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❧ CONTENTS OF PART - IV ❧

✪ CONTENTS OF PART - IV ✪

1. Causality Relationship between Indian NSE Nifty Sectoral Indices and Asian Emerging Stock Markets: An Empirical Study

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Abstract

Due to the integration of the world markets, the potentialities of international diversification opportunity are declining. Today the international portfolio investors are continue to wonder to search for less correlated markets to gain better growth oriented returns. The integration of world markets has diverted the investment strategy of the investors at sector wise diversification. This study examines the correlated behaviour of the Eleven Nifty sectoral indices with Nine Asian Emerging Stock markets. The Correlation and the Granger Causality Test has been used for the sample data period ranging from 1st of January 2009 to 31st of December 2018. The findings of the study indicated that in most of the instances there is a high degree of positive correlation within the Nifty sectoral indices and Nifty sectoral indices with Asian Emerging markets. Further from the causality test, we have found contractory result of having Unidirectional, Bi-directional and no causality relationship between the markets. This implies that the diversification opportunities in across the Nifty sectoral indices are not completely vanished but declining over a period of years due to increase in level of correlation.

Keywords: Nifty Sectoral Indices, Asian Emerging Markets, Correlation, Granger Causality, Sector Diversification

Introduction

In a dynamic global economic scenario it is very important to gain the knowledge of international Stock market interdependency to the various market players such as global investors, Portfolio Managers, Regulators and other Policy Makers. With the opening up of the market doors globally, various Foreign Institutional Investors (FII), Foreign Portfolio Investors (FPI) has inspired to spread their fund in a various markets across a different sectors to diversify

the portfolio risk and to enjoy the better taste of returns. Diversification opportunity has been enhanced globally due to economic growth at different pace and business cycle timing in a various regions and countries. However investing fund to gain a portfolio diversification benefits in a different markets is worthless if these markets are inter-linked. Enlargement in MNC's, advances and growth in Information Technology, deregulation of financial markets, growth in international Capital flows and abolishment of foreign exchange control have increased cross-country correlation, bringing the world nations economically together (Tehrani, 2011). Such a strong correlation or linkages amongst the Stock markets subject to bring different risk such as the contagion effect and ripple effects of economic events in distant countries (Mohanasundaram & Karthikeyan, 2015). The various liberalization measures amplified Indian Stock market to undergo a significant transformation. In this context, the Stock market is also prone to various risk exposure globally and regionally. Thus it is very vital to understand how Indian Stock market is affecting from a global contagion effect in market independent scenario. Over a period of year many studies has been conducted to examine the relationship of Indian Stock Market with other global markets, but they had considered only the leading Stock indices of India either NSE Nifty Fifty or BSE SENSEX Index. The present article emphasizes to investigate the relationship of Indian Nifty Sectorial Indices with Asian Emerging Stock markets. The study will signify the many implications to the various market players which can be helpful for their reference and decision making.

Previous Literature Work

The research work on Stock markets integration has been intensively explored over a period of years. Some of the previous literature works on Stock markets integration are: (Palamalai, et al., 2013), to examine the linkages, the Asian Emerging markets has been analysed. The study reported the findings of well-defined long-run equilibrium relationship among the major Stock markets, which reduces the long-term diversification benefits but exist a short-run benefit in the markets. (S. & M., 2014), conducted a comparative study of relationship of Bank Nifty Index and NSE other Sectoral indices. The study has employed Pearsonian Coefficient of Correlation and concluded that the banking Stock index and most of the other NSE sectoral indices are positively correlated. (Kasilingam, et al., 2015), assessed the As in Stock market indices of the countries such as India, China, Japan, Hong Kong, Singapore and Taiwan. They indicated the high degree of correlation exists among selected Asian market indices. Whether the markets are independent? A study conducted by (Pandya, 2016). With the usage of Correlation and Granger Causality test, they reported that some market indices have a

strong cause influence on other market indices. (Kok & Har, 2017), Integration and diversification opportunity has been observed in the Asian Emerging Markets. They had used Correlation and Co-integration test for a sample period of nine years and mentioned that Asian Emerging markets are integrated in character, thus eliminating the diversification opportunity to the investors. Five pairs of indices namely CAC consumer goods/NYSE consumer goods, CAC IT/DAX IT, CAC Pharma/NSE Pharma, CAC Pharma/NYSE Pharma and CAC consumer/CAC Pharma are co-integrated and the Error correction term for such co-integration are negative and significant which means that the equilibrium in the long-run will be stable (Shahani, et al., 2017). (S. & K. , 2018), assessed the Correlation between five sectoral indices and Nifty Fifty index. They stated that the sector such as Automobile, Banking and Media are highly and positively correlated to the market index.

Need for the Study

The several previous studies on Stock markets integration and co-movement has considered the leading Stock indices of the country and reported that whether there exists a co-integration between the markets or not and whether there exists a diversification opportunities or not. However the investors prefer to spread their fund in across the countries sectoral indices to gain the potential returns. Therefore it is very important to understand the nature of relationship of various sectors indices with other sectors indices and even leading Stock indices of the countries. Over a period of years a very few studies has been concentrated on this area and in Indian context, so far no study has been conducted to identify how Indian sectoral indices are correlated with international Stock markets. Thus this study attempting to examine the Indian NSE sectoral indices correlation with Asian Emerging Stock markets.

Objectives of the Study

1. To examine the Correlation behaviour between the NSE Nifty Sectoral Indices and the Asian Emerging Stock Markets.

2. To investigate the causality relationship between the NSE Nifty Sectoral Indices and the Asian Emerging Stock Markets.

3. To identify the diversification opportunity available in across a NSE Nifty Sectoral Indices.

Research Hypothesis

Null hypothesis are;

1. H_{01}: There is no Correlation behaviour between NSE Nifty Sectoral indices and Asian Emerging Stock Markets (r=0).

2. H_{02}: There is no Causality influence between NSE Nifty Sectoral indices and Asian Emerging Stock Markets.

Methodology

The study is based on secondary daily closing data of NSE Nifty Sectoral indices such as Nifty Auto, Nifty Bank, Nifty FMCG, Nifty Financial Services, Nifty IT, Nifty Pharma, Nifty Metal, Nifty Media, Nifty PSU, Nifty Private Bank, Nifty Realty and Asian Emerging Stock markets such as Nifty Fifty index (India), SHCOM (China), JCI (Indonesia), KLCI (Malaysia), KOSPI (South Korea), SET (Singapore), TWSE (Taiwan), PSEi (Philippines) and KSE-100 (Pakistan), collected from Bloomberg Database for a sample period from 1st of January 2009 to 31st of December 2018. This period falls after sub-prime global financial crisis. All the local currency denominated values has been taken in US dollar values, so that it will comparable to across the sample indices.

Empirical Analysis

Table 1 Summary Statistics

Indices	Mean	σ	Skewness	Kurtosis	Jarque-Bera
Auto	0.00072	0.01561	0.40790	10.3333	5501.02*
Bank	0.00070	0.01809	0.43687	11.8865	8056.39*
FMCG	0.00065	0.01337	0.00401	7.83051	2357.69*
FS	0.00075	0.01754	0.52704	13.8093	11918.1*
IT	0.00065	0.01548	0.03506	11.6314	7528.15*
Metal	0.00019	0.02039	0.30427	7.64059	2213.36*
Media	0.00041	0.01655	0.12191	8.02452	2556.89*
Pharma	0.00049	0.01355	0.10923	9.73048	4581.94*
PSU	0.00015	0.02269	0.85449	13.4996	11434.1*
Pvt. Bank	0.00090	0.01826	0.44843	11.8471	7989.89*
Realty	1.41E-05	0.02574	0.07362	8.26628	2840.45*
Nifty	0.00045	0.01416	0.80858	19.5583	27967.5*
SHCOM	0.00012	0.01474	-0.87643	7.97632	2812.63*
JCI	0.00050	0.01399	-0.18866	7.19565	1793.07*
KLCI	0.00021	0.00891	-0.10913	6.28242	1093.47*
KOSPI	0.0004	0.01357	-0.26565	6.25531	1099.26*
TWSE	0.00033	0.01115	-0.20246	7.08938	1706.29*
SET	0.00056	0.01164	-0.22875	6.40863	1195.13*
PSEi	0.00050	0.01199	-0.35209	5.71973	797.505*
KSE-100	0.00051	0.01071	-0.17228	6.19062	1040.61*

Note: *indicates rejection of Null hypothesis at 5% significant level. Nifty Sectoral Indices and Asian Emerging Stock Markets

Table 1 depicts the summary statistics/performance of selected variables of the study. Amongst the selected indices, the Nifty Financial Services index has reported the highest daily returns (0.00075) and the Nifty Realty had displayed the lowest returns of 1.41E-05. The highest volatile index amongst all is Nifty Realty (more risk prone and less daily return giving sectoral index) and lowest volatile index is KLCI (Malaysia). Further all the sectoral indices and Nifty Fifty index is positively skewed and other Asian Emerging Markets indices are negatively skewed. The kurtosis has shown the highest weighted peak for all the indices data, as its value is more than 3 (Leptokurtic). Lastly the Jarque Bera test has shown the significant value which is the indication of time series data are not normal.

Table 2 Correlation behaviour of Nifty Sectoral indices with Asian Emerging Stock Markets

Indices	Auto	Bank	FMCG	FS	IT	Metal	Media	Pharma	PSU	Pvt. Bank	Realty	Nifty	SHCOM	JCI	KLCI	KOSPI	TWSE	SET	PSEi	KSE-100
Auto	1	0.93	0.91	0.93	0.83	0.34	0.85	0.78	0.26	0.97	0.46	0.89	0.53	0.46	0.02	0.77	0.82	0.75	0.75	0.92
Bank	0.93	1	0.86	0.99	0.82	0.08	0.87	0.59	0.04	0.97	0.23	0.98	0.48	0.44	0.04	0.76	0.86	0.68	0.57	0.75
FMCG	0.91	0.86	1	0.88	0.81	0.51	0.68	0.71	0.41	0.93	0.61	0.79	0.31	0.60	0.20	0.82	0.85	0.90	0.84	0.87
FS	0.93	0.99	0.88	1	0.83	0.12	0.86	0.59	0.08	0.98	0.25	0.97	0.47	0.45	0.03	0.77	0.86	0.70	0.59	0.76
IT	0.83	0.82	0.81	0.83	1	0.22	0.66	0.76	0.14	0.83	0.40	0.85	0.48	0.42	0.18	0.73	0.84	0.70	0.66	0.71
Metal	0.34	0.08	0.51	0.12	0.22	1	0.06	0.58	0.83	0.29	0.88	0.06	0.07	0.24	0.11	0.18	0.11	0.51	0.70	0.57
Media	0.85	0.87	0.68	0.86	0.66	0.06	1	0.52	0.04	0.83	0.08	0.88	0.51	0.23	0.19	0.59	0.67	0.47	0.43	0.71
Pharma	0.78	0.59	0.71	0.59	0.76	0.58	0.52	1	0.31	0.67	0.66	0.56	0.57	0.39	0.16	0.53	0.55	0.66	0.84	0.81
PSU	0.26	0.04	0.41	0.08	0.14	0.83	0.04	0.31	1	0.25	0.68	0.08	0.02	0.03	0.16	0.07	0.06	0.33	0.44	0.49
P.Bank	0.97	0.97	0.93	0.98	0.83	0.29	0.83	0.67	0.25	1	0.40	0.92	0.48	0.45	0.05	0.76	0.84	0.75	0.68	0.85
Real	0.	0.	0.6	0.	0.	0.8	0.0	0.6	0.	0.	1	0.1	0.09	0.	0.3	0.4	0.3	0.	0.	0.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20
ty	46	23	1	25	40	8	07	6	68	40		1		50	2	3	6	67	79	63
Nifty	0.87	0.98	0.79	0.97	0.85	0.06	0.88	0.56	0.08	0.92	0.11	1	0.49	0.39	0.005	0.74	0.86	0.61	0.49	0.68
SHCOM	0.53	0.48	0.31	0.47	0.47	0.07	0.51	0.57	0.02	0.48	0.09	0.49	1	0.03	0.26	0.28	0.33	0.19	0.32	0.46
JCI	0.46	0.44	0.60	0.45	0.42	0.24	0.23	0.39	0.03	0.45	0.51	0.39	0.03	1	0.73	0.76	0.62	0.82	0.70	0.39
KLCI	0.02	0.04	0.20	0.038	0.18	0.11	0.19	0.16	0.16	0.05	0.32	0.005	0.26	0.73	1	0.49	0.33	0.53	0.44	0.40
KOSPI	0.76	0.76	0.82	0.77	0.73	0.18	0.59	0.53	0.07	0.76	0.44	0.74	0.28	0.76	0.49	1	0.92	0.86	0.71	0.64
TWSE	0.82	0.86	0.85	0.86	0.84	0.11	0.67	0.55	0.06	0.84	0.36	0.69	0.33	0.62	0.33	0.92	1	0.80	0.64	0.69
SET	0.75	0.68	0.90	0.70	0.70	0.51	0.47	0.66	0.33	0.75	0.67	0.72	0.19	0.82	0.53	0.86	0.80	1	0.91	0.72
PSEi	0.75	0.57	0.84	0.58	0.66	0.70	0.43	0.84	0.44	0.68	0.79	0.80	0.32	0.70	0.4	0.71	0.64	0.91	1	0.80
KSE-100	0.92	0.75	0.87	0.76	0.71	0.57	0.71	0.81	0.49	0.85	0.63	0.68	0.46	0.39	0.04	0.64	0.69	0.72	0.80	1

Note: All the figures displayed in the table are after rounding up.

Correlation analysis identifies the extent of relationship between two or more variables. By looking into the **Table 2**, we can narrate that all the market indices are positively correlated to each other. Most of the sectoral indices extend the higher degree of positive correlation with other sectors and with Asian Emerging Markets (except Nifty PSU and KLCI index). The highest correlation has been noted in the case of Nifty Financial Services and Nifty Bank index (0.99) and the lowest correlation has been observed in the case of Nifty Fifty and KLCI index (0.005). Thus we can conclude that diversification benefits is not completely vanished in Indian sectoral indices but declining gradually over a period of years due to increase in level of correlation.

Table 3 Unit Root Test Nifty Sectoral Indices and Asian emerging Stock Markets

Nifty Sectoral Indices	ADF		Asian Emerging Market Indices	ADF	
	Level	First Difference		Level	First Difference
AUTO	-0.0911	-45.28*	NIFTY FIFTY	-1.2104	-46.51*
BANK	-1.3219	-45.52*	SHCOM	-2.0649	-22.23*

FMCG	-0.9244	-47.78*	JCI	-0.1533	-46.04*
FS	-1.3557	-45.72*	KLCI	-0.2972	-44.06*
IT	-0.5709	-49.47*	KOSPI	-0.7206	-47.56*
MEDIA	-1.1819	-46.48*	TWSE	-0.3746	-47.23*
METAL	-1.2564	-46.93*	SET	0.1549	-45.54*
PHARMA	-0.3672	-46.58*	PSEi	0.0997	-44.86*
PSU	-1.9243	-44.68*	KSE-100	0.1106	-43.98*
P.BANK	-1.0602	-45.91*			
REALTY	-1.7508	-44.30*			

Note: *Rejection of Null hypothesis at 1%, 5% and 10% Significant level.

In the **Table 3,** we had tested the stationarity property and the order of integration of the sectoral indices and Asian Emerging Stock indices. The ADF stationarity test indicated that the time series data have unit root (non-stationarity) at level but data under ADF t-statistics is significant at 1%, 5% and 10% level, when the data had run at first difference. This is the connotation that the data series follows one order I (1) level of integration.

Table 4 Granger Causality Test between Sectoral Indices and Asian Emerging Stock Markets

Null Hypothesis	Decision	Null Hypothesis	Decision	Null Hypothesis	Decision
AUTO NIFTY	Bi-directional (*&**)	FS NIFTY	Unidirectional (*)	META NIFTY	Bi-directional (*&*)
AUTO SHCOM	No Causality relationship	FS SHCOM	No Causality relationship	META SHCOM	No Causality relationship
AUTO KOSPI	Bi-directional (**&*)	FS KOSPI	Bi-directional (**&*)	META KOSPI	Unidirectional (*)
AUTO JCI	No Causality relationship	FS JCI	No Causality relationship	META JCI	No Causality relationship
AUTO KLCI	No Causality relationship	FS KLCI	Unidirectional (*)	META KLCI	Unidirectional (**)
AUTO SET	No Causality relationship	FS SET	No Causality relationship	META SET	No Causality relationship
AUTO TWSE	Bi-directional (*&*)	FS TWSE	Bi-directional (***&*)	META TWSE	Bi-directional (*&*)
AUTO PSEi	No Causality relationship	FS PSEi	No Causality relationship	META PSEi	No Causality relationship
AUTO KSE-100	Bi-directional (***&*)	FS KSE-100	Bi-directional (*&*)	META KSE-100	Bi-directional (**&*)
BANK NIFTY	Bi-directional (*&*)	IT NIFTY	Bi-directional (*&*)	PHARMA NIFTY	Unidirectional (*)
BANK SHCOM	No Causality relationship	IT SHCOM	No Causality relationship	PHARMA SHCOM	Unidirectional (***)
BANK	Bi-directional	IT	Bi-directional	PHRAMA	Unidirectional

KOSPI	(**&*)	KOSPI	(***&*)	KOSPI	(*)
BANK JCI	No Causality relationship	IT→ JCI	Unidirectional (**)	PHARMA→ JCI	Unidirectional (**)
BANK KLCI	No Causality relationship	IT KLCI	No Causality relationship	PHARMA KLCI	No Causality relation ship
BANK SET	No Causality relationship	IT SET	No Causality relationship	PHARMA SET	No Causality relationship
BANK→ TWSE	Bi-directional (**&**)	IT↔ TWSE	Bi-directional (*&*)	PHARMA TWSE	Unidirectional (**)
BANK PSEi	No Causality relationship	IT← PSEi	Unidirectional (***)	PHARMA PSEi	No Causality relationship
BANK→ KSE-100	Bi-directional (**&*)	IT→ KSE-100	Bi-directional (**&*)	PHARMA→ KSE-100	Bi-directional (***&**)
FMCG→ NIFTY	Unidirectional (*)	MEDIA→ NIFTY	Bi-directional (*&*)	P.BANK→ NIFTY	Bi-directional (*&*)
FMCG SHCOM	No Causality relationship	MEDIA SHCOM	No Causality relationship	P.BANK SHCOM	No Causality relationship
FMCG KOSPI	Unidirectional (***)	MEDIA← KOSPI	Bi-directional (*&*)	P.BANK→ KOSPI	Bi-directional (**&*)
FMCG JCI	No Causality relationship	MEDIA JCI	No Causality relationship	P.BANK JCI	No Causality relationship
FMCG KLCI	Unidirectional (***)	MEDIA→ KLCI	Unidirectional (**)	P.BANK KLCI	No Causality relationship
FMCG SET	No Causality relationship	MEDIA← SET	Unidirectional (**)	P.BANK SET	No Causality relationship
FMCG→ TWSE	Unidirectional (**)	MEDIA↔ TWSE	Bi-directional (*&**)	P.BANK↔ TWSE	Bi-directional (*&**)
FMCG PSEi	No Causality relationship	MEDIA→ PSEi	Unidirectional (**)	P.BANK PSEi	No Causality relationship
FMCG→ KSE-100	Unidirectional (*)	MEDIA↔ KSE-100	Bi-directional (*&*)	P.BANK→ KSE-100	Bi-directional (**&*)
PSU→ NIFTY	Unidirectional (**)			REALTY→ NIFTY	Unidirectional (*)
PSU SHCOM	No Causality relationship			REAL SHCOM	No Causality relationship
PSU← KOSPI	Bi-directional (**&***)			REALTY→ KOSPI	Unidirectional (**)
PSU JCI	No Causality relationship			REALTY JCI	No Causality relationship
PSU← KLCI	Unidirectional (*)			REALTY← KLCI	Unidirectional (**)
PSU SET	No Causality relationship			REALTY SET	No Causality relationship
PSU→ TWSE	Unidirectional (***)			REALTY→ TWSE	Bi-directional (***&*)
PSU→ PSEi	Unidirectional (**)			REAL PSEi	No Causality relationship

PSU➡ KSE-100	Unidirectional (**)	REALTY➡ KSE-100	Bi-directional (*&*)

Note:*, **, *** indicates rejection of Null hypothesis at 1%, 5% and 10% significant level. Level of Causality based upon four lags. P.Bank stands at (Nifty Private Bank)

Table 4 represents the causality flows or the two way causality relationship between the selected variables. The sectoral indices such as Nifty Auto, Bank, IT, Media, FS, Metal, Realty, PSU, Pvt. Bank and the Asian Emerging Markets such as TWSE, KSE-100, KOSPI and Nifty Fifty Index follow the Bi-directional causality. The Unidirectional causality flows from FMCG, Media, FS, IT, Pharma, Realty to other indices such as Nifty Fifty, KLCI and PSEi index. Lastly there is no causality relationship between Auto, Bank, FMCG Sectoral indices and the Asian Emerging indices such as SHCOM, JCI and SET index. Most of the markets are not highly influenced from each other, thus still there exists a little diversification opportunities in the Nifty Sectoral indices.

Conclusion

Sector wise diversification is very important to gain a higher return in portfolio. This article investigated the correlated behaviour and causality relationship of Eleven Nifty Sectoral indices (Nifty Auto, Nifty Bank, Nifty FMCG, Nifty Financial Services, Nifty IT, Nifty Pharma, Nifty Metal, Nifty Media, Nifty PSU, Nifty Private Bank, Nifty Realty) with Nine Asian Emerging Stock markets such as Nifty Fifty index (India), SHCOM (China), JCI (Indonesia), KLCI (Malaysia), KOSPI (South Korea), SET (Singapore), TWSE (Taiwan), PSEi (Philippines) and KSE-100 (Pakistan) for a sample data period starting from 1st of January 2009 to 31st of December 2018. The outcome of the analysis exhibited that (1) The Financial Services, Auto and Bank sectoral indices offer a good performance under a summary statistics. (2) The stationarity Unit root test signifies that the stationarity property amongst the Sectoral and Asian Emerging markets indices data found at first difference. (3) There is a high degree of positive correlation within the Nifty sectoral indices and Nifty sectoral indices with Asian Emerging Markets (except KLCI and sectoral indices). (4) Under the Causality test, we have found contractory result of having Unidirectional, Bi-directional and No causality relationship amongst the indices. Thus the diversification opportunities in across the Nifty sectoral indices are declining over a period of years due to increase in the level of correlation. This study will signify the many implications to the various Market players which can be helpful for their reference and decision making.

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