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VAR and VECM models were used to investigate the factors that influence of Indian securities market performance, including the period of Covid 19's financial crises

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Abstract

Using a dummy variable, we evaluate commodities in addition to macroeconomic considerations of the Indian securities market from 2010 to 2021, which includes the era of the Covid 19 crises. We used the Bombay Stock Exchange (BSE) (Sensex) for securities market performance and developed a Vector Auto regressive models that combines the short- and long-run model of economics. On stock price indexes, we discovered that the Indian securities market reflects both macroeconomic indicators and prices of commodity. Growth in the economy, inflation, interest, rates, currency rates, crude oil prices, and gold prices are all factors to consider were all used in this study to see how they affected BSE (Sensex) prices during the Covid 19 crises. In their first difference, all series were judged to be stationary. We discovered that shocks to all eight factors had both positive and negative effects on BSE (Sensex) prices in the short and long term, including Covid 19 crises. Each securities market index's most significant impulse is its own shock, decreasing from short to long-term. We also used the Joint Co-Integration Test to detect and confirm the lack of a long-term equilibrium link (cointegration) between all eight variables, resulting in four cointegration equations with an estimated error correction term at the 0.05 level (speed of adjustment towards equilibrium) of 0.007362. Vector Error Correction Mode (VECM), on the other hand, suggests that the BSE (Sensex) has a significant value with its lagged values of.007362 and 0.517952. We created Vector Auto regressive (VAR) models for the BSE (Sensex) using eight independent variables, including Dummy variables, but their statistics were not significant, despite the fact that the lagged value of crude oil, gold prices, the rupee, and the BSE (Sensex) lagged value were all significant. We proceed to estimate VECM. We proved the short and long-term effects of lagged BSE(Sensex) prices, crude oil prices, gold prices, and the currency on the BSE (SENSEX) using several robustness tests. Dummy factors have also been included to see how the Covid 19 crisis affected the BSE (Sensex)

prices. We discovered that crude oil prices followed value, gold prices lagged value, and rupees based on the dollar had a significant impact on BSE(Sensex) pricing over the study period, including the Covid 19 crises from March 2020 to June 2021.

Keywords: VECM, VAR model, cointegration, BSE (Sensex), Covid 19

1. Introduction

Because it reflects the centre of network transactions at a specific price, securities market performance is a multi-dimensional financial concept for sellers and buyers of securities. As a result of most countries' liberalized and globalized policies, the securities market plays a vital role in mobilizing capital in rising and developing countries like India, resulting in increased industry expansion and commerce. The securities market is part of the free market economy, and it assists in the transfer of capital from shareholders to investors through the exchange of shares and ownership. Capital markets facilitate the transfer of funds from savers to borrowers. Prices of Stock are influenced by the performance of the significant variables of macroeconomic, according to both economic and financial theories. According to the theoretical perspective, the overall activity impacts the capital market's performance, either positively or negatively. Capital markets are critical to attaining long-term economic growth, and their development reflects how sophisticated and competitive the domestic economy is. The capital market is thought to be a reflection of economic activity. Securities market indexes often reflect the market's or a specific sector's overall performance, which informs investors about their future movements based on the price effect costs of their selections. For example, if the price of a stock is rising, it is seen as positive news or signals, which are referred to as bullish perspectives. On the other hand, if the price falls, the market interprets this as negative signals known as bearish sentiments.

Thus, stock price and index changes reflect a country's overall economic trend, serve as a barometer for the economy, and are influenced by various factors, including financial, political, international, company-specific, and industry-specific drivers. As a result, investors in the current economic environment cannot disregard macro variables since they can alter their portfolios to reduce portfolio losses or maximize gains. s During the Covid s 19 crises, the securities market index Bombay Stock Exchange (BSE) (Sensex) in India has been influenced by the main macroeconomic indicators such as Growth in Gross Domestic Product, inflation, interest rate, and currency rate, as well as commodity prices such as crude oil WTI and gold price will be examined in this paper.

We will use monthly observations from 2010 to 2021 to build a Vector Auto regressive (VAR) model. A Vector Error Correction Mode (VECM) to investigate the impulse-response functions to BSE (Sensex) caused by a one S. Dshock in the remaining variables, and analyze the components of the variance decomposition in the BSE (Sensex) index to verify the structural regularities in the index. This research varies from prior studies in that it integrates and provides several statistical tests to reaffirm the short- and long-term causality between all variables, as well as calculating the expected error correction term in India During the Covid 19 Crises.

All eight variables are cointegrated and execute a long-term equilibrium relationship, according to our findings. Growth in Gross Domestic Product, interest, rate, currency rate, oil price, and gold price affect the BSE (Sensex) in the short run, but not in the long run during this period of Covid 19. Furthermore, both securities market indexes have been influenced by their own previous prices (own shock), and their magnitude has decreased over time. The stock market's job in the economy is to raise capital and ensure that the money raised is invested in the most profitable opportunities. The influence of macroeconomic variables and commodity prices on the BSE (Sensex) is empirically demonstrated in our research. The further part of the paper is divided into four parts. The first part covers the literature review and hypothesis development. The research approach is presented in the second section. The third section contains empirical data. Finally, the final section examines the findings and summarizes the study's findings.

2. Review of literature

The impact of a few macroeconomic variables on the New Zealand securities market index is not statistically significant (Dassanayake and Jayawardena, 2017). According to the findings of this study, GDP, inflation, and business trade show all have a substantial relationship with the securities market and influence its volatility (Bhullar, 2017). The goal of this research is to look at the elation ships in the long and short term between stock price and a collection of macroeconomic indicators in the Indian economy. The findings show that there is a long-run relationship between the variables (Giri and Joshi, 2017). The securities market is a leading indicator of a country's economic health. While money supply and three-month treasury bills rate harmed return on stock (Sohail and Zakir, 2010). The study concludes that changes in short and long-term interest, rates, industrial production, price levels, rate of exchange, and money supply have a cointegrating link with the Singapore securities market and property index (Maysami et al., 2004). The impact of certain macroeconomic parameters such as remittances, money supply, exchange, rate, and interest, rate on securities market performance is investigated in this article. The analysis shows that remittances and money supply have a beneficial impact on the stock market, whereas interest, rates and exchange, rates negatively impact (Rakhal, 2015). According to this study, real M2 does not affect the securities market index (Hsing, 2011). Return on stock are added into a structural VAR model to capture the interaction between the different variables, as stock prices represent an important wealth transmission route in an oil-rich country. Return on stock improve by 2.5 per cent after a 10% spike in oil prices, according to my research, before the effect fades. The results are resistant to various (linear and non-linear) oil price modifications. The effects on the other factors are a little less pronounced. However, all variables show that when oil prices rise, the Norwegian economy responds by rising aggregate wealth and demand. Other shocks, particularly monetary policy shocks, are also has effect on stock price unpredictability in the short term, according to the findings. The empirical findings suggest that in Jordan, there is a long-run equilibrium link between the securities market index and the main macroeconomic indicators (Al-Majali and Al-Assaf, 2014). Başci and Karaca (2013) used a VAR model to investigate the Association between the ISE 100 Index and a collection of four macroeconomic considerations. Short and long interest, rates are cointegrated with nominal GNP, but not with M1, M3, or aggregate liquid assets. Consumption and income are cointegrated with M2, but not with M1, M3, or aggregate liquid assets, according to a series of cases. It means that real M2 has no effect on the securities market index (Hsing, 2011). Cheung and Ng (1998) discovered empirical evidence of long-term correlations between five national securities market indexes and aggregate real activity metrics such as the real oil price, real consumption, real money, and real production. Using the VAR model, this paper investigated the link between the ISE 100 Index and a set of four macroeconomic variables (Başci and Karaca, 2013). We looked at commodities and macroeconomic elements in the Korean securities market and discovered that stock price indices reflect macroeconomic variables and commodity prices (Belen et al., 2019). The results of this study, which use an EGARCH framework, reveal that volatility in stock markets and currency rate markets does not persist in developed countries (Beer and Hebein, 2008). The analysis found that, at least in terms of two macroeconomic variables, the exchange, rate and inflation (WPI), the Indian securities market is reaching informational efficiency (Singh, 2010)**.** The novel and potentially more powerful 'state space' study of the relationship between return on stock and inflation allows us to characterize better the nature of this relationship and the direction of causality (Najand and Noronha, 1998). In the long run, macroeconomic considerations such as industrial production, inflation, money supply, and exchange, rate are cointegrated with securities market prices, according to the study (Ali et al., 2016). The results of the variance decomposition test imply that there is small evidence of that crude oil price shocks in the Turkish securities market have been rationally analyzed (Berk and Aydogan, 2012). Several key elements support the claim that the benefits of SOX implementation surpass the compliance expenses (Boylan, 2015)**.** The VECM study demonstrates that inflation and the CNX nifty index have a bidirectional causal relationship

(Joshi and Giri, 2015). Belen et al. (2019) used the VECM, which incorporates the model of economics in the short and long terms, to look at commodities and macroeconomic considerations in the Korean and Japanese stock markets. They discovered that securities market indexes in Korea and Japan mirror macroeconomic data and commodities prices.

From above review of literature our hypotheses are:

- *Hypothesis 1*: Growth in Gross Domestic Product, inflation, interest, rates, currency rates, crude oil prices, and gold prices would all affect India's securities market index BSE (Sensex) in the short and long run during financial crises Covid 19.
- *Hypothesis 2*: The most significant impetus on the Sensex during financial crises is its own shock, and its size reduces from short to long term during crises period of Covid 19.
- *Hypothesis 3*: During financial crises in India, the securities market index, Growth in Gross Domestic Product, Rates of inflation, currency exchange rates, interest rates, prices of crude oil, and gold prices are all important factors to consider all have a long-term equilibrium relationship.

2.1. Source and Measurement of Variables (Research Model A)

All of the data was gathered from theInvesting.com. This analysis uses monthly observations from 2010 to 2021 for each variable.

Variables and their corresponding definitions. The BSE (Sensex) Stock Price Index is a monthly stock price index. Growth in Gross Domestic Product is measured as a percentage change over the preceding quarter's real GDP.

The rate of inflation. The consumer price index (CPI) is used to calculate the quarterly growth rate.

The rate of interest, The rate of exchange. This research uses the Indian Rupee against the US Dollar, the WTI price of crude oil, and the price of real gold. It is made up of the gold closing price at the end of each quarter**.**

3. Methodology (B)

The VAR model and the VECM are the empirical methodologies used in this paper. To begin, we look at the unit root in the variables using the ADF of unit root test and the PP test to see if all of the series are stationary in their initial difference, which is a condition for VAR and VECM construction. Second, we use Schwaz Criteria to determine which lag in adding to the VAR model (SC). Third, we use VAR models to analyze the impulse-response functions in the other variables in reaction to a one-SD shock to the BSE (Sensex). Fourth, we look at the components of the BSE (Sensex) variance decomposition to see if the factors have any structural regularities in the short and long run. Fifth, we use the Joint Co-Integration Test to confirm long-term cointegration between variables. Finally, we build VECM for BSE (Sensex) to incorporate the model of economics in the short and long run. Because of its versatility and capacity to forecast, the model VAR is one of the most often in use approaches for multivariate time series analysis. Sims (1980), who argued for non-theoretical explanations for connections between different time series, popularized VAR models in econometrics. As a result of their interdependence, When SC indicates the lowest value, the ideal lag duration for the VAR model is.

VAR can be expressed mathematically in a variety of ways.

$$Yt=\alpha_0 + \sum_{i=1}^{N} \alpha t Yt - 1 + et \quad (1)$$

Where:

- Yt: matrix of Variables,
- α0: matrix of Intercepts,
- αt: matrix of variables coefficients,
- et: matrix of residual white noise.

If two or more variables move in the same direction, they are said to be cointegrated. Or stable long-term relationships (Engle and Granger, 2015). If two-time series are cointegrated, they are said to be cointegrated. Both series become stationary in their initial difference, indicated I (1), and a linear relationship is expected. Combination of the two variables Johansen the Cointegration Test looks at a variety of cointegration patterns. Using systems of equations, create vectors between variables. Johansen Test of cointegration for a VAR model of:

Equation denotes the p order.

Yt=αyt-1+…..αp Yt-p+Bxt+et (2)

Where:

- Yt: vector of k non-stationary variables,
- Xt: vector of d deterministic variables,
- et: the innovation vector.

If the variables are cointegrated, ECM, also known as VECM, can be used to express the short-term nature of the relationship. The model considers both short- and long-term causality. The Cointegration Test, developed by Johansen, determines the number of cointegrated vectors and verifies their cointegration. As a result, the following hypotheses are proposed for the cointegration test:

H0: r=0, inexistence of cointegrated vectors,

H1: r=1, existence of cointegrated vectors.

If there is more than one cointegrated vector:

H0: r ≤ 1, there is less than one cointegrated vector,

H1: r=2, there is more than one cointegrated vector.

Because of the existence of a common trend, a VAR in the first difference becomes misspecification when non-stationarity variables are cointegrated. To build a VECM, the model should include one period lagged residual from the vectors. Generalized Korea and Japan VECM is presented in Equation

ΔStock Market Index 1, t=μ1, t-ϕ [Stock Market Index - ϒ0-ϒ1 GDP Growth-ϒ2 Inflation Rate-ϒ3 Interest Rate-ϒ4 Exchange Rate-ϒ5 Crude Oil WTI-ϒ6 Gold]t-1

$+\sum_{i=1}^{j} = 1\beta 1, j$ΔStock Market Index 1, t-1,

$+\sum_{i=1}^{j} = 1\beta 2, j$Δ GDP Growth 1, t-1

$+\sum_{i=1}^{j} = 1\beta 3, j$Δ Inflation Rate 1, t-1

$+\sum_{i=1}^{j} = 1\beta 4, j$Δ Interest Rate 1, t-1

$+\sum_{i=1}^{j} = 1\beta 5, j$Δ Exchange Rate 1, t-1

$+\sum_{i=1}^{j} = 1\beta 6, j$Δ Crude Oil WTI 1, t-1

$+\sum_{i=1}^{j} = 1\beta 7, j$Δ Gold 1, t-1.

The error correction term's statistical significance in the VECM demonstrates that macroeconomic factors and commodity prices have a considerable impact on both the present and future values of stock prices. Because one (some) variable can predict the other(s), there should be a Johansen co integration causality in at least one direction if all the time series are integrated with order one and co integrated (Dassanayake and Jayawardena, 2017).

$$Fc = \frac{[ESSR - ESSU)/n]}{[\frac{ESSU}{T-m-n}]} \quad (3)$$

Where:

- ESSR: residual sum of squares of the restricted regression,
- ESSU: residual sum of Squares of the unrestricted regressions.

In the unrestricted regression, T is the number of data, m and n is the appropriate order of lags.

4. Empirical Analysis and Results

The study demonstrates how to use the ADF unit root test to look at the unit root in each variable and verify the model's integration order. All series have been shown to be stationary in their initial difference after seasonal adjustment. The unit root test's null hypothesis is thus disproved at the 1% level for all variables in their first difference. As a result, the variables in Korean and Japanese are stationary, or steady at their initial difference. Table 2 displayed the Unit Root Test findings.

The model's choice of lag order is made using S.C. Table 3 displays the model's eighth order, which was selected for Korea and Japan.

The degree of event transmission from one variable to the others is shown by the impulse-response function. In this study, only the variables' responses are examined. The result of Table 1 shows the Results of Unit Root Test - ADF Test Statistics and Phillips-Perron test statistic as per this, All the variables have been subjected to first-order differencing, and the results of both the ADF and Phillips-Perron tests provide strong evidence of stationarity. This implies that after differencing, which often assumes stationary data. Additionally, the very low p-values suggest that the results are highly significant, further supporting the conclusion of stationarity.

Table 1. Results of Unit Root Test - ADF Test Statistics and Phillips-Perron test statistic

Variable	Order	ADF Test Statistics	Probability value	Phillips-Perron test statistic	Probability value	Result
D(LNCPI_ACTUAL)	Level first difference	-3.321212	0.0158	-6.819781	0.0000	Significant
D(LNCRUDE_OIL_WTI_PRICE)	Level first difference	-2.674518	0.0812	-4.996740	0.0000	Significant
D(LNGDPACTUAL	Level first difference	-4.446355	0.0004	-8.524790	0.0000	Significant
D(LNGOLD__PRICE	Level first difference	-4.281244	0.0007	-6.797399	0.0000	Significant
D(LNINTEREST_RATE_ACTUAL)	Level first difference	-4.633959	0.0002	-7.272239	0.0000	Significant
D(LNBSE(SENSEX)_PRICE	Level first difference	-3.819466	0.0035	-4.947567	0.0001	Significant
D(LNUS_DOLLAR_INDIAN_RUPEE)	Level first difference	-3.496225	0.0096	-8.296622	0.0000	Significant

The Table 2 presents result for different lag orders (differencing) and provides statistics and criteria to evaluate the goodness of fit for a model. The goal is to select the lag order that results in the best-fitting model. In this case, the lag order (Lag) varies from 0 to 8, which corresponds to different degrees of differencing applied to the data. LogL, LR, FPE, AIC, SC, and HQ are criteria used to assess the quality of the model fit. In general, lower values for AIC, SC, and HQ indicate a better fit, while higher LogL and LR values suggest a better fit.

Table 2. VAR Lag Order
LNBSE(SENSEX)_PRICE LNCPI_ACTUAL LNCRUDE_OIL_WTI_PRICE LNGDPACTUAL LNGOLD__PRICE LNINTEREST_RATE_ACTUAL LNUS_DOLLAR_INDIAN_RUPEE

Lag	LogL	LR	FPE	AIC	SC	HQ
0	291.6303	NA	3.59e-11	-4.185739	-4.035823	-4.124817
1	1394.761	2076.481	6.65e-18	-19.68766	-18.48833	-19.20028
2	1644.953	445.1957	3.47e-19	-22.64637	-20.39763	-21.73254
3	1670.946	43.57555	4.93e-19	-22.30803	-19.00987	-20.96774
4	1869.882	313.0320	5.59e-20	-24.51297	-20.16540	-22.74623
5	2045.213	257.8399	9.10e-21	-26.37078	-20.97380*	-24.17759
6	2077.960	44.78616	1.24e-20	-26.13176	-19.68537	-23.51211
7	2246.923	213.6881	2.33e-21	-27.89592	-20.40012	-24.84982
8	2392.292	168.8854*	6.45e-22*	-29.31312*	-20.76791	-25.84056*

* indicates lag order selected by the criterion

The table 3 provides the corresponding eigenvalue, test statistic, critical value, and probability value (p-value). The tests are conducted at a 5% significance level (0.05), The results indicate that for the Trace test, the null hypothesis of no cointegrating equations can be rejected at a 5% significance level. The test suggests the presence of at least four cointegrating equations in the system. Similarly, the Maximum Eigenvalue test also suggests the presence of at least four cointegrating equations based on the significance of the test statistic.

Table 3. Series: LNBSE(SENSEX)_PRICE LNCPI_ACTUAL LNCRUDE_OIL_WTI_PRICE LNGDPACTUAL LNGOLD__PRICE LNINTEREST_RATE_ACTUAL LNUS_DOLLAR_INDIAN_RUPEE DUMM

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of C.E. (s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.515483	320.6273	159.5297	0.0000
1 *	0.451247	217.7337	125.6154	0.0000
2 *	0.314744	132.5186	95.75366	0.0000
3 *	0.288053	78.84798	69.81889	0.0080
4	0.120282	30.60314	47.85613	0.6877
5	0.055472	12.40524	29.79707	0.9168
6	0.024727	4.301259	15.49471	0.8778
At most 7	0.005239	0.745823	3.841466	0.3878

Trace test indicates four cointegrating eqn(s) at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of C.E. (s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.515483	102.8937	52.36261	0.0000
1 *	0.451247	85.21505	46.23142	0.0000
2 *	0.314744	53.67062	40.07757	0.0008
3 *	0.288053	48.24483	33.87687	0.0005
4	0.120282	18.19791	27.58434	0.4788
5	0.055472	8.103979	21.13162	0.8972
6	0.024727	3.555436	14.26460	0.9031
At most 7	0.005239	0.745823	3.841466	0.3878

Note: Here we have eight variables that are LNBSE(SENSEX)_PRICE LNCPI_ACTUAL LNCRUDE_OIL_WTI_PRICE LNGDPACTUAL LNGOLD__PRICE LNINTEREST_RATE_ACTUAL LNUS_DOLLAR_INDIAN_RUPEE DUMM. You can see so the dummy variable “DUMM” is 0 that from until February 2020 after this from march 2020, this value of "Dumm" is one this "1" dumm is representing Covid 19 period.

The objective is that whether LNBSE(SENSEX)_PRICE has some impact with this independent variable even in the covid19 period these are independent variables LNCPI_ACTUAL LNCRUDE_OIL_WTI_PRICE LNGDPACTUAL LNGOLD__PRICE LNINTEREST_RATE_ACTUAL LNUS_DOLLAR_INDIAN_RUPEE DUMM respectively. And if the dummy variable becomes significant and the coefficient of the dummy variable becomes positive, then only we can say that the Covid 19 period has a positive impact on the BSE (Sensex). We shall develop our target is to build error-correction mortal gradually, but first, we develop the unit root testing that means whether our LNBSE(SENSEX)_PRICE LNCPI_ACTUAL LNCRUDE_OIL_WTI_PRICE LNGDPACTUAL LNGOLD__PRICE LNINTEREST_RATE_ACTUAL LNUS_DOLLAR_INDIAN_RUPEE DUMM whether these variables have unit root or not these three variables become these eight variables become stationary after first difference that means at the level they are non-stationary, by converting this variable into first difference they become stationary that we just assumed and when this thing happened only then we can run the Johanson cointegration.

Them into first difference they will become stationary okay then we have run the Johansson model, and here we have chosen eight lag.

So first, we check this trace statistics standard, and it is our null hypothesis number of cointegrated Equation suppose the null hypothesis is normal means there is no cointegration equation, so we can reject this null hypothesis because the p-value is less than 5%. that trace statistics is more than critical value so as per the guideline we can reject null hypothesis similarly Max Eigen statistics as per these results also the p-value is less than 5% so we can reject the null hypothesis and also from here that the Max Eigen statistics.

The Table 4 Vector Auto Regression Estimates provides the coefficients for lagged values of the variables, along with their standard errors and t-statistics.

Table 4. Vector Autoregression Estimates

Date: 06/30/21 Time: 18:12
Sample (adjusted): 2010M06 2021M12
Included observations: 139 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LNBSE(SENSEX)_PRICE	LNCPI_ACTUAL	LNCRUDE_OIL_WTI_PRICE	LNGDPACTUAL	LNGOLD_PRICE	LNINTEREST_RATE_ACTUAL	LNUS_DOLLAR_INDIAN_RUPEE	DUMM
LNBSE(SENSEX)_PRICE(-1)	1.521525	-0.564936	-0.034445	-0.618923	-0.258653	0.332355	-0.044645	0.984486
	(0.17857)	(0.29444)	(0.26291)	(4.26794)	(0.19260)	(0.18972)	(0.07770)	(0.45611)
	[8.52081]	[-1.91866]	[-0.13101]	[-0.14502]	[-1.34294]	[1.75182]	[-0.57454]	[2.15843]
LNBSE(SENSEX)_PRICE(-2)	-0.614384	0.571752	-0.078820	1.297400	0.209297	-0.231934	0.024154	-1.952745
	(0.30885)	(0.50928)	(0.45474)	(7.38196)	(0.33313)	(0.32815)	(0.13440)	(0.78890)
	[-1.98925]	[1.12267]	[-0.17333]	[0.17575]	[0.62828]	[-0.70680]	[0.17971]	[-2.47527]
LNBSE(SENSEX)_PRICE(-3)	-0.213057	-0.946531	0.647363	5.212663	-0.052980	-0.372352	0.004509	1.034112
	(0.31695)	(0.52263)	(0.46667)	(7.57553)	(0.34186)	(0.33675)	(0.13792)	(0.80959)
	[-0.67221]	[-1.81108]	[1.38720]	[0.68809]	[-0.15497]	[-1.10572]	[0.03269]	[1.27733]
LNBSE(SENSEX)_PRICE(-4)	0.277902	0.887499	-1.034864	-12.31368	-0.016645	0.836666	0.025682	-0.962623
	(0.31730)	(0.52320)	(0.46718)	(7.58383)	(0.34224)	(0.33712)	(0.13808)	(0.81048)

	[0.87584]	[1.69627]	[-2.21513]	[-1.62368]	[-0.04863]	[2.48181]	[0.18600]	[-1.18773]
LNBSE(SENSEX)_PRICE(-5)	-0.032034	-0.214303	0.338485	6.744509	0.110279	-0.446186	-0.005885	0.855138
	(0.18456)	(0.30433)	(0.27175)	(4.41131)	(0.19907)	(0.19609)	(0.08031)	(0.47143)
	[-0.17357]	[-0.70417]	[1.24559]	[1.52891]	[0.55397]	[-2.27538]	[-0.07327]	[1.81392]
LNCPI_ACTUAL(-1)	-0.044396	1.346065	-0.037619	-1.283833	-0.059360	0.102642	0.006260	-0.825876
	(0.07051)	(0.11626)	(0.10381)	(1.68516)	(0.07605)	(0.07491)	(0.03068)	(0.18009)
	[-0.62969]	[11.5782]	[-0.36239]	[-0.76185]	[-0.78057]	[1.37022]	[0.20403]	[-4.58587]
LNCPI_ACTUAL(-2)	0.030081	-0.496091	-0.026245	0.785311	0.054283	-0.067191	-0.014816	0.937674
	(0.08132)	(0.13410)	(0.11974)	(1.94375)	(0.08772)	(0.08640)	(0.03539)	(0.20773)
	[0.36989]	[-3.69945]	[-0.21919]	[0.40402]	[0.61885]	[-0.77764]	[-0.41867]	[4.51398]
LNCPI_ACTUAL(-3)	-0.063218	-0.888058	0.250996	0.115631	-0.162421	0.180652	-0.017488	-0.177743
	(0.06666)	(0.10991)	(0.09814)	(1.59320)	(0.07190)	(0.07082)	(0.02901)	(0.17026)
	[-0.94840]	[-8.07956]	[2.55742]	[0.07258]	[-2.25909]	[2.55081]	[-0.60290]	[-1.04393]
LNCPI_ACTUAL(-4)	0.008315	1.202323	-0.421369	-1.863086	0.166880	-0.185633	0.026876	-0.581418
	(0.08234)	(0.13577)	(0.12123)	(1.96794)	(0.08881)	(0.08748)	(0.03583)	(0.21031)
	[0.10099]	[8.85578]	[-3.47581]	[-0.94672]	[1.87912]	[-2.12202]	[0.75012]	[-2.76456]
LNCPI_ACTUAL(-5)	0.003650	-0.450955	0.148379	1.462903	-0.049531	0.085366	-0.025379	0.506542
	(0.05692)	(0.09385)	(0.08380)	(1.36039)	(0.06139)	(0.06047)	(0.02477)	(0.14538)
	[0.06413]	[-4.80494]	[1.77057]	[1.07536]	[-0.80683]	[1.41165]	[-1.02467]	[3.48419]
LNCRUDE_OIL_WTI_PRICE(-1)	0.132385	0.029846	1.637263	1.599830	0.156208	-0.115505	0.007167	0.374913
	(0.09130)	(0.15055)	(0.13443)	(2.18216)	(0.09848)	(0.09700)	(0.03973)	(0.23321)
	[1.45001]	[0.19825]	[12.1797]	[0.73314]	[1.58627]	[-1.19075]	[0.18039]	[1.60765]
LNCRUDE_OIL_WTI_PRICE(-2)	-0.071064	0.027714	-0.670539	-2.142930	-0.108324	0.032361	-0.001579	-0.410383
	(0.14923)	(0.24607)	(0.21972)	(3.56678)	(0.16096)	(0.15855)	(0.06494)	(0.38118)
	[-0.47620]	[0.11263]	[-3.05177]	[-0.60080]	[-0.67299]	[0.20411]	[-0.02432]	[-1.07662]
LNCRUDE_OIL_WTI_PRICE(-3)	-0.330877	-0.424262	-0.720494	-0.552439	-0.192179	0.191308	-0.024877	0.074020
	(0.14574)	(0.24031)	(0.21458)	(3.48334)	(0.15719)	(0.15484)	(0.06342)	(0.37226)
	[-2.27034]	[-1.76545]	[-3.35768]	[-0.15859]	[-1.22256]	[1.23550]	[-0.39226]	[0.19884]
LNCRUDE_OIL_WTI_PRICE(-4)	0.657410	0.503509	1.077717	2.336047	0.453769	-0.358142	0.062621	-0.081283
	(0.15220)	(0.25096)	(0.22409)	(3.63770)	(0.16416)	(0.16170)	(0.06623)	(0.38876)
	[4.31947]	[2.00631]	[4.80932]	[0.64218]	[2.76419]	[-2.21480]	[0.94551]	[-0.20908]
LNCRUDE_OIL_WTI_PRICE(-5)	-0.317611	-0.104105	-0.503111	-1.918063	-0.225976	0.141470	-0.044532	0.131500
	(0.09753)	(0.16082)	(0.14360)	(2.33101)	(0.10519)	(0.10362)	(0.04244)	(0.24911)
	[-3.25665]	[-0.64736]	[-3.50368]	[-0.82285]	[-2.14821]	[1.36530]	[-1.04930]	[0.52787]
LNGDPACTUAL(-1)	-0.000515	0.000846	-0.000518	1.548377	-0.000735	0.000817	-0.001071	-0.001171
	(0.00374)	(0.00617)	(0.00551)	(0.08940)	(0.00403)	(0.00397)	(0.00163)	(0.00955)
	[-0.13771]	[0.13717]	[-0.09406]	[17.3196]	[-0.18220]	[0.20554]	[-0.65794]	[-0.12252]
LNGDPACTUAL(-2)	-0.000292	0.002864	0.002835	-0.671418	-0.000772	-0.001151	0.000283	0.001935
	(0.00611)	(0.01008)	(0.00900)	(0.14608)	(0.00659)	(0.00649)	(0.00266)	(0.01561)
	[-0.04783]	[0.28414]	[0.31503]	[-4.59624]	[-0.11703]	[-0.17729]	[0.10638]	[0.12394]

LNGDPACTUAL(-3)	0.002301	-0.004427	-0.001937	-0.681573	0.001991	0.001142	0.001853	0.000123
	(0.00603)	(0.00995)	(0.00888)	(0.14417)	(0.00651)	(0.00641)	(0.00262)	(0.01541)
	[0.38143]	[-0.44507]	[-0.21811]	[-4.72753]	[0.30595]	[0.17827]	[0.70591]	[0.00795]
LNGDPACTUAL(-4)	-0.003563	0.007288	0.000638	1.044301	-0.001799	-0.001345	-0.003120	-0.001026
	(0.00614)	(0.01012)	(0.00904)	(0.14675)	(0.00662)	(0.00652)	(0.00267)	(0.01568)
	[-0.58030]	[0.71989]	[0.07054]	[7.11623]	[-0.27165]	[-0.20625]	[-1.16793]	[-0.06541]
LNGDPACTUAL(-5)	0.000911	0.001242	0.004408	-0.480816	-0.001396	-0.000377	0.000783	0.001054
	(0.00389)	(0.00641)	(0.00572)	(0.09292)	(0.00419)	(0.00413)	(0.00169)	(0.00993)
	[0.23428]	[0.19381]	[0.77010]	[-5.17447]	[-0.33285]	[-0.09126]	[0.46287]	[0.10615]
LNGOLD__PRICE(-1)	0.148499	-0.124128	0.198673	2.073876	1.775075	-0.086681	-0.022735	-0.508702
	(0.17382)	(0.28662)	(0.25593)	(4.15457)	(0.18748)	(0.18468)	(0.07564)	(0.44399)
	[0.85432]	[-0.43307]	[0.77628]	[0.49918]	[9.46783]	[-0.46936]	[-0.30057]	[-1.14574]
LNGOLD__PRICE(-2)	-0.155086	-0.031124	-0.196858	-3.495177	-0.806724	0.088442	0.001903	0.901087
	(0.32931)	(0.54301)	(0.48486)	(7.87092)	(0.35519)	(0.34988)	(0.14330)	(0.84116)
	[-0.47094]	[-0.05732]	[-0.40601]	[-0.44406]	[-2.27122]	[0.25278]	[0.01328]	[1.07125]
LNGOLD__PRICE(-3)	-0.482246	0.851525	-0.663566	-3.353654	-0.552485	0.001735	-0.006468	-0.390708
	(0.34065)	(0.56171)	(0.50156)	(8.14196)	(0.36743)	(0.36193)	(0.14824)	(0.87012)
	[-1.41566]	[1.51595]	[-1.32300]	[-0.41190]	[-1.50367]	[0.00479]	[-0.04363]	[-0.44903]
LNGOLD__PRICE(-4)	0.977224	-1.452928	1.212807	10.64736	0.938892	-0.051846	-0.041550	0.421939
	(0.33560)	(0.55338)	(0.49412)	(8.02123)	(0.36198)	(0.35656)	(0.14604)	(0.85722)
	[2.91188]	[-2.62555]	[2.45446]	[1.32740]	[2.59379]	[-0.14541]	[-0.28451]	[0.49222]
LNGOLD__PRICE(-5)	-0.570077	0.631253	-0.692409	-7.804446	-0.433170	0.070806	0.000560	-0.248031
	(0.19354)	(0.31914)	(0.28497)	(4.62593)	(0.20876)	(0.20563)	(0.08422)	(0.49437)
	[-2.94547]	[1.97798]	[-2.42979]	[-1.68711]	[-2.07501]	[0.34433]	[0.00665]	[-0.50171]
LNINTEREST_RATE_ ACTUAL(-1)	0.090190	-0.434206	0.044916	0.102008	-0.059072	1.814147	-0.033903	0.570851
	(0.13715)	(0.22615)	(0.20194)	(3.27808)	(0.14793)	(0.14572)	(0.05968)	(0.35032)
	[0.65760]	[-1.91997]	[0.22243]	[0.03112]	[-0.39932]	[12.4497]	[-0.56806]	[1.62949]
LNINTEREST_RATE_ ACTUAL(-2)	-0.046432	0.471283	-0.174573	-0.862564	0.107726	-0.890781	0.024468	-1.203005
	(0.19401)	(0.31991)	(0.28565)	(4.63708)	(0.20926)	(0.20613)	(0.08443)	(0.49556)
	[-0.23933]	[1.47317]	[-0.61113]	[-0.18601]	[0.51480]	[-4.32148]	[0.28982]	[-2.42757]
LNINTEREST_RATE_ ACTUAL(-3)	0.156767	-1.274327	-0.048429	-0.053678	0.051163	-0.780701	0.101153	0.624476
	(0.16893)	(0.27856)	(0.24873)	(4.03768)	(0.18221)	(0.17948)	(0.07351)	(0.43150)
	[0.92799]	[-4.57474]	[-0.19470]	[-0.01329]	[0.28079]	[-4.34970]	[1.37600]	[1.44721]
LNINTEREST_RATE_ ACTUAL(-4)	-0.091233	1.312179	0.142987	-1.298324	-0.074464	1.419215	-0.109543	-0.923565
	(0.20684)	(0.34106)	(0.30454)	(4.94369)	(0.22310)	(0.21976)	(0.09001)	(0.52833)
	[-0.44108]	[3.84732]	[0.46952]	[-0.26262]	[-0.33378]	[6.45807]	[-1.21704]	[-1.74809]
LNINTEREST_RATE_ ACTUAL(-5)	0.028459	-0.306272	-0.201037	-0.852301	0.100216	-0.706340	0.019499	0.721896
	(0.16273)	(0.26834)	(0.23960)	(3.88952)	(0.17552)	(0.17290)	(0.07081)	(0.41567)
	[0.17488]	[-1.14138]	[-0.83905]	[-0.21913]	[0.57095]	[-4.08530]	[0.27535]	[1.73671]

LNUS_DOLLAR_INDIAN_RUPEE(-1)	-0.490184	0.359476	-0.111371	-5.443454	-0.341925	0.277138	1.444456	-0.087199
	(0.27671)	(0.45628)	(0.40742)	(6.61381)	(0.29846)	(0.29400)	(0.12041)	(0.70681)
	[-1.77144]	[0.78783]	[-0.27335]	[-0.82304]	[-1.14562]	[0.94265]	[11.9957]	[-0.12337]
LNUS_DOLLAR_INDIAN_RUPEE(-2)	0.416672	-0.149645	0.030864	5.755131	0.297558	-0.310258	-0.512361	0.850004
	(0.46569)	(0.76790)	(0.68567)	(11.1307)	(0.50230)	(0.49478)	(0.20265)	(1.18952)
	[0.89473]	[-0.19488]	[0.04501]	[0.51705]	[0.59239]	[-0.62706]	[-2.52829]	[0.71457]
LNUS_DOLLAR_INDIAN_RUPEE(-3)	0.566232	-3.582249	0.311462	-5.275267	-0.357784	0.228004	-0.594084	-0.310930
	(0.46664)	(0.76947)	(0.68707)	(11.1534)	(0.50332)	(0.49579)	(0.20306)	(1.19195)
	[1.21341]	[-4.65550]	[0.45332]	[-0.47298]	[-0.71084]	[0.45988]	[-2.92559]	[-0.26086]
LNUS_DOLLAR_INDIAN_RUPEE(-4)	-1.391662	5.490716	-0.641783	-1.306815	0.379293	0.019877	0.865774	-1.940563
	(0.49104)	(0.80970)	(0.72299)	(11.7365)	(0.52964)	(0.52172)	(0.21368)	(1.25427)
	[-2.83410]	[6.78120]	[-0.88767]	[-0.11135]	[0.71614]	[0.03810]	[4.05170]	[-1.54716]
LNUS_DOLLAR_INDIAN_RUPEE(-5)	0.753470	-2.078286	0.314801	3.625260	-0.122459	-0.182641	-0.353306	1.947213
	(0.29507)	(0.48655)	(0.43445)	(7.05251)	(0.31826)	(0.31350)	(0.12840)	(0.75370)
	[2.55354]	[-4.27148]	[0.72460]	[0.51404]	[-0.38477]	[-0.58259]	[-2.75156]	[2.58355]
DUMM(-1)	0.015947	-0.114059	9.47E-05	-0.310024	0.012537	-0.001601	0.007159	0.729262
	(0.03822)	(0.06302)	(0.05627)	(0.91343)	(0.04122)	(0.04060)	(0.01663)	(0.09762)
	[0.41727]	[-1.80996]	[0.00168]	[-0.33940]	[0.30414]	[-0.03943]	[0.43045]	[7.47058]
DUMM(-2)	-0.072339	0.237553	0.063517	-0.823907	-0.087263	0.009155	-0.032050	-0.004259
	(0.04668)	(0.07697)	(0.06873)	(1.11570)	(0.05035)	(0.04960)	(0.02031)	(0.11923)
	[-1.54969]	[3.08625]	[0.92417]	[-0.73847]	[-1.73317]	[0.18459]	[-1.57781]	[-0.03572]
DUMM(-3)	0.001973	-0.194228	-0.032618	0.568029	-0.002525	0.041548	-0.013478	0.489776
	(0.04543)	(0.07491)	(0.06689)	(1.08579)	(0.04900)	(0.04827)	(0.01977)	(0.11604)
	[0.04343]	[-2.59288]	[-0.48766]	[0.52315]	[-0.05154]	[0.86082]	[-0.68177]	[4.22084]
DUMM(-4)	-0.041176	0.013635	-0.003941	0.074405	-0.036249	0.035256	-0.016316	-0.261972
	(0.04682)	(0.07720)	(0.06894)	(1.11904)	(0.05050)	(0.04974)	(0.02037)	(0.11959)
	[-0.87947]	[0.17661]	[-0.05717]	[0.06649]	[-0.71781]	[0.70875]	[-0.80082]	[-2.19056]
DUMM(-5)	0.061429	0.038860	-0.059083	0.648833	0.097472	-0.051341	0.048580	0.040624
	(0.03762)	(0.06204)	(0.05540)	(0.89925)	(0.04058)	(0.03997)	(0.01637)	(0.09610)
	[1.63274]	[0.62639]	[-1.06657]	[0.72153]	[2.40193]	[-1.28438]	[2.96721]	[0.42272]
C	1.726370	1.884475	2.936576	13.25452	1.123669	-1.144414	1.017369	-4.100584
	(0.77423)	(1.27665)	(1.13995)	(18.5050)	(0.83508)	(0.82259)	(0.33691)	(1.97761)
	[2.22979]	[1.47611]	[2.57606]	[0.71627]	[1.34558]	[-1.39123]	[3.01968]	[-2.07350]
R-squared	0.993349	0.992589	0.990930	0.905622	0.966073	0.986308	0.990112	0.977498
Adj. R-squared	0.990634	0.989564	0.987228	0.867101	0.952225	0.980719	0.986076	0.968314
Sum sq. resids	0.063866	0.173651	0.138452	36.48465	0.074300	0.072094	0.012094	0.416691
S.E. equation	0.025528	0.042094	0.037587	0.610158	0.027535	0.027123	0.011109	0.065207
F-statistic	365.9176	328.1518	267.6641	23.50952	69.76329	176.4858	245.3209	106.4295
Log-likelihood	336.9058	267.3878	283.1309	-104.2705	326.3885	328.4836	452.5598	206.5546
Akaike AIC	-4.257638	-3.257379	-3.483897	2.090223	-4.106310	-4.136455	-5.921724	-2.382080
Schwarz SC	-3.392074	-2.391815	-2.618333	2.955787	-3.240745	-3.270891	-5.056160	-1.516516
Mean dependent	10.13922	-2.700200	4.304039	-2.615961	7.231679	-2.890924	4.135645	0.158273
S.D. dependent	0.263787	0.412067	0.332584	1.673712	0.125974	0.195333	0.094142	0.366317

LNBSE(SENSEX)_PRICE = C(1)*LNBSE(SENSEX)_PRICE(-1) + C(2)*LNBSE(SENSEX)_PRICE(-2) + C(3)*LNBSE(SENSEX)_PRICE(-3) + C(4)*LNBSE(SENSEX)_PRICE(-4) + C(5)*LNBSE(SENSEX)_PRICE(-5) + C(6)*LNCPI_ACTUAL(-1) + C(7)*LNCPI_ACTUAL(-2) + C(8)*LNCPI_ACTUAL(-3) + C(9)*LNCPI_ACTUAL(-4) + C(10)*LNCPI_ACTUAL(-5) + C(11)*LNCRUDE_OIL_WTI_PRICE(-1) + C(12)*LNCRUDE_OIL_WTI_PRICE(-2) + C(13)*LNCRUDE_OIL_WTI_PRICE(-3) + C(14)*LNCRUDE_OIL_WTI_PRICE(-4) + C(15)*LNCRUDE_OIL_WTI_PRICE(-5) + C(16)*LNGDPACTUAL(-1) + C(17)*LNGDPACTUAL(-2) + C(18)*LNGDPACTUAL(-3) + C(19)*LNGDPACTUAL(-4) + C(20)*LNGDPACTUAL(-5) + C(21)*LNGOLD__PRICE(-1) + C(22)*LNGOLD__PRICE(-2) + C(23)*LNGOLD__PRICE(-3) + C(24)*LNGOLD__PRICE(-4) + C(25)*LNGOLD__PRICE(-5) + C(26)*LNINTEREST_RATE_ACTUAL(-1) + C(27)*LNINTEREST_RATE_ACTUAL(-2) + C(28)*LNINTEREST_RATE_ACTUAL(-3) + C(29)*LNINTEREST_RATE_ACTUAL(-4) + C(30)*LNINTEREST_RATE_ACTUAL(-5) + C(31)*LNUS_DOLLAR_INDIAN_RUPEE(-1) + C(32)*LNUS_DOLLAR_INDIAN_RUPEE(-2) + C(33)*LNUS_DOLLAR_INDIAN_RUPEE(-3) + C(34)*LNUS_DOLLAR_INDIAN_RUPEE(-4) + C(35)*LNUS_DOLLAR_INDIAN_RUPEE(-5) + C(36)*DUMM(-1) + C(37)*DUMM(-2) + C(38)*DUMM(-3) + C(39)*DUMM(-4) + C(40)*DUMM(-5) + C(41)

Dependent Variable: LNBSE(SENSEX)_PRICE
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 06/30/21 Time: 18:13
Sample (adjusted): 2010M06 2021M12
Included observations: 139 after adjustments

LNBSE(SENSEX)_PRICE = C (1)*LNBSE(SENSEX)_PRICE(-1) + C (2)
*LNBSE(SENSEX)_PRICE(-2) + C (3)*LNBSE(SENSEX)_PRICE(-3) + C (4)
*LNBSE(SENSEX)_PRICE(-4) + C (5)*LNBSE(SENSEX)_PRICE(-5) + C (6)
*LNCPI_ACTUAL(-1) + C (7)*LNCPI_ACTUAL(-2) + C (8)
*LNCPI_ACTUAL(-3) + C (9)*LNCPI_ACTUAL(-4) + C (10)
*LNCPI_ACTUAL(-5) + C (11)*LNCRUDE_OIL_WTI_PRICE(-1) + C (12)
*LNCRUDE_OIL_WTI_PRICE(-2) + C (13)*LNCRUDE_OIL_WTI_PRIC
E(-3) + C (14)*LNCRUDE_OIL_WTI_PRICE(-4) + C (15)
*LNCRUDE_OIL_WTI_PRICE(-5) + C (16)*LNGDPACTUAL(-1) + C (17)
*LNGDPACTUAL(-2) + C (18)*LNGDPACTUAL(-3) + C (19)
*LNGDPACTUAL(-4) + C (20)*LNGDPACTUAL(-5) + C (21)
*LNGOLD__PRICE(-1) + C (22)*LNGOLD__PRICE(-2) + C (23)
*LNGOLD__PRICE(-3) + C (24)*LNGOLD__PRICE(-4) + C (25)
*LNGOLD__PRICE(-5) + C (26)*LNINTEREST_RATE_ACTUAL(-1) +
C (27)*LNINTEREST_RATE_ACTUAL(-2) + C (28)*LNINTEREST_RATE
_ACTUAL(-3) + C (29)*LNINTEREST_RATE_ACTUAL(-4) + C (30)
*LNINTEREST_RATE_ACTUAL(-5) + C (31)*LNUS_DOLLAR_INDIAN_
RUPEE(-1) + C (32)*LNUS_DOLLAR_INDIAN_RUPEE(-2) + C (33)
*LNUS_DOLLAR_INDIAN_RUPEE(-3) + C (34)*LNUS_DOLLAR_INDIA
N_RUPEE(-4) + C (35)*LNUS_DOLLAR_INDIAN_RUPEE(-5) + C (36)
*DUMM(-1) + C (37)*DUMM(-2) + C (38)*DUMM(-3) + C (39)*DUMM(-4) +
C (40)*DUMM(-5) + C (41)

	Coefficient	Std. Error	t-Statistic	Prob.
(1)	1.521525	0.178566	8.520808	**0.0000**
(2)	-0.614384	0.308853	-1.989246	**0.0495**
(3)	-0.213057	0.316952	-0.672207	0.5030
(4)	0.277902	0.317299	0.875837	0.3833
(5)	-0.032034	0.184564	-0.173568	0.8626

(6)	-0.044396	0.070505	-0.629687	0.5304
(7)	0.030081	0.081324	0.369888	0.7123
(8)	-0.063218	0.066658	-0.948396	0.3453
(9)	0.008315	0.082336	0.100986	0.9198
(10)	0.003650	0.056917	0.064129	0.9490
(11)	0.132385	0.091299	1.450011	0.1502
(12	-0.071064	0.149230	-0.476205	0.6350
(13)	-0.330877	0.145739	-2.270342	0.0254
(14)	0.657410	0.152197	4.319467	**0.0000**
(15)	-0.317611	0.097527	-3.256654	**0.0015**
(16)	-0.000515	0.003740	-0.137709	0.8908
(17)	-0.000292	0.006112	-0.047825	0.9620
(18)	0.002301	0.006032	0.381433	0.7037
(19)	-0.003563	0.006140	-0.580304	0.5630
(20)	0.000911	0.003888	0.234283	0.8153
(21)	0.148499	0.173822	0.854316	0.3950
(22)	-0.155086	0.329310	-0.470942	0.6387
(23)	-0.482246	0.340650	-1.415664	0.1600
(24)	0.977224	0.335599	2.911878	**0.0044**
(25)	-0.570077	0.193543	-2.945470	**0.0040**
(26)	0.090190	0.137151	0.657599	0.5123
(27)	-0.046432	0.194010	-0.239329	0.8114
(28)	0.156767	0.168932	0.927992	0.3557
(29)	-0.091233	0.206838	-0.441081	0.6601
(30)	0.028459	0.162733	0.174880	0.8615
(31)	-0.490184	0.276714	-1.771445	0.0796
(32)	0.416672	0.465695	0.894732	0.3731
(33)	0.566232	0.466644	1.213413	0.2279
(34)	-1.391662	0.491042	-2.834097	**0.0056**
(35)	0.753470	0.295069	2.553538	**0.0122**
(36)	0.015947	0.038217	0.417269	0.6774
(37)	-0.072339	0.046680	-1.549691	0.1244
(38)	0.001973	0.045428	0.043426	0.9655
(39)	-0.041176	0.046820	-0.879465	0.3813
(40)	0.061429	0.037623	1.632740	0.1057
(41)	1.726370	0.774229	2.229792	**0.0280**
R-squared	0.993349	Mean dependent var		10.13922
Adjusted R-squared	0.990634	S.D. dependent var		0.263787
S.E. of regression	0.025528	Akaike info criterion		-4.257638
Sum squared resid	0.063866	Schwarz criterion		-3.392074
Log-likelihood	336.9058	Hannan-Quinn criteria.		-3.905895
Durbin-Watson stat	2.040043			

Note: From the above table, we get the p values of dependent and independent variables with their lagged values and found that coefficient C.1 and coefficient C.2 are significant with independent variable BSE (Sensex) price during selected periods of study there are aged I and aged two value of BSE (Sensex) prices then C.14 and C.15 are 4 and 5 lagged value of crude oil price respectively they are also significant with independent variable BSE(Sensex) and also C.24, and C.25 are the coefficient of gold prices of 3 and 4 lagged .are significant with BSE(Sensex) price similarly C.34, and C.35 are coefficient of Indian currency on the dollar with lagged value at 3

and 4 laggs.AS these variables only have a p-value less than 5% means they only are significant during this period of study and impact the independent variable.

This shows that our eight variables have a long-run Association. When the variables are cointegrated, then we can run the VECM model so as per the guideline. If the variables are Co integrated, we can efficiently run a vector error correction model. Table 5 shows VECM analysis which examines the relationships and dynamics between various economic variables, including stock prices, oil prices, GDP, gold prices, interest rates, and exchange rates. It provides insights into both long-term equilibrium relationships and short-term adjustments.

Table 5. Vector Error Correction Estimates

Date: 06/20/21 Time: 13:49
Sample (adjusted): 2010M03 2021M12
Included observations: 142 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNBSE(SENSEX)_PRICE(-1)	1.000000
LNCRUDE_OIL_WTI_PRICE(	
-1)	15.78898
	(2.41613)
	[6.53482]
LNGDPACTUAL(-1)	-0.295884
	(0.14199)
	[-2.08385]
LNGOLD__PRICE(-1)	6.864617
	(3.00470)
	[2.28462]
LNINTEREST_RATE_ACTUA	
L(-1)	27.33957
	(3.59710)
	[7.60044]
LNUS_DOLLAR_INDIAN_RU	
PEE(-1)	0.834363
	(4.19027)
	[0.19912]
C	-52.90965

Error Correction:	D(LNBSE(SENSEX)_PRICE)	D(LNCRUDE_OIL_WTI_PRICE)	D(LNGDPACTUAL)	D(LNGOLD__PRICE)	D(LNINTEREST_RATE_ACTUAL)	D(LNUS_DOLLAR_INDIAN_RUPEE)
CointEq1	0.007362	-0.007812	0.018129	0.009778	-0.011706	0.002778
	(0.00152)	(0.00201)	(0.03403)	(0.00181)	(0.00163)	(0.00067)
	[4.83713]	[-3.88125]	[0.53281]	[5.40117]	[-7.18393]	[4.17153]
D(LNBSE(SENSEX)_PRICE(-						
1))	0.517952	0.310737	0.391828	-0.240536	0.143465	-0.066173
	(0.13128)	(0.17360)	(2.93488)	(0.15615)	(0.14055)	(0.05745)
	[3.94546]	[1.78994]	[0.13351]	[-1.54039]	[1.02073]	[-1.15192]

D(LNCRUDE_OIL_WTI_PRICE(-1))	-0.094310	0.611965	-0.467137	-0.071952	0.036362	-0.022159
	(0.07040)	(0.09309)	(1.57378)	(0.08373)	(0.07537)	(0.03080)
	[-1.33972]	[6.57383]	[-0.29682]	[-0.85929]	[0.48246]	[-0.71934]
D(LNGDPACTUAL(-1))	0.002567	-0.002781	0.511219	0.003074	-0.001593	0.001284
	(0.00342)	(0.00452)	(0.07639)	(0.00406)	(0.00366)	(0.00150)
	[0.75113]	[-0.61540]	[6.69187]	[0.75616]	[-0.43534]	[0.85869]
D(LNGOLD__PRICE(-1))	-0.076999	-0.122146	-0.388390	0.598194	-0.118795	-0.004894
	(0.13892)	(0.18371)	(3.10573)	(0.16524)	(0.14873)	(0.06079)
	[-0.55427]	[-0.66489]	[-0.12506]	[3.62008]	[-0.79871]	[-0.08051]
D(LNINTEREST_RATE_ACTUAL(-1))	-0.070763	0.078014	-0.687907	-0.165569	0.645629	-0.031682
	(0.08523)	(0.11271)	(1.90544)	(0.10138)	(0.09125)	(0.03730)
	[-0.83024]	[0.69217]	[-0.36102]	[-1.63314]	[7.07530]	[-0.84948]
D(LNUS_DOLLAR_INDIAN_RUPEE(-1))	0.031899	0.075536	-2.142335	-0.182088	0.259628	0.556669
	(0.23153)	(0.30618)	(5.17624)	(0.27541)	(0.24789)	(0.10132)
	[0.13777]	[0.24670]	[-0.41388]	[-0.66116]	[1.04736]	[5.49435]
C	0.002657	-0.004164	-0.000474	0.001588	-0.000287	0.001147
	(0.00347)	(0.00458)	(0.07747)	(0.00412)	(0.00371)	(0.00152)
	[0.76685]	[-0.90854]	[-0.00612]	[0.38528]	[-0.07725]	[0.75610]
DUMM	-0.014204	0.001961	0.010548	-0.008986	0.007141	-0.002587
	(0.00863)	(0.01141)	(0.19293)	(0.01027)	(0.00924)	(0.00378)
	[-1.64591]	[0.17184]	[0.05467]	[-0.87541]	[0.77289]	[-0.68493]
R-squared	0.456318	0.412752	0.258707	0.372322	0.493775	0.366704
Adj. R-squared	0.423616	0.377429	0.214118	0.334567	0.463326	0.328611
Sum sq. resids	0.172057	0.300883	85.99419	0.243438	0.197221	0.032946
S.E. equation	0.035968	0.047563	0.804098	0.042783	0.038508	0.015739
F-statistic	13.95356	11.68501	5.802041	9.861501	16.21614	9.626530
Log-likelihood	275.3293	235.6479	-165.8794	250.6898	265.6378	392.6895
Akaike AIC	-3.751116	-3.192224	2.463090	-3.404082	-3.614617	-5.404077
Schwarz SC	-3.563775	-3.004883	2.650431	-3.216741	-3.427276	-5.216736
Mean dependent	0.001980	-0.006586	0.000340	-0.001822	0.004098	0.001449
S.D. dependent	0.047376	0.060281	0.907048	0.052446	0.052565	0.019208
Determinant resid covariance (dof adj.)		7.95E-17				
Determinant resid covariance		5.37E-17				
Log-likelihood		1450.985				
Akaike information criterion		-19.59134				
Schwarz criterion		-18.34240				

D(LNBSE(SENSEX)_PRICE) = C.(1)*(LNBSE(SENSEX)_PRICE(-1) + 15.7889758078*LNCRUDE_OIL_WTI_PRICE(-1) - 0.295884053163*LNGDPACTUAL(-1) + 6.8646166127*LNGOLD__PRICE(-1) + 27.3395701259*LNINTEREST_RATE_ACTUAL(-1) + 0.834362512956*LNUS_DOLLAR_INDIAN_RUPEE(-1) - 52.9096548478) + C.(2)*D(LNBSE(SENSEX)_PRICE(-1)) + C.(3)*D(LNCRUDE_OIL_WTI_PRICE(-1)) + C.(4)*D(LNGDPACTUAL(-1)) + C.(5)*D(LNGOLD__PRICE(-1)) + C.(6)*D(LNINTEREST_RATE_ACTUAL(-1)) + C.(7)*D(LNUS_DOLLAR_INDIAN_RUPEE(-1)) + C.(8) + C.(9)*DUMM

Dependent Variable: D(LNBSE(SENSEX)_PRICE)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 06/20/21 Time: 13:56
Sample after(adjusted): 2010M03 2021M12
Included observations: 142 after adjustments
D(LNBSE(SENSEX)_PRICE) = C (1)*(LNBSE(SENSEX)_PRICE(-1) + 15.7889758078
*LNCRUDE_OIL_WTI_PRICE(-1) - 0.295884053163*LNGDPACTUAL(-1) + 6.8646166127*LNGOLD__PRICE(-1) + 27.3395701259
*LNINTEREST_RATE_ACTUAL(-1) + 0.834362512956
*LNUS_DOLLAR_INDIAN_RUPEE(-1) - 52.9096548478) + C (2)
*D(LNBSE(SENSEX)_PRICE(-1)) + C (3)*D(LNCRUDE_OIL_WTI_PRICE(-1))
+ C (4)*D(LNGDPACTUAL(-1)) + C (5)*D(LNGOLD__PRICE(-1)) + C (6)
*D(LNINTEREST_RATE_ACTUAL(-1)) + C (7)*D(LNUS_DOLLAR_INDIAN_RUPEE(-1)) + C (8)+ C (9)*DUMM

	Coefficient	Std. Error	t-Statistic	Prob.
(1)	0.007362	0.001522	4.837134	0.0000
(2)	0.517952	0.131278	3.945456	0.0001
(3)	-0.094310	0.070396	-1.339718	0.1826
(4)	0.002567	0.003417	0.751126	0.4539
(5)	-0.076999	0.138920	-0.554268	0.5803
(6)	-0.070763	0.085231	-0.830244	0.4079
(7)	0.031899	0.231535	0.137772	0.8906
(8)	0.002657	0.003465	0.766849	0.4445
(9)	-0.014204	0.008630	-1.645909	0.1021
R-squared	0.456318	Mean dependent var		0.001980
Adjusted R-squared	0.423616	S.D. dependent var		0.047376
S.E. of regression	0.035968	Akaike info criterion		-3.751116
Sum squared resid	0.172057	Schwarz criterion		-3.563775
Log-likelihood	275.3293	Hannan-Quinn criteria.		-3.674989
Durbin-Watson stat	1.772004			

After running the vector error correction model and now we can estimate var; we choose the vector error correction model, and exogenous is our dummy variable. After getting the p-value of this model and coefficient of all independent here, C 1 is the coefficient of the error correction term. C 2 is the coefficient of the BSE (Sensex), which is positive and significant means BSE(Sensex) has a positive impact from its lagged value, so previous day value has a positive impact on current day values of BSE (Sensex), in case of C3 which is a coefficient of crude oil its value is negative and not significant it means it does not influence the BSE (Sensex) during the selected period of study and other independent variables are also have no effect on BSE (Sensex) during the chosen period. C 9 is the coefficient of dummy variable since its value is also negative and not significant means during covid 19 crises period all these independent variable are not important and has not shown and long-run Association with the BSE (Sensex), only the previous day prices of BSE (Sensex) has shown the positive Association with BSE (Sensex).

Figure 1 represents the Impulse Response Functions (IRFs) derived from a Vector Autoregression (VAR) model. IRFs are used to understand how a shock to one variable in the VAR affects all the variables in the system over a specified number of periods.

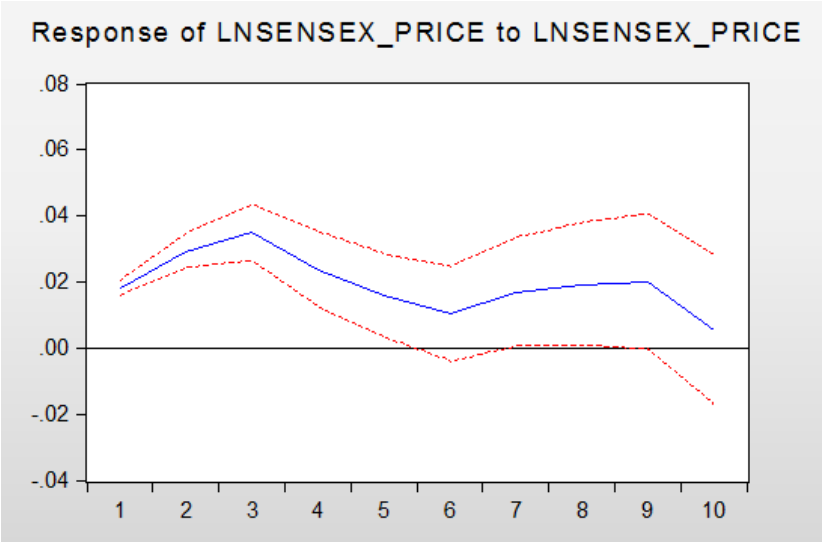

Figure 1. VAR impulse response function

Note: This graph is showing the response of BSE(Sensex) price The impulse response function for a one S. Dshock to BSE(Sensex) prices is shown in blue. The red lines, on the other hand, are merely the 95% confidence intervals, indicating that your impulse response function was always within the 95% confidence interval. Here in this figure from the IRF graph, we can see that from point 1to three this is showing the increasing trend then after 3 to 6 points showing a decline. On 6 points it is showing negative values also after this there is a slight increase in value and become positive and stable up to the 9 points and after that again showing negative during the selected period which also includes the Covid 19 effects.

Figure 2 shows the response of BSE (Sensex) price to a one standard deviation shock to Consumer Price Index (CPI) prices. The response is continuous and negative from 1 to 6 points. There is a slight increase in response from 6 to 9 points, although it remains below the negative line. Afterward, there is another decrease in response from 9 to 10 points. Overall, this indicates a negative response of CPI prices on BSE (Sensex) prices during the selected period of the study, particularly during the COVID-19 crisis.

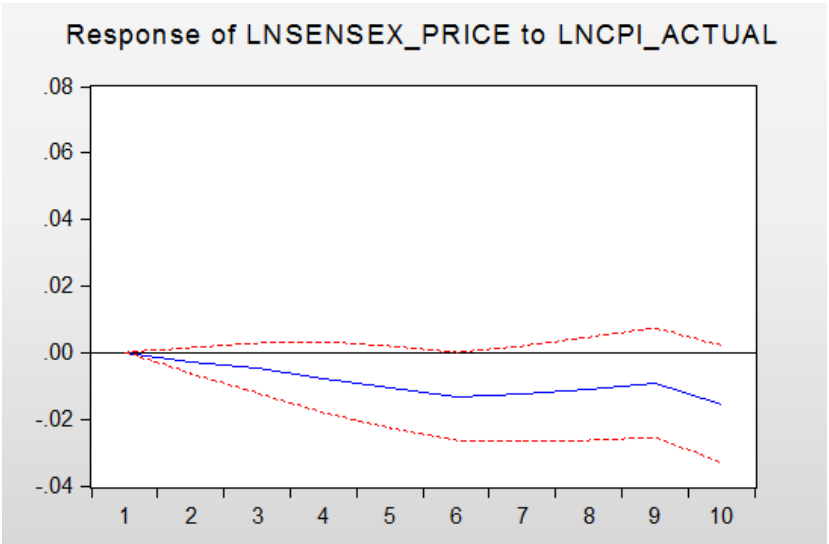

Figure 2. The IRF graph (1)

Note: This graph is showing the response of BSE(Sensex) price to a one S. Dshock to cpi prices. Here in this figure from the IRF graph the continuous decline in response from 1to 6 points then a slight increase in response even though still below the negative line till 9 points then again decrease in response from 9 to 10 points so we can say overall negative response of cpi on BSE (Sensex) price during the selected period of study during covid 19.

Figure 3 shows the response of BSE (Sensex) price to a one standard deviation shock to crude oil prices. The response is stable from 1 to 3 points. It turns negative from 3 to 6 points. There is a positive response from 6 to 9 points, and then it turns negative again from 9 to 10 points. This suggests that there is a mixed response of crude oil prices on BSE (Sensex) during the COVID-19 period.

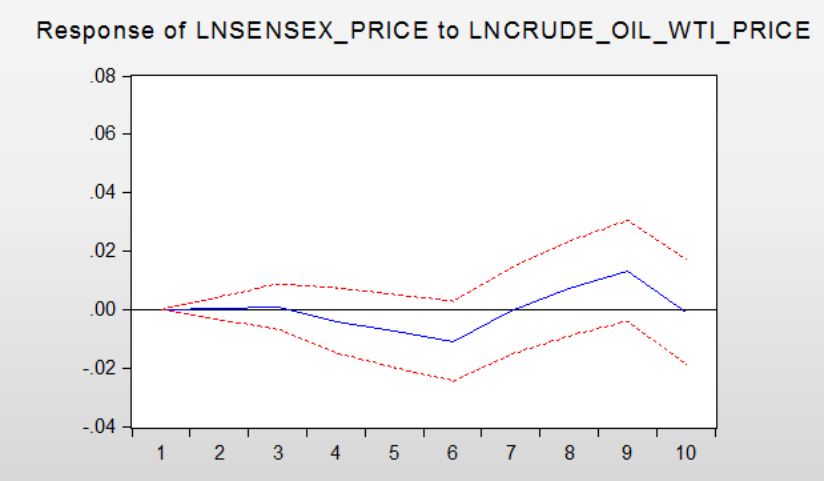

Figure 3. The IRF graph (2)

Note: This graph is showing the response of BSE(Sensex) price to a one S. Dshock to crude oil prices from the IRF graph it is showing stable from 1 to 3 points then from 3 to 6 showing negative response with BSE (Sensex) prices then from 6 to 9 points it is showing positive response then after 9 to 10 again showing negative response during Covid 19.

Figure 4 shows the response of BSE (Sensex) price to a one standard deviation shock to gold prices. The response increases slightly from 1 to 3 points. It decreases from 3 to 6 points. The response remains stable or almost zero from 7 to 9 points. Afterward, there is a decreasing response from 9 to 10 points during the COVID-19 crisis.

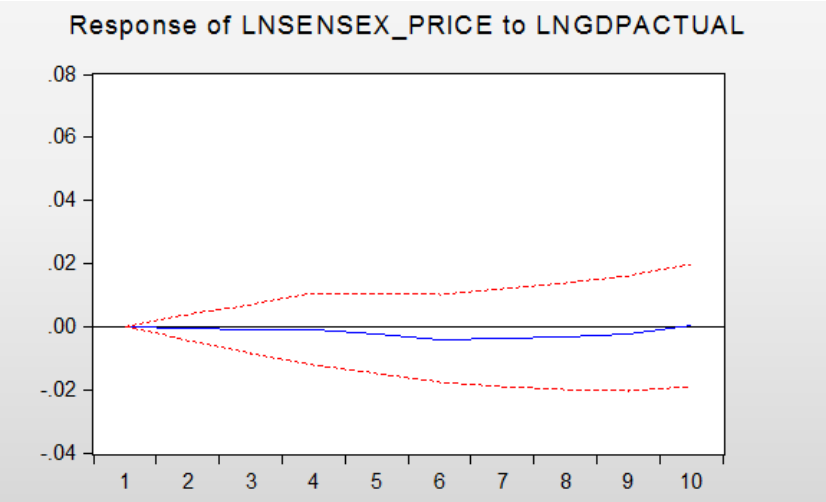

Figure 4. The IRF graph (3)

Note: This graph shows the response of BSE (Sensex) price to a one S. Dshock to GROSS DOMESTIC PRODUCT actual prices from the IRF graph from1 to 4 points it is stable after that it declines and again shows some increment at point 10 during Covid 19 crises.

Figure 5 demonstrates the response of BSE (Sensex) price to a one standard deviation shock to Gross Domestic Product (GDP) actual prices. The response is stable from 1 to 4 points. Afterward, it declines but shows some increment at point 10 during the COVID-19 crisis.

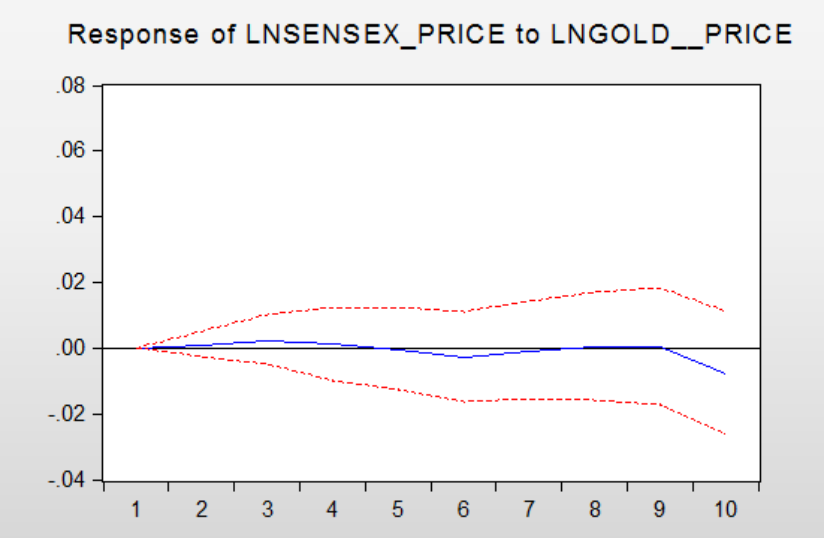

Figure 5. The IRF graph (4)

Note: This graph is showing the response of BSE (Sensex) price to a one S. Dshock to gold prices. From the IRF graph, we get that from1 to 3 points it is showing increasing slightly, and after 5 points it is showing decreases till 6 points, and from 7 to 9 points it is stable or almost zero and after9 it showing decreases response up to 10 points in Covid 19 crises.

Figure 6 shows the response of BSE (Sensex) price to a one standard deviation shock to interest rates. The response is stable from 1 to 3 points. It increases and is positive from 3 to 7 points. Then, it becomes regular from 7 to 8 points and slightly declines from 8 to 10 points.

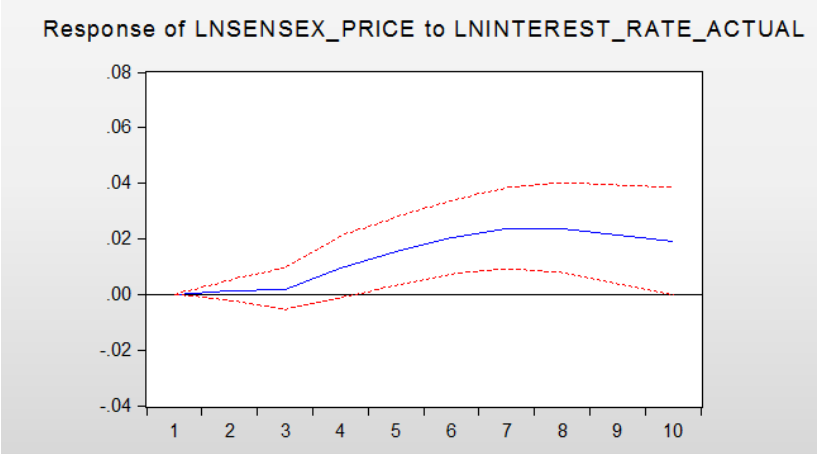

Figure 6. The IRF graph (5)

Note: This graph is showing the response of BSE (Sensex) price to a one S. Dshock to the Interest, rate from the IRF graph from 1 to 3 points it is showing stable response and after this up to 7 points showing increasing and positive response with BSE(Sensex) prices then regular from 7 to 8 points and after eight up to 10 points showing a slightly declining trend.

Figure 7 demonstrates the response of BSE (Sensex) price to a one standard deviation shock to the US dollar to Indian rupee exchange rate. The response is negative from 1 to 3 points. It increases from 4 to 8 points. Afterward, it shows a decreasing response from 8 to 10 points during the COVID-19 crisis.

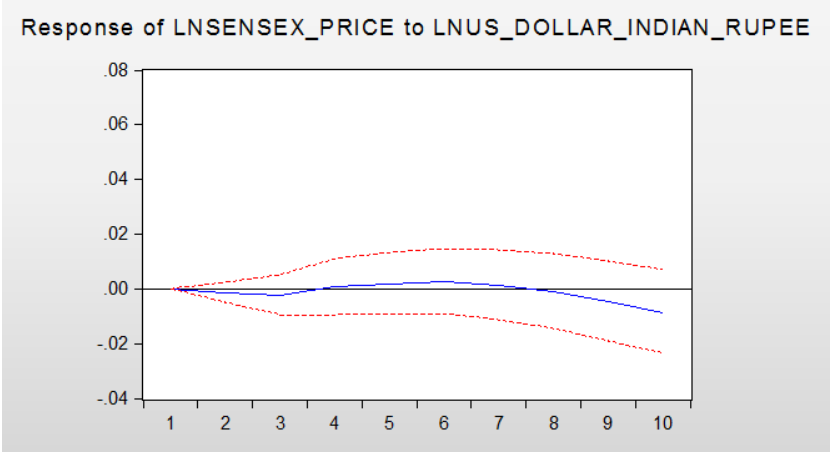

Figure 7. The IRF graph (6)

Note: This graph is showing the response of BSE (Sensex) price to a one S. Dshock to us dollar Indian rupee the IRF graph showing the negative response from 1 to 3 points then increases from 4 to 8 points and then showing decreasing response from 8 to 10 points during Covid 19 crises.

Figure 8 shows the response of BSE (Sensex) price to a one standard deviation shock to a dummy variable representing pre and post-COVID crisis values. The response is stable and equivalent to zero from 1 to 2 points. It declines after 2 points, remains stable from 5 to 8 points, and shows a slight positive response from 8 to 10 points.

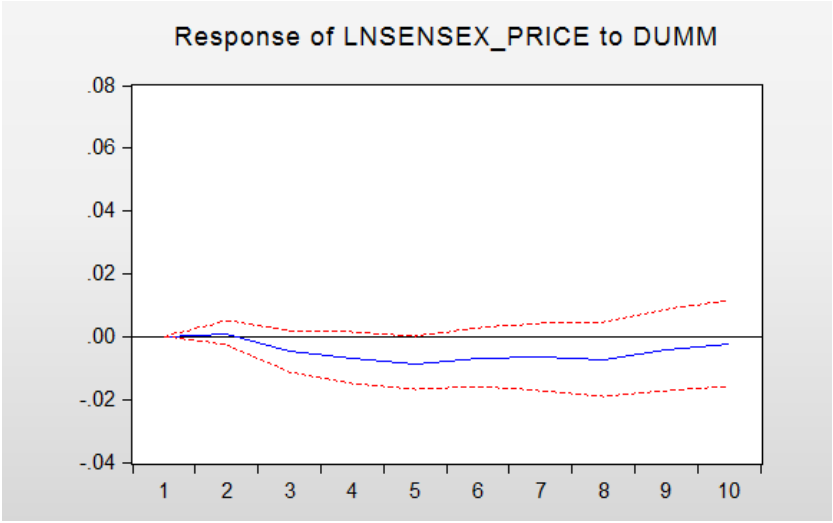

Figure 8. The IRF graph (7)

Note: This graph is showing the response of BSE (Sensex) price to a one S. Dshock to dummy, which is representing pre and post covid crises values from the IRF graph it is showing that from 1 to 2 points it is stable and equivalent to zero, but after 2 points it is showing declining response with BSE(Sensex) and stable from 5 to 8 points and after that from 8 to 10 showing slight positive response with BSE (Sensex).

The table 6 show a variance decomposition analysis for a variable labelled "LNBSE(SENSEX)_PRICE" over a period of 10 time intervals. Variance decomposition is a statistical technique used to understand the contribution of different factors to the variation in a particular variable.

Table 6. The variance decomposition of BSE (Sensex) prices

Variance Decomposition of LNBSE(SENSEX)_PRICE:

Period	S.E.	LNBSE(SENSEX)_PRICE	LNCPI_ACTUAL	LNCRUDE_OIL_WTI_PRICE	LNGDPACTUAL	LNGOLD__PRICE	LNINTEREST_RATE_ACTUAL	LNUS_DOLLAR_INDIAN_RUPEE	DUMM
1	0.019965	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.041077	99.50048	0.079580	0.033282	0.000155	0.017504	0.091699	0.004785	0.272518
3	0.062440	99.28699	0.305598	0.014924	0.002219	0.024636	0.155843	0.065866	0.143926
4	0.075066	96.51859	0.652002	0.243080	0.005204	0.245915	2.134649	0.045849	0.154710
5	0.084610	91.87599	0.925122	0.612216	0.004130	0.524185	5.780597	0.051798	0.225962
6	0.094167	84.70531	1.075673	1.093850	0.036175	0.881530	11.84356	0.130811	0.233093
7	0.107433	78.26909	0.953327	1.045061	0.110175	0.760247	18.47966	0.170101	0.212335
8	0.124736	71.71751	0.808104	2.017858	0.221762	0.585032	24.29330	0.141215	0.215222
9	0.143601	66.60647	0.775190	3.516689	0.345892	0.458986	28.00513	0.129119	0.162519
10	0.157991	61.08044	1.634498	2.999231	0.436890	0.876215	32.55585	0.272601	0.144266

Note: The first one is the variance decomposition of BSE (Sensex) prices. The second one is the variance decomposition of CPI actual, third is the CRUDE oil price, fourth is GDP, the fifth is gold prices, sixth is the Interest, rate, and seventh is Indian currency. Last is representing the Dummy variable which is defining Covid 19 crisis. And we can see that there are ten periods.

We can say from 1st period 100% forecast variance from BSE (Sensex) price is explained by the variable itself and other variables in the model do not have any substantial influence on BSE (Sensex) price in the short-run, or we can say they have solid exogenous impact means they don't influence BSE (Sensex) pieces in the short run. The second-year also they have strong erogeneity as 99.5% forecast variance is from BSE (Sensex) price explained by itself. But in the long run, the influence of exogenous variables has increased slightly. However, in the long run, the BSE (Sensex) prices are strongly influenced by itself only, so all other independent variables have a substantial exogenous impact. In the long run, they do not control BSE (Sensex) during the Covid 19 crises also. As per Figure 9 and 10 in short run, during the COVID-19 period, the variance decomposition analysis suggests that the independent variables under consideration (e.g., "LNCPI_ACTUAL," "LNCRUDE_OIL_WTI_PRICE," etc.) do not have a substantial impact on the fluctuations in BSE (Sensex) prices. The low proportion of variance explained by these factors indicates that short-term changes in the stock market are primarily influenced by other, potentially unforeseen, and unaccounted factors. This could be attributed to the heightened volatility and uncertainty often observed during a crisis like the COVID-19 pandemic. Similarly, in the long run, the independent variables do not seem to have much influence on BSE (Sensex) prices.

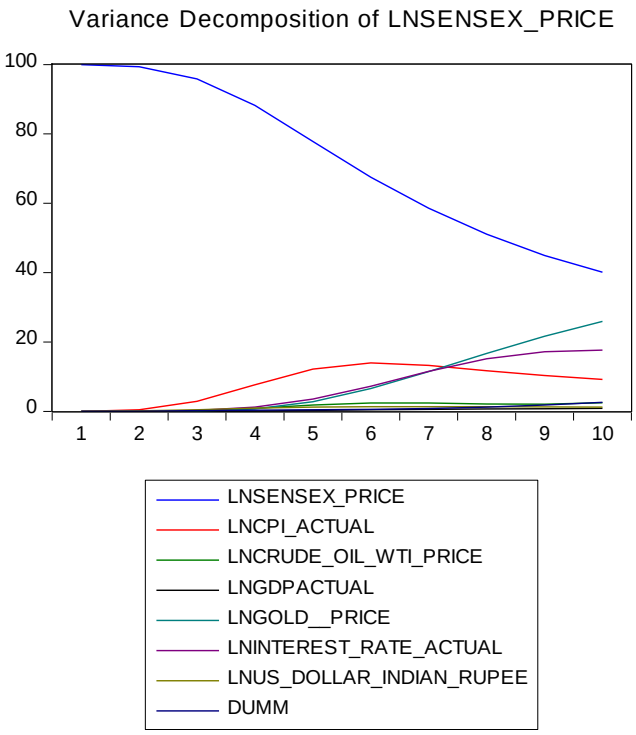

Figure 9. The graphs of variance decomposition (1)

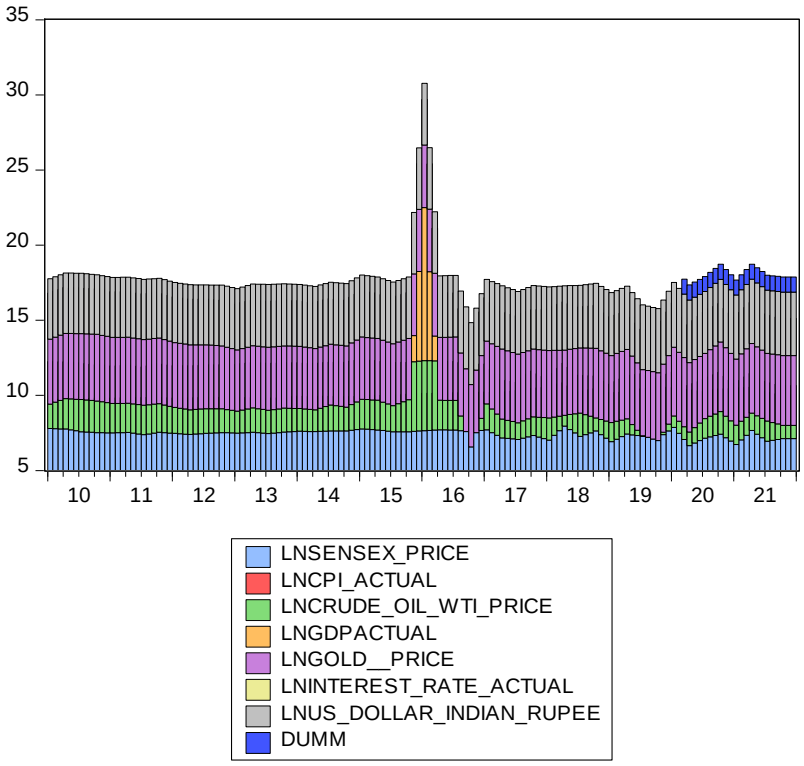

Figure 10. The graphs of variance decomposition (2)

Note: From these two graphs of variance decomposition, also we get to know that in the short run, these independent not have any influence on BSE (Sensex) prices during Covid 19. Also, in the long run, they have not influenced much.

5. Conclusion

Using monthly observations from 2010 to 2021 June, this paper evaluated the elements that can affect the short- and long-run securities market indices BSE (Sensex) in India. GROSS DOMESTIC PRODUCT growth, inflation, interest, rate, exchange, crude oil price, and gold price were all used in this study to see how they affected BSE (Sensex) prices throughout the last Covid 19 crises. In their first difference, all series were judged to be stationary. We discovered that shocks to all Eight variables have both positive and negative effects on BSE (Sensex) prices during the studied period, encompassing both short- and long-term Covid 19 crises. Each securities market index's most essential stimulus is its own shock. which diminishes from short to long term. We also yielding four cointegration equations with an estimated error correction term at the 0.05 level (speed of adjustment towards equilibrium) of 0.007362. And VECM is.007362 and 0.517952, indicating that BSE (Sensex) has substantial value with its lagging.

This research adds to the existing body of knowledge by combining empirical studies on these curities market index determinants movements to discover similar variables and methodology in each case. We built VAR models for the BSE (Sensex) with eight independent variables, including Dummy variables. However, their statistics were not significant, although the lagged value of crude oil, gold prices, the rupee, and the BSE (Sensex) lagged value were.

Since the imbalance proportion is corrected in the next period, we estimate VECM, which combines the model of economics in both the short and long run, using several robustness tests, we demonstrated the short- and long-term effects on BSE (SENSEX) caused by lagged BSE (Sensex) prices, crude oil prices, gold prices, and the currency. We've also included dummy variables to see how the Covid 19 crisis affected the BSE (Sensex) prices. During the study period, which included the Covid 19 situations from March 2020 to June 2021, we discovered that crude oil prices trailed value, gold prices lagged value. Rupees based on the dollar had a substantial impact on BSE (Sensex) pricing.

Furthermore, our research is helpful because better knowledge of securities market behaviour will enable enterprises and economic players to perform more efficiently, consistent with the efficient market hypothesis. Governments can help to keep these securities market and the economy in check by learning about interrelationship of macroeconomic, commodity prices, and securities market indexes, which will attract more investors and help control terrible or unstable economic and financial situations like Covid 19.

References

Al-Majali, A. A., & Al-Assaf, G. I. (2014). Long-run and short-run relationship between stock market index and main macroeconomic variables performance in Jordan. European Scientific Journal, 10(10), 156–171.

Ali, S. F., Abdelnabi, S. M., Iqbal, H. H., Weni, H., & Omer A. T. (2016). Long Run Relationship between Macroeconomic Indicators and Stock Price: The Case of South Africa. Journal of Internet Banking and Commerce, 21(S2), 1-16.

Başci, E. S., & Karaca, S. S. (2013). The Determinants of Stock Market Index: VAR Approach to Turkish Stock Market. International Journal of Economics and Financial Issues, 3(1), 163–171.

Beer, F., & Hebein, F. (2008). An Assessment of The Stock Market and Exchange Rate Dynamics in Industrialized and Emerging Markets. International Business & Economics Research Journal, 7(8), 59–70.

Belen, A., Prieto, T., & Lee, Y. (2019). Determinants of stock market Performance: VAR and VECM Designs in Korea and Japan. Global Business & Finance Review, 24(4), 24–44.

Berk, I., & Aydogan, B. (2012). Crude Oil Price Shocks and Stock Returns: Evidence from Turkish Stock Market under Global Liquidity Conditions. EWI Working Papers, (No. 12/15). Köln: Institute of Energy Economics at the University of Cologne (EWI).

Bhullar, P. S. (2017). Impact of Macroeconomic Variables on Stock Market Volatility in Emerging Economies: A case of India & China. International Journal of Advanced in Management, Technology and Engineering Sciences, 7(12), 137-144.

Boylan, D. (2015). A Review of the effects of Sarbanes - Oxley on Stock Price. Global Business & Finance Review, 20(1), 121-126.

Cheung, Y. W., & Ng, L. K. (1998). International evidence on the stock market and aggregate economic activity. Journal of Empirical Finance, 5(3), 281-296.

Dassanayake, W. & Jayawardena, C. (2017). Determinants of Stock Market Index Movements: Evidence from New Zealand Stock Market. The Proceedings of the 6th National Conference on Technology and Management (NCTM) (pp. 6-11). Malabe, Sri Lanka: IEEE.

Engle, R. F., & Granger, C. W. J. (2015). Co-Integration and Error Correction: Representation, Estimation, and Testing. Applied Econometrics, 39(3), 107–135.

Giri, A. K., & Joshi, P. (2017). The impact of Macroeconomic Indicators on Indian Stock Prices: An Empirical Analysis. Studies in Business and Economics, 12(1), 61–78.

Hsing, Y. (2011). Macroeconomic Determinants of the Stock Market Index and Policy Implications: The Case of a Central European Country. Eurasian Journal of Business and Economics, 4(7), 1-11

Joshi, P., & Giri, A. K. (2015). Cointegration and Causality between Macroeconomic variables and Stock Prices: Empirical Analysis from Indian Economy. Business and Economic Research, 5(2), 327-345.

Maysami, R. C., Howe, L. C., & Hamzah, M. A. (2004). Relationship between Macroeconomic Variables ands Stock Market Indices: Cointegration Evidence from Stock Exchange of Singapore's All-S Sector Indices. Jurnal Pengurusan, 24, 47-77.

Najand, M., & Noronha, G. (1998). Causal relations among stock returns, inflation, real activity, and interest rates: Evidence from Japan. Global Finance Journal, 9 (1), 71–80.

Rakhal, R. (2015). Determinants of Stock Market Performance. NCC Journal, 3(1), 134–142.

Sims, C. A. (1980). Macroeconomics and Reality. Econometrica, 48(1), 1-48.

Singh, D. (2010). Causal Relationship Between Macro-Economic Variables and Stock Market: A Case Study for India. Pakistan Journal of Social Sciences, 30(2), 263–274.

Sohail, N., & Zakir, H. (2010). Macroeconomic determinants of stock returns in Pakistan: The case of Karachi Stock Exchange. Journal of Advanced Studies in Finance, 1(2), 181-187.