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## CAUSAL RELATIONSHIP BETWEEN MAJOR BANKING RATES AND STOCK MARKET – EMPIRICAL EVIDENCE FROM INDIA DURING COVID-19

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**Abstract:** During this time when the entire world as well as India is confronted with economic crisis due to the flabbergasted shut down of core industrial production and other economic sectors due to lockdown, central bank like RBI in India is trying to stabilise the economy by injecting liquidity to the economy and market in form of loan through continuous adjusting and surveillance on its different monetary policy rates. Such unprecedented situation adds to extra uncontrollable risk to the stock market which adversely impacts stock market. This paper tries to investigate the causal relationship among major banking rates and Indian stock market during the COVID-19 pandemic. Policy repo rate, reverse repo rate, Marginal standing facility (MSF) rate, Cash reserve ratio (CRR), statutory liquidity ratio (SLR) and bank rate have been taken as the proxy to major banking rates whereas NIFTY has been taken as the proxy to Indian stock market. Sample size was finalised at 137 with daily data from 31 December, 2019 to 8 July, 2020. Multiple Linear regression model, Phillips-Perron unit root test, Johansen co integration test, Wald test and Granger causality were used as tools for analysis. It was found that there exist a negative relation between policy repo rate and NIFTY, reverse repo rate and NIFTY and CRR and NIFTY. There exist a positive relation between MSF rate and NIFTY, SLR and NIFTY and bank rate and NIFTY. Unit root test confirms that there is no unit root at first difference. Though there is no long run causality among the variables, there is short run causality among the variables. Further, NIFTY Granger causes policy repo rate, reverse repo rate, CRR, MSF and bank rate. CRR and bank rate Granger cause NIFTY.

**Index Terms-** Covid-19, Economic crisis, Major banking rates, Indian stock market, Causality, Regression, Co integration.

## **1. BACKGROUND OF THE STUDY**

The world is passing through a pandemic situation and India is also a victim of the same. On March 11, the World Health Organization declared COVID-19 as a pandemic. As infections and deaths soared in all-over the world, government of different countries have taken unprecedented measures including lockdown and quarantines. Schools, colleges, universities, business have been closed down and travel restrictions have been imposed to stem the spread of the pandemic. These measures together with the spontaneous reactions of consumer, workers and businesses have caused severe disruptions to activities in many sectors and a sharp global economic downturn. (<http://pubdocs.worldbank.org/en/667991588788067485/Global-Economic-Prospect-2020-June-2020-Analysis-EAP.pdf>).

In nearly 41 years, Indian economy is expected to contract as suggested by different rating agencies. SBI predicts a contraction of 6.8% in the growth rate of India and Fitch revised India's sovereign rating from stable to negative and Asian Development Bank also predicts 4% contraction in India's growth rate (Times of India, different issue).

At this very juncture, we should make an in depth analysis to get an insight as to how the major banking rates are bearing a causal relationship with stock market in India.

In most of the economic system and most of the countries in the world are controlled and regulated by two agencies the government and the central bank. Government is entitled for fiscal policy and central bank is entitled for monetary policy. These policies act as a double-edged sword and try to control the market situation in the economy.

In India central banking function is regulated by RBI and the different monetary policies like bank rate, repo rate, reverse repo rate, cash reserve ratio (CRR), statutory liquidity ratio (SLR), marginal standing facility (MSF) and liquidity adjustment facility (LAF) help to control credit within the economy. In this study, we are in search about the causal relationship between these major banking rates and stock market performance of India empirically.

Monetary policy is a regulatory policy formulated by RBI to have a control over the money supply for the achievement of general economic goals. (Kumari & Jha, 2019) In case of growing economy like India, RBI's duty is not merely of credit restriction, rather continuous credit expansion and money supply should be met. In India, monetary policy has always emphasised on the objectives of price stabilisation, growth, equity and social justice. Section 45ZB of the amended RBI Act, 1934 specified the setting up of six members Monetary Policy Committee.

There are two types of monetary policy; Firstly, expansionary policy which is applied by RBI to combat unemployment during recession period by reducing interest and increasing money supply rapidly in the economy and Secondly, contractionary policy to combat inflation by increasing interest rate and decrease money supply. (<https://www.investopedia.com/terms/c/contractionary-policy.asp>)

Stock market also called as Secondary market refers to the part of capital market where existing securities can be regularly bought and sold. This market enhance the liquidity and marketability of securities which encourage investors to take risk and make investment in this market and thereby keeping efficiency of flow of savings and fund. In India, there are presently 23 stock exchanges of which 2 national level stock exchanges are BSE and NSE and these are mostly popular. Bombay Stock Exchanges (BSE) and National Stock Exchange (NSE) jointly account for almost entire trading of stocks on Indian stock markets. (Puri & Misra, 2018) Efficiency and growth of stock market indicates the well performance of Indian economy because Indian stock markets are affected by many macro economic variables in which RBI's monetary policy rate changes are one of them.

Money is an important productive resource which affects almost all of the economic activities. RBI, being India's central bank regulates the money supply in the economy and which inevitably impacts Indian stock market trading. RBI uses different monetary instruments to control the money supply. So all monetary rates used by RBI have some indirect consequence on Indian stock market performance. This study will focus such consequence and causality relationship between NIFTY and other monetary policy rates and stock market behaviour during such economic and health emergency situation.

## **2. CONCEPTUAL FRAMEWORK**

Monetary policies are determined by central bank of any country and so by RBI of India. It is a policy which is formulated to control the money supply in the economy to stabilise the economic system of the country. To get at this objective, RBI uses different monetary policy rates such as Cash Reserve Ratio, Statutory Liquidity Ratio, Repo rate, Reverse repo rate, Bank rate and Marginal Standing Facility rate. These rates are determined by RBI at different points of time to facilitate economic activities.

The cash reserve ratio (CRR) is a fraction of total net demand and time liabilities (NDTL) that are received by the commercial banks from the public and this fraction should be kept with RBI in cash form through a specified current account. (Basu et. al, 2018) Maintenance of CRR is made compulsory as per RBI Act 1934, where it is stated that

commercial banks need to keep 5 percent against demand deposit i.e. savings and current deposits and 2 percent against time or fixed deposit. But this act was amended later. As per RBI (Amendment) Act, 1962, the RBI is empowered to determine CRR in range of 3 to 20 percent against aggregate NDTL. An amendment to the act in 2006 removed floor and ceiling rate and w.e.f. April 2007 RBI can stipulate CRR at its discretion. Banks have to maintain cash balances with RBI to meet the prescribed limit of CRR during fortnight, and banks need to maintain at least 70 percent of the amount of CRR on daily basis. RBI changes CRR rate to bring price stability i.e. during inflationary and deflationary situation. During inflationary situation, CRR gets increased and during deflationary period, CRR gets decreased.

The statutory liquidity ratio (SLR) is another weapon to the arsenal of RBI which is also used to immune the economy from price instability and liquidity crisis. It refers to the supplementary liquid reserve requirement of banks in addition to CRR. Banks need to maintain a minimum percentage of their deposits at the end of every business day in the form of cash (excluding balance maintained for CRR), gold (valued at price not exceeding current market price), government securities and other approved securities, with themselves. The main objective of SLR is to meet unforeseen demand of customers in future. Current SLR rate as on 2<sup>nd</sup> July 2020, is 18.50 percent i.e. bank needs to keep liquid assets of Rs. 18.50 if its total deposits amount to Rs.100. This ratio is prescribed by section 24(2A) of Banking Regulation Act, 1949. The main objectives of SLR are to control credit creation, to invest more in government securities and to ensure financial solvency of banks.

To combat the inflationary situation, RBI increases the SLR rate and decreases the rate when deflation takes place in the economy. Increase of CRR and SLR decreases the lendable fund to the hands of commercial bank. As a result of which the commercial banks can provide a lower amount of loan to the investors. This leads to a lower amount of investment in the stock market. Therefore cost of capital or expected rate of return to the investors or discounting rate need to be increased which in turn present value of future returns decline which will depress the equity as well as stock market. So the impact of CRR and SLR on stock market is negative (Talreja, 2020) and vice versa effect is found when CRR or SLR is decreased. (Bernake, 2003) argued that if other things remain unchanged, expected return on stocks can rise when current stock price declines. On the other hand, cut in CRR and SLR is beneficial to stock market. (Teja et al., 2013)

Bank rate is a minimum rate at which commercial banks take loan from RBI. It is also called as rediscounting rate that RBI extends to banks against securities like bills of exchange, commercial papers and other approved securities (Puri & Misra, 2018). According to section 49 of RBI Act 1934, bank rate means 'the standard rate at which RBI is prepared to buy or rediscount bills of exchange or other commercial papers eligible for purchase under this Act'.

When RBI increases bank rate to curb inflation and to drain out liquidity from market, lending capacity of commercial banks gets decreased, therefore interest rate is also increased by banks. Effect of interest rate on stock market is opposite in nature i.e. increase of bank rate will increase the interest rate as well as decrease the stock index and vice versa.

RBI uses Repo and Reverse Repo Rate for liquidity adjustment facility in the economy. When RBI thinks of injecting money supply to the country to increase liquidity, it may extend short term loan to banks through an agreement that RBI buys government securities from commercial banks and after certain period of time and at predetermined price commercial bank will repurchase those securities from RBI. The rate of interest charged by RBI on commercial banks is called as Repo rate or Repurchase rate. When RBI wants to drain out money from market, it will take loan from banks with a commitment to repurchase government securities from banks, it is called Reverse Repo and the interest charged by banks on RBI is called Reverse Repo Rate.

When Repo rate is increased, commercial banks also increase the interest rate that will make borrowing expensive to the public. Therefore it reduces money flow to stock market and also indirectly decreases the demand for goods and service in economy which will negatively impact stock market. An opposite effect is expected when repo rate is decreased. When RBI increases Reverse Repo rate, banks are encouraged to park their excess money in form of loan to RBI which reduces money supply to the economy and having the same effect as that of Repo Rate.

But ups and downs in stock market are affected by many factors and Repo or Reverse repo rate is one of them. Investor's sentiments and expectation play a pivotal role in stock market. So, investor's reaction to stock market regarding Repo or Reverse Repo Rate may be accounted before they are actually changed by RBI.

Marginal Standing Facility is introduced by RBI in 2011 to stabilise liquidity problem that faced by scheduled commercial banks due to mismatch between deposits and loan portfolios. Banks can borrow from RBI against government securities for overnight for meeting severe cash shortage. Under this scheme, banks can borrow up to 1



percent of NDTL. The interest rate which is charged by RBI under such facility is called MSF Rate. MSF rate is maintained at 25 bps above Repo rate.

Higher MSF rate means expensive borrowing by banks as well as for companies and individuals which ultimately indirectly have adverse consequence on stock market and vice versa.

The SENSEX and NIFTY are the indicators for measuring performance of stock market in India. Such index is used as a barometer of market behaviour and portfolio performance. Almost all the noteworthy firms of India are listed on both the exchanges, BSE and NSE. The BSE is the older stock market but the NSE is the largest stock market, in terms of volume. (<https://www.investopedia.com/articles/stocks/09/indian-stock-market.asp>)

### **3. LITERATURE SURVEY**

Following literatures from both national and international scenario have been surveyed minutely to conduct this research work:

#### **3.1 National Context**

- **Jeyalakshmi & Vasumathi (2020)** collected monthly data of 10 years of repo rate, reverse repo rate and CNX NIFTY to estimate their relationship. Significant effect of repo and reverse repo rate were found on NIFTY by using, correlation, regression and ANOVA.
- **Kumari & Jha (2019)** collected data from April, 2016 to March, 2018 of CRR, reverse repo rate and NIFTY to discover whether the progress in NIFTY 50 is the consequence of some selected monetary policy tool. They applied correlation and regression and it was seen that there is insignificant relationship between the variables.
- **Rajamohan & Vijayakumar (2017)** collected data to know the volatility, range of risk and return and investors' response on the basis of descriptive and analytical nature. They applied Wilcoxon signed rank test and paired t test to discover the pre and post impact of the repo rate declaration on the stock index price. They found out that stock market index has the optimistic performance after the repo rate announcement and the effect has not persistent as for long time.
- **Singh, Anamika (2014)** collected 15 years data to analyze the impact of monetary policy on market volatility. She applied augmented Dickey-Fuller test and ARCH test to analyze the volatility. It was found that NIFTY volatility is getting inclined to whenever monetary policy is declared.
- **Teja, Tejaswi, Madhavi & Ujwala (2013)** tried to inspect the impact of cash reserve ratio on stock market returns in India. They further attempted to examine relative other reasons that persuades stock market returns in India. They have used Inflation, Cash balance of scheduled and commercial banks with RBI, Repo rate, Reverse repo rate, Index of industrial product, Domestic institutional investment, Foreign institutional investment, Bank nifty and Nifty prices as the variables and have collected yearly data for analysis. They applied correlation, skewness and ANOVA as the tools for research. They concluded that impact of CRR is more on NIFTY than the other variables. Further they concluded that impact of change in monetary policy is more on bank NIFTY than NIFTY. In India there is necessity to initiate dual CRR for the banks and RBI need think on it.

#### **3.2 International Context**

- **Hojat, Simin (2015)** tried to analyze the impact of change in money supply, change in federal fund rates and federal fund futures on the expected rate of returns of publicly traded companies. A multiple regression confirmed a positive outcome of market rate of return and company size, a positive moderation outcome of M2 and a negative moderation and mediation consequence of FFR and FFF on the expected rate of returns of publicly traded companies.
- **Furman, Adeeb & Saeed (2014)** explored the dynamic shock of monetary policy on stock return in the manufacturing sector of Pakistan from 2001-2010. They considered CRR, discount rate, sales growth, leverage and size for the study. Company-definite variables, size of the firms has a noteworthy negative shock on stock returns whereas sales expansion and leverage are insignificant.
- **Gali & Gambetti (2014)** analyzed the reaction of stock prices in response to external jolts arising out of monetary policy by using VAR model. They pointed out that after a short run reduction, there is an increase in stock price from strict monetary policy.

- **Odhiambo, Nicholas. M (2010)** inspected the association between banks and stock market development in South Africa. The study attempted to answer are banks and stock markets positively related in South Africa? Empirical results show that there is a separate positive association between banks and stock markets in South Africa.
- **Bernanke & Kuttner (2005)** applied an event study approach on the basis of daily changes observed on monetary policy decision dates to expose the impact on stock prices of due to changes in federal fund rates. Their analysis includes response to a continual decline in the equity premium and to a minor scope of the relevant cash flows.

#### **4. RESEARCH GAP**

After minutely surveying the existing literatures in both national and international domain, following gaps have been identified in regard to the research topic:

- Most of the study has been made using yearly or monthly data
- There is no work in this area during the Covid-19 pandemic
- Using all major banking rates in any study is rarely found
- Application of different statistical tools like Co integration test, Wald Test, Granger causality could not be found

#### **5. OBJECTIVE OF THE STUDY**

On the basis of the research gaps, following objectives has been finalised for our study:

- To find out whether there is any relationship between major banking rates and Indian stock market
- To find out whether there is any causality among the variables over a long run time horizon
- To find out whether there is any causality among the variables over a short run time horizon
- To find out whether the dependent variable causes the independent variable and vice versa.

#### **6. RESEARCH METHODOLOGY**

##### **6.1 Type of Research**

The study is empirical in nature with secondary data. There is also theoretical study included for the part of going through the existing research works for identification of research gap and finalisation of the objectives.

##### **6.2 Sample Period**

In this research work, we have considered the time frame to be from 31 December, 2019 to 8 July, 2020 in order to ensure that the study can be conducted during the COVID-19 pandemic.

##### **6.3 Sample**

The sample size was initially determined at 191 but after going through the data screening process, it was finalized at 137 considering five days a week excluding Saturdays and Sundays.

##### **6.4 Data and its Source**

To conduct this study, we have collected seven variables – Policy repo rate, Reverse repo rate, Marginal standing facility (MSF) rate, Cash reserve ratio (CRR), Statutory liquidity ratio (SLR), Bank rate and NIFTY. NIFTY has been considered as the proxy to Indian stock market whereas the other variables are proxy to major banking rates. Daily data has been collected of the variables which have been converted into log natural. The major banking rates have been taken from weekly statistical supplement of Reserve Bank of India and the NIFTY data has been taken from NSE India website.

##### **6.5 Tools Used**

To conduct the empirical study, following tools have been used:

- Multiple Linear Regression Model
- Johansen Co integration Test (1991)
- Wald Test (1943)
- Granger Causality Test (1969)

We have also applied Phillips-Perron (1988) unit root test, descriptive statistics and statistical package E-views 8 has been used for analysis.

## 7. SIGNIFICANCE OF THE STUDY

At this crucial time, when the world is fighting against COVID-19, this study will provide necessary insights into the performance of Indian stock market and the effectiveness of major banking rates during the pandemic. The study will further help prospective investors and corporates to formulate their investment decision and will enable the researchers to make further studies in this area with some interesting outcomes. It will also enable the academic fraternity to understand its own unique behaviour during this economic and health emergency.

## 8. EMPIRICAL DATA ANALYSIS AND FINDINGS

### 8.1 Descriptive Statistics

	NIFTY	Policy Repo Rate	Reverse Repo Rate	MSF Rate	CRR	SLR	Bank Rate
Mean	10351.42	4.6456	4.2069	4.8956	3.4963	18.1569	4.862
Median	10116.15	4.4	4	4.65	3	18.25	4.65
Maximum	12362.3	5.15	4.9	5.4	4	18.5	5.4
Minimum	7610.25	4	3.35	4.25	3	18	4.25
Std. Dev.	1373.637	0.4896	0.6702	0.4896	0.5018	0.1485	0.4933
Skewness	0.1209	-0.1042	-0.072	-0.1042	0.0145	0.3408	0.0056
Kurtosis	1.6458	1.3048	1.2476	1.3048	1.0002	2.3101	1.2941
Jarque-Bera	10.8014	16.6505	17.6476	16.6505	22.8333	5.3699	16.6111
Probability	0.0045	0.0002	0.0001	0.0002	0	0.0682	0.0002
Sum	1418145	636.45	576.35	670.7	479	2487.5	666.1
Sum Sq. Dev.	257000000	32.6123	61.0909	32.6123	34.2481	3.0009	33.1076
Observations	137	137	137	137	137	137	137

The above table shows the descriptive statistics of all the variables. p value of Jarque-Bera statistics suggests that all the variables are normal except SLR due to p value more than 0.05. The variables have 137 samples each. During the study period, NIFTY rose to 12362.3 and came down to 7610.25 with a mean point of 10351.42. Policy repo rate rose to 5.15 and came down to 4 with a mean point of 4.6456. Reverse repo rate rose to 4.9 and came down to 3.35 with a mean point of 4.2069. MSF rate rose to 5.4 and came down to 4.25 with a mean point of 4.8956. CRR rose to 4 and came down to 3 with a mean point of 3.4963. SLR rose to 18.5 and came down to 18 with a mean point of 18.1569. Bank rate rose to 5.4 and came down to 4.25 with a mean point of 4.862.

### 8.2 Multiple Linear Regression Model

In our study, we have considered NIFTY to be the dependent variable and the major banking rates i.e., policy repo rate, reverse repo rate, MSF rate, CRR, SLR, bank rate are the independent variables. Hence, the regression equation can be framed as follows:

$$NIFTY = \beta_0 + \beta_1 * \text{policy repo rate} + \beta_2 * \text{reverse repo rate} + \beta_3 * \text{MSF rate} + \beta_4 * \text{CRR} + \beta_5 * \text{SLR} + \beta_6 * \text{bank rate} + \varepsilon_t$$

Regression Statistics	
Multiple R	0.8298
R Square	0.6885
Adjusted R Square	0.6742
Standard Error	0.0759
Observations	137

In the above table, multiple R value of 0.8298 suggests that there is high linear relationship among the variables. The R square value of 0.6885 suggests that about 68.85 percent of the variation of y values around the mean are explained by x values.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-64.8349	9.3065	-6.9665	1.4558	-83.2468	-46.423	-83.2468	-46.423
Policy repo rate	-405.0279	44.8907	-9.0225	2.0889	-493.8388	-316.217	-493.8388	-316.217
Reverse repo rate	-2.1543	0.6311	-3.4135	0.0008	-3.4028	-0.9057	-3.4028	-0.9057
MSF rate	429.4131	47.403	9.0587	1.7044	335.6318	523.1944	335.6318	523.1944
CRR	-0.1782	0.1446	-1.2322	0.22	-0.4645	0.1079	-0.4645	0.1079
SLR	4.9664	2.1214	2.3411	0.0207	0.7695	9.1634	0.7695	9.1634
Bank rate	1.8363	0.229	8.0187	5.412	1.3832	2.2894	1.3832	2.2894

The above table helps us to form the multiple linear regression model.

$$NIFTY = -64.8349 - 405.0279 * \text{policy repo rate} - 2.1543 * \text{reverse repo rate} + 429.4131 * \text{MSF rate} - 0.1782 * \text{CRR} + 4.9664 * \text{SLR} + 1.8363 * \text{bank rate} + \varepsilon_t$$

We find that there is negative relationship between the independent variables policy repo rate (-405.0279), reverse repo rate (-2.1543) and CRR (-0.1782) with the dependent variable NIFTY. This indicates that a 1 unit change in policy repo rate, reverse repo rate, CRR will cause a negative change in NIFTY by 405.0279, 2.1543 and 0.1782 respectively. There is a positive relationship between independent variables MSF rate (429.4131), SLR (4.9664) and bank rate (1.8363) with the dependent variable NIFTY. This indicates that a 1 unit change in MSF rate, SLR and bank rate will cause a positive change in NIFTY by 429.4131, 4.9664 and 1.8363 respectively.

### 8.3 Lag Selection

Before performing Co integration test, we should perform following tests:

VAR Lag Order Selection Criteria						
Sample: 1 137						
Lag	Log L	LR	FPE	AIC	SC	HQ
0	2712.93	NA	5.02E-27	-40.69072	-40.53859	-40.6289
1	3779.05	2003.981	1.15E-33	-55.98572	-54.76874	-55.49119
2	3815.19	64.12041	1.40E-33	-55.79228	-53.51042	-54.86502
3	3855.42	67.15621	1.62E-33	-55.66044	-52.31372	-54.30047
4	6432.27	4029.954*	5.16e-50*	-93.67316*	-89.26158*	-91.88046*

The above table suggests us with the optimum lag structure. Since, the \* is appearing at 4 lag in most of the criterion, we will select 4 as the lag in our study.



### 8.4 Phillips-Perron Test

Phillips-Perron Test					
At Level			At First Difference		
(Intercept only)			(Intercept only)		
Variables	t-statistics	p-values	Variables	t-statistics	p-values
NIFTY	-1.4373	0.5622	NIFTY	-13.24	0
Policy Repo Rate	-0.6063	0.8644	Policy Repo Rate	-11.701	0
Reverse Repo Rate	-0.4606	0.894	Reverse Repo Rate	-11.758	0
MSF Rate	-0.6084	0.8639	MSF Rate	-11.7	0
CRR	-0.9991	0.7525	CRR	-11.619	0
SLR	-2.0851	0.2511	SLR	-11.711	0
Bank Rate	-0.7003	0.8421	Bank Rate	-11.7	0

The above table portrays the unit root test as stated by Philips-Perron (1988). The Philips – Perron equation is:

$$y_t = c + \delta t + \alpha y_{t-1} + e(t)$$

The Philips-Perron test identifies the presence of unit root in a time series data. The result shows that p value is more than 1 percent at level but it is less than 1 percent at first difference for all the variables. This indicates that the data is non stationary at level and stationary at first difference. Hence, at first difference the data do not suffer from unit root.

### 8.5 Johansen Co integration Test

NIFTY and Policy Repo Rate							
No. of Co integration Equations	Eigen value	Trace Statistics	0.05 Critical Value	p-value	Max-Eigen Value	0.05 Critical Value	p-value
None	0.0617	12.9889	15.4947	0.1152	8.4171	14.2646	0.3379
At most 1	0.034	4.5718	3.8414	0.0325	4.5718	3.8414	0.0325

NIFTY and Reverse Repo Rate							
No. of Co integration Equations	Eigen value	Trace Statistics	0.05 Critical Value	p-value	Max-Eigen Value	0.05 Critical Value	p-value
None	0.0701	13.7132	15.4947	0.0911	9.5877	14.2646	0.2404
At most 1	0.0308	4.1255	3.8414	0.0422	4.1255	3.8414	0.0422

NIFTY and MSF Rate							
No. of Co integration Equations	Eigen value	Trace Statistics	0.05 Critical Value	p-value	Max-Eigen Value	0.05 Critical Value	p-value
None	0.062	13.0243	15.4947	0.1139	8.4514	14.2646	0.3347
At most 1	0.034	4.5728	3.8414	0.0325	4.5728	3.8414	0.0325



NIFTY and CRR							
No. of Co integration Equations	Eigen value	Trace Statistics	0.05 Critical Value	p-value	Max-Eigen Value	0.05 Critical Value	p-value
None	0.067	12.1539	15.4947	0.1497	9.1484	14.2646	0.274
At most 1	0.0225	3.0054	3.8414	0.083	3.0054	3.8414	0.083

NIFTY and SLR							
No. of Co integration Equations	Eigen value	Trace Statistics	0.05 Critical Value	p-value	Max-Eigen Value	0.05 Critical Value	p-value
None	0.0568	9.5564	15.4947	0.3164	7.7151	14.2646	0.4084
At most 1	0.0139	1.8413	3.8414	0.1748	1.8413	3.8414	0.1748

NIFTY and Bank Rate							
No. of Co integration Equations	Eigen value	Trace Statistics	0.05 Critical Value	p-value	Max-Eigen Value	0.05 Critical Value	p-value
None	0.062	13.4001	15.4947	0.1009	8.4512	14.2646	0.3347
At most 1	0.0368	4.9488	3.8414	0.0261	4.9488	3.8414	0.0261

A Co integration test is run to recognize whether there is any long run causality or association between two or more variables as proposed by Johansen in the year 1991 regardless of the fact that the series are trending either growing or descending. The results of co integration test suggests that there is no long run causality or association between the dependent variable NIFTY and independent variables policy repo rate, reverse repo rate, marginal standing facility (MSF) rate, cash reserve ratio (CRR), statutory liquidity ratio (SLR) and bank rate due to insignificant p value.

### 8.6 Wald Test

WALD TEST					
Null Hypothesis: C(1)=0					
Dependent Variable	Independent Variable	f-statistic	t-statistic	Chi-square	Probability
NIFTY	Policy Repo Rate	33974.24	184.321	33974.24	0
NIFTY	Reverse Repo Rate	11901.07	109.092	11901.07	0
NIFTY	MSF	41010.61	202.5108	41010.61	0
NIFTY	CRR	11472.01	107.1074	11472.01	0
NIFTY	SLR	758867.9	871.1302	758867.9	0
NIFTY	Bank Rate	42109.32	205.2056	42109.32	0

In the above table we see the results of wald test which predicts the short run causality or association between two variables. In our study, our dependent variable is NIFTY. The test result predicts that there is short run causality among the variables due to significant p value.

**8.7 Granger Causality Test**

Null Hypothesis:	Obs	F-Statistic	Prob.
Policy Repo Rate does not Granger Cause NIFTY	133	1.9242	0.1105
NIFTY does not Granger Cause Policy Repo Rate		10.2876	0

Null Hypothesis:	Obs	F-Statistic	Prob.
Reverse Repo Rate does not Granger Cause NIFTY	133	1.6308	0.1707
NIFTY does not Granger Cause Reverse Repo Rate		10.3275	0

Null Hypothesis:	Obs	F-Statistic	Prob.
MSF Rate does not Granger Cause NIFTY	133	1.92891	0.1097
NIFTY does not Granger Cause MSF Rate		10.3325	0

Null Hypothesis:	Obs	F-Statistic	Prob.
CRR does not Granger Cause NIFTY	133	3.9847	0.0045
NIFTY does not Granger Cause CRR		3.0492	0.0195

Null Hypothesis:	Obs	F-Statistic	Prob.
SLR does not Granger Cause NIFTY	133	0.3332	0.8552
NIFTY does not Granger Cause SLR		0.5371	0.7087

Null Hypothesis:	Obs	F-Statistic	Prob.
Bank rate does not Granger Cause NIFTY	133	5.9158	0.0002
NIFTY does not Granger Cause Bank Rate		4.8943	0.0011

From the tables above, we find the causality among the variables. We see that policy repo rate does not Granger cause NIFTY due to an insignificant p value of 0.1105 but NIFTY Granger cause policy repo rate due to a significant p value of 0. Reverse repo rate does not Granger cause NIFTY due to an insignificant p value of 0.1707 but NIFTY Granger cause reverse repo rate due to a significant p value of 0. MSF rate does not Granger cause NIFTY due to an insignificant p value of 0.1097 but NIFTY Granger cause MSF rate due to a significant p value of 0. CRR Granger causes NIFTY due to a significant p value of 0.0045 and NIFTY Granger causes CRR due to a significant p value of 0.0195. Neither SLR nor NIFTY Granger causes each other due to an insignificant p value of 0.8552 and 0.7087 respectively. Both bank rate and NIFTY Granger causes each other due to a significant p value of 0.0002 and 0.0011 respectively.

## **9. LIMITATION OF THE STUDY**

This study faces with following limitations:

- The study period is till 8 July, 2020. A larger time period could have provided a better result
- Other macro economic variables have not been considered in the study
- Customer sentiment could not be measured directly but assumed
- All other inherent limitations of secondary research are also there

## **10. FURTHER SCOPE OF RESEARCH**

Following scope for further research is as follows:

- Other macro economic factors could be added to get some different conclusions
- Study can be made with extending the time period
- Comparative analysis can be done taking into consideration the pre and post COVID-19 situation
- Different other tools can be used for analysis work

## **11. CONCLUDING OBSERVATIONS**

There exist a negative relation between policy repo rate and NIFTY (-405.0279), reverse repo rate and NIFTY (-2.1543) and CRR and NIFTY (-0.1782). This suggests that these variables emphasize same economic theoretical relation with NIFTY. It was observed from the multiple linear regression model that there exist a positive relation between MSF rate and NIFTY (429.4131), SLR and NIFTY (4.9664) and bank rate and NIFTY (1.8363). This suggests that there is an opposite reflection of theoretical behavior of nifty with bank rate. This is because during the pandemic investor's sentiment or motive is adversely directed for global economic crisis as emerged during Covid-19. Hence, it can be inferred that investors portray a risk-averse behavior due to global production shutdown which increases their precautionary demand for money leading to a reverse flow of money from stock market to secured investment avenues like bank deposits or increase in liquid cash holdings. There is no long run causality among the variables but there is short run causality which clearly indicates the association during COVID-19 within our time period. Further, NIFTY Granger causes policy repo rate, reverse repo rate, CRR, MSF and bank rate. CRR and bank rate Granger cause NIFTY.

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