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COMPARATIVE ANALYSIS OF INDIAN STOCK MARKET WITH ASIA PACIFIC DEVELOPED MARKETS

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Abstract
Knowledge on stock markets integration is very important for both practitioners and policymakers. Exchanges are now expanding national boundaries to extend their service areas and this has led to market integration. In this paper an attempt has been made to examine whether and to what extent, Indian stock market is integrated with stock markets in the Asian Pacific developed stock markets (Japan, Hong-Kong, Singapore and Australia before and after the financial crisis. The findings are Indian stock market outperformed other countries. There was no cointegration between India and other Asia Pacific developed countries all the three phases. In the short run bidirectional and unidirectional causality exists between India and other countries. The investor can enjoy the benefits of diversification in the long run.

Keywords: Finacial Crisis, Cointegration and Causality.

1. INTRODUCTION

Knowledge on stock markets integration is very important for both practitioners and policymakers. Exchanges are now expanding national boundaries to extend their service areas and this has led to market integration. To provide overseas investment options for investors, exchanges have begun to offer cross-border trading. This improved the image of the exchange for investors and attracts more volume. This encourages the global investors to look for investment opportunities internationally to diversify their portfolios and to reduce their portfolio's risk. Developing countries face the problems of low capital and low growth and they seek external sources to strengthen their economy. Foreign capital investment fills the resource gap of developing countries. Financial integration leads to rapid flow of funds from 'less returns markets' to 'high returns markets' and in this process it brings about equality in returns. Financing and investing decisions by individuals, corporate and particularly multinationals are greatly influenced by the perceived degree of market integration.

The recent global financial crisis has attracted the world in current periods. The global financial crisis set off by the sub-prime credit crisis in the US has destabilized the financial markets of the Asian countries. The financial turmoil that engulfed the US during 2007-09 began in the mortgage lending markets. The crisis has surged across national borders within the developed world, and now there are some reasons which has alarmed that the crisis will swamp other developing countries, affecting the significant economic progress of recent years. The purpose of this paper is to examine whether the Asian stock markets are interrelated after the financial crisis. The purpose of this study is to explore the nature of the association and the possible existence of a short run and long-run relationship between the Indian stock-market and the Asia Pacific developed markets.

2. RESEARCH BACKGROUND

Roca (1999) investigated the price linkages between the equity markets of Australia and those of the U.S., the U.K., Japan, Hong Kong, Singapore, Taiwan and Korea using weekly stock market and found that no cointegration between Australia and other markets. But he found that the Granger causality tests revealed that Australia was significantly linked with the U.S and the U.K..

Tatsuyoshi Miyakoshi (2003), examined the magnitude of return and volatility spillovers from Japan and the US to seven Asian equity markets. He concluded that only the influence of the US was important for Asian market returns; there was no influence from Japan. Secondly, the volatility of the Asian market was influenced more by the Japanese market than that of by the US. Thirdly, there existed an adverse influence of volatility from the Asian market to the Japanese market.

Wing-Keung, Aman Agarwal and Jun Du (2005), empirically investigated the long-run equilibrium relationship and short-run dynamic linkage between the Indian stock market and the stock markets in major developed countries (United States, United Kingdom and Japan) after 1990 by examining the Granger causality relationship and the pairwise, multiple and fractional co integrations between the Indian stock market and the stock markets from these three developed markets covering the period from January 1, 1991 to December 31, 2003. They concluded that Indian stock market was integrated with mature markets and sensitive to the dynamics in these markets in a long run. In a short run, both US and Japan Granger cause the Indian stock market but not vice versa.

Siew-yen at el (2008) explored the co-movements between the stock indices of Singapore and five Asian Pacific economies and evidenced that the interdependence between these markets had intensified after the financial crisis. Before the crisis, only Malaysian stock market was found to be co integrated with Singapore but after the crisis Hong-Kong, Malaysia, Japan and US were found to be co integrated with the Singapore stock market. The stock market of Singapore was Granger – caused by that of Malaysia, but the causal relationship had weakened after the crisis.

Huyghebaert and Wang (2010) examined the degree of stock markets integration among the seven major stock exchanges from developed and emerging countries such as; Hong Kong, Japan, Shanghai, Shenzhen, Singapore, South Korea and Taiwan. Their study also included the USA in the analysis to see the linkages with East Asian stock exchanges. Analysis conducted on pre-crisis, during-crisis and post-crisis (Asian financial crisis) by using daily data from July 1992 to June 2003. The Hong Kong and Singapore stock markets considerably responded to the shocks originating from other East Asian markets, particularly during financial crisis. During the post crisis period, shocks in Hong Kong and Singapore mainly influenced other East Asian markets (except mainland China). It was also observed that the associations between East Asian stock markets are time varying. The evidence showed that USA had significant influence on stock returns of East Asian markets (excluding mainland China) during all periods of study.

Claus and Lucey (2012) investigated the stock market integration between ten economies of Asia Pacific region. Results of this study indicate that the observed stock markets exhibit some degree of integration but the degree of segmentation varies among the ten economies. Further, it indicates that membership in a formal economic organization does not appear to influence the degree of integration.

3. DATA DESCRIPTION AND METHODOLOGY

This empirical study is based on daily closing values of the stock market indices of 4 important equity markets of the Pacific developed world. Daily closing prices of Nifty (India) Nikkei 225 index (Japan), AORD index (Australia) Hang–Seng (Hong Kong), and STI (Singapore) for the period April 1, 2000 to March 31, 2012 has been taken from Yahoo Finance. The continuously compounded rate of return is calculated by using the following formula. Return is calculated using logarithmic method as follows.

$rt = (\log pt – \log pt\text{-}1)*100$

Where
Rt = Market return at the period t
Pt = Price index at day t
Pt-1 = Price index at day t–1 and
log = Natural log

There are several methods available for examining the linkages among the stock markets across the countries. In this study the emphasis is given to test the inter-market relationship among the stock market in India with that of equity markets of Asia Pacific developed world, through ; (i). Descriptive statistics; (ii) Co integration tests, and (iii) Granger causality Test.

Before examine the linkage among the stock markets, the augmented Dickey- Fuller (ADF) unit-root test was employed to examine the stationary property of market prices. The null hypothesis of nonstationarity (unit root) and alternative hypothesis (no unit root) of stationarity are tested for each data series. Since the methodology of testing for unit roots is well known, the details are omitted.

Before conducting cointegration test it is of interesting to determine if there are any common forces driving the long-run movement of the data series or if each individual stock index is driven solely by its own fundamentals. Cointegration analysis is used to investigate long term relationship between Indian and other Asian stock markets and it is estimated by ordinary least squares under the following formula:

$$X t = \beta 1 + \delta Yt + \mu t \qquad (1)$$

The Engle Granger Augmented Dickey–Fuller test is applied on the “cointegrtating residuals” μt obtained from the equation (1). The formula for EG– ADF test is as follows

$$\Delta \text{«}_t = -\text{¢}\text{«}_{t-1} + a_i \sum_{i=1}^{m} \Delta \text{«}_{t-1} + \text{«}_t \qquad (2)$$

Δ μt represents the first differences of the residuals The specific hypotheses are :
H0 : δ = 0
H1 : δ ≠ 0
Null hypothesis is that there is no co integration among the stock indices. The value of a calculated absolute tau (τ) value is greater than the tabulated critical (τ) 7.

Granger representation theorem provides that if two variables are cointegrated then Granger causality must exist in at least one direction, which is a consequence of the relationships described by the ECM. Granger causality test captures lead lag relationship within the sample period. Short run integration is examined using Granger's (1969) causality test. Formally, a time series x_t Granger – causes another time series y_t if series y_t can be predicted with better accuracy by using past values of x_t rather than by not doing so, other information being identical. In other words, variable x_t fails Granger –cause y_t if

$$\Pr(y_{t+m} | \Omega_t) = \Pr(y_{t+m} | \Psi_t), \qquad (3)$$

Where $\Pr(y_{t+m} | \Omega_t)$ denotes conditional probability of y_t, Ω_t is the set of all information available at time t, and $\Pr(y_{t+m} | \Psi_t)$ denotes conditional probability of y_t obtained by excluding all information on x_t from y_t this set of information is depicted as Ψ_t. To examine the causality, if a cointegration relationship is found, a Vector Error Correction Model (VECM) is estimated.

$$x_t = \sim_0 + \bar{}_1 £_{t-1} + \sum_{j=1}^{k} ¥_j x_{t-j} + \sum_{j=1}^{k} {}_j y_{t-j} + \text{«}_{xt} \qquad (4)$$

$$y_t = \sim_0 + \bar{}_1 £_{t-1} + \sum_{j=1}^{k} ¥_j x_{t-j} + \sum_{j=1}^{k} {}_j y_{t-j} + \text{«}_{yt} \qquad (5)$$

where $£_{t-1}$ represents the deviation from long – run equilibrium in period t-1 obtained from the cointegration regression. Where k is a suitably chosen positive integer, $¥_j$ and $_j$, j = 0,1 ……k are parameters and ~ ' are constants and «_t's are disturbance terms with zero means and finite variances. The null hypothesis that y_t does not Granger – cause x_t is not accepted if the $_j$'s, j>0 in equation (4) are jointly significantly different from zero using a standard joint test (e.g., and F test). Similarly, x_t Granger – causes y_t, if the a $_j$'s j >0 coefficients in equation (5) are jointly different from zero. For non - cointegrating series, Granger causality is examined by the Vector Autoregressive (VAR) model.

4. EMPIRICAL RESULTS

Descriptive statistics for the stock indices returns are given in Table 1 and Table 2. India, Hong-Kong and Japan suffered loss consecutively for three years from 2000-2001 to 2002-2003. The global financial crisis affected all the stock markets in the year 2008-2009 and the loss was very high in Singapore (0.0413). In the year 2010-2011 all the countries return was negative except Japan, but in the year 2011-2012 all the countries return was positive except Japan. In the year 2003-2004, 2005-2006 and 2006-2007 all the countries enjoyed positive return. Among all the countries, India's return was high (0.0413) compared to other markets. In India the return was very high in the year 2003-2004 and in the year 2009-2010. The market suffered loss in the year 2008-2009 due to global financial crisis. In Hong-Kong the return was very high in the year 2009-2010 followed by the global financial crisis.

Before the global financial crisis all the all the countries had positive return except Japan. Only India earned positive return throughout the year irrespective of the global financial crisis because of the strict surveillance and monetary policy of the RBI.

Japan return was negative in all the three phases. Scarce in many natural resources, Japan has long been dependent on imported raw materials. Since the complete shutdown of Japan's nuclear reactors after the earthquake and tsunami disaster in 2011, Japan's industrial sector has become even more dependent than it was previously on imported fossil fuels. Modest economic growth continued after 2000, but the economy has fallen into recession four times since 2008. Government

stimulus spending helped the economy recover in late 2009 and 2010, but the economy contracted again in 2011 as the massive 9.0 magnitude earthquake and the ensuing tsunami in March of that year disrupted manufacturing.

Volatility was very high in Hong-Kong (3.056). Among all the countries Australia volatility was very low. A careful examination reveals that India stock exchange offers the highest return at a reasonable risk level. India outperformed Asia Pacific developed the countries under the study.

Table 1,Stock Index Daily Average Return and Volatility for India and Hong-Kong (percentage)

	India		Hong-Kong	
Year	**Mean**	**Std**	**Mean**	**Std**
2000-2001	-0.1139	1.984	-0.1267	1.801
2001-2002	-0.0066	1.404	-0.0607	1.704
2002-2003	-0.0573	0.992	-0.0984	1.167
2003-2004	0.2338	1.433	0.1543	1.063
2004-2005	0.0548	1.641	0.0259	0.962
2005-2006	0.2046	1.036	0.0625	0.721
2006-2007	0.0466	1.776	0.0898	1.043
2007-2008	0.0853	2.025	0.0572	2.192
2008-2009	-0.1848	2.664	-0.2074	3.056
2009-2010	0.2264	1.882	0.1762	1.714
2010 -2011	0.0415	1.118	0.0402	1.080
2011- 2012	-0.0393	1.301	-0.0540	1.613
2000 - 2007	0.0571	1.498	0.012	1.251
2007 - 2012	0.017	1.906	-0.004	2.082
2000- 2012	0.0413	1.670	0.0065	1.634

Table 2:Stock Index Daily Average Return and Volatility (percentage) (Australia, Singapore and Japan)

	Australia		Singapore		Japan	
Year	**Mean**	**Std**	**Mean**	**Std**	**Mean**	**Std**
2000-2001	-0.0046	0.808	-0.0971	1.481	-0.1826	1.616
2001-2002	0.0330	0.783	0.0298	1.443	-0.0675	1.826
2002-2003	-0.0651	0.770	-0.1397	1.120	-0.1317	1.531
2003-2004	0.0715	0.468	0.1518	1.028	0.1551	1.368
2004-2005	0.0718	0.425	0.0557	0.718	-0.0016	1.057
2005-2006	0.0845	0.629	0.0661	0.598	0.1543	1.081
2006-2007	0.0638	0.848	0.0973	1.042	0.0053	1.147
2007-2008	-0.0396	1.402	-0.0300	1.587	-0.1320	1.565
2008-2009	-0.1658	1.942	-0.2254	2.204	-0.1774	2.936
2009-2010	0.1282	1.121	0.2061	1.325	0.1282	1.421
2010 -2011	0.0028	0.929	0.0282	0.841	-0.0523	1.594
2011- 2012	-0.0430	1.121	-0.0122	1.133	0.0135	1.141
2000 - 2007	0.037	0.696	0.029	1.099	-0.007	1.388
2007 - 2012	-0.024	1.327	-0.013	1.514	-0.050	1.880
2000- 2012	0.0107	1.030	0.0123	1.280	-0.0244	1.600

The market capitalization and the gdp of the markets under the study are given in the table 3 and table 4. Market capitalization and gdp was very high in japan. It reached its peak in the year 2005. In india the market capitalization was very high in the year 2007. Economic liberalization measures, including industrial deregulation, privatization of state-owned

Enterprises, and reduced controls on foreign trade and investment, began in the early 1990s and served to accelerate the country's growth, which averaged under 7% per year from 1997 to 2011. Australia was ranked 5th out of 57 of the world's leading financial systems and capital markets by the world economic forum; market capitalization was very high in the year 2010.

In Hong-Kong it was high in the year 2008. In Singapore it was very high in 2012. There was a steady growth in Indian GDP. In Japan up to 2007 the GDP rate was fluctuating afterwards it grew steadily. Hong-Kong GDP was fluctuating. Australia and Singapore GDP reached its peak in the year 2012.

Table 3,Market Capitalization of Securities in the CM Segment and GDP of India, Japan and Hong –Kong Market (2000- 2012)

Year	India - Market Capitalization$ USD Millions	India-GDP $ USD Billions	Japan Market Capitalization $ USD Millions	Japan-GDP$ USD Billions	Hong-Kong$ USD Millions	Hong-Kong-GDP$ USD Billions
2000	148063	464.30	3157221	4432.60	623397	165.77
2001	110395	474.70	2251814	4731.20	506072	171.67
2002	131010	492.40	2126075	4159.86	463084	169.40
2003	279092	522.80	3040664	3980.82	551236	166.35
2004	387851	617.60	3678261	4303.94	665248	161.38
2005	553074	721.60	4736512	4655.80	693486	169.10
2006	818878	834.20	4726268	4571.87	895249	181.57
2007	1819100	949.10	4453474	4356.75	1162565	193.54
2008	645477	1238.70	3220485	4356.35	1328837	211.60
2009	1179235	1224.10	3377892	4849.18	915825	219.28
2010	1615860	1365.40	4099591	5055.14	1079640	214.05
2011	1015370	1708.50	3540684	5495.39	889596	228.64
2012	1263335	1835.81	3680982	5905.65	1108127	248.51

Table 4,Market Capitalization of Securities in the CM Segment and GDP of Australia, and Singapore Market (2000- 2012)

Year	Australia Capitalization$ USD Millions	Australia - GDP$ USD Millions	Singapore Capitalization$ USD Millions	Singapore- GDP$ USD Millions
2000	372794	388.69	152826	86.29
2001	375130	414.98	117338	95.84
2002	378845	378.48	101900	89.29
2003	585475	394.25	229328	91.94
2004	776402	466.45	277004	97.00
2005	804073	612.87	316657	114.19
2006	1095857	693.33	276329	127.42
2007	1298429	747.20	353488	147.79
2008	675618	853.44	180021	179.98
2009	1258455	1055.03	310765	192.24
2010	1454546	926.28	370090	192.41
2011	1198163	1141.26	308320	236.42
2012	1286437	1388.06	414125	275.37

Table 5, Table 6, and Table 7 present results of pair wise conintegration tests for the pre-crisis, post crisis and the entire sample period. We find that India stock market is not cointegrated with any of equity markets under the study. However India market is found integrated with Singapore during the post crisis period. Therefore, funds managers of Japan, Hong-Kong, and Australia can get the benefits of portfolio diversification by investing in the Indian stock market.

Table 5,Engle-Granger ADF Test of Cointegration (2000 – 2007) ((Lag 5)

Name of the Indices	**δ**	**probability**
India on Australia	-2.641	0.261
Australia on India	-2.500	0.327
India on Singapore	-2.323	0.361
Singapore on India	-2.247	0.399
India on Japan	-1.981	0.538
Japan on India	-3.233	0.065
India on Hong-Kong	-1.852	0.604
Hong –Kong on India	-2.084	0.484

Table 6,Engle-Granger ADF Test of Cointegration (2007 – 2012) ((Lag 5)

Name of the Indices	**δ**	**probability**
India on Australia	-1.827	0.616
Australia on India	-2.439	0.306
India on Singapore	-3.369	0.046*
Singapore on India	-3.571	0.027*
India on Japan	-1.557	0.740
Japan on India	-2.918	0.131
India on Hong-Kong	-2.149	0.450
Hong –Kong on India	-2.337	0.355

*Significant at 5 % level

Table 7,Engle-Granger ADF Test of Cointegration (2000 – 2012) ((Lag 5)

Name of the Indices	***δ***	***probability***
India on Australia	-1.172	0.914
Australia on India	-1.719	0.742
India on Singapore	-2.532	0.312
Singapore on India	-2.692	0.239
India on Japan	-0.516	0.982
Japan on India	-2.646	0.259
India on Hong-Kong	-2.962	0.143
Hong –Kong on India	-3.184	0.087

Results of Granger causality test is given in Table 8, Table 9 and Table 10. During the pre-crisis period bidirectional causality exist between Australia, Singapore and India and unidirectional granger causality exist between India and Japan and Hong-Kong equity markets. During the post crisis period the Granger causality was weakened. Unidirectional granger causality exist between India markets and Australia, Japan and Hong-Kong equity market and between Singapore to India .In the whole study period bidirectional Granger causality exist between India and all the countries except Australia.

Table 8

Pre- Crisis Period (April 2000 - June 2007) F-statistic		
	F-Statistic	**Causality Inference**
INDIA → AUSTRALIA	5.80	0.000**
AUSTRALIA → INDIA	3.93	0.003**
INDIA → SINGAPORE	5.43	0.000**
SINGAPORE→ INDIA	2.48	0.0421*
INDIA → JAPAN	9.67	0.000**
JAPAN → INDIA	1.69	0.148
INDIA → HONGKONG	4.45	0.001**
HONGKONG → INDIA	6.57	0.000

Table 9

Post Crisis Period (July 2007 - April 2012)	F-statistic	
	F-Statistic	Causality Inference
INDIA → AUSTRALIA	15.18	0.000**
AUSTRALIA → INDIA	0.59	0.723
INDIA → SINGAPORE	1.66	0.156
SINGAPORE → INDIA	4.23	0.002**
INDIA → JAPAN	17.39	0.000**
JAPAN → INDIA	1.21	0.301
INDIA → HONGKONG	9.86	0.000**
HONGKONG → INDIA	0.38	0.820

Table 10

Full Sample Period April 2000 - December 2012	F-statistic	
	F-Statistic	Causality-Inference
INDIA → AUSTRALIA	21.13	0.000**
AUSTRALIA → INDIA	0.95	0.430
INDIA → SINGAPORE	3.74	0.004**
SINGAPORE → INDIA	4.32	0.001**
INDIA → JAPAN	23.14	0.000**
JAPAN → INDIA	2.40	0.047*
INDIA → HONGKONG	14.13	0.000*
HONGKONG → INDIA	4.82	0.000**

5. CONCLUSION

India stock exchange offers the highest return, i.e. 0.2246 % per day at a reasonable risk level. Pair wise Cointegration analysis shows that the India stock market is not cointegrated with equity market Japan, Hong-Kong, Singapore and Australia. Therefore, funds managers of Japan, Hong-Kong, Singapore and Australia can get the benefits of portfolio diversification by investing in the Karachi stock market. However, in the short run Indian market influence other stock market. It reduces the benefits of diversification in the short run.

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