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Website: www.aarf.asia Email : editor@aarf.asia , editoraarf@gmail.com

A BRIEF STUDY ON STOCK MARKET INDICES OF BRICS NATIONS BETWEEN 2013 AND 2016

G Divakara Reddy

Branch Manager, Andhra Pragathi Grameena Bank,

Kanekal Branch, Anantapur Dist.

ABSTRACT

Much discussion has been made on similarities among the BRICS nations, those similarities includes GDP Size and Growth, Area, Population, per capita income, Continent, political features, types of governments, their share in world trade etc. Wide information published in media and academic world on this particular group of Nations. This paper is made an attempt to know correlation between / among stock markets of BRICS nations. It may useful for academicians and investors in their endeavor.

Keywords: Stock Market, Indices, Anova, NIFTY, SSE, JALSH, INDEXCF, BOVESPA

I. Introduction:

BRICS nations consist of more than forty percent population of the world, located in different continents (i.e. Asia, Africa, and South America, partly in Europe (Russia)).

The acronym "BRIC" was initially formulated in 2001 by economist Jim O'Neill, of Goldman Sachs, in a report on growth prospects for the economies of Brazil, Russia, India and China – which together represents more than 50% population of the world. In the year 2011 South Africa included to make BRIC as BRICS.

Trade Demography of BRICS by the end of 2012

Member Countries	Brazil, China, India, Russia and South Africa
GDP	US$ 15,76 trillion
Share (%) of world GDP	19.8%
Population	2,998 billion
Share (%) of world population	41.6%
Total exports (2012)	US$ 3,19 trillion
Share (%) of global exports	17.7%
Total imports (2012)	US$ 2,95 trillion
Share (%) of global imports	16.1%
Total Trade (2012)	US$ 6,14 trillion
Share (%) of world trade	16.9%
Trade balance (2012)	US$ 244 billion

Source:www.*brics.itamaraty.gov.br*

II. Review of literature:

1. " BRICS countries and scientific excellence: A bibliometric analysis of most frequently-cited papers" by Lutz Bornmann, Caroline Wagner, and Loet Leydesdorff in *Journal of the Association for Information Science and Technology*

III. Objectives of the study:

1. To find Correlation Between/among Stock markets of BRICS Nations namely NSE(Nifty), Shanghai Stock Exchange Composite Index(SSE), JSE Africa All Share Index(JALSH), MICEX Index(INDEXCF), Bovespa (BVSP) during January 2013 to January 2016.
2. Line Chart of trends among and between indices.
3. One-Way Analysis of Variance for Independent Samples (Indices) for the above mentioned Indices between 01.01.2013 and 01.01.2016.
4. *Tukey HSD Test after conducting Anova.*
5. *Trends in movements of indices of BRICS Stock markets.*

IV. Scope of study:

The scope of the study is to know correlation (TREND) between and among the stock market indices of BRICS nations. In the era of increasing globalization it is essentially important for investors and researchers apart from academicians.

V. Research methodology and Sample Design:

The study is based on secondary data (indices) collected from various sources such as websites and articles. The Indices collected from each quarter between January 2013 and January 2016, Indices on first working day of the each quarter has been considered to include in sample. Stock indices selected for Sample were Nifty 50, SSE, JSE, MICEX, BM&F Bovespa.

VI. Statistical Tools and techniques:

1. Correlation coefficient between stock indices
2. *Line Chart using MS-Excel for visual comparison*
3. Anova analysis
4. *Tukey HSD Test based on Anova analysis*

In statistics, the correlation coefficient R measures the strength and direction of a linear relationship between two variables on a scatter plot. The value of R is always between +1 and –1. To interpret its value, see which of the following values your correlation R is closest to:

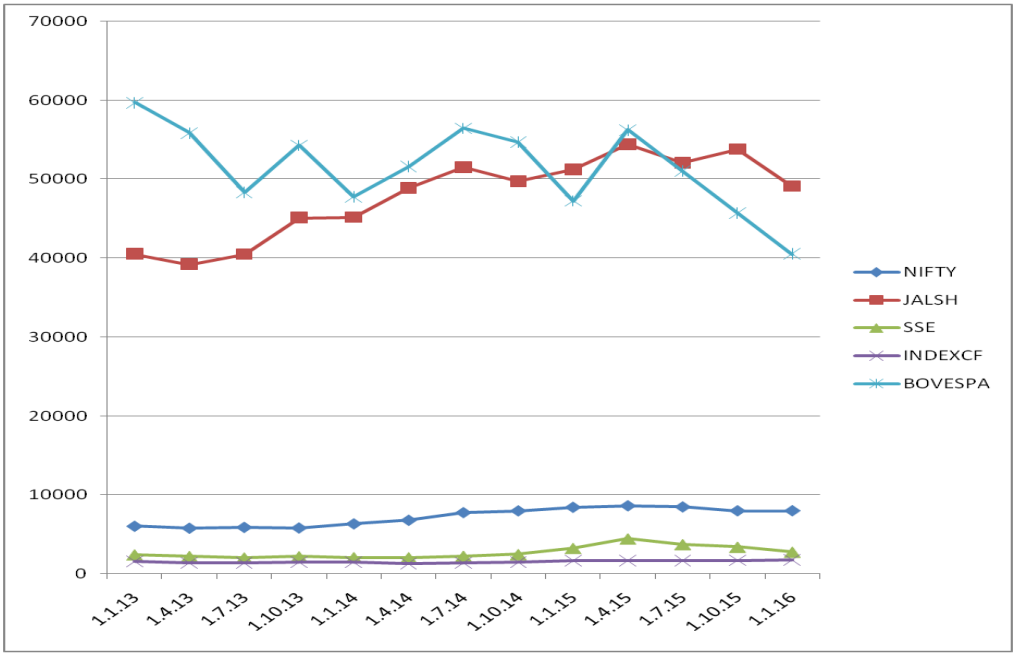
- **Exactly –1.** A perfect negative linear relationship
- **–0.70.** A strong downhill negative linear relationship
- **–0.50.** A moderate negative relationship
- **–0.30.** A weak downhill negative linear relationship
- **Exactly 0.** No linear relationship
- **+0.30.** A weak positive linear relationship
- **+0.50.** A moderate positive relationship
- **+0.70.** A strong positive linear relationship
- **Exactly +1.** A perfect positive linear relationship

TABLE1

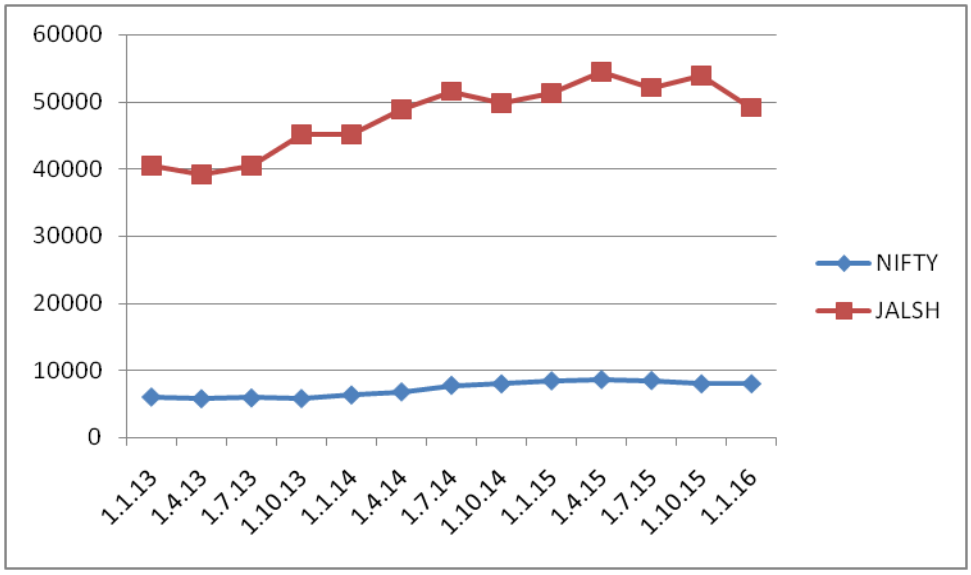
Date	NIFTY	JALSH	SSE	INDEXCF	BOVESPA
1.1.13	5993	40554	2383	1547	59750
1.4.13	5748	39200	2183	1391	55883
1.7.13	5858	40474	2000	1404	48343
1.10.13	5780	45103	2150	1504	54337
1.1.14	6302	45159	2033	1455	47763
1.4.14	6753	48900	2025	1285	51630
1.7.14	7725	51524	2208	1391	56463
1.10.14	7946	49737	2425	1487	54723
1.1.15	8395	51245	3217	1657	47280
1.4.15	8586	54428	4442	1689	56270
1.7.15	8445	52082	3708	1668	51050
1.10.15	7951	53813	3375	1717	45733
1.1.16	7963	49123	2733	1780	40513

Source: Secondary data

Line Chart for all (five) Indices



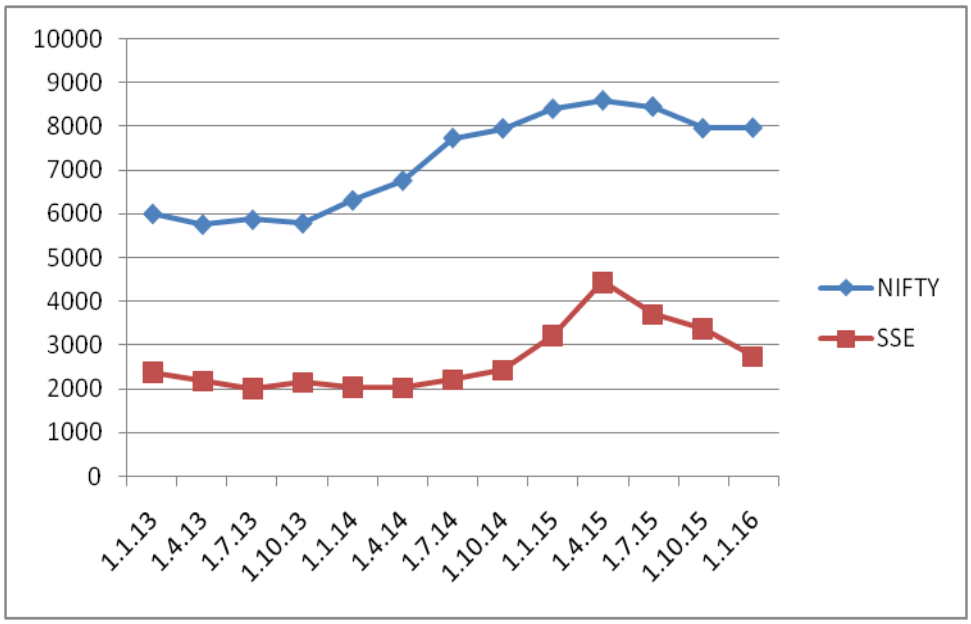
Line Chart for NIFTY Vs JALSH



Pearson Correlation coefficient between Nifty and JALSH is 0.91

The value of R is 0.91. This is a strong positive correlation

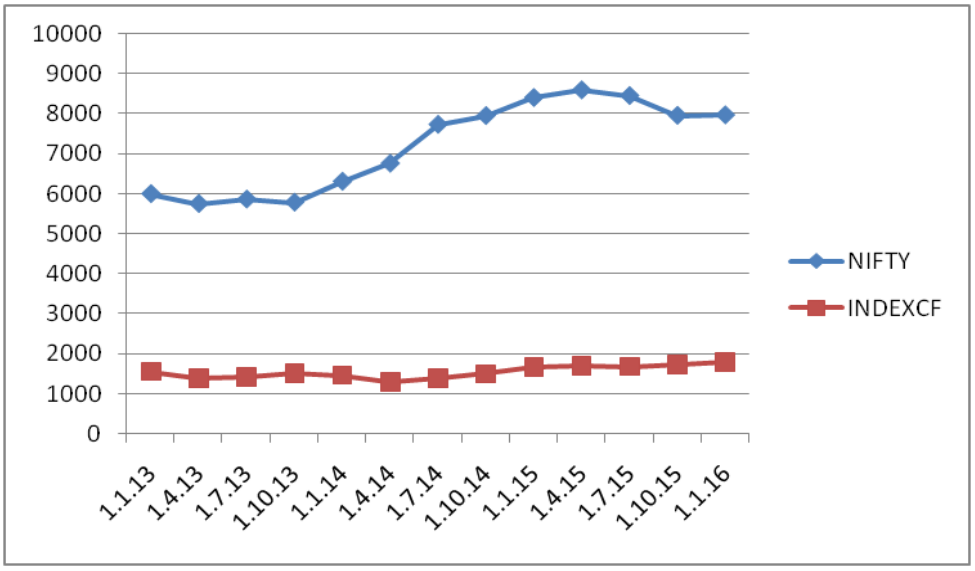
Line Chart for NIFTY Vs SSE



Pearson Correlation coefficient between Nifty and SSE is 0.77

The value of R is 0.77. This is a strong positive correlation

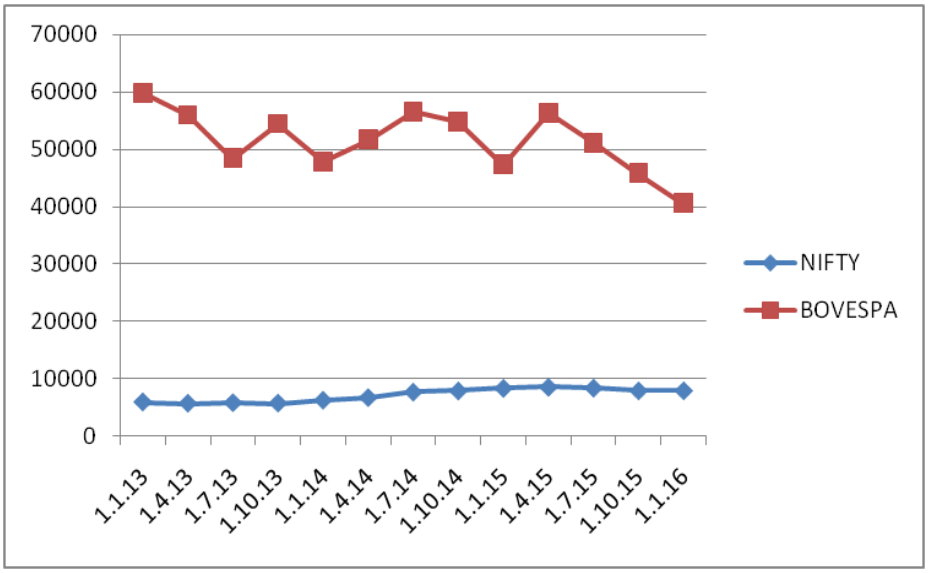
Line Chart for NIFTY Vs INDEXCF



Pearson Correlation coefficient between Nifty and INDEXCF is 0.64

The value of R is 0.64. This is a moderate positive correlation

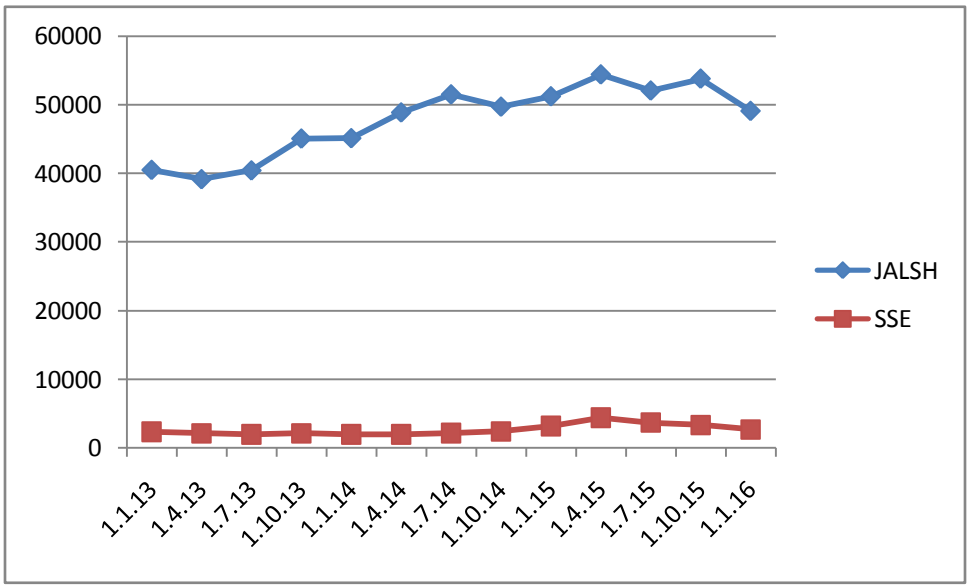
Line Chart for NIFTY Vs BOVESPA



Pearson Correlation coefficient between Nifty and BOVESPA is -0.26

The value of R is -0.26. Although technically a negative correlation, the relationship between your variables is only weak

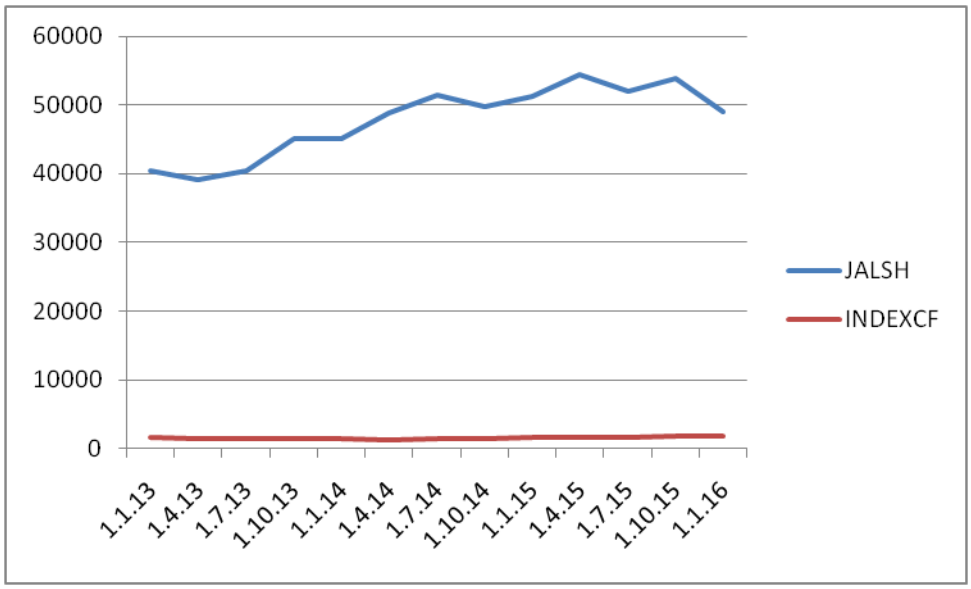
Line Chart for JALSH Vs SSE



Pearson Correlation coefficient between JALSH and SSE is 0.70

The value of R is 0.70. This is a moderate positive correlation

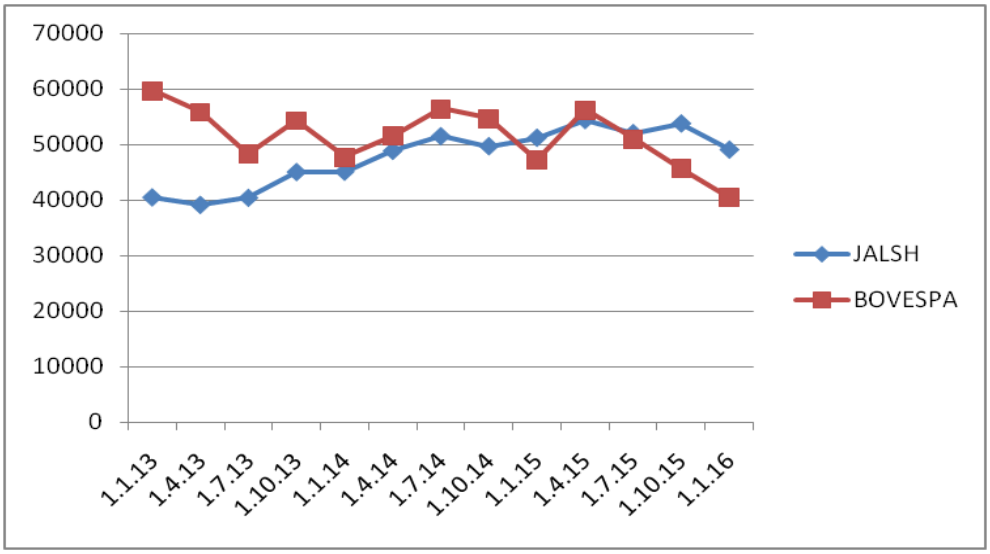
Line Chart for JALSH Vs INDEXCF



Pearson Correlation coefficient between JALSH and INDEXCF is 0.51

The value of R is 0.51. This is a moderate positive correlation

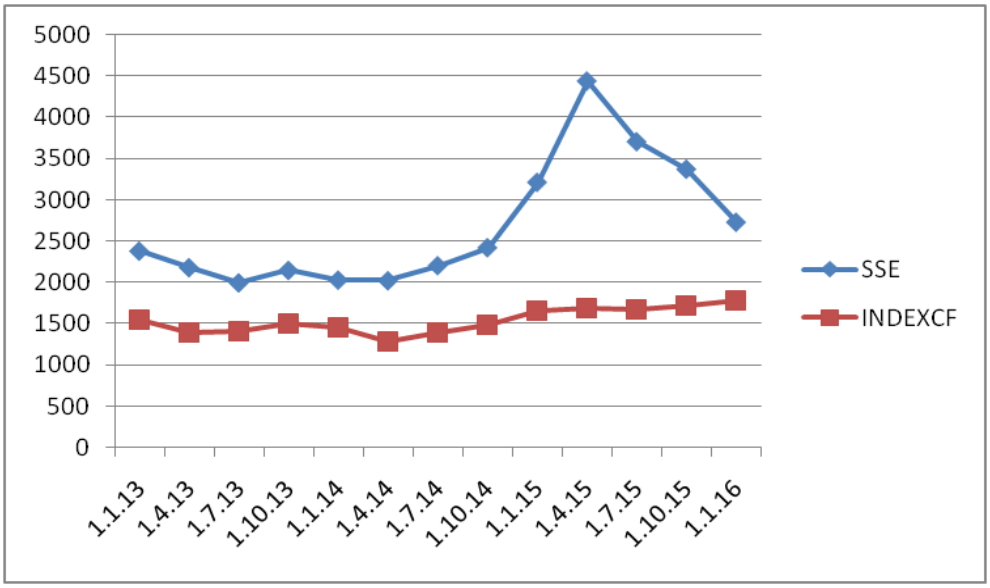
Line Chart for JALSH Vs BOVESPA



Pearson Correlation coefficient between JALSH and BOVESPA is -0.24

The value of R is -0.24. Although technically a negative correlation, the relationship between your variables is only weak

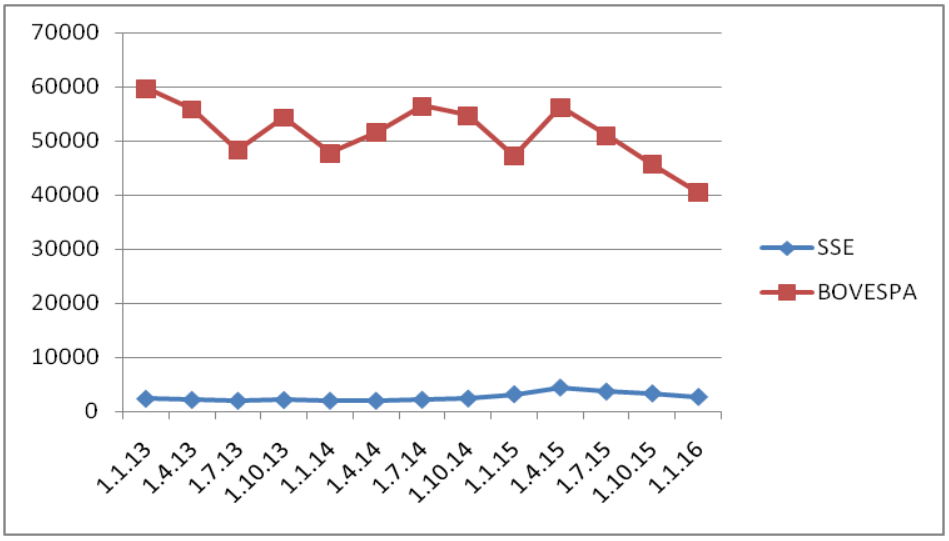
Line Chart for SSE Vs INDEXCF



Pearson Correlation coefficient between SSE and INDEXCF is 0.76

The value of R is 0.76. This is a strong positive correlation

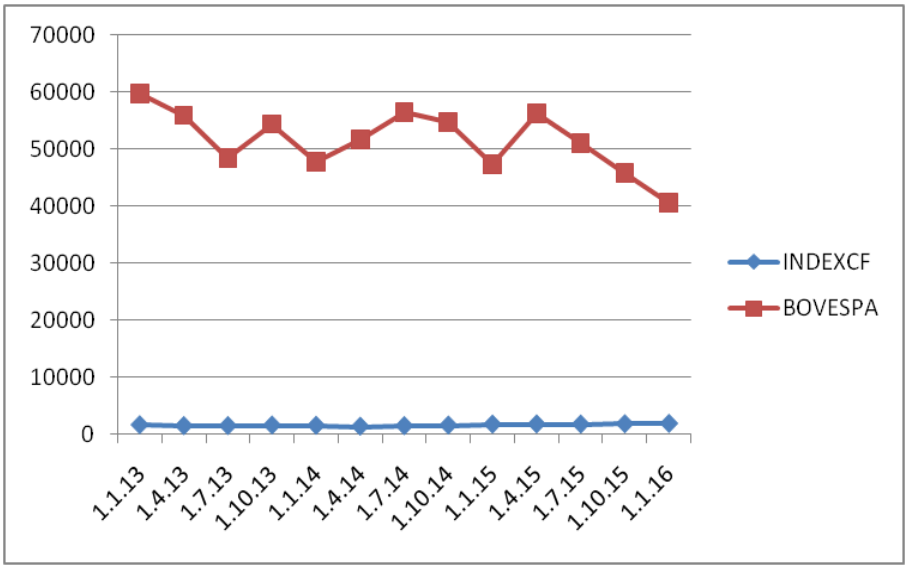
Line Chart for SSE Vs BOVESPA



Pearson Correlation coefficient between SSE and BOVESPA is -0.07

The value of R is -0.07. Although technically a negative correlation, the relationship between your variables is only weak

Line Chart for INDEXCF Vs BOVESPA



Pearson Correlation coefficient between INDEXCF and BOVESPA is -0.44

The value of R is -0.44. Although technically a negative correlation, the relationship between your variables is only weak

ANOVA FOR ABLE 1

One-way completely randomized

ANOVA FOR INDICES					
S. No	**Nifty 50**	**JALSH**	**SSE**	**INDEXCF**	**BOVESPA**
1	5993	40554	2383	1547	59750
2	5748	39200	2183	1391	55883
3	5858	40474	2000	1404	48343
4	5780	45103	2150	1504	54337
5	6302	45159	2033	1455	47763
6	6753	48900	2025	1285	51630
7	7725	51524	2208	1391	56463
8	7946	49737	2425	1487	54723
9	8395	51245	3217	1657	47280
10	8586	54428	4442	1689	56270
11	8445	52082	3708	1668	51050
12	7951	53813	3375	1717	45733
13	7963	49123	2733	1780	40513
n	13	13	13	13	13
X	7188.077	47795.538	2683.231	1536.538	51518.308
s	1127.839	5206.197	771.873	152.848	5393.062
$\mathbf{X}_{ave}$	22144.338				

source	**df**	**SS**	**MS**	**F**	**P-value**
treatments	4	33122960292.092	8280740073.023	712.8641	1.0000
error	60	696969318.462	11616155.308		
total	64	33819929610.554			

VII. Major findings of the study and conclusions.

Conclusion from Anova:

The p-value corresponding to the F-statistic of one-way ANOVA is lower than 0.05, suggesting that the one or more treatments are significantly different.

Tukey HSD Test:

The p-value corresponding to the F-statistic of one-way ANOVA is lower than 0.01 which strongly suggests that one or more pairs of treatments are significantly different. You have k=5 treatments, for which we shall apply Tukey's HSD test to each of the 10 pairs to pinpoint which of them exhibits statistically significant difference.

Statistic based on the k=5 treatments and v=60 degrees of freedom for the error term, for significance level α= 0.01 and 0.05 (p-values) in the Studentized Range distribution. We obtain these critical values for Q, for α of 0.01 and 0.05, as Q_α =0.01, k=5, v=60, *critical* = 4.8179 and Q_α =0.05, k=5, v=60 *critical*= 3.9774, respectively. Next, we establish a Tukey test statistic from our sample columns to compare with the appropriate critical value of the studentized range distribution. We calculate a parameter for each pair of columns being compared, which we loosely call here as the Tukey-Kramer HSD Q.

The test of whether the Tukey-Kramer confidence interval includes zero is equivalent to evaluating whether $Q_{I,j} > Q_{critical}$, the latter determined according to the desired level of significance α (p-value), the number of treatments k and the degrees of freedom for error v , as described above. *Post-hoc Tukey HSD Test Calculator results:* k=5 treatments degrees of freedom for the error term v=60 Critical values of the Studentized Range Q statistic: Q_α=0.01, k=5, v=60 *critical* = 4.8179 Q_α=0.05, k=5, v=60 *critical* = 3.9774 We present below color coded results (red for insignificant, green for significant) of evaluating whether $Q_{i,j} > Q_{critical}$ for all relevant pairs of treatments. In addition, we also present the significance (p-value) of the observed Q-statistic $Q_{I,j}$.

Tukey HSD results Table:

INDICES	Tukey HSD Q Statistic	Tukey HSD p-value	Tukey HSD inference
Nifty50 Vs JALSH	42.9582	0.0010053	p<0.01 & p<0.05
Nifty50 Vs SSE	4.7656	0.0111339	p<0.05
Nifty50 Vs INDEXCF	5.9787	0.0010053	p<0.01 & p<0.05
Nifty50 Vs BOVESPA	46.8965	0.0010053	p<0.01 & p<0.05
JALSH Vs SSE	47.7239	0.0010053	p<0.01 & p<0.05
JALSH Vs INDEXCF	48.9369	0.0010053	p<0.01 & p<0.05
JALSH Vs BOVESPA	3.9383	0.0535581	insignificant
SSE Vs INDEXCF	1.2131	0.8999947	insignificant
SSE Vs BOVESPA	51.6621	0.0010053	p<0.01 & p<0.05
INDEXCF Vs BOVESPA	52.8752	0.0010053	p<0.01 & p<0.05

VIII. References:

1. http://www.socscistatistics.com
2. http://statistica.mooo.com
3. www.**nse**india.com
4. www.tradingeconomics.com