



[www.elkjournals.com](http://www.elkjournals.com)

**INTERLIKAGE BETWEEN NASDAAQ & NIFTY 50**

<p><b>Hemlata Tiwari</b>                  Research Scholar, Institute of Banking,                  economics &amp; Finance                  Bundelkhand University, Jhansi - 284001                  (U.P.)</p>	<p><b>Dr. Shambhu Nath Singh</b>                  Assistant Professor, Institute of Banking,                  economics &amp; Finance                  Bundelkhand University, Jhansi - 284001                  (U.P.)</p>
---	--

**Abstract**

*In globally integrated, post liberalize existing era information are no longer transmitting in isolation. They are used to influence global stock markets & macroeconomic variables; a stock market is the place which shows incorporation of global information in stock prices & indices movement. Hence any fluctuation in any global indices, economic & political equations use to reflect in stock prices. US stock market has lot of influence on Indian stock market. In this study impact of NASDAQ index movement has been consider for study with major Indian indices i.e. Nifty 50. The descriptive & econometric analysis of daily data of two indices has shown cointegration. Granger causality will show direction of relationship between variables & VECM will tell about speed of correction of different variables. Variance decomposition will estimate the exact impact of all variable in defining the movement of one variable & impulse response function will tell about impact of 1unit change in standard deviation shock of one variable on rest of the variables. The analysis of above mentioned econometric tools has shown that a US NASDAQ index has more influence on Nifty rather than influence of Nifty on NASDAQ. This study has shown percentage influence over the time period of different indices on each other which will help investors & policy maker for future forecasting of both the indices. This kind of analysis will help to define the intrerlinkage of different stock indices. This intrerlinkage among various variables will use to influence the economic condition of any nation & its global dynamics with other nation.*

**KEY WORDS:** NASDAQ, US market, NIFTY, Indian market.

**INTRODUCTION**

It is very often in headlines of news bulletins & business news that due to rise or fall in NASDAQ stock exchange nifty stock are on

downward rally. This is due to globalization that all the global indices are interlinked with one another. Now in liberalize glove any small news in one corner of glove has its influence on another part of glove. It is due to

market cointegration that information is flowing so quickly across the global stock markets. In this way this cointegration is impacting macroeconomic policies of any nation. These policies are influencing foreign institutional investors (FII's) investment decision in that country. In this way it is going to affect our foreign exchange rate (FEX) & foreign exchange reserve (FER). This all will affect the current account balance (CAB) of the particular nation. Here we can see how a single information/ impact from a corner of this world can bring so much change in another nation economy. Hence it is very much important to understand the significance of the movement of global indices & their relation with the nation indices.

This will help in understanding the movement of various macroeconomic variables of the country & policy formulation of any economy. To understand this type of integration among global indices this study

has chosen NASDAQ & a major index of our National stock exchange (NSE) i.e. Nifty 50.

National stock exchange (NSE) is the leading stock exchange in India<sup>1</sup>. It is the advance stock exchange at which around 90 % of total trading in cash segment & 100% in derivative segment occurs in India<sup>2</sup>. Nifty is the major indices of NSE. This comprises of 50 companies of major segments of Indian economy<sup>3</sup>. It is considered as the barometer of Indian economy.

NASDAQ is second largest stock exchange across the world in term of market capitalization of various global indices<sup>4</sup>. It is a famous American stock, while New York Stock Exchange located in the same city is the first stock exchange on the basis of market capitalization<sup>5</sup>. The ownership of this exchange platform is under NASDAQ, Inc., which also owns the Nasdaq Nordic (formerly known as OMX), and Nasdaq Baltic stock market network and several U.S. stock and options exchanges<sup>6</sup>.

---

<sup>1</sup>

[https://en.wikipedia.org/wiki/National\\_Stock\\_Exchange\\_of\\_India](https://en.wikipedia.org/wiki/National_Stock_Exchange_of_India).

<sup>2</sup>

[https://en.wikipedia.org/wiki/National\\_Stock\\_Exchange\\_of\\_India](https://en.wikipedia.org/wiki/National_Stock_Exchange_of_India).

<sup>3</sup>

[https://en.wikipedia.org/wiki/National\\_Stock\\_Exchange\\_of\\_India](https://en.wikipedia.org/wiki/National_Stock_Exchange_of_India).

<sup>4</sup> <https://en.wikipedia.org/wiki/NASDAQ>.

<sup>5</sup> <https://en.wikipedia.org/wiki/NASDAQ>.

<sup>6</sup> <https://en.wikipedia.org/wiki/NASDAQ>.

## PURPOSES OF THE STUDY

- To explore the short & long time relation amid NASDAQ & Nifty 50.
- To find out the explanatory power of selected indices to each other current & future variations.

## REVIEW OF LITERATURE

This study has considered wide range of relevant literature from 2005 – 2018. Here we are starting with current year & move down up to research article of year 2005 so it will summarize all the past researches on the stated topic.

Scott W. Hegerty (2018.31.04) publish a research work related to pressure of foreign exchange on stock price & commodity price in east of euro. In this article author emphasis links among the exchange, equity, commodity and commodity markets of a set of Central and Eastern European (CEE) economies by using time-series data at monthly time interval. In this researcher examine whether stock – or commodity – price movement might put impact on these currencies depreciation/ appreciation, and whether these influence are transmitted within the region or in larger neighbors. This study clearly models two major economic

methods in a part of the world that is relatively hardly observed. These comprise events in Central and Eastern European exchange markets and central bank intercession, and also tried to find out linkage among regional currency and equity markets, foreign equity markets, and global commodity prices. This will consent policymakers to evaluate assimilation between these countries, the rest of the European Union, and the global economy.

Kaur Ravleen (December, 2017) discussed in research topic related to comparative analysis of Indian stock exchange & their global counterparts of major stock exchange indices. In this research author has find out that Sensex is highly correlated with Hang Sang i.e. 93.14% followed by shanghai Composite with 70.83%, then Dow Jones with 68.68% and least with Nikkei 225 with 58.57%.

Yalavatti Prakash (July, 2017) explored influence of market instability on stock return of banking sector companies in India. The paper investigates relation between NSE-Nifty Bank Index and other major banks' stock return over the eight years calendar period (2009 - 2015) by taking monthly closing returns over the study period. The

tools used for the purpose of studying this relation include time moving average method and regression model. The result of regression shows that there is very close statistically significant positive linear relationship between Nifty Bank Index and selected Indian banking companies' stock return.

Sensex is showing highly positive correlation with all the indices. Here highest correlation exists between Sensex & Hang Sang and least between Nikkei 225 & Shanghai Composite with 22.28%. Author has done comparative analysis among various global indices. Author has use tool like mean, median, mode, standard deviation, kurtosis, skewness & range.

Prasad Dr. U. Raghavendra (November, 2016) made an attempt to examine association between nifty 50 and selected shares of national stock exchange. In this article author explored that there is a strong positive correlation between Nifty 50 and HDFC Bank, TCS, Reliance whereas for Nifty 50 and ITC it is a moderate positive correlation.

Rathod Ms. Karvi (July, 2015) investigated on title A Realistic Analysis on behavior of Indian Indices with World Indices - A

investigation of Economic Revival stage. Here author discussed about correlation between indices with respect to nominal return, inflation, real return, sharp's ratio, risk free rate as a benchmark stock exchanges of China, India, Japan, Singapore, U.S.A. and linkages among them.

Mandaviya Jayshree (March, 2014) had explored Indian stock market prejudiced by global stock market –study of world major stock markets. In the above mention study author has investigated correlation among BSE Sensex, NYSE, NASDAQ, S&P 500, TOPIX, FTSE100, Han sang, SSE composite index, DEX & Dow jones index. Author has find out strong correlation of NSE with BSE, Han sang & Topix. BSE has shown maximum fluctuation with Han sang, DAX, NASDAQ & TOPIX.

R. Deepak & M. Sandeep (December, 2013) investigated Assimilation of Indian Markets with few chosen global markets: Shifting Patterns and Dynamics. In this study author examined the strength of the stock market assimilation for modification motives of both retail and institutional investors. The above mention study was accompanied seeing five major indices of the world namely BSE 30, NSE CNX NIFTY, HANG SANG index,

S&P 500, and KLSE COMPOSITE for the period 2002-13. Author discover out association midst the returns of the indices has increased over the period of time.

This may be visualizing as first sign for the growing interdependency and assimilation of the markets. All the indices chosen for the study were found to be co-integrated stressing the presence of long term relationship. Granger causality test shown one-way and two-way assimilation between the indices which have noticeably changed over the time period.

Tripathi Vanita and Sethi Shruti (2010) explored on topic related to Intrerlinkage of Indian equity market with its major global counter parts. The author of this research scans the assimilation of the Indian stock market with the stock markets the United Kingdom, the United States, Japan and China. To find out this relationship data has been collected from 1 January 1998 to 31 October 2008. After data collection, data got analyse using Johansen & Engle – granger cointegration & granger – causality. The data has been collected at daily frequency. The findings of data analysis show that the Indian stock market is influenced by the US stock market, but not with that of Japan, the UK

and China. Granger causality test has shown unidirectional causality in most cases. The outcome of this research has important implications for investment and speculative purposes.

Siddiqui Dr. Saif (2009) examined Connotations between S&P CNX Nifty and chose global equity markets. This study is based on secondary data divided in two time periods. To analyse data augmented dickey fuller, cointegration & granger- causality test has been used.

Mukherjee Debjiban (April, 2007) has explored on topic intrerlinkage of Indian equity market with global equity market. In this research article author has tried to establish relation among Hong Kong Stock exchange (HSE), Tokyo Stock exchange (TSE), Russian Stock exchange (RSE), Korean Stock exchange (KSE), New York Stock Exchange (NYSE) with Bombay Stock exchange (BSE) and the National Stock Exchange of Indian Limited (NSE) at diverse time intervals. In this study assessment was done on various parameters like circuit filters & settlement, Market Capitalization, Number of listed securities & listing agreements.

Bose Suchismita & Mukherjee Paramita (April, 2005) investigated integration among

the Indian stock market and other emerging and developed markets. In this research author did a comparative study of Indian stock market with developed markets like Japan, US and other Asian market, using data at daily time interval from January, 1999 to June, 2004. Some econometric tools like pairwise and group wise cointegration and Granger-causality test are used for data analysis & interpretation. The findings of this research say that the US market may not be playing a unique role in assimilation of Asian markets. Since the Indian market had so far not been considered in studies on regional assimilation; thus this research has given a new outcome that, except Indian market among the Asian markets rest has no or fewer cointegrating relations; this indicates an important role of India in interlinking of several stock markets during the recent period of open capital market, here FII use to play main role in deciding the market movements across the region. The extent of integration which is found not very high denotes the nature of assimilation with evolving Asian markets does not yet assure any direct unease for India concerning likely contagion and also indicates that there is quiet much space for reaping profits of

portfolio diversification, by participating in Indian stock markets.

## RESEARCH METHODOLOGY

This research is based on secondary data. The data for the selected variable i.e. NYSE & Nifty 50 is taken from yahoo finance. The data is analyzing by using E- Views software. Descriptive statistics & econometric tools have been used for data analyse. To perform econometric analysis unit root test (To check stationarity among data series), regression analysis, Durbin Watson test (To check autocorrelation.), multicollinearity, heteroskedasticity, Johanson & Engle – granger cointegration, Granger – causality, VECM, Variance decomposition & impulse response function are going to apply.

## DATA ANALYSIS & INTERPRETATION

### DESCRIPTIVE STATISTICS

The descriptive statistics data Table -1 has shown that series has positive skewness & high standard deviation. The JB statistics value is higher than tabulated value at 5% i.e. 5.991 indicates normal distribution. The probability value is more than 5% for NASDAQ indices. It means data is normal. Test of stationarity shows data is not

stationary. It means it has unit root. The result of multiple regressions shows that value of  $(R^2 > d)$ , indicates autocorrelation in data series. It also indicates presence of spurious regression. **(Ref Table – 1)**

To overcome above stated problem log transformation of data series has been taken still series has unit root. To eliminate this problem first difference of log transform has been calculated. Now the entire unit root test like augmented dickey fuller, Phillip Perron & KPSS are applied. Summary of the entire unit root test has shown (Table -2) absence of unit root at 5% level of significance. Now data series is stationary. **(Ref Table – 2)**

Now series becomes stationary. It indicates now there is a need to test cointegration between the series.

**TESTS OF COINTEGRATION:**

Two series may be integrated (in the time series sense) it means two variables are equilibrium or long term relationship. It is possible that two cointegrating variables may deviate in the short term but a long run association between them is maintained. In case such a linear combination exists, the non-stationary time series are said to be cointegrated. Thus, a set of variables are

cointegrated if a linear combination of them is stationary. The stationary linear combination is called the cointegrating equation. There are few tests to identify cointegration among data series. **(Ref Table – 3)**

**ENGLE – GRANGER COINTEGRATION**

In this test of cointegration  $\tau$  (t- statistics) is used to determine acceptance or rejection of null & alternate hypothesis.

If  $|\tau| > |\text{Engel Granger Critical Value at 5\%}|$ , then reject null hypothesis

$H_0$ : The series are not cointegrated.

$H_1$ : The series are cointegrated.

Here t statistics is more than z statistics & probability value is less than 0.05. It is recommending rejection of null hypothesis of no cointegration & probing that selected time series has cointegration.

**COINTEGRATION REGRESSION DURBIN-WATSON (CRDW) TEST**

The hypothesis for CRDW test is:

$H_0: d = 0$  Existence of unit root  $\longrightarrow$  Non-stationary time series      No cointegration.

$H_1: d \neq 0$  Non-existence of unit root  
Stationary time series  $\xrightarrow{\hspace{1cm}}$  Cointegration,  
where  $d$  is Durbin Watson statistics.

Further, if  $R^2 > d$ ; then it is spurious regression but if  $R^2 < d$  indicates non spurious regression.

Table – 4 provide value of  $R^2$  &  $d$  which is 0.017365 & 1.898911 respectively. Here value of  $R^2$  is less than  $d$  indicates non spurious regression. (Ref Table – 4)

### JOHANSEN COINTEGRATION TEST

Johansen test statistics table - 5 has shown that there is linear deterministic trend in the model & lag interval is 1 to 4. The next part of cointegration result predict about cointegrating relations. Two types of tests statistics are reported. The first block reports the so-called trace statistics, it is showing presence of two cointegrating equation it means it is rejecting null hypothesis of no cointegration & accepting alternate hypothesis of presence of cointegration. The second block reports the maximum eigenvalue statistics. It also proves presence of two cointegrating equation in the given data. (Ref Table – 5)

Analyzing the normalizing coefficient in the VECM allows us to understand how the

different indices chosen for the study adjust in the selected time period. In this research we can't apply vector auto regression model due to presence of cointegration among data that why VECM model has been applied.

### VECTOR ERROR CORRECTION MODEL (VECM)

VECM tool help to explore long & short duration relationship among the variables. The hypotheses for this test are following.

$H_{0A}$ : There is no long-run and short-run relationship between identified indices.

$H_{1A}$ : There is long-run and short-run relationship between identified indices.

The result of VECM from table – 6, indicates result normalized on GNASDAQ. A 1% increase in GNIFTY leads to 1.139 % increase in GNASDAQ.

The next sub table in VECM result has shown, the speed of adjustment to the equilibrium position, here it is observed that Nifty has less speed of adjustment comparison to NASDAQ. The findings of VECM model suggest presence of relation between the variables.

### 5.2.6 GRANGER CAUSALITY



This is used to find out the direction of causality among the variables. Due to presence of cointegration in the data series granger causality block exogeneity test is applied to find out the direction of relationship.

The Granger Causality block exogeneity test results are summarized in the Table -7

$H_0$ : There are no causality relationships between selected indices.

$H_1$ : There are causality relationships between selected indices. (Ref Table – 6 & 7)

The Granger Causality/Block Exogeneity test indicates that out of 2 pairs of macroeconomic variables no pairs show bidirectional causality between various macroeconomic variables at  $\alpha=5\%$ .

## VARIANCE DECOMPOSITION

Variance Decomposition (VDC) determines the proportion of changes in dependent variable due to proportion of changes in different explanatory variables over the period of time. It helps in estimating the short-run robustness of system in incorporating the information / innovations.

The VDC result influence a lot due to order of variables. (Table - 8). To interpret the

result Cholesky – dof adjusted ordering of the variable has been taken. (Ref Table – 8)

**The ordering used is:**

**CHOLESKY - dof ADJUSTED ORDERING: GNASDAQ, GNIFTY**

By application of this tool we can take each variable as endogenous variable & check the impact of chosen variable on it in short & long term.

Here in this study daily data has been collected for study so variance decomposition result can predict only for short run. If we will take data at monthly interval, we will be able to predict about long term variation in dependent variable due to predictor variables.

## 1. VARIANCE DECOMPOSITION OF GNASDAQ

In short term of 1 to 10 days we can see that as time passes variation in NASDAQ is dependency on Nifty indices as predictor variable increasing from 0% to 23 %. Here we can say NASDAQ got affected by nifty indices but there is time lag between two indices. It may be due time lag between two countries, whose indices has been chosen for the study. This may be the probable reason

that any fluctuation in Indian stock market visible slowly in US market.

## **2. VARIANCE DECOMPOSITION OF GNIFTY**

In short term of 1 to 10 days we can see that GNIFTY is more dependent on NASDAQ comparison dependency of NADAQ on Nifty. There is an increase in influence of 5% to 36% from 1 day to 10 day time period. Here we can say Indian stock market much sensitive to any fluctuation in US stock market.

## **IMPULSE RESPONSE FUNCTION**

Impulse response is also known as the impact multiplier. It seeks to determine the level of impact of one unit shock on each explanatory variable over a period of time.

The impulse response of one standard deviation (S.D.) innovation on each of 2 selected indices is given in the Figure – 1& 2.

$H_0$ : Impulse response of 1 standard deviation (S.D.) of innovation will not influence on the interlinked indices over selected time period.

$H_1$ : Impulse response of 1 S.D. of innovation will influence on the interlinked indices over selected time period.

Here is a brief discussion based on table & graph about the direction of movement of various variables on exposition of 1 S.D. innovation of single variable. Here for data analysis purpose 10 days' time has been chosen. (Ref Figure – 1)

## **IRF OF SELECTED MACROECONOMIC VARIABLES**

### **1. RESPONSE OF GAUTO TO OTHER SELECTED VARIABLES**

Due to imposition of 1 S.D. changes / innovation in NASDAQ, there is sharp fall in NASDAQ itself & there is an upward movement in Nifty indices till 4 days, afterward there is change in direction in both the indices & later on almost constant movement of both the indices. This show both the selected indices shows sudden change till 4 days after that they have not shown any impact of any innovation.

### **2. RESPONSE OF GAUTO TO OTHER SELECTED VARIABLES**

Due to injection of 1 S.D. innovation in NIFTY index NASDAQ indices has shown little up down movement while nifty indices come down drastically & later both remain upside & move as constant fluctuating line with little variations. It

indicates that nifty shows major change in its movement on imposition of any shock/ innovation in nifty indices. (Ref Figure – 2)

## CONCLUSION & RECOMMENDATIONS

This can be concluded from above data analysis both the time series are cointegrated, VECM analysis has shown that NIFTY indices has shown low speed of adjustment comparison to NASDAQ. Granger causality analysis has shown no cause – effect relation between two indices.

Variance decomposition shows that Nifty indices have more dependency on NSADAQ comparison to NASDAQ indices on Nifty index. Hence it shows US market has more influence on Indian market comparison of influence of Indian market on US market. Impulse response function findings again indicated that any fluctuation in NASDAQ index has much influence on Nifty index. Hence Indian policy maker should keep this thing in their mind while policy formulation that Indian market has more impact of US shares market on their index & shares. This may be due dominance of USD over Indian currency or may be due to lot of jobs outsourcing by US companies to Indian companies or may be both. There may be

another reason i.e. foreign institutional investment (FII) in India. Investors & policymaker should keep attention on all those facts & analysis while making short & long term investment plan & policy formulation. The finding of this study will also help those investing in currency derivatives.

## REFERECES

1. [www.yahoofinance.com](http://www.yahoofinance.com).
2. <https://en.wikipedia.org/wiki/NASDAQ>.
3. Bose Suchismita & Mukherjee Paramita (April, 2005) a study of intrerlinkage between the Indian stock market and some other emerging and developed markets, World Economic Outlook, IMF.
4. Kaur Ravleen (December, 2017) comparative analysis of Indian stock exchange and major index with global stock exchange and their major index, International Journal of Management and Applied Science, ISSN: 2394-7926, Volume-3, Issue-12.
5. Mandaviya Jayshree (March, 2014) Indian stock market influenced by

- global stock market – A study of world select world major stock markets, journal of management research, Vol 2 Issue 1.
6. Mukherjee Debjiban (April, 2007) Comparative Analysis of Indian Stock Market with International Markets, Great Lakes Herald – Volume 1, Issue 1 by Great Lakes Institute of Management, Chennai.
  7. Prasad Dr. U. Raghavendra (November, 2016) examining relationship between nifty 50 and selected shares in NSE, international journal of advance research(IJAR), Int. J. Adv. Res. 4(11), 772-775,ISSN: 2320-5407.
  8. R. Deepak & M. Sandeep (December, 2013) Integration of Indian Markets with Select Global Markets: Changing Paradigms and Dynamics, international journal of innovative research & development, Vol 2 Issue 12 (Special Issue), ISSN 2278 – 0211 (Online).
  9. Rathod Ms. Karvi (July, 2015) An Empirical Analysis on Performance of Indian Indices over World Indices - A Study of Economy Recovery Phase, international journal of research, Volume : 4 | Issue : 7 | July 2015, ISSN - 2250-1991.
  10. Scott W. Hegerty (2018.31.04) ,Exchange market pressure, stock prices, and commodity prices east of the Euro, Journal of economics & Management Vol. 31 (1) • 2018, ISSN 1732-1948.
  11. Siddiqui Dr. Saif (2009) Associations between S&P CNX Nifty and selected Asian & US Stock Markets Submitted to National Stock Exchange of India Ltd.
  12. Tripathi Vanita and Sethi Shruti (2010) Integration of Indian Stock Market with Major Global Stock Markets, Asian Journal of Business and Accounting, 3(1), 2010, 117-134 ISSN 1985-4064.
  13. Yalavatti Prakash (July, 2017) impact of market volatility on stock return of banking companies in India, International journal of recent scientific research, Vol. 8, Issue, 7, pp. 18861-18868, ISSN: 0976-3031.

**LIST OF TABLES**

**Table - 1**

	NASDAQ_C...	NIFTY_50_...
Mean	7469.092	10786.23
Median	7422.945	10712.38
Maximum	8109.690	11738.50
Minimum	6777.160	9998.050
Std. Dev.	319.7888	410.2399
Skewness	0.082628	0.540313
Kurtosis	1.999725	2.541562
Jarque-Bera	7.280668	9.760234
Probability	0.026244	0.007596
Sum	1269746.	1833659.
Sum Sq. Dev.	17282759	28442162
Observations	170	170

**Table – 2**

Group unit root test: Summary  
 Series: GNASDUSANA, GNIFTANA  
 Date: 09/21/18 Time: 18:37  
 Sample: 1/02/2018 9/14/2018  
 Exogenous variables: Individual effects  
 Automatic selection of maximum lags  
 Automatic lag length selection based on SIC: 0  
 Newey-West automatic bandwidth selection and I  
 Balanced observations for each test

Method	Statistic	Pro
<u>Null: Unit root (assumes common unit root proce:</u>		
Levin, Lin & Chu t*	-18.9005	0.0
<u>Null: Unit root (assumes individual unit root proce</u>		
Im, Pesaran and Shin W-stat	-17.6413	0.0
ADF - Fisher Chi-square	174.783	0.0
PP - Fisher Chi-square	174.753	0.0

\*\* Probabilities for Fisher tests are computed usir  
 -square distribution. All other tests assume a

**Table - 3**

Date: 09/21/18 Time: 18:48  
 Series: GNASDUSANA GNIFTANA  
 Sample (adjusted): 1/03/2018 9/14/2018  
 Included observations: 169 after adjustments  
 Null hypothesis: Series are not cointegrated  
 Cointegrating equation deterministics: C  
 Automatic lags specification based on Schwarz criterion (maxlag=13)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
GNASDUSANA	-13.02870	0.0000	-169.1666	0.0000
GNIFTANA	-12.27747	0.0000	-160.8475	0.0000

\*MacKinnon (1996) p-values.

Intermediate Results:

	GNASDUS...	GNIFTANA
Rho - 1	-1.006944	-0.957426
Rho S.E.	0.077287	0.077982
Residual variance	0.000109	4.65E-05
Long-run residual variance	0.000109	4.65E-05
Number of lags	0	0
Number of observations	168	168
Number of stochastic trends**	2	2

\*\*Number of stochastic trends in asymptotic distribution

**Table- 4**

Dependent Variable: GNIFTANA  
 Method: Least Squares (Gauss-Newton / Marquardt steps)  
 Date: 09/21/18 Time: 18:43  
 Sample (adjusted): 1/03/2018 9/14/2018  
 Included observations: 169 after adjustments  
 GNIFTANA = C(1) + C(2)\*GNASDUSANA

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.000511	0.000527	0.969619	0.3336
C(2)	0.086000	0.050061	1.717900	0.0877

R-squared	0.017365	Mean dependent var	0.000579
Adjusted R-squared	0.011481	S.D. dependent var	0.006867
S.E. of regression	0.006828	Akaike info criterion	-7.123951
Sum squared resid	0.007785	Schwarz criterion	-7.086911
Log likelihood	603.9738	Hannan-Quinn criter.	-7.108919
F-statistic	2.951180	Durbin-Watson stat	1.898911
Prob(F-statistic)	0.087668		

**Table - 5**

Date: 09/21/18 Time: 18:47  
 Sample (adjusted): 1/10/2018 9/14/2018  
 Included observations: 164 after adjustments  
 Trend assumption: Linear deterministic trend  
 Series: GNASDUSANA GNIFTANA  
 Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.203546	67.31663	15.49471	0.0000
At most 1 *	0.167133	29.99251	3.841466	0.0000

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.203546	37.32412	14.26460	0.0000
At most 1 *	0.167133	29.99251	3.841466	0.0000

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'\*S11\*b=I):

GNASDUSANA	GNIFTANA
-185.5035	306.9164
145.3057	140.9868

Unrestricted Adjustment Coefficients (alpha):

D(GNASDUS...)	0.002893	-0.003873
D(GNIFTANA)	-0.002505	-0.001892

1 Cointegrating Equation(s): Log likelihood 1095.717

Normalized cointegrating coefficients (standard error in parentheses)

GNASDUSANA	GNIFTANA
1.000000	-1.654505
	(0.25800)

Adjustment coefficients (standard error in parentheses)

D(GNASDUS...)	-0.536737
	(0.16545)
D(GNIFTANA)	0.464775
	(0.10136)

Table - 6

Vector Error Correction Estimates

Date: 09/21/18 Time: 18:52

Sample (adjusted): 1/08/2018 9/14/2018

Included observations: 166 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
GNASDUSANA(-1)	1.000000	
GNIFTANA(-1)	-1.139071 (0.17894) [-6.36555]	
C	-0.000160	
Error Correction:	D(GNASDU...	D(GNIFTANA)
CointEq1	-0.777496 (0.13562) [-5.73278]	0.436723 (0.08683) [ 5.02986]
D(GNASDUSANA(-1))	-0.097788 (0.11414) [-0.85677]	-0.211209 (0.07307) [-2.89049]
D(GNASDUSANA(-2))	-0.100745 (0.08314) [-1.21175]	-0.150077 (0.05323) [-2.81958]
D(GNIFTANA(-1))	-0.670096 (0.14811) [-4.52436]	-0.328411 (0.09482) [-3.46354]
D(GNIFTANA(-2))	-0.337713 (0.11873) [-2.84428]	-0.192323 (0.07601) [-2.53010]
C	-3.29E-05 (0.00087) [-0.03775]	2.57E-05 (0.00056) [ 0.04607]
R-squared	0.442725	0.431339
Adj. R-squared	0.425310	0.413569
Sum sq. resids	0.020149	0.008258
S.E. equation	0.011222	0.007184
F-statistic	25.42225	24.27258
Log likelihood	512.8326	586.8635
Akaike AIC	-6.106417	-6.998355
Schwarz SC	-5.993935	-6.885874
Mean dependent	-7.59E-06	4.56E-05
S.D. dependent	0.014803	0.009382
Determinant resid covariance (dof adj.)		6.19E-09
Determinant resid covariance		5.75E-09
Log likelihood		1103.758
Akaike information criterion		-13.12961
Schwarz criterion		-12.86715



**Table - 7**

VEC Granger Causality/Block Exogeneity Wald Tests

Date: 09/22/18 Time: 00:08

Sample: 1/02/2018 9/14/2018

Included observations: 166

Dependent variable: D(GNIFTANA)

Excluded	Chi-sq	df	Prob.
D(GNASDU...	9.672501	2	0.0079
All	9.672501	2	0.0079

Dependent variable: D(GNASDUSANA)

Excluded	Chi-sq	df	Prob.
D(GNIFTANA)	20.50238	2	0.0000
All	20.50238	2	0.0000

**Table- 8**

Variance Decomposition of GNASDUSANA:			
Period	S.E.	GNASDUSANA	GNIFTANA
1	0.011222	100.0000	0.000000
2	0.011456	98.26029	1.739706
3	0.011861	92.87688	7.123121
4	0.012742	86.53559	13.46441
5	0.013194	85.08934	14.91066
6	0.013644	83.20791	16.79209
7	0.014195	81.13617	18.86383
8	0.014647	79.61549	20.38451
9	0.015089	78.19390	21.80610
10	0.015544	76.90102	23.09898

Variance Decomposition of GNIFTANA:			
Period	S.E.	GNASDUSANA	GNIFTANA
1	0.007184	4.775510	95.22449
2	0.007808	16.93977	83.06023
3	0.008149	20.32250	79.67750
4	0.009062	27.97943	72.02057
5	0.009587	31.08798	68.91202
6	0.010048	33.02595	66.97405
7	0.010607	35.28399	64.71601
8	0.011083	37.11407	62.88593
9	0.011528	38.50770	61.49230
10	0.011983	39.78134	60.21866

Cholesky Ordering: GNASDUSANA GNIFTANA

LIST OF FIGURES

Figure- 1

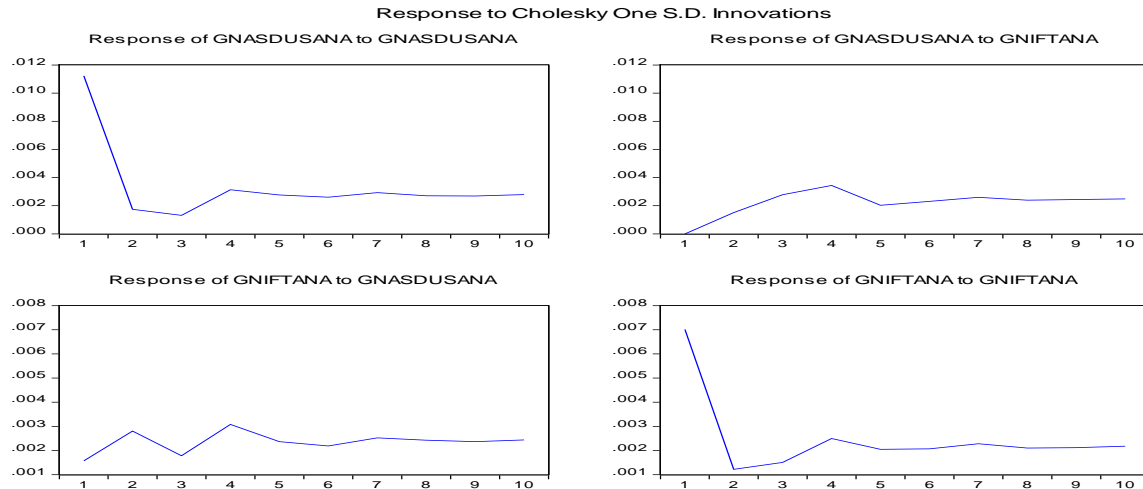


Figure- 2

