

## “STUDY ON INTERDEPENDENCY OF INDIAN STOCK MARKETS WITH NYSE AND LSE”

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### ABSTRACT

The stock market is important indicator of an economy and is increasingly gaining importance. In the current context of globalization and the subsequent integration of the global markets this study captures the trends and movements of the Indian Stock Market in comparison to its international counterparts. This study covers New York Stock Exchange (NYSE), London Stock exchange (LSE) from various socio-politico-economic backgrounds. Both the Bombay Stock exchange (BSE) and the National Stock Exchange of Indian Limited (NSE) have been used in the study as a part of Indian Stock Market.

The study has objective to find whether interdependency exist between Indian stock and foreign stock market and find level of correlation between Indian stock market and other major stock markets. The time period under study is 5 years i.e. from April 2013 to May 2018 with month-wise average closing prices of indices. The study uses Tableau and Excel to analyse and data mine the extensive stock market reports.

The result of this study supports the view that LSE has highest average returns with greater fluctuations. Indian stock markets have moderate correlation with NYSE hence slightly dependent on NYSE; whereas weak correlation with LSE. Indian stock markets SENSEX and NSE gives moderate returns.

**Key Words: Stock Market, Sensex, Interdependency, Average Returns**

## **INTRODUCTION**

Stock Market is where the trading of company stocks, listed securities takes place. Stocks, also known as equities, represent a fraction ownership in a company, and the stock market is a place where investors can buy and sell ownership of those assets that can be invested. An efficiently functioning stock market is considered critical to economic development, as it gives companies the opportunity to access public capital quickly.

Stock markets began when New World countries began trading with each other. Many merchants wanted to start huge companies, which required considerable sums that no single trader could raise alone. As a result, groups of investors pooled their savings and became trading partners and co-owners with individual shares in their companies to form joint stock companies. Created by the Netherlands, joint stock companies have become a viable business model for many troubled companies. In 1602, the Dutch East India Co. issued the first paper shares. This exchangeable medium allowed shareholder to buy, sell and trade their shares with other shareholders and investors.

## **ABOUT LONDON STOCK EXCHANGE, UNITED KINGDOM**

The London Stock Exchange was founded in 1698. As the volume of shares increased, the need for an organized marketplace to exchange these shares became necessary. As a result, stock traders decided to meet at a London coffeehouse, which they used as a marketplace. Eventually, they took over the coffeehouse and, in 1773, changed its name to the "stock exchange". Thus, the first exchange, the London Stock Exchange, was founded. The idea made its way to the American colonies with an exchange started in Philadelphia in 1790.

It has more than 3,000 listed companies with a combined market capitalization of \$3.76 trillion. The LSE was the world's largest stock exchange until the end of the First World War, when it lost that title to the New York Stock Exchange.

## **NEW YORK STOCK EXCHANGE, UNITED STATES**

Founded in 1792, the New York Stock Exchange has been the world's largest stock exchange since the end of World War I, when it overtook the London Stock Exchange. It has a market capitalization of \$22.9 trillion and about 2,400 listed companies. The NYSE alone accounts for roughly 40% of the world's stock market capitalization. Advances in telegraphic communication allowed buying and selling through the telegraph, creating a new ease in trading. Membership increased and became more exclusive. By the start of the Civil War, securities, commodities and gold, discovered in California, excited participation in the exchange. In 1878, telephones were installed, giving investors direct access to brokers on the floor of the exchange. The increased activity made the exchange cap the number of members to 1,060, seats for which required purchase from retiring members. Technology on the NYSE moved from early ticker tapes to handheld computation devices to its current high-speed transactions.

### **HISTORY OF INDIAN STOCK MARKET**

Indian stock market marks to be one of the oldest stock market in Asia. It dates back to the close of 18th century when the East India Company used to transact loan securities. In the 1830s, trading on corporate stocks and shares in Bank and Cotton presses took place in Bombay. Though the trading was broad but the brokers were hardly half dozen during 1840 and 1850. An informal group of 22 stockbrokers began trading under a banyan tree opposite the Town Hall of Bombay from the mid-1850s, each investing a (then) princely amount of Rupee 1. This banyan tree still stands in the Horniman Circle Park, Mumbai. In fact, the 'Share Mania' in India began with the American Civil War broke and the cotton supply from the US to Europe stopped. Further the brokers increased to 250. The informal group of stockbrokers organized themselves as the The Native Share and Stockbrokers Association which, in 1875, was formally organized as the Bombay Stock Exchange (BSE). BSE was shifted to an old building near the Town Hall. In 1928, the plot of land on which the BSE building now stands (at the intersection of Dalal Street, Bombay Samachar Marg and Hammam Street in downtown Mumbai) was acquired, and a building was constructed and occupied in 1930.

### **BOMBAY STOCK EXCHANGE, INDIA**

Founded in 1875, the Bombay Stock Exchange was the first stock exchange in Asia. As of November 2018, it had a market capitalization of \$2.05 trillion. It is the stock exchange with the highest number of listed companies on this list. BSE has 5,749 listed companies; however most of them are small-caps. It is located at Dalal Street in Mumbai.

BSE is now one of the fastest stock exchange in the world which has the speed of 6 microseconds. It provides an efficient, integrated, transparent and secure market for trading in equity, currencies, debt

instruments, derivatives, mutual funds. It provides an array of services like clearing, settlement, risk management, education and market data services. It has a global reach with overseas customers and a nation-wide presence. It provides depository services through its Central Depository Services Ltd. (CDSL) arm. The S&P BSE SENSEX is India's most widely tracked stock market benchmark index. It is traded internationally on the EUREX as well as leading exchanges of the BRICS nations (Brazil, Russia, China and South Africa).

### **NATIONAL STOCK EXCHANGE, INDIA**

NSE started trading on 4 November 1994. Within less than a year, NSE turnover exceeded the BSE. BSE rapidly automated, but it never caught up with NSE spot market turnover. NSE launched trading on equity. Today, NSE has roughly 66% of equity spot turnover and roughly 100% of equity derivatives turnover.

### **NEED TO STUDY STOCK MARKET**

- Exchange are responsible for the creation, and destruction, of large amounts of financial wealth every hour of every trading day.
- Index performance is used to compare their investor's performances with index returns.
- The rise and fall of share prices affects investor sentiment, encouraging or discouraging investors to spend more or less money in the economy according to gains or losses in their investment portfolios.
- The Indian stock market is the world third largest stock market on the basis of investor base and has a collective pool of about 20 million investors.

There are over 9,000 companies listed on the stock exchanges of the country.

### **OBJECTIVES FOR THE STUDY**

- To find whether interdependency exist between Indian stock i.e. NSE, BSE and foreign stock market i.e. NYSE & LSE.
- Study of level of correlation between Indian stock market and other major stock markets.
- To compare the risk and returns of the selected stock market for investor's perspective.

### **SCOPE OF THE STUDY**

The study is confined to Indian and selected World stock market only and data used in this research used secondary data to meet the set objectives and collected data taken is monthly closing index values of Nifty50, SENSEX, NYSE& LSE. Duration period under study is 5 years i.e. from

April 2013 to May 2018 (62 months).

### HYPOTHESIS

For the purpose of hypothesis design, we assume Indian stock markets to be dependent variable on foreign stock markets.

H<sub>0</sub>: Indian stock market is not dependent on foreign stock market.

H<sub>1</sub>: Indian stock market is dependent on foreign stock market.

### FORMULAE

Returns is calculated using the formula

$$\text{Returns} = \frac{(P1 - P0)}{P0} * 100$$

P1: Closing price of current month (or) Stock price at end of month

P0: Closing price of previous month (or) Stock price at beginning of month

**Table 1.1: Calculation of Returns**

Date	SENSEX	Nifty	NYSE	LSE	R_SENSEX (%)	R_Nifty (%)	R_NYSE (%)	R_LSE (%)
Apr-13	19504.18	5930.2	9276.88	1235.3				
May-13	19760.3	5985.95	9302.27	1295.1	1.31315	0.94010	0.27369	4.84093
Jun-13	19395.81	5842.2	9112.70	1231.6	-1.84456	-2.40146	-2.03789	-4.90310
Jul-13	19345.7	5742	9558.83	1449.9	-0.25835	-1.71511	4.89570	17.72491
Aug-13	18619.72	5471.8	9270.66	1437	-3.75267	-4.70568	-3.01470	-0.88972
Sep-13	19379.77	5735.3	9621.25	1415.8	4.08196	4.81560	3.78172	-1.47530
Oct-13	21164.52	6299.15	10009.65	1512.5	9.20935	9.83122	4.03690	6.83006
Nov-13	20791.93	6176.1	10183.23	1498.7	-1.76045	-1.95344	1.73413	-0.91240
Dec-13	21170.68	6304	10400.33	1596.3	1.82162	2.07089	2.13194	6.51231
Jan-14	20513.85	6089.5	9967.65	1694.9	-3.10255	-3.40260	-4.16025	6.17678
Feb-14	21120.12	6276.95	10425.86	1867.2	2.95542	3.07825	4.59697	10.16579
Mar-	22386.27	6704.2	10527.77	1814.7	5.99499	6.80665	0.97747	-2.81170

<b>14</b>								
<b>Apr-14</b>	22417.8	6696.4	10627.18	1669.1	0.14085	-0.11634	0.94426	-8.02336
<b>May-14</b>	24217.34	7229.95	10756.32	1803.6	8.02728	7.96771	1.21519	8.05823
<b>Jun-14</b>	25413.78	7611.35	10979.42	1848.7	4.94043	5.27528	2.07413	2.50055
<b>Jul-14</b>	25894.97	7721.3	10726.43	1785.2	1.89342	1.44455	-2.30422	-3.43485
<b>Aug-14</b>	26638.11	7954.35	11046.33	1881.9	2.86982	3.01827	2.98235	5.41676
<b>Sep-14</b>	26630.51	7964.8	10702.93	1868	-0.02853	0.13137	-3.10872	-0.73862
<b>Oct-14</b>	27865.83	8322.2	10845.00	2015	4.63874	4.48724	1.32739	7.86938
<b>Nov-14</b>	28693.99	8588.25	10955.41	2255	2.97196	3.19687	1.01807	11.91067
<b>Dec-14</b>	27499.42	8282.7	10839.24	2221	-4.16314	-3.55777	-1.06039	-1.50776
<b>Jan-15</b>	29182.95	8808.9	10537.22	2365	6.12206	6.35300	-2.78636	6.48357
<b>Feb-15</b>	29361.5	8901.85	11062.79	2480	0.61183	1.05518	4.98775	4.86258
<b>Mar-15</b>	27957.49	8491	10899.18	2459	-4.78181	-4.61533	-1.47892	-0.84677
<b>Apr-15</b>	27011.31	8181.5	11049.74	2549	-3.38435	-3.64504	1.38139	3.66002
<b>May-15</b>	27828.44	8433.65	11056.30	2457	3.02514	3.08195	0.05937	-3.60926
<b>Jun-15</b>	27780.83	8368.5	10805.20	2370	-0.17108	-0.77250	-2.27110	-3.54090
<b>Jul-15</b>	28114.56	8532.85	10882.28	2611	1.20130	1.96391	0.71336	10.16878
<b>Aug-15</b>	26283.09	7971.3	10176.50	2520	-6.51431	-6.58104	-6.48559	-3.48525
<b>Sep-15</b>	26154.83	7948.9	9799.69	2419	-0.48799	-0.28101	-3.70275	-4.00794
<b>Oct-15</b>	26656.83	8065.8	10460.96	2545	1.91934	1.47064	6.74787	5.20876
<b>Nov-15</b>	26145.67	7935.25	10409.58	2650	-1.91756	-1.61856	-0.49116	4.12574
<b>Dec-15</b>	26117.54	7946.35	10143.42	2744	-0.10759	0.13988	-2.55688	3.54717
<b>Jan-16</b>	24870.69	7563.55	9632.70	2474	-4.77399	-4.81731	-5.03499	-9.83965
<b>Feb-16</b>	23002	6987.05	9559.53	2678	-7.51362	-7.62208	-0.75960	8.24576

Mar-16	25341.86	7738.4	10207.38	2820	10.17242	10.75347	6.77701	5.30246
Apr-16	25606.62	7849.8	10436.92	2713	1.04475	1.43957	2.24877	-3.79433
May-16	26667.96	8160.1	10441.00	2735	4.14479	3.95297	0.03909	0.81091
Jun-16	26999.72	8287.75	10489.76	2531	1.24404	1.56432	0.46701	-7.45887
Jul-16	28051.86	8638.5	10785.51	2775	3.89686	4.23215	2.81942	9.64046
Aug-16	28452.17	8786.2	10764.75	2755	1.42704	1.70979	-0.19248	-0.72072
Sep-16	27865.96	8611.15	10721.74	2800	-2.06033	-1.99233	-0.39954	1.63339
Oct-16	27930.21	8625.7	10481.89	2810	0.23057	0.16897	-2.23704	0.35714
Nov-16	26652.81	8224.5	10838.46	2748	-4.57354	-4.65122	3.40177	-2.20641
Dec-16	26626.46	8185.8	11056.89	2914	-0.09886	-0.47055	2.01532	6.04076
Jan-17	27655.96	8561.3	11222.95	3171	3.86645	4.58721	1.50187	8.81949
Feb-17	28743.32	8879.6	11512.39	3078	3.93174	3.71789	2.57900	-2.93283
Mar-17	29620.5	9173.75	11492.85	3171	3.05177	3.31265	-0.16973	3.02144
Apr-17	29918.4	9304.05	11536.08	3383	1.00572	1.42036	0.37615	6.68559
May-17	31145.8	9621.25	11598.03	3425	4.10249	3.40927	0.53701	1.24150
Jun-17	30921.61	9520.9	11761.70	3646	-0.71981	-1.04300	1.41119	6.45255
Jul-17	32514.94	10077.1	11967.67	3748	5.15280	5.84188	1.75119	2.79759
Aug-17	31730.49	9917.9	11875.69	3950	-2.41258	-1.57982	-0.76857	5.38954
Sep-17	31283.72	9788.6	12209.16	3830	-1.40801	-1.30370	2.80801	-3.03797
Oct-17	33213.13	10335.3	12341.01	3761	6.16746	5.58507	1.07993	-1.80157
Nov-17	33149.35	10226.5	12627.80	3779	-0.19203	-1.05222	2.32388	0.47860
Dec-17	34056.83	10530.7	12808.84	3793	2.73755	2.97412	1.43366	0.37047
Jan-18	35965.02	11027.7	13367.96	3927	5.60296	4.71953	4.36511	3.53282

<b>Feb-18</b>	34184.04	10492.8	12652.55	4028	-4.95198	-4.85006	-5.35168	2.57194
<b>Mar-18</b>	32968.68	10113.7	12452.06	4126	-3.55534	-3.61341	-1.58458	2.43297
<b>Apr-18</b>	35160.36	10739.3	12,515.3	4,300.00	6.64776	6.18616	0.50835	4.21716
<b>May-18</b>	34616.13	10516.7	12,806.8	4,543.00	-1.54785	-2.07322	2.32890	5.65116
<b>Sum of Returns</b>					<b>62.08292</b>	<b>62.26919</b>	<b>34.69511</b>	<b>139.77745</b>
<b>Avg. Returns per month</b>					<b>1.01775</b>	<b>1.02081</b>	<b>0.56877</b>	<b>2.29143</b>
<b>Avg. Returns per annum</b>					<b>12.21303</b>	<b>12.24968</b>	<b>6.82527</b>	<b>27.49720</b>

It can be observed from above analysis that LSE has highest average returns per annum of 27.5% followed by Indian markets having return around 12.2%. NYSE has least average returns of 6.8%.

**Table 1.2: Descriptive Statistics**

	<b>R_SENSEX</b>	<b>R_Nifty</b>	<b>R_NYSE</b>	<b>R_LSE</b>
<b>Mean</b>	1.017752724	1.020806397	0.5687723	2.291433658
<b>Standard Error</b>	0.495232466	0.510140306	0.359635321	0.675428653
<b>Median</b>	1.044753621	1.420356997	0.94426455	2.571937866
<b>Standard Deviation</b>	3.867889205	3.984323163	2.808841648	5.275266416
<b>Sample Variance</b>	14.9605669	15.87483107	7.889591401	27.82843576
<b>Kurtosis</b>	-0.31325031	-0.296055483	0.100007618	0.170082621
<b>Skewness</b>	0.059193645	0.110649324	-0.203607512	0.140508675
<b>Range</b>	17.68604326	18.37554756	13.26259624	27.56456083
<b>Minimum</b>	-7.513623466	-7.622082223	-6.485589417	-9.839650146
<b>Maximum</b>	10.17241979	10.75346534	6.777006819	17.72491069
<b>Sum</b>	62.08291616	62.26919022	34.69511027	139.7774531
<b>Count</b>	61	61	61	61



- LSE gives highest average return of 2.29% per month with greater fluctuations which has been indicated by high variance. SENSEX and NSE gives moderate returns of 1% per month followed NYSE with 0.56% per month.
- Kurtosis reflects the characteristics of the tails of a distribution. When interpreting kurtosis, the normal distribution is used as reference.
- LSE and NYSE have positive kurtosis implies that they have more extreme data values (outliers) than a normal distribution thus Leptokurtic distribution. SENSEX and NSE have negative kurtosis implies that they have less extreme data values (outliers) than a normal distribution thus Platykurtic distributions.
- Skewness is measure of asymmetry. SENSEX distribution is nearly symmetrical, NIFTY and LSE are positively skewed. NYSE is negatively skewed with long tail towards left.

#### **CORRELATION (Price Relationship)**

Correlation is a numerical summary measure that indicates the strength of linear relationships between the pairs of variables. Correlation has been divided into three levels.

- Correlation below 0.40 is treated as Weak;
- Correlation between 0.40 to 0.70 as moderate;
- Correlation between 0.70 to 1 as strong.
- Stock price Correlation among stock exchange

Correlation	R_SENSEX	R_Nifty	R_NYSE	R_LSE
R_SENSEX	1			
R_Nifty	0.992972824	1		
R_NYSE	0.518783375	0.506763269	1	
R_LSE	0.23361799	0.227076929	0.383692764	1

#### **Relationship between SENSEX and other indices**

Highest correlation was recorded between SENSEX and NIFTY as they belong to same nation. Moderate correlation was recorded between SENSEX and NYSE and weak correlation was recorded between SENSEX and LSE.

#### **Relationship between NIFTY and other indices**

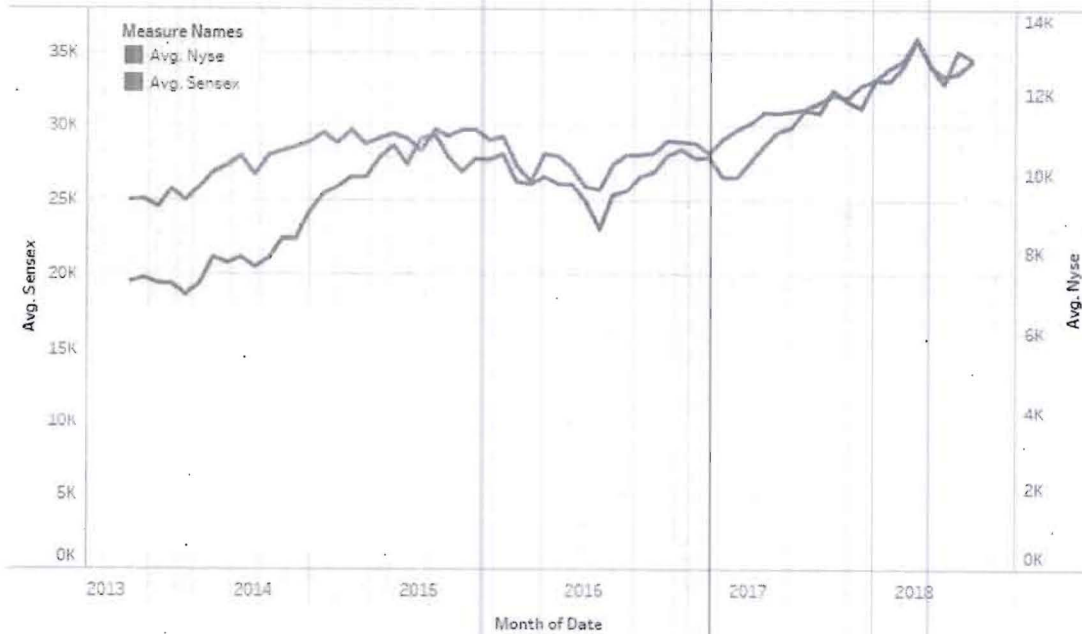
Highest correlation was recorded between NIFTY and SENSEX as they belong to same nation. Moderate correlation was recorded between NIFTY and NYSE and weak correlation was recorded

between NIFTY and LSE.

**Regression**

Regression is a statistical measurement used to determine the strength of the relationship between dependent variable (denoted by Y) and independent variable (denoted by X).

Regression Statistics						
Multiple R	0.518783					
R Square	0.269136					
Adjusted R Square	0.256749					
Standard Error	3.334586					
Observations	61					
ANOVA						
	Df	SS	MS	F	Significance F	
Regression	1	241.5858	241.5858	21.7263	1.84E-05	
Residual	59	656.0482	11.11946			
Total	60	897.634				
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.61143	0.435758	1.40314	0.165816	-0.26052	1.48338
R_NYSE	0.714386	0.153264	4.661158	1.84E-05	0.407706	1.021066

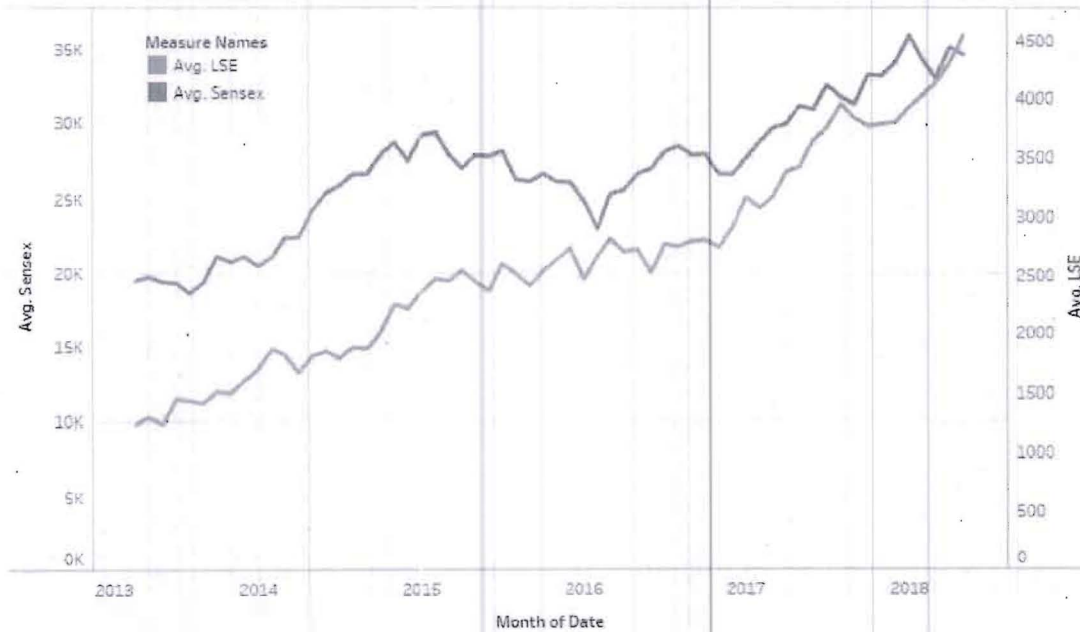


P-value is less than 0.05,  $H_1$  is accepted.

$H_1$ : Indian stock market SENSEX is dependent on foreign stock market NYSE.

Regression Statistics						
Multiple R	0.233618	Independent variable-X	Dependent variable-Y	LSE	SENSE	
R Square	0.054577					X
Adjusted R Square	0.038553					
Standard Error	3.792597					
Observations	61					
ANOVA						
	df	SS	MS	F	Significance F	
Regression	1	48.9905	48.9905	3.40595	0.069981	
Residual	59	848.6435	14.38379	2		
Total	60	897.634				

	Coefficient	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.62525	0.530125	1.179439	0.242958	-0.435536	1.686026
R_LSE	0.171292	0.092815	1.845522	0.069981	-0.014433	0.357013



P-value is more than 0.05,  $H_1$  is rejected.

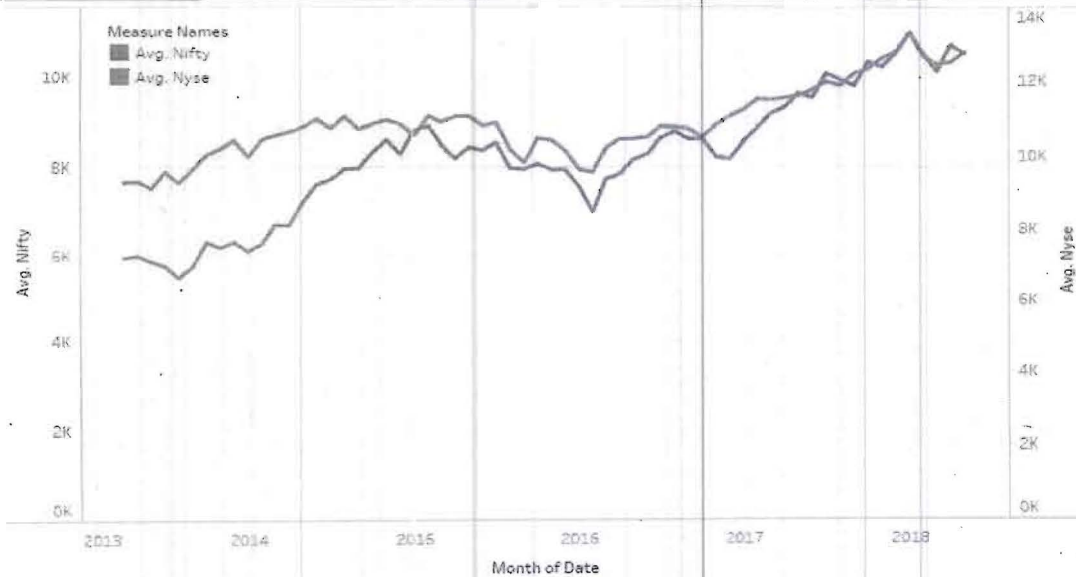
$H_0$ : Indian stock market SENSEX is independent on foreign stock market LSE.

Regression Statistics		Independent variable-X	Dependent variable-Y
Multiple R	0.506763	NYSE	NIFTY
R Square	0.256809		
Adjusted R Square	0.244213		
Standard Error	3.463813		
Observations	61		

ANOVA						
	df	SS	MS	F	Significance F	
Regression	1	244.608	244.608	20.3874	3.08E-05	
Residual	59	707.8819	11.998			
Total	60	952.4899				

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.61195	0.452645	1.351941	0.181554	-0.293791	1.517691
R_NYSE	0.71884	0.159203	4.515241	3.08E-05	0.400276	1.037405



P-value is less than 0.05,  $H_1$  is accepted.

$H_1$ : Indian stock market NIFTY is dependent on foreign stock market NYSE.

Regression Statistics			
Multiple R	0.227077	Independent variable-X	LSE
R Square	0.051564	Dependent	NIFTY
Adjusted R	0.035489		

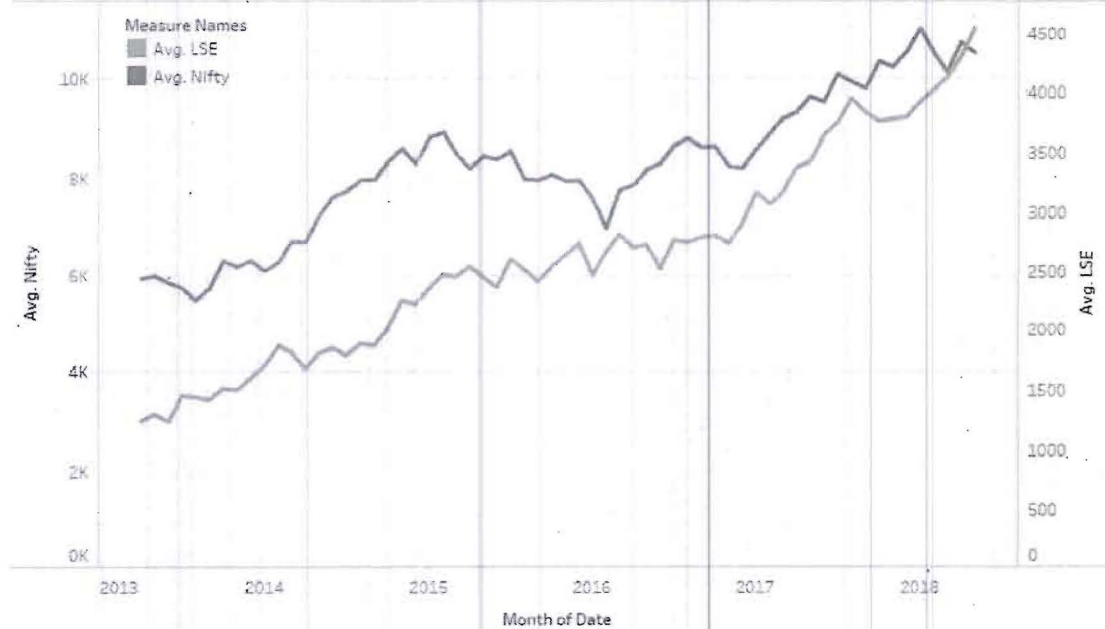
Square  
Standard  
Error 3.912985  
Observations 61

variable-Y

ANOVA

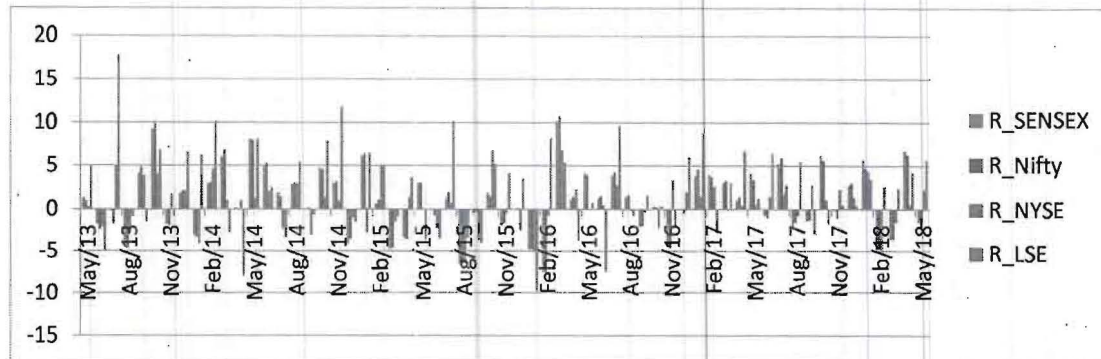
	df	SS	MS	F	Significance F
Regression	1	49.11412	49.11412	3.20767	0.078424
Residual	59	903.3757	15.31145		
Total	60	952.4899			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.627808	0.546952	1.14783	0.25567	-0.46664	1.72225
R_LSE	0.171508	0.095761	1.790998	0.07842	-0.02011	0.36312



P-value is more than 0.05,  $H_1$  is rejected.

$H_0$ : Indian stock market NIFTY is independent on foreign stock market LSE.

**FINDINGS**

Percentage returns of stock markets over the period May 2013 to May 2018

According to graphical explanation NIFTY, SENSEX and NYSE are correlated with each other and their trends are positively correlated. Remaining index LSE has highest volatility.

**CONCLUSION:**

At 5% level of significance, highest correlation was recorded between SENSEX and NIFTY as they belong to same nation. Moderate correlation was recorded between Indian indices (SENSEX & NIFTY) and NYSE. Weak correlation was recorded between Indian indices (SENSEX & NIFTY) and LSE. From regression analysis it can be identified that Indian stock markets are dependent on foreign stock market NYSE but are independent of LSE because p-value is more than 0.05.

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