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Impact of commodities and Exchange rates on Stock exchange Indices in India

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ABSTRACT

The country's economic growth can be measured using stock market indices. Sensex and Nifty are the barometers of the Indian economy which measure the performance. Any country's economic growth depends upon various factors. Out of which gold prices, crude oil prices and US Dollar exchange rates are found to be the important factors which have an impact on the stock market indices. Sensex being Asia's oldest stock exchange and NSE being the most popular stock exchange of the country are selected for the purpose of the study for a period of 12 years from 2008 to December 2020. Tools like descriptive statistics, Correlation Matrix and OLS Regression Model is used. From the study it is found that from the selected variables crude oil prices and exchange dollar rates have a significant impact on Sensex and Nifty whereas gold prices do not affect the index movements.

KEYWORDS: Gold price, Crude oil price, US exchange rate, BSE and NSE.

Introduction

There are various factors which play a vital role in the nation's development. In this study we aim at studying the relationship between Gold prices, Crude oil prices, and US $ Exchange rates on both BSE (SENSEX) and NSE (NIFTY) and how these variables Gold, Crude oil and US $ Exchange rates have an effect on both these indices

Gold is a precious metal and malleable in nature. Historically, it has been a very valuable metal due to its precious nature and used as a medium of exchange or as currency. Gold is popularly used in the making of jewellery. What more, gold is also very useful in industrial application. As it is a good conductor, very malleable and highly ductile, it is used in electronics, typically as wiring. Gold is viewed as a safe-haven investment in the face of slowing global economies and recession.

Crude oil is one of the most economically mature commodity markets in the world. Global supply and demand determines prices for these energy sources. Oil prices are highly volatile and dependent on supply, global demand, geopolitical uncertainty and a host of other economic criteria.

US Dollar is a global currency which is accepted for trade throughout the world. In the foreign exchange market, the dollar rules other currencies. More than 85% of Forex trading involves the U.S. dollar. As we all know

that India is a faster growing economy of the world and is in its developing stage. The financial markets basically the stock markets play a vital role in the nation's progress towards development. For the study Sensex and Nifty have been selected. Sensex refers to Sensitive Index of BSE. It is Asia's oldest stock exchange. It comprises of 30 stocks. Nifty belongs to NSE and it comprises of 50 stocks. It's a popular index of the country. The movements of Sensex and Nifty show the economic growth of the country.

Gold is one of the most essential commodities when determining the nation's progress, and in this study we aim at studying the effect of Gold prices on both the indices. Exchange rates in terms of US $ fluctuations also have a great impact in determining nations progress and we aim at studying the impact of Exchange rates in terms of US $ on both BSE and NSE indices. Crude oil is also one of the most essential commodities when it comes to determining the nation's progress and in this study we aim at studying the impact of Crude oil prices on both BSE and NSE indices.

2. LITERATURE REVIEW:

Golaka C. Nath and G. P. Samantha (2015): The authors have made an attempt to study the association between rate of currency exchange and Indian Stock prices. The authors have examined the direct linkages between foreign exchange rates and stock prices for India. In India though stock market investment does not constitute a very significant portion of the total household savings compared to other forms of financial assets, it may have a significant impact on exchange rate movement as FII investment has played a dominant role..

Ranjusha. N, Dr. Devasia, and Nandakumar (2017): The study article was titled "Co-integrating Relationship between Exchange Rate and Gold Price" by the authors. The goal of this research is to examine the relationship between gold price and the U.S. Dollar exchange rate. The article utilizes annual data from 1970 to 2015 to determine the link between both the exchange rate (ER) and the gold price (GP). For finding the long run relationship, if any, between the mentioned variables, different statistical approaches such as the Unit root test, Johansen co integration test, Vector error correction model, and Granger causality test are utilised. The results reveal that the variables have a long-run co-integrating relationship. That is, we can control exchange rate fluctuations and therefore stabilise the gold price movement. Furthermore, it demonstrates that perhaps the exchange rate has no bearing on the price of gold and vice versa. It signifies that one variable's time series data cannot be utilised to predict another. The analysis discovered that the variables in question had a long-run cointegrating relationship.

S. Subhashini and Dr. S. Poornima (2014):
The authors have made an attempt to determine the co-integration relationship and causality relationship for five years between commodities and Exchange rates. The gold investment is looked as a safe investment. The findings are that the prices of gold are affected by various factors like Exchange rates, Crude oil etc. Hence the authors have made an attempt to study these variables.

Gireesh et al (2015): In India, the relationship between gold price and exchange rate value was investigated by the author. The study looked at the spot price of exchange rate and the gold from 2005 up to the year 2013, and used the Johansen co-integration test to see if there was a long-term relationship between the two. According to the research, the value of the US dollar plays a significant role in influencing the gold price in India. The

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conclusion of this paper is that there are fluctuations in gold price caused by the movement in the US dollar exchange rate.

Rabia Najaf, Khakhan Najaf, Salman Yousaf (2016): In their study the authors have made an attempt to study the relationship between Gold and Oil prices on Karachi stock exchange. The correlation study between these variables show that there is no positive relationship between Gold and Crude oil prices on Karachi stock Exchange. The results also show that oil growth have significant relationship with Karachi stock Exchange and GDP of Pakistan.

Makhija and P.S Raghukumari (2016): In their study the authors have made an attempt to study the relationship between stock market indices in emerging economies and crude oil. The researchers state that market indices influence crude oil prices at a low degree. The researchers also state that bullish market influences demand for goods and services marginally, which leads to increase in production, transportation, and shipping activities. Thereby demand for oil prices which lead to in oil prices. Bearish market influences nature of these participants in an opposite direction.

3. RESEARCH GAP:

Most of the studies were conducted on the co-integrating relationship between Gold prices, Oil prices and exchange rates. Last two years no much studies were conducted on this topic to analyse the impact of variables on the Indian economic barometers.

4. OBJECTIVES OF THE STUDY:

1. To study the relationship among the indices BSE Sensex and Nifty 50.
2. To study the impact of commodities and US $ Exchange rates on NSE Index (NIFTY).
3. To study the impact of commodities and US $ Exchange rates on BSE Index (SENSEX)

5. HYPOTHESIS:

Ho 1: *The indexes Nifty 50 and BSE Sensex have no significant relationship.*

Ho 2: *There is no significant impact of* commodities *and US Dollar Exchange rates on Nifty.*

Ho 3: *There is no significant impact of* commodities *and US Dollar Exchange rates on Sensex.*

6. RESEARCH METHODOLOGY:

For the purpose of our study we have used secondary data as a source of information for our analysis, and time series data was retrieved from the Reserve Bank of India publication on a monthly basis from January 1 2008 to December 31 2020. The variable exchange rate is measured in rupees per US dollar unit from January 2008 until December 2019, the prices of gold, crude oil, US dollar exchange rates, and indices were documented on a monthly basis. So also we have taken BSE (SENSEX) and NSE (NIFTY) as dependent variables because they give overall view of the Indian Financial markets and variables like Gold prices, Crude oil prices, and US $ Exchange rates are taken as independent variables.

6.1 Period of study: The time period of our study is for 12 years on a monthly basis from January 2008 till December 2020.

6.2 Tools used: Descriptive statistics, Correlation Matrix and Regression Analysis using OLS Model by using Gretl software.

7. IMPORTANCE OF THE STUDY:

An index is an indicator or measure of something, and in finance, it typically refers to a statistical measure of change in a securities market. In the case of financial markets, stock and bond market indices consist of a hypothetical portfolio of securities representing a particular market or a segment of it. The movements of Sensex and Nifty represent the economic growth of a country. There are various reasons due to which the indices react and change. Some of the important factors which need to be studied are gold prices, crude oil and US Dollar exchange rates. Gold is considered as a precious metal and is viewed as a safe heaven investment during crisis situation in an economy. Crude oil is an essential commodity. Its price movement help in determining the nation's progress. And dollar is a strong currency and is acceptable worldwide. Gold, Crude oil and US dollar are the variables which have been selected for the study.

8. VARIABLES:

8.1 Gold Reserves:

A gold reserve is gold maintained by a central bank as a store of value and a guarantee to pay depositors, note holders (e.g. paper money), or trading peers, or to secure a currency. Gold's value fluctuate on a daily basis, so does the price of all gold. At that figure and using 2018 predictions, the total worth of all gold ever produced would have been almost US$ 7.5 trillion.

8.2 Oil Reserves:

Oil Reserves denote the amount of crude oil that can be technically recovered at a cost that is financially feasible at the present price of oil. Hence reserves will change with the price, unlike oil resources, which include all oil that can be technically recovered at any price. Based on data from OPEC at the beginning of 2017 the highest proved oil reserves including non-conventional oil deposits are in Venezuela (20% of gold reserves), Saudi Arabia (18% of gold reserves), Canada (13% of gold reserves) and Iran (9%)..

8.3 Exchange Rates:

Exchange rates are the prices of a country's currency in terms of another currency. The US dollar operates as the foundation currency for most exchange rates with other currencies functioning as the counter currency. As the US dollar is the dominant currency in global foreign exchange markets, the convention is to generally use direct quotes that have the US dollar as the base currency and other currencies like the Canadian dollar, Japanese yen, and Indian rupee as the counter currency.

8.4 National Stock Exchange of India:

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The National Stock Exchange of India Limited (NSE), headquartered in Mumbai, is India's largest stock exchange. The NSE was created in 1992 as the country's first electronic exchange.

8.5 BSE SENSEX:

The S&P BSE Sensex (S&P Bombay Stock Exchange Sensitive Index), often known as the BSE30 or just the SENSEX, is a free-float market-weighted stock market index that tracks the performance of 30 well-established and financially solid companies listed on the Bombay Stock Exchange.

9. Analysis and Discussion

9.1 Descriptive Statistics

Table 9.1.1. Descriptive Statistics

	Gold price	crude oil	US $ Exchange rate	Nifty 50	Sensex
Mean	46780	4119.183	53.04108	5907.593	19619.52
Median	25825	3783	50.94	5633.55	18691.23
Standard Deviation	7454.496	1200.496	9.144	1587.132	5143.771
Kurtosis	-1.2923	-0.7935	-1.3583	-0.6889	-0.6407
Skewness	-0.4554	0.4017	0.2000	0.2751	0.2115
Minimum	8662	1996	39.195	2755.1	8891.61
Maximum	32989	7246	68.598	8901.85	29361.5

(Source: Author's Compilation)

From the above descriptive statistics the following conclusions can be drawn. When we look at the mean values it can be said that the average gold price in India was Rs 46,780 22 Carat gold for 10 gram during the period of the study. The crude oil price per barrel on an average is Rs 4119.183 during 2007 to 2020. And the dollar exchange rate has average price of Rs 53.04 during the period of the study. The movements of the selected index on average was 5907.59 points for Nifty and 19619.52 points for Sensex. The median values are very close to the average values of the variables.

From the above descriptive statistics it is found that crude oil US Dollar exchange rates, nifty and Sensex are positively skewed since mean values of these variables are higher than their Median values but only gold prices are negatively skewed.

From the above table the minimum and maximum values have been obtained for the period of study. Minimum refers to the lowest value recorded of each variables and maximum refers to the highest values of each variables.

9.2 Correlation Analysis

Objective 1: To study the relationship among the indices BSE Sensex and Nifty 50.

Ho 1: The indexes Nifty 50 and BSE Sensex have no significant relationship.

Table 9.2.1: Correlation Matrix

	Gold price	Crude oil price	USD PRICE	Nifty 50	BSE Sensex
Gold price	1				
Crude oil price	0.440432	1			
USD PRICE	0.801218	0.107623	1		
Nifty 50	0.642404	0.040391	0.764507	1	
BSE Sensex	0.631703	0.057228	0.753034	0.99877	1

(Source: Author's Compilation)

The null hypothesis is rejected and alternate hypothesis is accepted as from the above Correlation matrix we can say that, both the Indices that is Nifty50 and BSE Sensex have a Perfect Positive Correlation among them (0.99877), which implies that both these variables are perfectly related to one another. It can also be concluded that fluctuations in any of these variables will have a direct effect on the other variable, which means that if any fluctuation takes place in Nifty50, it will have a direct impact on BSE Sensex.

In the above Correlation matrix, both Crude oil prices and Gold have a Moderate Positive Correlation among them (0.440432). Both Gold prices and Nifty50 also have a Moderate Positive Correlation among them (0.642404). Gold prices and BSE Sensex also have a Moderate Positive Correlation among them (0.631703).

In the above Correlation Matrix, both Crude oil prices and USD prices have a Weak Positive Correlation among them (0.107623). Both the variables Crude oil and Nifty50 are also having a Weak Positive Correlation among them (0.040391). Crude oil and BSE Sensex are also having a Weak Positive Correlation among them (0.057228).

Therefore it can be concluded that from the above Correlation matrix and interpretation of the Correlation matrix we can say that both the Indices have a Perfect Positive Correlation among them. USD prices is one variables which is having a Strong Positive Correlation with almost all the other variables, which indicate that any changes or fluctuations in USD prices will have a strong impact on the other related variables. Gold is a variable which is having a Moderate Positive Correlation with almost all the other variables, which implies that any change or fluctuations in Gold prices will have a Moderate impact on the other related variables. Crude oil is the variable which is having a Weak Positive Correlation with almost all the other variables, which indicates that any change or fluctuations will have a Weak or Small impact on the other related variables.

9.3 Regression analysis

Objective 2: To study the impact of Gold prices, Crude oil prices and US $ Exchange rates on NSE Index (NIFTY).

Ho 2: There is no significant impact of Gold prices, Crude Oil Prices and US Dollar Exchange rates on Nifty.

Table 9.3.1 Regression Model 1

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Variable	Coefficient	t-Statistic	Prob.	Adjusted R-squared	F-statistics	DW
Impact of Gold, Crude Oil, US $ Exchange Rate on NIFTY 50(Dependent variable :Nifty 50)						
Constant	0.0143175	2.9116	0.00431 ***	0.416837	3.40e-14	1.981911
Gold	-0.061814	-0.6489	0.51770			
Crude Oil	0.13934	2.6899	0.00820 ***			
US $ Exchange Rate	-1.66677	-8.7807	<0.00001 ***			

(Source: Author's Compilation)

By running the OLS regression model, we have obtained the above output

The equation framed for the model is $Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3$,

Where Y is the dependent variable and X_1, X_2, X_3 are independent variables.

In the above equation the dependent variable Y is Nifty50 returns and Independent variables X_1, X_2, X_3 are Gold returns, Crude oil returns and Exchange rates in terms of US $ returns respectively.

It is found that Crude oil and US dollar returns is having a significant impact on Nifty50 at 1% significance level (at 99% confidence limit). It is also found that the probability value of constant is 0.00431 which is significant at 1% level (99% confidence limit) *which implies that the null hypothesis is rejected that is crude oil and US Dollar exchange rates does have a significant impact on Nifty but for gold price the null hypothesis is accepted.*

Gold returns does not have an impact on Nifty50, since the probability value is 0.51770 which implies that the null hypothesis is accepted. Therefore gold is insignificant. R Square is 43.15% and Adjusted R Square is 41.68%, which implies that the change in USD and Crude oil is explained by 43% change in Nifty 50. Therefore 43% percent of variations is explained in above framed model.

The F Statistics value as compared to the probability value (F) which is (3.40e-14) is significant which implies that the null hypothesis is rejected. It can be concluded that Crude oil and US dollars returns have a joint impact on Nifty50.

Coefficient: Gold Returns is having a negative coefficient of -0.0618, which means that if there is 1% increase in the prices of gold then there will -0.0618 % decrease in nifty index movements.

US dollars returns is having a negative coefficient of -1.6667, which means that if there is 1% increase in US Dollar exchange then there will -1.6667 % decrease in nifty index movements Crude oil is having a positive coefficient of 0.13934, which means that if Crude oil prices increases by 1% ,then Nity50 will also increase by 0.13934%.

Durbin-Watson Test:

The above model has a Durbin-Watson test of 1.9819, which is closer to 2, which means that there is no auto-correlation in the above framed OLS Regression Model. *Therefore null hypothesis is rejected that is crude*

oil and US Dollar exchange rates does have a significant impact on Nifty but for gold price the null hypothesis is accepted.

Objective 3: To study the impact of Gold prices, Crude oil prices and US $ Exchange rates on BSE Index (SENSEX)

Ho 3: There is no significant impact of Gold prices, Crude Oil Prices and US Dollar Exchange rates on Sensex

Table 9.3.2: Regression Model 2

Variable	Coefficient	t-Statistic	Prob.	Adjusted R-squared	F-statistics	DW
Impact of Gold, Crude Oil, US $ Exchange Rate on SENSEX(Dependent variable :SENSEX)						
Constant	0.0136714	2.8258	0.00555 ***	0.413448	4.75e-14	1.854414
Gold	-0.0882572	-0.9417	0.34832			
Crude Oil	0.148418	2.9121	0.00431 ***			
US $ Exchange Rate	-1.60377	-8.5875	<0.00001 ***			

(Source: Author's Compilation)

By running the OLS regression model, we have obtained the above output

The equation framed for the model is $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3$,

Where Y is the dependent variable and X_1, X_2, X_3 are independent variables.

In the above equation the dependent variable Y is Sensex returns and Independent variables X_1, X_2, X_3 are Gold returns, Crude oil returns and Exchange rates in terms of US $ returns respectively. It is found that Crude oil and US dollar returns is having a significant impact on Sensex at 1% significance level. It is also found that the probability value of constant is 0.00555 which is significant at 1% level *which implies that the null hypothesis is rejected that is crude oil and US Dollar exchange rates does have a significant impact on Sensex but for gold price the null hypothesis is accepted.*

Gold returns does not have an impact on Sensex, since the probability value is 0.34832 which implies that the null hypothesis is accepted. Therefore gold is insignificant.

R Square is 42.82% and Adjusted R Square is 41.34%, which implies that the change in USD and Crude oil is explained by 42.82% change in Sensex. Therefore 42.82% percent of variations is explained in above framed model.

The F Statistics value as compared to the probability value (F) which is (4.75e-14) is significant which implies that the null hypothesis is rejected. It can be concluded that Crude oil and US dollars returns have a joint impact on Sensex.

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Coefficient: Gold Returns is having a negative coefficient of -0.0882, which means that if there is 1% increase in the prices of gold then there will -0.088 % decrease in Sensex index movements.

US dollars returns is having a negative coefficient of -1.6037, which means that if there is 1% increase in US Dollar exchange then there will -1.60 % decrease in Sensex index movements

Crude oil is having a positive coefficient of 0.1484, which means that if Crude oil prices increases by 1%, then Sensex will also increase by 0.148%.

Durbin-Watson Test:

The above model has a Durbin-Watson test of 1.8544, which is closer to 2, which means that there is no auto-correlation in above framed OLS Regression Model. ***Therefore the null hypothesis is rejected that is crude oil and US Dollar exchange rates does have a significant impact on Sensex but for gold price the null hypothesis is accepted.***

10. CONCLUSION:

From the above study it can be concluded that any country economic growth depends upon various factors. Out of which gold prices, crude oil prices and US Dollar exchange rates are found to be the important factors which have an impact on the stock market indices. Sensex being Asia's oldest stock exchange and NSE being the most popular stock exchange of the country are selected for the purpose of the study. The study shows that the selected indices are sensitive to the changes in prices of crude oil and US Dollar exchange rates. For the study two OLS regression models have been done using Gretel Software. For the purpose of our study we have taken BSE (SENSEX) and NSE (NIFTY) as dependent variables because they give overall view of the Indian Financial markets and variables like Gold prices, Crude oil prices, and US $ Exchange rates are taken as independent variables. For the purpose of normality of data the returns of each variable is calculated.

When the impact of selected variables is studied on nifty it is found that Crude oil and US dollar have a significant impact on Nifty50 at 1% significance level. It is also found that the probability value of constant is 0.00431 which is significant at 1% level. Because the probability value is 0.51770, the null hypothesis is accepted, gold returns have no influence on the Nifty50. It is found that Crude oil and US dollar returns is having a significant impact on Sensex at 1% significance level. It is also found that the probability value of constant is 0.00555 which is significant at 1% level. Gold returns does not have an impact on Sensex, since the probability value is 0.34832 which implies that the null hypothesis is accepted. Therefore gold is insignificant. Adjusted R Square is 41.68%, which implies that the change in USD and Crude oil is explained by 43% change in Nifty 50. Adjusted R Square is 41.34%, which implies that the change in USD and Crude oil is explained by 42.82% change in Sensex. In both regression models Gold prices and US Dollar exchange rates have negative coefficient which implies for every one unit increase in gold prices and US Dollar exchange rates will lead to a decrease in the value of Sensex and Nifty. Based on F-statistic it can be said that crude oil prices and US Dollar exchange rates have an joint impact on Nifty and Sensex

From the interpretation of the Correlation matrix we can say that both the Indices have a Perfect Positive Correlation among them. USD prices is one variables which is having a Strong Positive Correlation with almost all the other variables, which indicate that any changes or fluctuations in USD prices will have a strong impact on the other related variables. Gold is a variable which is having a Maderate Positive Correlation with almost all the other variables, which implies that any change or fluctuations in Gold prices will have a Moderate impact on the other related variables. Crude oil is the variable which is having a Weak Positive Correlation with almost all the

other variables, which indicates that any change or fluctuations will have a Weak or Small impact on the other related variables.

Therefore it can be concluded that from the selected variables crude oil prices and exchange dollar rates have a significant impact on both the exchanges whereas gold prices do not affect the index movements. The author suggest further research can be conducted using more variables and to further study the impact on the world economy.

10. RECOMMENDATION FOR FURTHER STUDY:

1. The study can be conducted on more variables.
2. Researchers can further study the impact of variables on the world economy.

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