$$\Delta Y_t = \alpha_y + \sum_{i=1}^{k} \beta_{y,i} \Delta Y_{t-i} + \sum_{i=1}^{k} \gamma_{y,i} \Delta X_{t-i} + \mathcal{E}_{y,t}$$

The F statistics obtained from the test indicates if X granger causes Y or not. If the value is significant, then we can say that X's changes happened first, followed by changes in Y.

EMPIRICAL DISCUSSION

CAGR Returns in Gold ETFs are the most common mutual fund returns used when a fund's performance is discussed, and the CAGR of total returns in the stock market depicts the rate of growth in average returns generated. As indicated by the calculated figures in Table 1, it was observed that the market's CAGR went negative during the crisis period under study. On the contrary, the CAGR of Gold ETFs went vertically up.

Table 1: CAGR Returns Table

Particulars	10 Years	5 Years	3 Years	1 Year
HDFC GOLD ETFs	9.9%	12.0%	15.6%	33.3%
UTI GOLD ETFs	10.4%	12.0%	13.1%	36.8%
SBI GOLD ETFs	10.0%	12.3%	16.0%	33.9%
NIFTY 200 INDEX	7.1%	7.6%	8.3%	-1.1%
USD to INR	5.7%	3.7%	3.4%	4.4%

Source: Author compilation from various sources

Jarque-Bera test was done to confirm the normality (Table 2). A normal distribution has a skew of zero (i.e., it is perfectly symmetrical around the mean) and a kurtosis of three. The null hypothesis for the test is that the data is normally distributed; the alternate hypothesis is that the data does not come from the normal distribution. As displayed by the calculations in Table 2, the small p-values are a piece of strong evidence that rejects the null hypothesis of the Jarque-Bera Test. This implies that the data does not come from the normal distribution.

Table 2: Descriptive Statistic of the variables: Full period

	UTI	SBI	HDFC	NIFTY	USD
Mean	0.0330	0.0323	0.0320	0.021566101	0.020608
Standard Deviation	1.9758	1.2755	0.8735	1.086710544	0.545736
Skewness	0.4855	-0.8498	-0.2320	-1.1820	0.7941
Kurtosis	415.97	333.12	12.2	15.9	105.4
JarqueBera	14040.86	5792.23	3.10	7.88	238.75
p value	0.000000	0.000000	0.211987	0.019380	0.000000

Source: Author compilation

Pearson's correlation coefficient among the variables is reported in Table 3. The correlation table displays a negative correlation between changes in the gold price and changes in the NIFTY 200 market price index during the crisis period.

Table 3: Correlation Matrix - full period and during crises

	UTI		SBI		HDFC		NIFTY		USD
	Full period	During crises	Full period	During crises	Full period	During crises	Full period	During crises	
UTI	1								
SBI	0.9776	0.9711	1						
HDFC	0.9808	0.9894	0.9977	0.9864	1				
NIFTY	0.4165	-0.0923	0.3938	-0.1826	0.4040	-0.1344	1		
USD	0.5701	0.5004	0.5631	0.5632	0.5787	0.5282	0.8184	-0.857	1

Source: Author compilation

Before following formal tests of stationary, it is necessary to plot the logarithmic form of time series variables, as we have done in figure 3. These graphs clarify the nature of the series. A non-stationary time series may give spurious results, so it is imperative to integrate the time series in the same order. Each time series under consideration is tested for stationary, and the result of the ADF test is depicted in Table 4. ADF test has been performed to check the stationarity of the time series, i.e., whether the shift in time does not cause a change in the

shape of the distribution (Table 4). This test's null hypothesis is that there is a unit root; the alternate hypothesis is that the time series is stationary. The ADF test statistics displayed in Table 4 are more negative than the tabulated critical values calculated at 1 percent, 5 percent, and 10 percent. Thus, the variable series are integrated at the first difference I(I).

Table 4: Unit root test - Augmented Dickey-Fuller for stationarity

	Variable	UTI	HDFC	SBI	Nifty	USD to INR
	ADF Test Statistics	-76.517	-51.577	-65.328	-48.399	-56.661
ADF Ref. range (Tau Statistics)	1%	-3.434	-3.434	-3.434	-3.434	-3.434
	5%	-2.863	-2.863	-2.863	-2.863	-2.863
	10%	-2.568	-2.568	-2.568	-2.568	-2.568
	Significance	**I(I)**	**I(I)**	**I(I)**	**I(I)**	**I(I)**
	Conclusion	Series does not have a unit root	Series does not have a unit root	Series does not have a unit root	Series does not have a unit root	Series does not have a unit root

Source: Author compilation

Granger Causality Test was performed to investigate causality between variables considered in the study (Gold ETFs, NIFTY 200 Index, and Exchange Rate-USDINR) in a time series (Table 5.1 and 5.2). The null hypothesis for the test is that lagged x-values do not explain the variation in y. In other words, it assumes that x(t) does not Grager-cause y(t). As per the calculation displayed in Table 5, if the p-value is greater than 0.05, we accept the null hypothesis, or else we reject the null hypothesis.

Web: www.pbme.in

Table 5: Granger Causality Test

Table 5.1 Granger Causality Test Result - Full Period

Null Hypothesis	Lag 2		Lag 4	
	F statistics	p-value	F statistics	p-value
INDX does not granger causes HDFC Gold ETF	1.14	0.24	3.18	0.012**
HDFC gold ETF does not granger cause INDX	0.87	0.41	3.27	0.01088**
INDX does not granger causes SBI Gold ETF	0.65	0.51	1.46	0.209
SBI gold ETF does not granger cause INDX	1.15	0.31	1.005	0.403
INDX does not granger causes UTI Gold ETF	0.28	0.74	2.55	0.036**
UTI gold ETF does not granger cause INDX	1.38	0.25	4.02	0.003*
EXRATE does not granger causes HDFC Gold ETF	0.29	0.74	0.23	0.92
HDFC gold ETF does not granger cause EXRATE	0.50	0.6	0.95	0.432
EXRATE does not granger causes SBI Gold ETF	0.25	0.77	1.39	0.233
SBI gold ETF does not granger cause EXRATE	0.69	0.49	0.48	0.749
EXRATE does not granger causes UTI Gold ETF	0.34	0.70	0.22	0.925
UTI gold ETF does not granger cause EXRATE	0.82	0.43	0.79	0.529
*, **, *** denotes significance at 1%, 5% respectively				

Table 5.2 Granger Causality Test Result – During Crises

Null Hypothesis	Lag 2		Lag 4	
	F statistics	p-value	F statistics	p-value
INDX does not granger causes HDFC Gold ETF	5.85	0.0034 *	4.81	0.001*
HDFC gold ETF does not granger cause INDX	2.12	0.122	2.72	0.03**
INDX does not granger causes SBI Gold ETF	8.41	0.0003*	5.20	0.0005*
SBI gold ETF does not granger cause INDX	2.002	0.137	0.97	0.42
INDX does not granger causes UTI Gold ETF	1.63	0.198	0.40	0.0034*
UTI gold ETF does not granger cause INDX	1.94	0.145	1.50	0.20
EXRATE does not granger causes HDFC Gold ETF	1.016	0.364	0.705	0.58
HDFC gold ETF does not granger cause EXRATE	0.60	0.54	1.12	0.34
EXRATE does not granger causes SBI Gold ETF	0.80	0.449	0.56	0.68
SBI gold ETF does not granger cause EXRATE	0.35	0.698	0.70	0.58
EXRATE does not granger causes UTI Gold ETF	1.61	0.201	0.82	0.51
UTI gold ETF does not granger cause EXRATE	1.13	0.324	0.66	0.61
*, **, *** denotes significance at 1%, 5% respectively				

Source: Author compilation

RESULT AND FINDINGS

Past one year return of Gold ETFs and market index substantiates an inverse relationship between the market returns and the Gold returns. This relationship can be seen in Figure 2, where returns of all variables are plotted.

The inference from the negative correlation between the variables is that gold is used as a hedging tool during crisis time. The ADF test concluded that the series is stationary on the first difference. The Granger causality number indicates the existence of unidirectional causality running from Index and 3 Gold ETFs in the study when two lags and four lags are applied at the 1 percent and 5 percent level of significance. Hence, it is observed that the returns of the Market Index led to an increase in the Gold price during the crisis, but a rise in Gold price does not lead to an increase in Market Index. However, the Exchange rate does not Granger cause the gold price nor the gold price. Granger causes the Exchange Rate (i.e., they are independent of each other).

CONCLUSION

The study tried to examine the causal relationship between Gold ETFs prices and the Nifty 200 Index and Exchange rate for ten years and during the pandemic period. The study used daily data from the year 2010 to September 2020. The Granger causality test result reveals that the Market Index returns lead to an increase in the Gold price during the crisis, and a rise in Gold price does not lead to an increase in Market Index. During the COVID-19-driven pandemic time, the stock market crashed, and Gold prices went to an all-time high price level in India as it is considered a safe haven during the crisis. Thus, we may consider gold as a tool to hedge the portfolio during a crisis.

However, during the normal period, Gold and the Stock Market are indifferent because today, gold does not have a practical application in business and everyday human needs. It means that gold operates by a different set of independent factors and principles, and knowing what these are and what kind of impact they have is important. The macro factors that may impact the fluctuation of Gold prices (such as Inflation, Interest Rate, Monsoon, Correlation with other asset classes, Geo-political factors, Mining production, amongst others) need to be analyzed for better empirical analysis. This could be a possible area of future research in India.

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GRAPHS

i)   Figure 2: Price trends of the Gold ETFs, USDINR, and Market Index (Source: Prepared by Authors)

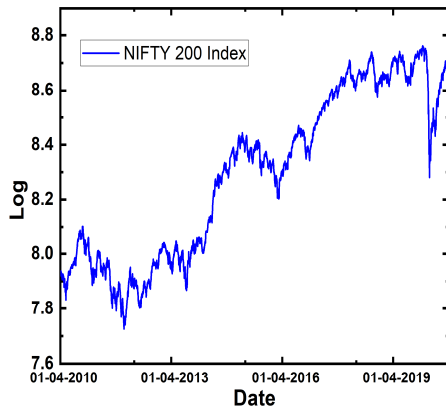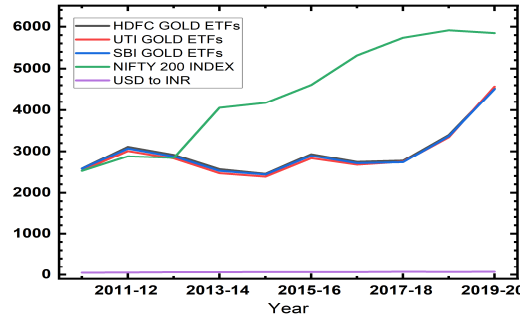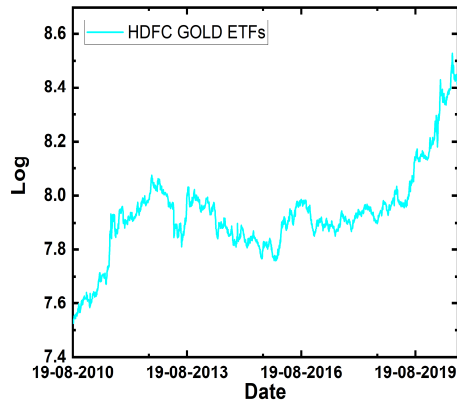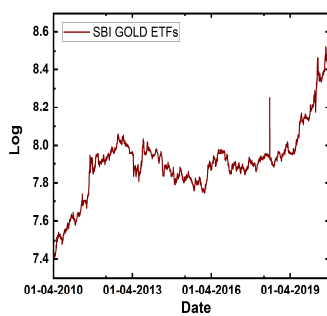ii) Figure 3: Log price of Gold ETFs and Index and ER Full period (Source: Prepared by Authors)

Figure 3.1

Figure 3.2

Figure 3.3

Figure 3.4

Figure 3.5