INTEGRATION BETWEEN INDIAN AND AMERICAN STOCK MARKET: AN EMPIRICAL STUDY

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ABSTRACT

Integrated financial market is of immense significance as it constitutes an important vehicle for promoting domestic savings, investment and economic growth, signaling financial crisis and enhances the necessary conditions for a country's financial sector to emerge as an international market. Financial integration improves the efficacy and efficiency of the economy by improving the global allocation of capital (also share of risk) which in turn reduces consumption volatility. This study examines the various interlinkages of stock market in India with American countries. To explore their relationship, we have used the daily stock indices from Jan 2009 to Dec 2018 by applying univariate co-integration test and consider the financial time series econometric framework based on ARIMA using Vector Error Correction Model. The purpose of this study is to explore the nature of association and the possible existence of long term as well as short term cointegration between the indices of NSE and New York stock Exchange of United States

Keywords: - Co-integration, ARIMA model, NSE, New York Stock Exchange.

Introduction

Globalization has gained momentum over the past two decades. Financial markets are at the forefront of this development. In 2013, the global market capitalization increased significantly to USD 64 trillion (17 per cent growth rate) and the value of share trading increased to USD 55 trillion (12 per cent growth rate). Development in multinational companies, advances in information technology, deregulation of financial systems, growth in international capital flows and abolishment of foreign exchange control have increased cross-country correlation, bringing nations together economically (Tehrani 2011). The movement towards enhanced earnings and portfolio diversification makes way for a worldwide capital movement in the form of both direct and portfolio investments, which ultimately leads to stock market integration. On the other hand, inter-linkages among stock markets may bring different risks, such as the contagion effect and ripple effects of economic events in distant countries. These were evidenced during the 2008 subprime credit market crisis in the USA. It is therefore of great academic and practical importance to understand the linkages between the different world stock markets. India's economy has grown drastically since it integrated into the global economy in 1991. It has drastic impact on India's economic condition. Its average annual rate has grown from 3.5% (1950–1980) to 7.7% (2002–2012). That rate peaked at 9.5% from 2005–2008. Economic growth has also led to increases in the per capita gross domestic product (GDP), from $1,255 in 1978 to $3,452 in 2005, and finally to $3,900 in 2012. **(**K. Majumdar). India accounts for over 17.5 per cent of the world's population and its huge domestic market forms the basis of its rising global importance. India is expected to be one of the significant global economic powers in the years ahead. Financial market integration is a process through which several markets are integrated and channelize the assets for economic growth and also term as a process of unifying market and enabling convergence of risk-adjusted returns on the assets of similar maturity across the market. Integration of markets in globalized platform enhance the

contagion effects and makes the economy more vigorous. Moreover, integrated financial markets are a central theme in international finance and benefits of the economic growth via risk sharing, improvement in allocation efficiency and reductions in macroeconomic volatility. The role of Indian stock market as well as American stock markets is influential globalized economy.

Literature Review

Mohanasundaram and Karthikeyan (2015) investigates the relationship and the degree of cointegration between the South African, Indian and US stock market indices and concluded that there is a strong positive correlation among the variables. The correlation between the time-series variables of NIFTY and JALSH is very high. Ranjan Dasgupta (2014) concluded in his study there is short-run interrelationships and integration has been found in both directions for the Indian and Brazilian stock markets. Ramaprasad Bhar and Shigeyuki Hamori (2008) investigated the co-movement in four large European equity markets over a sample period of nearly 30 years and found that the overall co-movement in the equity markets was well established. The Johansen cointegration procedure indicates that there is no long-term relationship between the German and Central European markets, either individually or as a group.

Chelley-Steeley (2005) and Kearney and Poti (2006) examined the links among the various equity markets in the European markets. They found evidence in favour of a structural break in the process of market integration and established that the markets of Eastern Europe in particular are moving away from market segmentation. Among the European markets, Gilmore and McManus (2003) examine the bilateral and multilateral cointegration properties of the German stock market and three other Central European markets.

The US market was found to Granger-cause the Australian market. The studies of Maran Marimuthu (2010); Sowmya Dhanaraj et al. (2013); Valadkhani & Chancharat (2008) use the Granger causality test to examine the presence of any Granger cause relationship between Asian and developed markets (the US and the UK). The study found that the developed markets, particularly the US, influence Asian markets.

Tripathi & Sethi (2010) examine the integration of the Indian stock market with four (4) other major stock markets in the world, namely, the USA, the UK, Japan and China. The Indian stock market is found to be integrated only with one (1) out of the four (4) markets considered in their study. This implies that in the long run the benefits can be reaped from diversifying the portfolio by investing funds in these markets.

Most of the above studies have accepted that there is a considerable level of integration among the stock markets. This implies that the benefit of international diversification is minimal owing to a higher level of integration among the stock markets. It is also noted that regional stock markets are experiencing more movement compared with other stock markets.

Objective of the study

1.To examine the existence of Cointegrations among Indian stock markets and American stock markets.

Hypothesis

Ho = There is no integrations among both stock markets (Indian markets and American stock markets)

Data and Methodology

Research gap

The majority of stock market cointegration studies have been carried out on advanced economies like European markets. There are also a reasonable number of studies that compare various Asian stock markets. However, none of the studies reviewed by the researchers explore the stock market cointegration of Asian and American markets. This paper attempts to find out the cointegration between Indian and American markets. Taking these factors into

account, a detailed examination of cointegration and stock market interdependence among India and American becomes highly relevant.

Methodology and theoretical framework

The secondary market data used in this study consists of monthly time series stock-market indices of the National Stock Exchange – NSE(India), New York stock market- Dows Jones. The study is undertaken with the objective of finding whether co-relation among these stock-market indices exists, based on the data of the past decade. The study covers the period from Jan 2008 to Dec 2018 with total 116 observations.

Normality test

The data series of all the stock indices are tested for normality to know the nature of data distribution. The study uses the Jarque-Bera (JB) test to check whether the monthly closing values of the stock-market indices are normally distributed. The JB test is most commonly used to verify the nature of the distribution of time series data. This test statistic used in the JB test is as follows:

$JB = n\ [S2/6 + (K-3)2/24]$ (2)

Where n = sample size, S = Skewness coefficient, and K = Kurtosis coefficient. Normally distributed variables have S = 0 and K = 3.

Unit root test

A unit root test examines whether a time series variable is stationary or non-stationary using an autoregressive model. The presence of a unit root in the data series is checked by applying the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. Although there are many available tests for verifying the presence of a unit root, in this paper we use Augmented Dickey-Fuller (ADF) test because of their popularity and wide application. Before finding the co-integration among any economy Time series data should be stationary for analyzing i.e. whether the statistical properties of the series should be constant. The Augmented Dickey-Fuller (ADF) test controls for higher order correlation by adding lagged difference terms of the dependent variable to the right-hand side of the regression (Mohd. Aamir Khan et al, 2010). The Augmented Dickey Fuller specification used here is as follows:

$\Delta Yt = b0 + \beta Yt\text{-}1 + \mu 1 \Delta Yt\text{-}1 + \mu 2 \Delta Yt\text{-}2 + \ldots + \mu p\ \Delta Yt\text{-}p + ut$

Where, Yt represents the time series to be tested, b0 is the intercept term, β is the coefficient of interest in the unit root test, μp is the parameter of the augmented lagged first difference of Yt to represent the pth order auto regressive process and ut is the white noise error term.

Vector autoregression model

When there is no cointegration vector as per the maximum Eigen value test, only unrestricted VAR must be used for studying the short-run relationship among the stock indices. The vector autoregression (VAR) model is used to capture the linear interdependencies among multiple time series. It is commonly used for forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. In a VAR, each variable is explained by its own lagged values and the lagged values of all the other variables in the system.

The mathematical representation of VAR is:

$= A1Yt\text{-}1 + \ldots + ApYt\text{-}p + Bxt + et$ (6)

Where Yt is a 'k' vector of endogenous variables, xt is a 'd' vector of exogenous variables, A1 …

Ap, 'B' are matrices of coefficients to be estimated, and et is a vector of innovations that may be concurrently correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables.

Cointegration approach

The cointegration test is used to check the presence of a long-run relationship among the selected economic and financial variables. Gonzalo and Granger (1995) point out that the evidence of cointegration among national stock-market indices implies equilibrium constraints, which prohibit the cointegrated stock-market indices from diverging too much in the long run. This is because the indices share common stochastic trends or the same

driving forces over the time period. The absence of cointegration indicates that within the stock market there is no long-run relationship.

Results and Findings

The normality test has been conducted for the data of NIFTY and Dow Jones stock indices. Jarque-Bera test has been applied for the normality of both data. Table 2 shows the results, along with the descriptive statistics. The skewness value (0) and kurtosis value (3) is considered as the data is normally distributed. Thus, the value of both indices is differing from the normality that is Nifty (-0.39, 2.15) and Dow Jones (0.39, 2.39). The probability of 0.03 and 0.07 indicates that the null hypothesis that is data is normally distributed is rejected in the Nifty and Dow Jones.

Table -1

Statistics	Nifty	Dow Jones
Mean	0.092840	0.084929
Median	0.214704	0.068349
Maximum	0.666786	0.593453
Minimum	-0.542430	-0.529957
Std. Dev.	0.291445	0.279943
Skewness	-0.395839	0.39585
Kurtosis	2.157475	2.398593
Jarque-Bera	6.571633	5.15571
Probability	0.037410	0.075942
Sample size	118	118

After the test of normality, the next essential step is to verify whether the data used for the study has a unit root or not. The easiest and simplest way to check for stationarity is to plot a time series data graph and note the trends in mean and variance. Time series data is believed to have stationarity if the mean and variance of the time series are constant over the time period. The data series graphs are shown below of the stock-market indices which specify that stock-market indices are not moving around the constant mean and variance.

Figure-1
Nifty Index time series

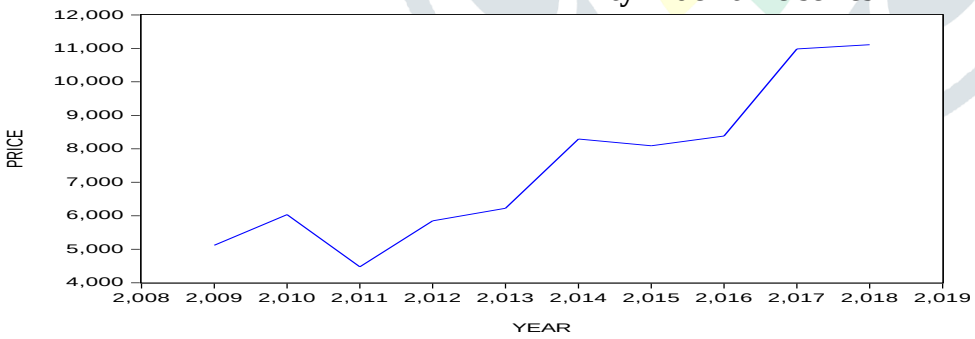
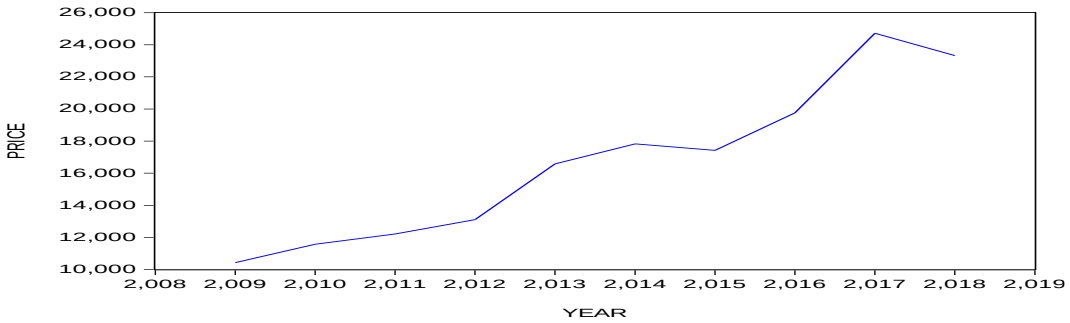


Figure-2

Dow & Jones Time series



Unit root tests are applied in addition to the graphical inspection to decide the real nature of time series. For this, the Augmented Dickey-Fuller (ADF) is carried out to verify the stationarity of the time series data. The tests are carried out with the null hypothesis of non- stationarity (has unit root) for each data series and the results indicate both data series are at the non-stationary level and become stationary after first-order difference. The null hypothesis that data is non- stationary is rejected at 1st order difference in Augmented Dickey-Fuller (ADF) test.

Table -2

Augmented Dickey – Fuller (ADF) test -Trends and Intercept				
Data Series	At level		At 1st order Difference	
	t- statistics	Prob.	t-statistics	Prob.
NIFTY	-4.046555	0.0001	-10.5756	0.0001
Dow Jones	-4.91582	0.0005	-5.238979	0.0002

In table-3 Durbin Watson econometrics test analyze the data and it is found that both time series data is positive auto corelated with their past value with considering error term. The p- value is less than 0.05 null hypothesis that is there is no auto-correlation is rejected and both indices Nifty and Dow Jones is positively correlated to themselves. Output value of Durbin Watson test are 0.076322 and 0.05682 respectively.

Table 3

Durbin Watson Test at 1st order test		
Data series	t-statistics value	Prob.
NIFTY	0.076322	0.00001
DOW JONES	0.056852	0.00001

A correlation test is carried out between the Nifty and Dow Jones, that gives the preliminary insight into the existence of co- movement among the time series variables. Table- 5 displays the correlation between both stock markets indices.

Table-4
Correlation matrix between Nifty and Dow Jones

Indices	NIFTY	DOW JONES
NIFTY	1	0.925291
DOW JONES	0.925291	1

With the table -4 we can analyze that Nifty and Dow Jones have a high positive association that is 92.52 percent, which indicates that both markets are following the same trends over the applicable period. In other words, there is strong linear trends exists between Nifty and Dow Jones. This is because they may be sharing a common driving force.

As the time series data for the two indices are non-stationary at level and become stationary at first-order difference, Johansen's cointegration test is applied to examine the long-term relationship between them.

Table-5
Johansen cointegration test

Unrestricted cointegration rank test (Trace)				
Hypothesized no. of CE(s)	**Eigenvalue**	**Trace statistic**	**0.05 Critical value**	**Prob****
None *	0.276695	40.46254	15.49471	0.0000
At most 1	0.024584	2.887403	3.841466	0.0893

Unrestricted cointegration rank test (Maximum Eigenvalue)				
Hypothesized no. of CE(s)	**Eigenvalue**	**Max-Eigen statistic**	**0.05 Critical value**	**Prob****
None	0.276695	37.57514	14.26460	0.0000
At most 1	0.024584	2.887403	3.841466	0.0893

** Rejection of null hypothesis at 0.05 level; ** Mackinnon, Haug & Michelis (1999) p-values*

In Johansen's cointegration approach, the trace statistic shows the presence of 1 cointegration equation and the Max-eigenvalue statistic indicates no cointegration at 0.05 level. As the eigenvalue statistic says there is no cointegration equation between the variables, it is concluded that there is no long-run relationship between the stock-market indices (NIFTY, DOW JONES).

Conclusion

The endeavor of this study to empirically investigated the relationship and degree of correlation between Indian stock markets and American stock markets. Both stock market prices are found to be non-stationary and become stationary after the Augmented Dicker Fuller 1st order difference. While analyzing the autocorrelation on both stock prices it is found that there is a strong positive auto correlation among the variables as well as highly correlated to each other (Mohanasundaram& Karthikeyan). To examine the dynamics relation between stock markets, Vector Autoregression test is applied which indicates that both stock market is predicable by their stock market movement. Hence the null hypothesis that there is no interlinkage between both the markets is rejected and both the stock markets are highly correlated in short term (Maran, Dhanaraj, Valadkhani & Chancharat) but independent in long run provides a further investment diversification opportunity international market.

Recommendations & suggestions

The Financial Market Integration is a central theme of international finance and promotes economic growth via risk sharing, improvement in allocation efficiency and reductions in macroeconomic volatility. The result of this research paper shows that markets are highly integrated in short term which not only promotes investors for better portfolio diversification but also poses the possibility of contagion effects that will affects our economy. To curb

the contagion, affect our government and central bank should make their economic policy vigilant so as to absorb American's financial shocks to our economy. Our economic policies should be framed in such a manner that it acts as cushion against further financial crisis.

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