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STOCK MARKET INTEGRATION: A STUDY OF INDIAN STOCK MARKET WITH FOREIGN CAPITAL MARKETS

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ABSTRACT

The degree of interdependence of capital markets across the world remain a burning topic among researchers. In this context the current study attempts to find interrelationship between Advanced, East Asian and Indian stock market by employing Granger causality and Johannesburg tests for short-run and long-run linkages, respectively. Since the prime motive of the study is to inspect the short-run linkages and long-term integration among the equity indices to better understand how the volatility in one market influences other markets. Therefore, the study observed that Indian capital market is impacted by the foreign stock markets. The conditions in the international stock market influence the movement in the Indian stock market. For instance, British, American and French stock markets have a significant impact on the Indian capital market in short- run. However, it is observed that capital market in India has influenced on the other Asian markets. In long-run a country's idiosyncratic fundamentals decide the performance of the stock indices.

JEL Classifications: *G02, G15, G14*

KEYWORDS: *Indian Stock Market, Co-Integration, Causality*

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INTRODUCTION

Globalization and deregulation of financial markets contribute by increasing the flow of funds from one economy to another, for taking the benefits of mispricing of securities and earning profits from investments. The institutional and individual investors diversify their investment for attaining the abnormal returns and mitigating the risks by investing in different countries. Accordingly, globalisation has provided the opportunity to foster the growth of the host country. However, the panic selling during recession may make the host country's capital market highly risky and volatile. The research work on the extent of integration among the capital markets has important implications for diversification, improve the investment decision making process and the international strategies.

Indian stock market (ISM) being one of the fastest growing market, is a home for a large number of institutional investors across the globe. Hence it is critically important to examine whether ISM has integrated with the advanced and Asian stock market or not. Thus, the prime aims of this piece of study are to examine the short-term linkage (STL) and long-term integration (LTI) dynamics of Indian stock market with that of three developed (US, UK, and France) and five East Asian stock markets (Hong Kong, China, Japan, India, Taiwan).For the objectives the study includes more than thirteen years starting from April, 2000, daily closing value of popular stock indices in each country. The indices values are extracted from Bloomberg database and applied causality test of Granger and co-integration test of Johannesburg. The

findings conclude that the returns are highly volatile and non-normally distributed. Indian stock market exhibits a positive short-term interrelation with US, UK and French stock markets and regional exchanges, such as China, Japan, Taiwan and Hong Kong. The study noticed the absence of any long-term relation among the groups of countries in the sample. The remaining part of the study is designed as follow; the section II describes the review existing studies in this field. In section III the sample used in the study is described. The section IV and its subsections describe the methodology and discussion of results of the paper whereas the section V concludes the study.

REVIEW OF LITERATURE

Since the international diversification fetches more abnormal gains as compare to the non-diversified investment hence a substantial amount of studies has been dedicated on the issue of co-movement of various stock markets by linking the stock market efficiency.

The significant studies by [Janakiramanan and Lamba (1998); Huth (1994); Click and Plummer (2005); Siklos and Ng (2001); Syriopoulos (2007); Siddiqui (2009b)] have advocated that the stock markets across the world have their own patterns and have unique trend based on their own economic and non-economic environment. Hence, the investment in different countries is observed to be a decision for diversification in investment. However, the studies by [Seabra (2001); Marashdeh and Shrestha (2010); Valadkhani and Chancharat (2008); Ahmad et al. (2005)] concluded that the stock markets of different countries considered for the study were integrated and share same trend in the long run. Therefore, international diversification may not generate the abnormal returns. Furthermore, the integration among different stock markets has great importance on the investment decisions, because the modern portfolio theory argues that prices of different stock markets move differently so that investors could hold the securities in foreign as well as home markets this provides the benefits of global diversification. Hillard (1979) and Lessard (1976) observed a low degree of dependence between domestic and foreign stock markets, their results support the international diversification. Sharma and Kennedy (1977) applied the VAR and examined the price behaviour of ISM with the UK and US capital markets. The study concluded that the interrelationship among these markets is statistically significant. Wheatley (1988), by employing data for US and seventeen other nations for the period of 1960-1985, advocates the financial market integration based on the consumption based CAPM and asset pricing line. The line is a demonstrative of investor's expected return on the asset. Eun and Shim (1989) noticed the evidences of interrelationship between the US and foreign capital markets. The study further advocates those innovations in the US are instantly transmitted to rest of the world markets, whereas no single foreign capital market can significantly explain the deviation in US. Also, the quick response by the markets is generally linked with the informational efficiency of international capital markets. In research by Jeon and Furstenberg (1990), the study applied VAR and the IRF methodology, and they argued that the extent of international dependence in stock price indices has risen significantly after the 1987 crash. Campbell and Hamao (1992) analysed the forecasting capability of equity portfolios and interest rates for US and Japanese economies for the period of 1971 to 1989. By using Asset pricing framework, the findings argued that dividend-price ratio and interest rate variables are the determinants of each country for excess returns. Kasa (1992) provides the evidences for the common characteristics in the equity markets of the US, Canada, UK, Japan and Germany for quarterly and monthly returns for January 1974 to August 1990. The conclusion favour for the absence of differential trend driving the stock returns of the sample countries. Contrary to this Koop (1994) applied Bayesian methodology and found that there are differential trend driving the stock returns of the world. This paper used unit root and co-integration methodology to analyze properties of two different data sets.

Lee and Kim (1994) studied the impact of 1987 crash and found that the interrelationship among markets get stronger after the crash.

Hansda and Ray (2002) observed that the major indices i.e., tech stocks and Nasdaq of NYSE enjoys their dominance on the performance of American stock prices. Wong, Agarwal and Du (2005) have reported that the ISM is integrated with the developed and matured capital markets across the globe.

As cited above the significant amount of literature is devoted to the developed countries and is age-old. This may have lost relevance, since the globalization measures have been adopted. A handful of studies such as Maneschiold (2006) have reported a low interrelationship between the Baltic and other capital markets, for instance US, UK, Germany, France and Japan. Mukhopadhyay (2009) examined some critical issues regarding capital market co-movements. They consider local indices, national indices and sectoral indices for 1995-2008 period and reported that the markets are integrated in the long and short-run.

The above-mentioned literature attests that the studies in this field are either old age or related to the developed nations. ISM and its integration with the rest of the world is a subject that is lurking for the researcher's attentions. Hence this study is an attempt to provide latest literature with novel dataset and robust methodology. The main objectives of the study focus on examining the STL and LTL dynamics of Indian stock market with that of three developed (US, UK, and France) and five East Asian stock markets (Hong Kong, China, Japan, India, Taiwan). In the next section III, the data used in the study is analyzed.

DATA DESCRIPTION

This current research utilizes the daily closing values of important stock indices in the US, UK, France, India and East Asian region. The daily values are considered because all jumps and diffusion in the stock market are incorporated by daily data and stock market shocks are not persistent but their impacts last soon (Cotter, 2004). This study covers daily data for the period of 13 years commencing from January 2000 and ends on 31st March 2013. Based on the capitalization and share in the financial market of the country, study uses the major indices of US, UK, France, India, Hong Kong, Japan, China and Taiwan. The study has collected the data from Bloomberg.

The following Table 1 shows the list of countries and their indices chosen for the study:

The study employed the closing values of each index after dividend payment effect to minimize dividend effect. The indices values are changed into index returns that are calculated by adopting following method.

Index Return (R_t) = $LogI_1 - LogI_0$

Here, $Log\ I_1$represents the natural logarithmic value of indices at time T_1 and $LogI_0$exhibits value of index at T_0. The stylized facts of index returns and to analyses the sample data, this paper presents the descriptive statistics. The results for the same are provided in Table 2.

The Table 2 represents the summary of the sample for the eight-stock indices return. It also shows that these indices have significant differences in their mean index returns. During the sample period the index returns have risen for the US, India, China, Hong Kong and Taiwan as they represent positive mean value. ISM has experienced a highest growth rate than any other stock market during the period of study. Whereas, the UK and French stock markets have met a negative growth rate. The UK stock market shows highest fall in the index returns. The median of the sample countries is

different from their other central tendency values. A significant difference in lowest and highest values shows more spread in the index returns. The larger values of SD of indices returns for all countries prove the volatile nature of index returns. Among all, the countries in the sample UK followed by US having the lowest volatility. All markets in the sample have a positive value for kurtosis and negative value of skewness.

Based on the hypothesis of normality it is given in the table that index returns are non-normally distributed Thus, based on the given characteristics of the index return it may be inferred that they are non-normally distributed, highly volatile and leptokurtic that is in-line with the previous studies by [Mandelbrot (1963); Brock and Lima (1995); Bollerslev (1992); Campbell and McKinlay (1997); Mandala and Rao (1997)]. The next section of the paper explains the research methodology in details.

Table 1: The List of Countries and Their Indices Chosen for the Study

Country	Stock Index	Abbreviation
USA	Standard and Poor	S&P 500
UK	Financial Times Series Exp.	FTSE 100
France	CAC	CAC 40
India	NIFTY	S&P CNX NIFTY50
China	Shanghai Stock Exchange	SSE Composite
Hong Kong	Hang Sang	Hang Sang
Japan	NIKKAI	NIKKAI 250
Taiwan	Taiwan Stock Exchange	TSEC

Table 2: Descriptive Statistics

Countries	US	UK	France	India	China	H. Kong	Japan	Taiwan
Obs.	3265	3302	3343	2992	3057	2996	3305	2977
Mean	1.26E-05	-1.50E-06	-0.0001	0.0005	2.21E-05	0.0002	0.0003	0.0001
Median	0.0005	0.0003	0.0002	0.0010	0.0000	0.0002	0.0004	0.0005
Maximum	0.1095	0.0938	0.1059	0.1633	0.0940	0.1340	0.1323	0.0652
Minimum	-0.0946	-0.0926	-0.0947	-0.1305	0.0925	-0.1358	-0.1211	-0.0691
Std. Dev	0.01337	0.0128	0.0155	0.0158	0.0161	0.0157	0.0161	0.0142
Skewness	-0.1684	-0.1258	-0.0415	-0.2646	-0.1031	-0.0008	-0.2963	-0.2064
Kurtosis	10.63	8.96	7.63	11.99	7.26	11.72	9.15	5.28
J-B St.	7946	4900	2991	10112	2320	9501	4789	670
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

RESEARCH METHODOLOGY

The financial time patterns tend to follow a trend and random walk (Brooks, 2008). Following this assumption, the study conducted unit root test by using trend random walk model in augmented Dicky - Fuller and Philip-Parron test. Additionally, one lag of the stock returns, is used with an assumption that all the stock markets are in the weak form of efficiency hence last one day price reflects all the information of the past. The unit root tests work on the basis of rejecting and not rejecting the null hypothesis on the basis of tau statistics.

The Table 3 in Annexure 1 results exhibits that all the indices' values from all countries in the sample are non-stationary in their level form meaning that they follow a trend and random walk model. On the basis of p-value the null hypothesis is not rejected for any indices in the sample in the level form. However, opposite may be observed when the study considered the first difference. This non stationarity in the level form and stationarity in the first difference justify the adoption of granger causality and co-integration methodology for estimating the parameters of interests.

Short Term Dynamics (Granger Causality)

This part of the paper is devoted to the analysis and finding the co movement between Indian, advanced and some selected east countries. In this process, the study represents the correlation matrix of index values for the whole period in Table 3

It is evident that during the whole period of the study from Table4, ISM showed a positive correlation with the foreign stock markets as well as regional markets. The highest positive correlation is observed with Hong Kong (0.9443), Taiwan (0.869), and China (0.647), whereas the lowest correlation is observed with Japanese (0.092) stock market. The regional integration is found to be more than the global integration such as UK (0.6658), US (0.5937) and France (0.0786).

An analysis of correlation among the index returns are critically important, because the correlation of indices might be aggravated because of presence a time series trend and the persistence in the level form. The correlations of indices exhibit that the ISM is highly correlated with global markets. A noticeably findings is that the ISM has a positive and significant correlation with Japan, Hong Kong and Taiwan. Chinese stock market does not show a direct result, as in the beginning it was positive but not significant while in the later stage it was negative and significant. Though, the coefficient of correlation of ISM and global market is lower than the regional markets. The correlation analysis tells the direction of the relationship but it is salient about the degree and tenure of the relationship. Therefore, the study further testifies the relationship between stock markets by dividing the relationship into short term and long term. In the next part, the study applied Granger causality and co-integration technique for STL and LTL relationship between index returns and index prices respectively.

The findings of Granger causality test are given in Table 5 of Annexure 2. It may be observed that there is a unidirectional causal effect between ISM and UK, France and US. This indicates that Indian sock returns are affected by the advanced countries. On the basis of f-statistics and corresponding p-value, none of the Granger causality hypothesis is rejected. Since the corresponding p-values of F-statistics are highly significant at all levels for the whole sample period. Therefore, the hypothesis of FTSE, CAC 40, S&P 500 does not granger cause effect NIFTY is rejected. However, UK and French capital markets are not affected by the movement in the ISM. The null hypothesis of no granger causality between India to UK, India to France, and India to US is not rejected since the computed value and F-value are highly significant. Therefore, ISM has been influenced by American, British, and French stock market but these are not influenced by the ISM for the whole sample period. Whereas in case of Asian stock market it may be inferred that the ISM granger causes the returns of Japan, Taiwan and Hong Kong at all level of significance. However, in case of China, the Indian market weakly granger causes Chinese stock market. In nutshell, it may be concluded that the developed markets influence ISM whereas ISM dominates Asian capital markets in short-term. The next part of the paper is focused on the long-term integration of ISM with the developed and Asian capital markets.

Table 3: Correlation Matrix for the Period of 2000-2013

	FTSE100	CAC 40	S&P 500	TSEC	CHINA	H S	NIKKAI	NIFTY
FTSE100	1							
CAC 40	0.6949	1						
S&P 500	0.9261	0.5966	1					
TSEC	0.7676	0.3499	0.7224	1				
CHINA	0.5156	0.3829	0.4037	0.694	1			
H S	0.7619	0.3203	0.6836	0.924	0.782	1		
NIKKAI	0.6448	0.9057	0.625	0.358	0.281	0.2955	1	
NIFTY	0.6658	0.0786	0.5937	0.869	0.647	0.9443	0.092	1

Long-Term Dynamics (Co-Integration)

In the presence of unit root i.e., non-stationarity, co-integration states that there may be an LTL and short run relationships in the modelling process in two or more series. This study has presented the evidence for presence of unit root in each index value by formal method provided in Table 6. The study also noticed that all the index values are stationary after the first difference. These minimum conditions of having unit root in the level form and stationary in the first difference allows the study to adopt co-integration in the model to test whether Indian stock market follow any trend in the long run with advanced and East Asian stock market. To analyze long run relationship between ISM and advanced (US, UK and French) and East Asian stock markets (Japan, China, Taiwan and Hong Kong) Johansen co-integration model has been adopted. The study has used two test statistics namely 'Trace' and 'Eigen' value statistics to detect any LTL between Indian and any other economies in the study. The results are provided in Table6for the sample period. All empirical are considered at 5 % level of significance. The results of both the statistics are found to be same while considered for 10 % and 1 % level of significance. Johansen (1988, 1991) methodology might distinguish the number of co-integration equations. Johansen (1988) further advocated two statistic tests of the likelihood ratio, i.e., Trace test and Maximum Eigen value test which are considered the base for rejecting and not rejecting the null hypothesis. The results are given below in the Table 4.

Table 4 shows the results of Maximum Eigen value and trace statistics, the hypothesis of zero co-integrating equations in contrast to the alternative of at least one co integrating equations is not rejected for the pair of ISM, advanced and East Asian stock markets. Therefore, it may be concluded that there is absence of long run relationship between ISM and UK, French, US, Chinese, Taiwanese, Korean, Japanese and Hong Kong stock market. Thus, the results indicate that the ISM is not co-integrated with any of the markets. The absence of a co-integrating relationship favour that in the long-run, index values are not following same pattern as other countries are following. It may be concluded that each country has their own pattern in the capital market which are unrelated to other stock market.

Table 4: Results of Co-Integration for the Period of 2000-2013

Series: NIFTY FTSE				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None	0.003275	14.81991	25.87211	0.5895
At most 1	0.002583	6.533284	12.51798	0.3957
Series: NIFTY SP500				
None	0.005389	13.7729	25.8721	0.68
At most 1	0.004893	6.55359	12.5179	0.39
Series: NIFTY CAC40				
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None	0.004108	15.60037	25.87211	0.525
At most 1	0.002057	5.202018	12.51798	0.5676
Series: NIFTY SSE				
None	0.0061133	18.244823	25.87210793	0.327718
At most 1	0.0010901	2.7550847	12.5179829	0.904273
Series: NIFTY HSI				
None *	0.010319	32.38808	25.87211	0.0067
At most 1	0.002446	6.186084	12.51798	0.437
Series: NIFTY NIKKAI				
None	0.004269	13.74174	25.87211	0.6789
At most 1	0.001161	2.934992	12.51798	0.8842
Series: NIFTY TSEC				
None	0.006474	23.29558	25.87211	0.1012
At most 1	0.002723	6.888269	12.51798	0.3563

FINDINGS AND CONCLUSIONS

The current study is primarily centred on findings the STL and LTL between the Indian, advanced and East Asian stock market for the period of 2000-2013. Eight stock indices, one major stock index from each country is chosen on the basis of liquidity and capitalization for the period of 1st April 2000 to 30th March 2013. The study employed descriptive statistics, correlation, Granger causality and Johansen co-integration test to observe the STL and LTL association among Index values and index returns. The findings indicate that index returns are non-normally distributed and highly volatile, furthermore the volatility is seemed to be clustered towards both extremes for all the countries. ISM exhibits a positive inter linkage with capital markets of the US, UK and French stock markets and regional exchanges, such as those of China, Japan, Taiwan, Korea and Hong Kong. It is also observed that recently Chinese stock market has inverse movement with ISM. The US stock market significantly impacts the ISM during period of the study. UK and French stock market also granger cause ISM. The study did not notice any long-term co-integration of ISM with the advanced and East Asian stock market for the whole sample period. This is in-line with the notion that all the stock market follows their own behaviour based on their fundamentals in the long run whereas in the short period all markets are interrelated.

Annexure: 1 Unit Root Tests

Table 5: Results of Augmented Dickey-Fuller Unit Root Test

Null Hypothesis: SP500 has a unit root	t-statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.353	0.405
Null Hypothesis: D(SP500) has a unit root		
Augmented Dickey-Fuller test statistic	-43.642	0.000
Null Hypothesis: FTSE100 has a unit root		
Augmented Dickey-Fuller test statistic	-2.349	0.407
Null Hypothesis: D(FTSE100) has a unit root		
Augmented Dickey-Fuller test statistic	-36.454	0.000
Null Hypothesis: CAC40 has a unit root		
Augmented Dickey-Fuller test statistic	-2.079	0.557
Null Hypothesis: D(CAC40) has a unit root		
Augmented Dickey-Fuller test statistic	-58.916	0.000
Null Hypothesis: CHINASSE has a unit root		
Augmented Dickey-Fuller test statistic	-1.393	0.863
Null Hypothesis: D(CHINASSE) has a unit root		
Augmented Dickey-Fuller test statistic	-25.581	0.000
Null Hypothesis: HANGSANG has a unit root		
Augmented Dickey-Fuller test statistic	-2.538	0.309
Null Hypothesis: D(HANGSANG) has a unit root		
Augmented Dickey-Fuller test statistic	-57.163	0.000
Null Hypothesis: NIKKAI has a unit root		
Augmented Dickey-Fuller test statistic	-1.735	0.736
Null Hypothesis: D(NIKKAI) has a unit root		
Augmented Dickey-Fuller test statistic	-58.105	0.000
Null Hypothesis: TSEC has a unit root		
Augmented Dickey-Fuller test statistic	-2.727	0.226
Null Hypothesis: D(TSEC) has a unit root		
Augmented Dickey-Fuller test statistic	-52.511	0.000
Null Hypothesis: NIFTY has a unit root		
Augmented Dickey-Fuller test statistic	-1.710	0.746
Null Hypothesis: D(NIFTY) has a unit root		
Augmented Dickey-Fuller test statistic	-16.902	0.000

Annexure 2

Table 6: Granger Causality for Whole Period 2000-2013

Pairwise Granger Causality Tests			
Lags: 1			
Null Hypothesis:	Observations	F-Statistic	Prob.
NIFTY does not Granger Cause FTSE	2529	2.617294392	0.10582939
FTSE does not Granger Cause NIFTY		39.39557045	0.00***
NIFTY does not Granger Cause CAC40	2529	2.950980225	0.085948043
CAC40 does not Granger Cause NIFTY		35.85019328	0.000***
NIFTY does not Granger Cause SP	2529	1.027180853	0.310918792
SP does not Granger Cause NIFTY		100.3912419	0.000***
NIFTY does not Granger Cause SSE	2529	7.557309006	0.006019241
SSE does not Granger Cause NIFTY		3.006969567	0.083029161*
HSI does not Granger Cause NIFTY	2529	0.002191035	0.962669558
NIFTY does not Granger Cause HIS		20.3352593	0.000***
NIKKAI does not Granger Cause NIFTY	2529	0.881334091	0.347926299
NIFTY does not Granger Cause NIKKAI		57.18360446	0.000***
KOSPI does not Granger Cause NIFTY	2529	6.033665253	0.01410241
NIFTY does not Granger Cause KOSPI		38.03152905	0.000***
TSEC does not Granger Cause NIFTY	2529	1.716662913	0.190242296
NIFTY does not Granger Cause TSEC		36.64955914	0.0000***

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