A STUDY ON LONG RUN AND SHORT RUN ASSOCIATION BETWEEN DOMESTIC AND GLOBAL FACTORS WITH SELECT SECTORAL INDICES OF INDIAN STOCK MARKETS

Abstract

The impact of global and domestic economic factors may not be same on all the sectoral indices, hence the present debate is made as an experiment to analyze the Long-term and short-term causality between select global and domestic economic factors with select sectoral indices of Indian stock market. Johansen co-integration test, VECM/VAR model, Wald test has been used to test the remote future and fleeting causality. The study concluded that, lag variables of respective index, NIFTY, IIP, NASDAQ and Petroleum rates posses long and short run association with Auto and Bank Index.

Keywords: Global and Domestic Economic Factors, Sectoral Indices, Co-integration, Causality, Lag variables.

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I. PRESENTATION

The economic life of a country is tightly linked with stock exchanges. The ability to conserve community funds and fuel economic growth is provided by stock exchanges. In the normal business conditions markets discover the prices of securities based on the demand and supply conditions prevailed, where as in specific condition such as high rate of inflation, interest rate changes, deprived currency values, global economic phenomenon etc., will show impact regarding the erratic nature of stock returns, Indian stock markets are not the exception for this phenomenon.

Plenty of studies are made to analyze the performance of Indian stock markets and found that global and domestic economic factors will show significant effect on stock markets besides the fundamentals of companies that are trading in the markets such as corporate performance, industrial growth.

The previous studies, with the help of stepwise regression analysis, identified that NIFTY, IIP and LIBOR are the good exogenous variables in order to predict the variations in Auto Index; NIFTY, MCX, FII, USD, NASDAQ and Dow Jones can be considered to observe the variability in the Bank Index; Hence the present study is aimed to analyze the long run and short run association between select global and domestic economic factors to that of select sectoral indices of Indian big market.

II. NEED FOR THE ANALYSIS

Stock market growth will create various opportunities for both investors and entrepreneurs. The investors can get more profits, existing and prospective entrepreneurs will get required funds for the growth of the business. This will lead to the growth of the economy. Volatility is general tendency of the markets. This will arise due to various technical and fundamental factors such as performance of the firm, industry growth rate, changes in global and domestic economic factors. Among this information, some factors may have long run and some other factors will have short run effect on the markets. In order curtail the volatility, the long run and short effect should be modeled. Hence the present study is made an attempt to develop the model and analyze the long run and short run effect of select economic factors on select sectoral indices of Indian Wall Street.

III. REVIEW OF LITERATURE

Zukarnain & Shamsuddin, 2012 Based on monthly data from January 2000 to June 2012, it was determined that only interest rate volatility was found to be a Granger cause of stock market volatility in Malaysia. The other four macroeconomic variables, inflation, GDP, interest rates, exchange rates, and money supply, were not found to be Granger causes.

Kumar & Padhi, 2012 studied the relationships between the Indian stock market index and five macroeconomic variables over the period 1994:04–2011:06, including the wholesale price index, industrial production index, treasury bills rates, exchange rates, and money supply, and discovered that the stock market index and macroeconomic variables are co-integrated and, therefore, a long-run equilibrium relationship exists between them. It is also observed that the stock prices positively relate to the index, which shows that the economy is

growing. It is discovered that exchange rates and short-term interest rates have no bearing on forecasting stock values. The relationship between stock prices and industrial production is bidirectional, whereas the relationship between stock prices and the money supply, interest rates, and inflation is found to be unidirectional.

(Irfan Javaid Attari & Safdar, 2013) examined the connection between stock returns and macroeconomic variables. Interest rate, inflation, and gross domestic product are three examples of macroeconomic factors that the Karachi Stock Exchange has deemed representative of the stock market. The study used monthly data for the variables from December 1991 to August 2012 and discovered that macroeconomic factors had a significant impact on stock prices, making stock markets the best predictors of future economic growth.

Kumari & Mahakud, 2014 uses two stage estimating methodologies to investigate the hypothesised relationship between stock market volatility and macroeconomic volatility in the developing Indian stock market. Utilizing uni-variate autoregressive conditional heteroskedasticity models, conditional volatility is extracted. The relationship between stock market volatility and macroeconomic volatility was further examined using a multivariate VAR model, impulse response function, block exogeneity, and variance decomposition, and it was discovered that there was a connection between the two.

Pethe & Karnik, 2015 investigated the inter-relationships between stock prices and important macro-economic variables such as prime lending rate, exchange rate of rupee vis-à-vis US dollar, broad and narrow money supply, and index of industrial production are considered and found that there is a significant relation between select variables and stock market returns.

Maio & Philip, 2015 attempted to decompose the stock market return by incorporating the information from 124 macroeconomic variables and these have made as 6 factors and run a VAR containing these factors and financial variables such as the T-bill rate and market dividend yield. Using the macro factors in the computation of discount rate news and cash-flow does not significantly improve the fit of a two-factor ICAPM for the cross-section of stock returns.

Chen, Jiang, Li, & Xu, 2016 investigated the effects of U.S. economic variables on the time variation of Chinese stock market volatility and found that U.S. economic variables such as the dividend yield, dividend price ratios, and industrial production strongly forecast the future monthly volatilities of the Chinese stock market returns.

IV. RESEARCH GAP

Majority of the studies have focused on investigating the impact, co-integration, long run and short run association between economic variables on broad stock exchange indicators across the world, where as very few have focused on sectoral indices of the market. Hence the researcher found that there is a need to undergo a study on long run and short run causality between select global and domestic economic factors and select sectoral indices of Indian commodities exchange.

V. PRINCIPLES OF THE STUDY

1. To study the co-integration between select global and domestic economic factors with the privileged sectoral indices of Indian stock exchange.
2. To analyze the long run and short run causality between the select economic factors and sectoral indices.

VI. HYPOTHESIS

1. **H_{01}:** There is no co-integration between select sectoral indices and select global and domestic economic factors.
2. **H_{02}:** There is no short run causality between select sectoral indices and global and domestic factors.

VII. STATISTICAL TOOL USED FOR THE STUDY

The Johansen co-integration test is performed to non-stationary data to observe the long run association between sectoral indices and the economic variables, if the variables are co-integrated then Vector Error Correction Model (VECM) has been used for correction of error variations among variables and establish the exact long run association, if the elements are not co-integrated then it Vector Auto Regressive (VAR) model has performed to understand the long run association between variables. As an extension to Johansen co-integration and VECM/VAR models, the Wald test is accomplished to observe the temporary impact of the variables.

VIII. SAMPLE SIZE AND PERIOD OF THE STUDY

After globalization, Indian Stock Market has been receiving foreign capital funds and the domestic players were also started showing interest to invest. In this regard, the Indian Stock Market becomes more volatile and dynamic. In India National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) are two stock exchanges. Foremost stock exchanges as majority of the share transactions are done by the investors in these two stock exchanges, Kaur (2004). These two exchanges are well equipped with electronic trading platforms.

To study the impact of Global and domestic factors influences on sectorial indices of Indian Stock Market, the researcher has considered two sectorial indices of NSE, such as NIFTY Auto and Bank indices since these indices plays vital role in NIFTY. The researcher has also considered global stock market indexes such the New York Stock Exchange (NYSE), Shanghai Stock Exchange, National Association of Securities Dealers Automated Quotations (NASDAQ), and Morgan Stanley Capital International (MSCI) Composite Index (SHCOMP), Global currency rate fluctuations such as Dollar Index, Yuan and Euro value changes, changes in the prices of Commodities like Crude Oil rates, and Gold, Global shipping index such as Baltic Dry Index (BDI), Flow of FII and FDI in India. Domestic factor include Repo rate, government bond rates, Money supply (M3), GDP growth rate, rate of inflation, Consumer Price Index (CPI), Balance of trade, and Index of Industrial Production (IIP) as global and domestic economic factors for analysis.

In order to make extensive study, the researcher has collected the statistics for ten years period from April 2006 to March 2016 for both sectorial indices as well as select global and domestic factors. The researcher has gathered day wise and monthly closing prices of sectorial indices and the same data has been used for the study to find the impact of global and domestic factors.

IX. ANALYSIS OF THE STUDY

The study has planned make an analysis for sectoral indices such as Auto Index and Bank Index.

1. Analysis of auto index

- **Johansen co-integration test:** Multivariate Johansen Co-integration test is performed for Auto Index and select factors such as NIFTY, IIP, and LIBOR. The Null hypothesis statement is set as "There is no Co-integration between Auto Index and select factors".

Table 1: Test of Johannes Co-Integration between Auto Index and Select Factors

Series: Auto Index, NIFTY, IIP and LIBOR				
Lags interval: 1 to 4 (in first differences)				
Unlimited Co-integration Rank Test (Trace)				
Estimated number of CE (s)	**Value of Eigen**	**Observe Statistics**	**0.05Critical Value**	**Prob.****
None *	0.414271	104.6823	47.85613	0.0000
at most 1,	0.179557	43.16907	29.79707	0.0008
at most 2,	0.103847	20.40934	15.49471	0.0084
at most 3,	0.065579	7.800205	3.841466	0.0052
At the 0.05 level, a trace test reveals 4 co-integrating equations.				
*** indicates that the hypothesis was rejected at the 0.05 level.**				
****MacKinnon-Haug-Michelis (1999) p-values**				
Test of Unconditional Co-integration (Maximum Eigen value)				
Hypothesized No. of CE(s)	**Eigen value**	**Max-Eigen Phenomenon**	**.05Demanding Price**	**Prob.****
Nil *	.414271	61.51318	27.58434	.0000
Solely 1,	.179557	22.75973	21.13162	.0293
Simple 2,	.103847	12.60914	14.26460	.0898
Only 3,	.065579	7.800205	3.841466	.0052
At the 0.05 level, the Max-Eigen value test reveals two co-integrating equations.				
*** indicates that the hypothesis was rejected at the 0.05 level.**				
p-values from MacKinnon-Haug-Michelis (1999)				

Source: Compiled data

Table 1 indicates that, the null hypothesis should be rejected and there are three co-integration equations between Auto Index and select economic factors since the trace statistic

values of unrestricted co-integration rank test (104.6823, 43.16907, 20.40934 and 7.8) and Max Eigen statistic values of MacKinnon-Haug-Michelis (1999) test (61.51318, 22.75973, 12.60914 and 7.8) are greater than critical values at five percent level of significance (47.85613, 29.79707, 15.49471 and 3.841466 and 27.58434, 21.13162, 14.26460 and 3.841466). The respective probability values also reveal that there is a co-integration among variables since the values are less than five per cent. Hence one can conclude that, the Auto Index has long run association with select economic factors.

Table 2: Vector Error Correction Estimates of Auto Index and Select Economic Factors

Co-integrating Equation	Test values	Co-integrating Equation	Test values	Co-integrating Equation	Test values
AUTO(-1)	1.000000	D(NIFTY(-1))	0.618854		[-0.39216]
NIFTY(-1)	0.000000		(0.23863)	D(LIBOR(-3))	-0.017112
IIP(-1)	0.000000		[2.59335]		(0.02814)
LIBOR(-1)	0.907264	D(NIFTY(-2))	0.433544		[-0.60803]
	(0.15009)		(0.23214)	D(LIBOR(-4))	-0.025735
	[6.04479]		[1.86762]		(0.02711)
C	-9.29095	D(NIFTY(-3))	0.628090		[-0.94915]
Error Correction:	D(AUTO)		(0.22840)	C	0.007416
Co-integration Equation 1	0.062556		[2.75001]		(0.00802)
	(0.04933)	D(NIFTY(-4))	0.462903		[0.92510]
	[1.26820]		(0.23817)	R-squared	0.318050
Co-integration Equation 2	-0.132865		[1.94360]	Adj. R-squared	0.181661
	(0.09454)	D(IIP(-1))	0.309495	Sum sq. residual	0.491580
	[-1.40544]		(0.17351)	S.E. equation	0.071934
Co-integration Equation 3	-0.51213		[1.78369]	F-statistic	2.331921
	(0.17030)	D(IIP(-2))	0.492790	Log likelihood	150.4882
	[-3.00726]		(0.17006)	Akaike AIC	-2.26936
D(AUTO(-1))	-0.576855		[2.89769]	Schwarz SC	-1.79198
	(0.23054)	D(IIP(-3))	0.331295	Mean dependent	0.012021
	[-2.50216]		(0.16340)	S.D. dependent	0.079519
D(AUTO(-2))	-0.423377		[2.02751]	Determinant residual covariance (dof adj.)	8.34E-10
	(0.21647)	D(IIP(-4))	0.266896	Determinant residual covariance	3.88E-10
	[-1.95582]		(0.13212)	Log likelihood	593.2606
D(AUTO(-3))	-0.51423		[2.02010]	Akaike information criterion	-8.717575
	(0.21023)	D(LIBOR(-1))	-0.026176	Schwarz criterion	-6.52163
	[-2.44605]		(0.03050)		
D(AUTO(-4))	-0.233145		[-0.85828]		
	(0.22160)	D(LIBOR(-2))	-0.011559		
	[-1.05209]		(0.02947)		

- **Vector Error Correction Model (VECM):** A multiple time series model called the VECM is employed when the variables being studied have a long-term stochastic

tendency, commonly known as co-integration. It is helpful for assessing the long- and short-term effects of one time-series-based variable on another variable of a comparable kind. The phrase "last period deviations from long run equilibrium influences its short run dynamics" is the definition of error correction. Therefore, the pace at which an endogenous variable returns to equilibrium following a change in other variables is directly estimated by the error correction model.

Table 2 is the representation of error correction equations of Auto Index. As the Johansen co-integration test reveals that there are 3 co-integration equations between Auto index and select sectoral indices and lag selection criterion suggests considering four lags, the error correction model has considered the same order of lags and co-integration equations. The R-square value (31.8 per cent) of the model reveals that the predictive ability of lag co-efficient of select economic factors as well as Auto index lag variables is 31.8 percent. The model also provides beta coefficients, standard error and t-statistic values for lag terms of Auto index, NIFTY, IIP and LIBOR, but it will not reveal the significance of those values.

- **Testing of hypothesis for coefficients:** In order to test the significance, one has to take the help of Traditional Least Squares (OLS) evalution technique. The following is revealed by the OLS approach for error correction model:

In the Table 3, C (1), C(2) and C(3) were explain the long run association among the variables. When the beta co-efficient values of C (1), C(2) and C(3) are negative and significant then one can conclude that variables are associated in long run. In the above table C (1) (0.062556) is having a positive sign of co-efficient and in-significant (0.2078) at 5 per cent level of significance, C (2) coefficient (-0.132865) is negative in sign but in-significant (0.1632) at 5 per cent level of significance. The third co-efficient C (3) is significant since its beta value (-0.512130) is negative in symbol and significant at (0.0034) 5 per cent level of significance. Therefore one can conclude that there exists long-term relationships between the variables.

The table also reveals that C(4) for (D(Auto(-1)), C (6) for (D(Auto(-3)),C(8) for (D(NIFTY(-1)), C(10) for (D(NIFTY(-3)), and C (15) for (D(IIP-4)) are powerful at 5% level of implication whereas C(5) i.e., for (D(Auto(-2)), C (9) for (D(NIFTY(-2)), C (11) for(D(nifty(-4)), C (12) for (D(IIP(-1)) are significant at 10 % of significance. The rest of variables are in-significant at both 5 and 10% level of sense.

The F statistic (2.331921) and respective probability values (0.003849) reveals that the model is significant at 5 and 1% of connotation.

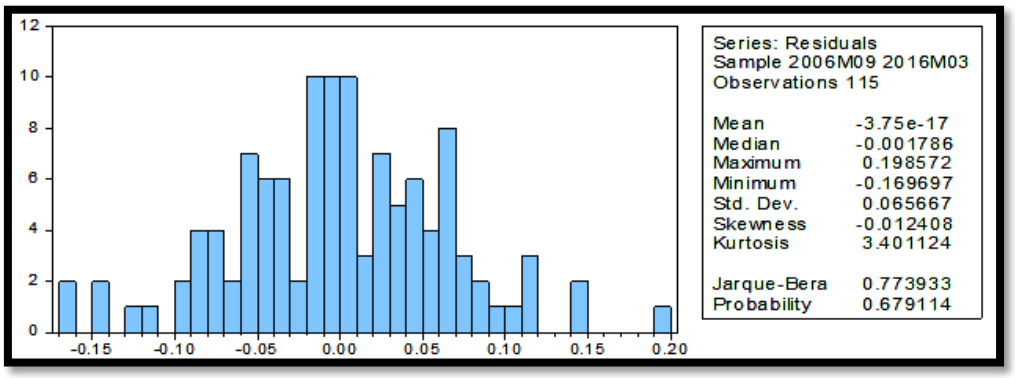
Table 3: Tests of Significance for Inaccuracy Correction Model

Dependent Variable: D(AUTO)				
Error Correction Model: D(AUTO) = C(1)*(AUTO(-1) + 0.90726394415*LIBOR(-1) -9.29095037385) + C(2)*(NIFTY(-1) + 0.475600517345*LIBOR(-1) -9.18167571573) + C(3)*(IIP(-1) + 0.0907651737148*LIBOR(-1) -7.09912903309) + C(4)*D(AUTO(-1)) + C(5)*D(AUTO(-2)) +C(6)*D(AUTO(-3)) + C(7)*D(AUTO(-4)) + C(8)*D(NIFTY(-1)) + C(9)*D(NIFTY(-2)) + C(10)*D(NIFTY(-3)) + C(11)*D(NIFTY(-4)) + C(12)*D(IIP(-1)) + C(13)*D(IIP(-2)) + C(14)*D(IIP(-3)) + C(15)*D(IIP(-4)) +C(16)*D(LIBOR(-1)) + C(17)*D(LIBOR(-2)) + C(18)*D(LIBOR(-3)) + C(19)*D(LIBOR(-4)) + C(20)				
	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
C-1	.062556	.049326	1.268204	.2078
C-2	-.132865	.094537	-1.405438	.1632
C-3	-.512130	.170298	-3.007259	.0034
C-4	-.576855	.230543	-2.502162	.0141
C-5	-.423377	.216470	-1.955822	.0534
C-6	-.514230	.210229	-2.446049	.0163
C-7	-.233145	.221601	-1.052095	.2954
C-8	.618854	.238632	2.593346	.0110
C-9	.433544	.232137	1.867623	.0649
C-10	.628090	.228395	2.750011	.0071
C-11	.462903	.238168	1.943601	.0549
C-12	.309495	.173514	1.783693	.0777
C-13	.492790	.170063	2.897694	.0047
C-14	.331295	.163400	2.027510	.0454
C-15	.266896	.132121	2.020096	.0462
C-16	-.026176	.030498	-.858282	.3929
C-17	-.011559	.029475	-.392163	.6958
C-18	-.017112	.028144	-.608031	.5446
C-19	-.025735	.027113	-.949151	.3450
C-20	.007416	.008016	.925096	.3573
R-squared	.318050	Mean dependent		.012021
Adjusted R-squared	.181661	S.D. dependent		.079519
S.E. of regression	.071934	Akaike info criterion		-2.269360
Sum squared residual	.491580	Schwarz criterion		-1.791980
Log likelihood	150.4882	Hannan-Quinn criterion		-2.075594
F-statistic	2.331921	Durbin-Watson stat		1.968573
Probability value (F-statistic)	.003849			

Source: Compiled data

- **Test of normality for residual:** One of the criterion for a good regression model is, that the residual must be normally distributed. In order to analyze the normality of residuals, one can use the Jarque-Bera statistic and histogram. The null hypothesis that has considered here is that "The residuals are normally distributed".

Graph 1: Histogram and Normality Test of Residual for Auto Index



Source: Compiled data

The graph 1 and respective table reveals that the null hypothesis should be accepted i.e., the "Residual are normally distributed" since the Jarque-Bera Statistic's (0.773933) probability values (0.679114) is greater than 5 per cent level of significant.

- **Wald chi-square test or wald test:** The Wald chi-square test, also known as the Wald test, can be used to determine whether a parameter's true value is consistent with the sample estimate whenever a relationship within or between data items can be described as a statistical model with parameters to be estimated from a sample. After examining the long-term relationships between the variables with the use of an error correction model, one can use the Wald Test to examine the short-term relationships between endogenous and exogenous variables. The framed null hypothesis is that there is no short run causation of lagged coefficients on Auto Index or that the value of coefficients for lagged economic variables such as NIFTY, IIP, and LIBOR are zero.

The table number 4 indicates the Wald-test results. C(8), C(9), C(10) and C(11) represents the lagged coefficients for NIFTY, C(12), C(13), C(14) and C(15) are the lagged coefficients for IIP and C(16), C(17), C(18) and C(19) represents the lagged coefficients of LIBOR. We have sufficient information to refuse the null hypothesis and obtain substitute hypothesis, i.e., C(8), C(9), C(10), C(11), C(12), C(13), C(14) and C(15) possess short run causality with Auto Index since F (0.0133, 0.0459) and Chi-square (0.0097, 0.0388) statistical probability values are less 0.05 or 5 per cent level of significance. In the case of C(16), C(17), C(18) and C(19) variables, the null hypothesis should be accepted i.e., C(16), C(17), C(18) and C(19) variables does not possess short run causality with Auto Index, since the F (0.7664) and Chi-square statistical probability values (0.7667) are more than 0.05 or 5% level of significance.

Table 4: Wald Test

Null Hypothesis: C(8)=C(9)=C(10)=C(11)=0			
Assessment Data	**Value**	**D_f**	**Probability**
F-phenomenon	3.334422	(4, 95)	0.0133
Chi-square	13.33769	4	0.0097
Null Hypothesis Summary:			
Normalized Restriction (= 0)		**Value**	**Std. Err.**
C(8)		0.618854	0.238632
C(9)		0.433544	0.232137
C(10)		0.628090	0.228395
C(11)		0.462903	0.238168
Null Hypothesis: C(12)=C(13)=C(14)=C(15)=0			
Test Statistic	**Value**	**D_f**	**Probability**
F-data	2.524331	(4, 95)	0.0459
Chi-square	10.09732	4	0.0388
Null Hypothesis Summary:			
Normalized Restriction (= 0)		**Value**	**Std. Err.**
C(12)		0.309495	0.173514
C(13)		0.492790	0.170063
C(14)		0.331295	0.163400
C(15)		0.266896	0.132121
Null Hypothesis: C(16)=C(17)=C(18)=C(19)=0			
Test Statistic	**Value**	**D_f**	**Probability**
F-factor	0.457959	(4, 95)	0.7664
Chi-square	1.831836	4	0.7667
Null Hypothesis Summary:			
Normalized Restriction (= 0)		**Value**	**Std. Err.**
C(16)		-0.026176	0.030498
C(17)		-0.011559	0.029475
C(18)		-0.017112	0.028144
C(19)		-0.025735	0.027113

Source: Compiled data

2. Analysis of Bankex

- **Johansen Co-integration test:** Multivariate Johansen Co-integration test is performed for Bankex and select factors such as NIFTY, MCX, FII, USD, NASDAQ, DOWJONES. The Null hypothesis statement is set as "There is no Co-integration between Bankex and select factors".

Table 5: Test of Johansen Co-Integration between Bankex and Select Factors

Series: BANKEX NIFTY MCX FII USD NASDAQ DOWJONES				
Lags interval (in first differences): 1 to 4				
Unrestricted Co-integration Rank Test (Trace)				
Hypothesized No. of CE(s)	**Eigen value**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.285625	132.3620	125.6154	0.0182
At most 1	0.247823	94.01832	95.75366	0.0655
At most 2	0.166100	61.55302	69.81889	0.1908
At most 3	0.131731	40.84582	47.85613	0.1936
At most 4	0.120186	24.74283	29.79707	0.1708
At most 5	0.076510	10.14576	15.49471	0.2697
At most 6	0.009358	1.071880	3.841466	0.3005
Trace test indicates 1 co-integrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Co-integration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	**Eigen value**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
None	0.285625	38.34363	46.23142	0.2711
At most 1	0.247823	32.46531	40.07757	0.2782
At most 2	0.166100	20.70720	33.87687	0.7060
At most 3	0.131731	16.10298	27.58434	0.6570
At most 4	0.120186	14.59707	21.13162	0.3181
At most 5	0.076510	9.073885	14.26460	0.2800
At most 6	0.009358	1.071880	3.841466	0.3005
Max-eigen value test indicates no co-integration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: Compiled data

Table 5 indicates that, the null hypothesis should be rejected and there is one co-integration equations between Bankex and select economic factors since the trace statistic value of unrestricted co-integration rank test (132.3620) is exceeding critical values at five percent level of significance (125.6154). The respective probability value also reveals that there is a co-integration among variables since the value (0.0182) is less than five per cent. Hence one can conclude that Bankex has long run association with select economic factors.

Table 6: Vector Error Correction Estimates of Bankex and Select Economic Factors

Co-integrating Eq:	CointEq1	Co- integrating Eq:	CointEq1	Co-integrating Eq:	CointEq1
BANKEX(-1)	1.000000	D(NIFTY(- 1))	0.443312	D(USD(-1))	0.575730
NIFTY(-1)	-4.09653		(0.37778)		(1.02487)
	(0.51501)		[1.17346]		[0.56176]
	[-7.95432]	D(NIFTY(- 2))	1.255308	D(USD(-2))	-0.49981
MCX(-1)	-2.99385		(0.36845)		(1.03992)
	(0.54050)		[3.40698]		[-0.48062]
	[-5.53901]	D(NIFTY(- 3))	0.646091	D(USD(-3))	1.691033
FII(-1)	0.186270		(0.37353)		(0.97018)
	(0.05208)		[1.72969]		[1.74301]
	[3.57687]	D(NIFTY(- 4))	1.169672	D(USD(-4))	4.233704
USD(-1)	-10.4962		(0.34398)		(0.80691)
	(2.00655)		[3.40044]		[5.24682]
	[-5.23098]	D(MCX(-1))	-0.14294	D(NASDAQ(-1))	-0.45762
NASDAQ(-1)	7.719280		(0.27462)		(0.49255)
	(1.54041)		[-0.52051]		[-0.92908]
	[5.01120]	D(MCX(-2))	0.081345	D(NASDAQ(-2))	-0.32197
DOWJONES(-1)	-5.86606		(0.28221)		(0.49059)
	(1.35077)		[0.28824]		[-0.65628]
	[-4.34275]	D(MCX(-3))	0.574767	D(NASDAQ(-3))	-0.61214
C	91.06650		(0.27910)		(0.47800)
Error Correction:	D(BANKEX)		[2.05938]		[-1.28063]
CointEq1	0.084767	D(MCX(-4))	0.446987	D(NASDAQ(-4))	-0.37506
	(0.05446)		(0.24294)		(0.44436)
	[1.55656]		[1.83992]		[-0.84406]
D(BANKEX(-1))	-0.16952	D(FII(-1))	-0.0094	D(DOWJONES(-1))	0.415875
	(0.23917)		(0.01001)		(0.56581)
	[-0.70878]		[-0.93906]		[0.73500]
D(BANKEX(-2))	-0.85558	D(FII(-2))	0.004254	D(DOWJONES(-2))	-0.38066

	(0.23746)		(0.00965)		(0.57019)
	[-3.60298]		[0.44068]		[-0.66760]
D(BANKEX(-3))	-0.20012	D(FII(-3))	0.009064	D(DOWJONES(-3))	0.433524
	(0.24372)		(0.00889)		(0.56268)
	[-0.82108]		[1.02014]		[0.77046]
D(BANKEX(-4))	-0.33225	D(FII(-4))	0.000604	D(DOWJONES(-4))	0.359419
	(0.22866)		(0.00720)		(0.52434)
	[-1.45298]		[0.08392]		[0.68547]
				C	0.002766
					(0.00933)
					[0.29642]
R-squared		0.475265	Log likelihood		138.3246
Adj. R-squared		0.294106	Akaike AIC		-1.90043
Sum sq. residuals		0.589532	Schwarz SC		-1.18038
S.E. equation		0.083775	Mean dependent		0.009809
F-statistic		2.623471	S.D. dependent		0.099711
Determinant residual covariance (dof adj.)		7.09E-19	Akaike information criterion		-20.2556
Determinant residual covariance		8.36E-20	Schwarz criterion		-15.0472
Log likelihood		1371.569			

Source: Compiled data

Table 6 is the representation of error correction equations of Bankex. As the Johansen co-integration test reveals that there is one co-integration equations between Bankex and select sectoral indices; lag selection criterion suggests considering four lags, the error correction model has considered the same order of lags and co-integration equations. The R-square value (47.52 per cent) of the model reveals that the predictive ability of lag co-efficient of select economic factors as well as Bankex lag variables is 47.52 percent. The model also provides beta coefficients, standard error and t-statistic values for lag terms of Bankex, NIFTY, MCX, FII, USD, NASDAQ, DOWJONES, but it will not reveal the significance of those values. In the above table C (1) (0.084767) is having a positive sign and in-significant (0.1233) at 5 per cent level of significance. Therefore one can windup that there no remote futrur associations among the variables.

The bench also reveals that C(3) for D (Bankex(-2)), c (7) for D(NIFTY(-2)), C(9) for D(NIFTY(-4)), and C(21) for (D(USD(-4)) are significant at c(13) for D(MCX(-4)) is significant at 10% level of significance compared to 5% level of significance for C(13). At both the 5% and 10% levels of significance, the remaining variables are not significant.

The F statistic (2.623471) and respective probability values (0.000329) reveals that the mode is significant at 5 and 1 per cent level of significance.

Table 7: Tests of Significance for Error Correction Model

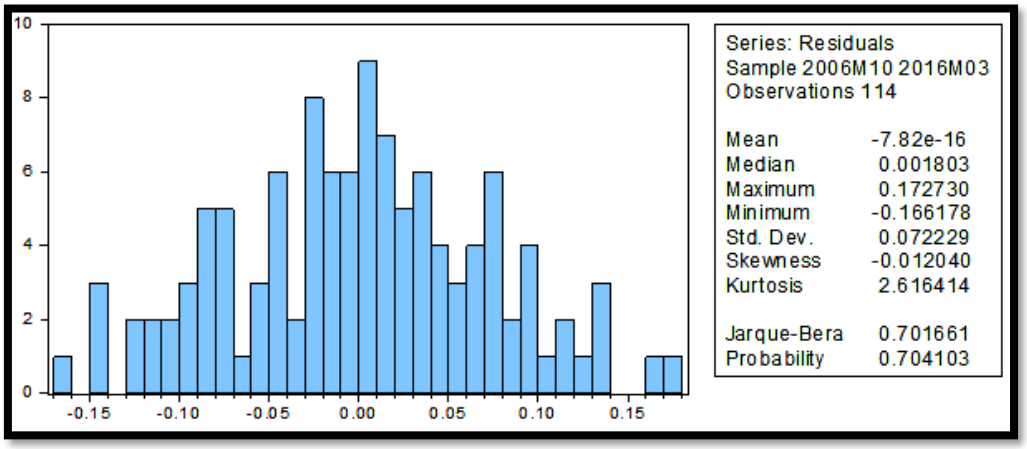
Dependent Variable: D(BANKEX)

D(BANKEX) = c-1*(BANKEX(-1) - 4.09653034571*NIFTY(-1) -2.99384470615*MCX(-1) + 0.186270014852*FII(-1) - 10.4962122477*USD(-1) + 7.71927956669*NASDAQ(-1) - 5.86605833038*DOWJONES(-1) + 91.0664976114) + C-2*D(BANKEX(-1)) + C-3*D(BANKEX(-2)) + C-4*D(BANKEX(-3)) + C-5*D(BANKEX(-4)) + C-6*D(NIFTY(-1)) + C-7*D(NIFTY(-2)) + C-8*D(NIFTY(-3)) + C-9*D(NIFTY(-4)) + C-10*D(MCX(-1)) + C-11*D(MCX(-2)) + C-12*D(MCX(-3)) + C-13*D(MCX(-4)) + C14*D(FII(-1)) + C-15*D(FII(-2)) + C-16*D(FII(-3)) + C-17*D(FII(-4)) + C-18*D(USD(-1)) + C-19*D(USD(-2)) + C-20*D(USD(-3)) + C-21*D(USD(-4)) + C(22)*D(NASDAQ(-1)) +C-23*D(NASDAQ(-2)) + C-24*D(NASDAQ(-3)) + C-25*D(NASDAQ(-4)) + C-26*D(DOWJONES(-1)) + C-27*D(DOWJONES(-2)) + C-28*D(DOWJONES(-3)) + C-29*D(DOWJONES(-4)) + C-30

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
C 1	0.084767	0.054458	1.556556	0.1233
C2	-0.169522	0.239174	-0.708782	0.4804
C3	-0.855581	0.237465	-3.602979	0.0005
C4	-0.200115	0.24372	-0.821085	0.4139
C5	-0.332245	0.228665	-1.452977	0.15
C6	0.443312	0.377783	1.173458	0.2439
C7	1.255308	0.368451	3.406985	0.001
C8	0.646091	0.373531	1.729688	0.0874
C9	1.169672	0.343977	3.400441	0.001
C10	-0.14294	0.274616	-0.520509	0.6041
C11	0.081345	0.282215	0.288237	0.7739
C12	0.574767	0.279097	2.059383	0.0426
C13	0.446987	0.242938	1.839923	0.0693
C14	-0.009403	0.010014	-0.939056	0.3504
C15	0.004254	0.009654	0.440684	0.6606
C16	0.009064	0.008885	1.020144	0.3106
C17	0.000604	0.007203	0.083925	0.9333
C18	0.57573	1.024871	0.561759	0.5758
C19	-0.499809	1.039921	-0.480621	0.632
C20	1.691033	0.97018	1.743008	0.085
C21	4.233704	0.806909	5.246817	0
C22	-0.457621	0.492553	-0.929079	0.3555
C23	-0.321966	0.490593	-0.656278	0.5134
C24	-0.61214	0.478	-1.280627	0.2038
C25	-0.375062	0.444355	-0.844059	0.401
C26	0.415875	0.565813	0.735005	0.4644
C27	-0.380659	0.57019	-0.6676	0.5062
C28	0.433524	0.562684	0.770458	0.4432
C29	0.359419	0.52434	0.685469	0.4949
C30	0.002766	0.009332	0.296421	0.7676
R-squared	0.475265	Mean dependent var		0.009809
R-squared adjusted	0.294106	S.D. dependent var		0.099711
Rate of regression, S.E.	0.083775	Akaike info criterion		-1.900432
Squared-sum residual	0.589532	Schwarz criterion		-1.18038
Log probability	138.3246	Hannan-Quinn criter.		-1.608203
F-statistic	2.623471	Durbin-Watson stat		1.973797
Prob(F-statistic)	0.000329			

Source: Compiled data

Graph 2: Histogram and Normality test of Residual for Bankex



Source: Compiled data

The graph 2 and respective table reveals that the null hypothesis should be accepted i.e., the "Residual are normally distributed" since the Jarque-Bera Statistic's (0.773933) probability values (0.679114) is greater than 5 per cent level of significance.

- **Wald chi-square test or wald test:** After testing the long-run union among the variables with the help of Error Correction model, one can go for testing of short run association among the endogenous and exogenous variables by using Wald Test. The null hypothesis that has framed here is that the value of coefficients for lagged economic variables such as NIFTY, MCX, FII, USD, NASDAQ, DOWZONES are zero or there is no impact of lagged coefficients on Bankex.

The table number 8 indicates the Wald-test results. C(2), C(3), C(4) and C(5) represents the fall off coefficients for Bankex, C(6), C(7), C(8) and C(9) are the lagged coefficients for NIFTY, C(10), C(11), C(12) and C(13) represents the lagged coefficients of MCX, C(14), C(15), C(16) and C(17) represents the lagged coefficients of FII, c(18), c(19), c(20) and C(21) represents lagged coefficients of USD, C(22), C(23), C(24) and C(25) represents lagged coefficients of NASDAQ, C(26), C(27), C(28) and C(29) represents lagged coefficients of Dowjones. We have sufficient information to dismiss the null hypothesis and obtain substitute thesis, i.e., C(2), C(3), C(4), C(5), C(6), C(7), C(8), C(9), C (18), C (19), C (20) and C(21) possess short run causality with Bankex since F (0.0133, 0.0010 and 0.00) and Chi-square (0.0077, 0.0004 and 0.00) statistical probability values are less 0.05 or 5 per cent level of significance. In the case of C(10), C(11), C(12), C(13), C(14), C(15), C(16), C(17), C(22), C(23), C(24), C(25), C(26), C(27), C(28), and C(29) variables, the null hypothesis should be accepted i.e., C(10), C(11), C(12), C(13), C(14), C(15), C(16), C(17), C(22), C(23), C(24), C(25), C(26), C(27), C(28), and C(29) variables does not possess short run causality with Bankex, since the F (0.1231, 0.4125, 0.6786 and 0.7428) and Chi-square statistical probability values (0.1124, 0.4062, 0.6778 and 0.7429) are more than 0.05 or 5% level of significance.

Table 8: Wald Test

Wald Test: Null Hypothesis: C(2)=C(3)=C(4)=C(5)=0			
Test Statistic	**Value**	**df**	**Anticipation**
F-statistic	3.469089	(4, 84)	0.0113
Chi-square	13.87636	4	0.0077
Null Hypothesis Summary: Normalized Restriction (= 0)		**Value**	**Std. Err.**
C(2)		-0.169522	0.239174
C(3)		-0.855581	0.237465
C(4)		-0.200115	0.243720
C(5)		-0.332245	0.228665
Null Hypothesis: C(6)=C(7)=C(8)=C(9)=0			
Test Statistic	**Value**	**df**	**Possibility**
F-statistic	5.128504	(4, 84)	.0010
Chi-square	20.51402	4	.0004
Null Hypothesis Summary:			
Normalized Restriction (= 0)		**Value**	**Std. Err.**
c(6)		.443312	.377783
c(7)		1.255308	.368451
c(8)		.646091	.373531
c(9)		1.169672	.343977
Wald Test: Null Hypothesis: C(10)=C(11)=C(12)=C(13)=0			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	1.871150	(4, 84)	.1231
Chi-square	7.484600	4	.1124
Null Hypothesis Summary: Normalized Restriction (= 0)		**Value**	**Std. Err.**
c(10)		-.142940	.274616
c(11)		.081345	.282215
c(12)		.574767	.279097
c(13)		.446987	.242938
Wald Test: Null Hypothesis: C(14)=C(15)=C(16)=C(17)=0			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	0.999691	(4, 84)	0.4125
Chi-square	3.998764	4	0.4062
Established Restriction (= 0)		**Value**	**Std. Err.**
c(14)		-.009403	.010014
c(15)		.004254	.009654
c(16)		.009064	.008885
c(17)		.000604	.007203
Wald Test: Null Hypothesis: C(18)=C(19)=C(20)=C(21)=0			
Test Statistic	**Value**	**df**	**Probability**

F-statistic	7.571164	(4, 84)	.0000
Chi-square	30.28465	4	.0000
Null Interpretation Summary: Distributed control (= 0)		**Value**	**Std. Err.**
c(18)		.575730	024871
c(19)		-0.499809	1.039921
c(20)		1.691033	.970180
c(21)		4.233704	.806909
Wald Test: Null Hypothesis: C(22)=C(23)=C(24)=C(25)=0			
Test data	**Value**	**df**	**Probability**
F-statistic	.579084	(4, 84)	.6786
Summary of Chi-square	2.316336	4	.6778
Null Inference Summary: Assigned Restriction (= 0)		**Value**	**Std. Err.**
c(22)		-0.457621	.492553
c(23)		-0.321966	.490593
c(24)		-0.612140	.478000
c(25)		-0.375062	.444355
Wald Test: Null Hypothesis: C(26)=C(27)=C(28)=C(29)=0			
Test stats	**Value**	**df**	**Chance**
F-statistic	.490313	(4, 84)	.7428
Chi-square	1.961251	4	.7429
Null Hypothesis Summary:			
Plan Restriction (= 0)		**Value**	**Std. Err.**
c(26)		.415875	.565813
c(27)		-.380659	.570190
c(28)		.433524	.562684
c(29)		.359419	.524340

Source: Compiled data

X. FINDINGS

1. Co-integration test for non-stationary data reveals that NIFTY, IIP and LIBOR will influence the Auto Index in long run. The study found three co-integration equations between Auto Index and NIFTY, IIP and LIBOR.

2. Error correction mechanism for Auto Index reveals that, the lag variables of Auto index, NIFTY, IIP and LIBOR have the long run predictive ability of 31.8 per cent. Second and third lag variables of Auto index, first and third lag variables of NIFTY and first lag variable of IIP are compelling variables to predict the variations of Auto Index in long run at five per cent level of significance.

3. Normality test for residual of Auto index long run model reveals that, the residual are normally distributed hence it is found that the model is free from normality problem and the predictions that are made with this model will have more accuracy.

4. From Wald test, it is found that first, second, third and fourth lagged coefficients of NIFTY, IIP and LIBOR has short run causality with the returns of Auto Index. Hence it is clear that the present month auto index returns are influenced by the variations in past four month of NIFTY, IIP and LIBOR.

5. The co-integration test for non- stationary data reveals that, there exist one co-integration equation between Bankex and NIFTY, MCX, FII, US dollar index, NASDAQ and DOW JONES and posse's predictive ability of 47.52 per cent.

6. The error correction mechanism for Bankex reveals that, the lag variables of Bankex, NIFTY, MCX, FII, US dollar index, NASDAQ and DOW JONES doesn't have the long run association among the variables since the coefficient sign of C(1) is positive and not significant at five per cent level of significance. Among 28 lag variables of Bankex, NIFTY, MCX, FII, US dollar index, NASDAQ and DOW JONES, only four variables such as second lag of Bankex, NIFTY, fourth lag of NIFTY, USD are significant variables to explain the variations Bankex returns.

7. Normality test for residual of Bankex long run model reveals that, the residual are normally distributed hence it is found that the model is free from normality problem and the predictions that are made with this model will have more accuracy.

8. From Wald test for short run association, it is found that first, second, third and fourth lagged coefficients of Bankex, NIFTY and US dollar index has short run causality with the returns of Bankex. Hence it is clear that the present month Bankex returns are influenced by the variations in past four month of Bankex, NIFTY and USD.

XI. CONCLUSION

The presented study has made an attempt to analyze the long run and short run causality at intervals select global and domestic factors with select sectoral indices of Indian stock market and concludes that Auto Index has long run association with four lag variables of Auto index, NIFTY and IIP and it has short run causality with NIFTY, IIP and LIBOR. Second and fourth lag variables of Bankex, fourth lag of NIFTY has long run association with Bankex, US Dollar index has short run impact on Bankex.

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