

Stock Markets' Integration in Post Financial Crisis Era: Evidence from Literature

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Abstract: Research Question: This study is conducted to organize the literature on long-run equilibrium of stock markets during the post-financial crisis era (2010-17), to document the latest developments. **Motivation:** Integration-status of markets contribute significantly to the decision of investment-diversification by a portfolio manager. Studies on the topic exist for pre-financial crisis period (e.g. Sharma and Seth (2012)); however, we intend to organizes literature on the subject in post-financial crisis era. Financial crisis is a significant event of 21st century and knowing about developments in the area of market-integration is expected to enhance portfolio decision making. **Idea:** A collection and organisation of the published literature for review period to present a broader picture as opposed to empirical results of few selected markets. **Data:** Multiple studies have been published, however, we include 76 research articles [published in indexed Journals] in the area of market integrations during the period under review (2010-17). **Method/Tools:** We classified the publications based on country of origin; sample countries studied, sample periods, data frequency & econometric techniques used, and yearly publication trends, during the period under review. A selected review of findings is incorporated. **Findings:** Our findings suggest that developed and developing, larger GDP as well as Smaller GDP, countries have been researched during the period under review. Certain economic regions—Central Asia, East Europe, Africa (North, South, and Central), South America—have got less focus in research during the period under review, and offer potential research avenue. A period ranging from 9-17 years is the most widely used study period during the review period. Most widely used techniques to study market equilibrium are Correlation cointegration, regression and Granger causality. On the issue of integration, results indicate increase in integration of markets in various regions. **Contributions:** Our findings serve as a reference point for future researches in the area of portfolio diversification, potentially. To the best of our knowledge, no study has been conducted to organize the literature on market integration, covering post-financial crisis era.

Keywords: Portfolio diversification, cointegration of stock markets, emerging markets.

JEL Classification: G10, G11, G15

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1. Introduction

With the advent of modern portfolio theory (Markowitz, 1952), research in the area of investments achieved a milestone, which led to the building of asset pricing models (Sharpe, 1964; Black, 1972; Ross, 1976; Fama and French, 1992; Carhart, 1997). Quantification of risk assisted in efficient portfolio selection. A portfolio is said to be efficient if it surpasses the other portfolios either in risk or return. Efficient portfolio concept is based on the diversification of investments. Initially, such diversification was achieved within national boundaries; however, the revolution in Information and Communication Technology (ICT) assisted in global diversifications of portfolios. At present, diversification in global markets is much more comfortable than 30 years ago. In order to achieve global diversification, study of co-movement of various classes of assets and various markets is of great help. An important reason to diversify globally is the concentration of capital in few markets (well organized and developed), posing a shortage of resources in other markets (lacking in transparency and effective legal mechanism). Markets with abundant capital resources offer lesser returns, as compared to markets with scarce capital. Furthermore, in recent years some markets in underdeveloped regions (e.g. South America, South Asia, Africa, and Central Asia) have outperformed global markets in yearly returns (Petroff, 2016, 2017; Lemke, 2015), offering an incentive to be included in global portfolio diversification.

Regulatory framework and performance of the stock market are essential to attract foreign investments. During the 1980s onward waves of privatizations emerged, and market reforms were taken place, globally, resulting in the liberalization of financial markets and opportunities for foreign investors in domestic markets. The degree of reforms and liberalization varies from country to country; however, with the fall of communism in Union of Soviet Socialist Republics (USSR) in 1991, an overwhelming response towards *free*-economy (capitalism) is being witnessed, globally. For a beneficial diversification, lesser than perfect positive correlation among investments opportunities is recommended by the MPT. Only assets/securities with negative (or less than perfect positive) correlation can ensure the benefits of diversification.

To diversify in two or more equity markets, evidence on integration of these markets is essential. Studies on cointegration of markets were started initially among developed markets, followed by developed Vs. emerging markets, within the specific economic grouping, and among markets locating in a particular region. (e.g. see Kanas, 1998; Narayan and Smyth, 2005; Lamba, 2005; Gilmore *et al.*, 2008; Menon *et al.*, 2009; Ali *et al.*, 2011; Zhang and Li, 2013; Masih and Masih, 1999; Siklos and Ng, 2001; Voronkova, 2004; Yang *et al.*, 2014; Sarwar and Khan, 2017; Fukuda and Tanaka, 2017; Chow, 2017; Chien *et al.*, 2015; Dasgupta, 2014; Youcef and Adewale, 2017). Literature suggests that integration of financial markets is a well-documented area of portfolio management, covering studies on integration of developed-developed, developed-developing, BRICS, and geographic location. Although, evidence leads to inconclusiveness—results of long-run equilibrium are found, as well as, findings leading to no cointegration. In the case of developmental stage (developing Vs. developed markets), evidence on lack of co-movement of markets is more than integration, while in case of geographic location, markets are integrated. However, integration of financial markets has increased, significantly, over the years and interdependencies of markets become important with the degree of economic interactions (Sharma and Bodla, 2010).

Whether the integration of markets is desirable? The answer leads to the trade-off. On the one hand, integration of markets assists in a movement towards perfect competition—a preferred state of the global economy, with the right pricing of goods and services. Law of one price is achieved if financial markets are integrated (Góes and Matheson, 2015). The other side of the integration is very dangerous because the integration of markets poses a severe challenge during financial crisis eras (e.g., stock market crashes 1987, Global financial

crisis 2007). From the portfolio selection point of view, lack of integration in financial markets is a welcome state of affairs, as it helps in achieving diversification, quickly.

This study is proposed to organize the literature on equity markets' integration in the post-financial crisis era. In the literature, Study of Sharma and Seth (2012) is very close to our study, covering 20 years (1990-2010). We document developments in the area of stock markets' integration from 2010-17, which will serve, potentially, as a ready reference for future research debates. We present a quantitative review of literature in the area of co-movements of equity markets by classifying published research through multiple lenses—the ranking of most widely studied markets, country rankings in publishing research, country rankings in conducting research, sample size, econometric techniques employed and yearly frequency of published articles. A selected review of findings has been incorporated. We traced 131 articles, however, reviewed 76 published in indexed journals during the sample period and classified under multiple grouping. Such a systematic review is required to gauge the interest of the academic community in portfolio diversification, as well as, to take account of methods being applied in the study of cointegration, including econometric tests, sample periods, data frequencies, etc. Also, this review shall segregate/highlight the ignored/less focused markets during the period under review—potential candidates for researching. This study is expected to serve as a reference point for future research plans—as it offers last eight years developments at a single avenue for the academic community, interested in enhancing dialogue in the area of portfolio selection.

We contribute to the literature by presenting a quantitative literature review during the post-financial crisis era (2010-17). Our findings suggest that developed and developing, larger GDP as well as Smaller GDP, countries have been researched during the period under review. Certain economic regions—Central Asia, East Europe, GCC, Africa (North, South, and Central), South America—have got less focus in research during the period under review, and offer potential research avenue. A period ranging from 9-17 years is the most widely used study period during the review period. Most widely used techniques to study market equilibrium are Correlation cointegration, regression and Granger causality. Western Europe and the United States are at the top of the list as far publications (research published) is concerned. Average publications per year during the period under review are 9.5. In research contributions, highest contributions in the research area of market integration have been made by researchers from South and Southeast Asia (India, Pakistan and Malaysia). Results on the integration of various markets are mixed. Overall, increased integration of markets has been documented during the review period.

Rest of the study proceeds as follows. Purpose of the study is presented in section 2, followed by methodology in section 3. Section 4 presents the objective classification of literature, followed by a selected review of the findings in section 5. Section 6 concludes the study.

2. Study Objectives

The purpose of this study is a quantitative organization of the literature on co-movement of multiple stock markets in the post-financial crisis era, and selected review of findings in order to document ready reference for future researches. In summary, following are the research objectives:

- To classify the markets based on More (less) research focus in post-financial crisis era—in order to identify the literature gap (less focused economies)
- To present an account of methodological developments in the study of market integrations—sample periods and econometric techniques
- To highlight the research contributions, in the area of market integration, by various nations—research conducted and research published

- To document publication trends (year wise) during the period under review
- To present a review of the findings of selected studies

3. Methodology

Figure 1 depicts the study design. We traced 131 published articles during the review period, however, included 76 articles published in indexed/ranked journals. In order to include a study in the sample, indexing/ranking in one of the following agencies is required:

- Web of Science
- SCOPUS
- ABDC—Australian Business Deans Council Journal list
- CASB—Chartered Association of Business School-Academic Journal Guide

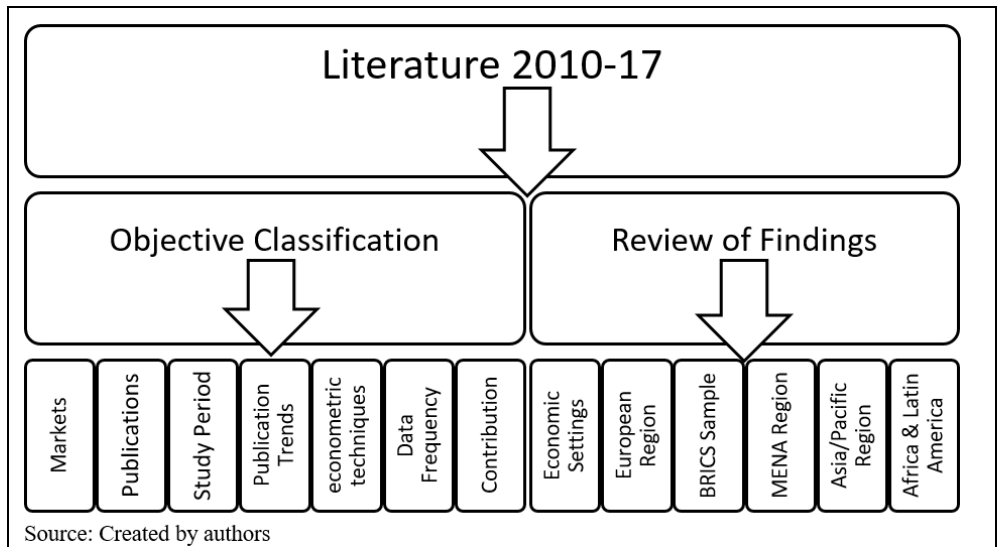


Figure 1: Design of study

Keywords [integration of stocks, market integration, co-movements, etc.] are used in search queries. Our materials for this study include published academic research in the area of cointegration of markets during the period under review (2010-17). Our final sample includes 76 research studies (Journal articles published in indexed/ranked), conducted elsewhere, during the post-financial crisis era (2010-17). The selection includes 55 Journals (Table 1). Considering the methodology of Sharma and Seth (2012), as well as Kumari and Sharma (2017), we have organized literature based on multiple research objectives.

- Publications are classified based on Markets covered in studies. The findings help in identifying the highly researched markets as well as less focused/ignored markets (research focus);
- Findings of countries with research publications contribute in understanding the publications centers in the area of market integrations (origin of publications);
- Classification of studies based on sample periods covered are expected to help in understanding the average study period used/required to form an opinion on market integrations (methodology);
- Identification of data frequencies (daily, weekly, monthly, quarterly, etc.) used in published research will contribute in understanding about selection of appropriate observation frequencies in future studies (methodology);

- Yearly publications trends reveal the less or more focus of researchers in the area of market integrations; and
 - Update on econometric techniques used in the literature will help in choice of econometric methods for future researches (methodology)
- Summary review of the results of selected studies is incorporated.

Table 1: Selected studies—Journals

Sr. #	Journals	Number of publications
1	Emerging Markets Finance and Trade	5
2	Economic Modelling	4
3	Research in International Business and Finance	3
4	Asian Academy of Management Journal of Accounting and Finance	3
5	International Research Journal of Finance and Economics	2
6	International Economics	2
7	Physica A: Statistical Mechanics and its Applications	2
8	Journal of Financial Economic Policy	2
9	Asian Economic and Financial Review	2
10	Managerial Finance	2
11	Emerging Markets Review	2
12	International Journal of Islamic and Middle Eastern Finance and Management	2
13	South Asian Journal of Global Business Research	2
14	International Journal of Emerging Markets	2
15	Romanian Statistical Review	1
16	Management Research Review	1
17	Iranian Economic Review	1
18	Review of development Finance	1
19	South Asian Journal of Business Studies	1
20	Finance Research Letters	1
21	Pakistan Journal of Applied Economics	1
22	De Gruyter	1
23	International Review of Economics & Finance	1
24	Journal of Chinese Economic and Foreign Trade Studies	1
25	Journal of Property Investment & Finance	1
26	Economics and Finance in Indonesia	1
27	South African Journal of Economic and Management Sciences	1
28	Review of Accounting and Finance	1
29	The Journal of Economic Asymmetries	1
30	Journal of Advances in Management Research	1
31	Journal of International Accounting Research Conference	1
32	The Singapore Economic Review	1
33	Journal of Economic Integration	1
34	Journal of Applied Business Research	1
35	Sage Open	1
36	Journal of Economics and Business	1
37	Business and Economics Research Journal	1
38	Economic System	1
39	Pacific-Basin Finance Journal	1
40	Journal of International Financial Markets, Institutions & Money	1
41	Journal of Economics and Finance	1
42	The Journal of Risk Finance	1
43	Asia-Pacific Journal of Business Administration	1
44	International Journal of Managerial Finance	1

Table 1 (continued)

Sr. #	Journals	Number of publications
45	International Journal of Humanities and Social Science	1
46	International Review of Financial Analysis	1
47	Contemporary Studies in Economic and Financial Analysis	1
48	China Economic Review	1
49	Journal of Banking & Finance	1
50	International Journal of Business	1
51	The Quarterly Review of Economics and Finance	1
52	Applied Economics Letters	1
53	Review of International Economics	1
54	European Journal of Economics, Finance and Administrative Sciences	1
55	International Journal of Finance & Economics	1

4. Literature Classification

Our analysis includes the quantification of multiple aspects in published research. We have quantified published research based on multiple groupings, including a ranking of markets based on research-focus, sample periods used, ranking of countries in research publishing, ranking of countries based on research contributions, year-wise articles published, econometric techniques applied (Figure 2).

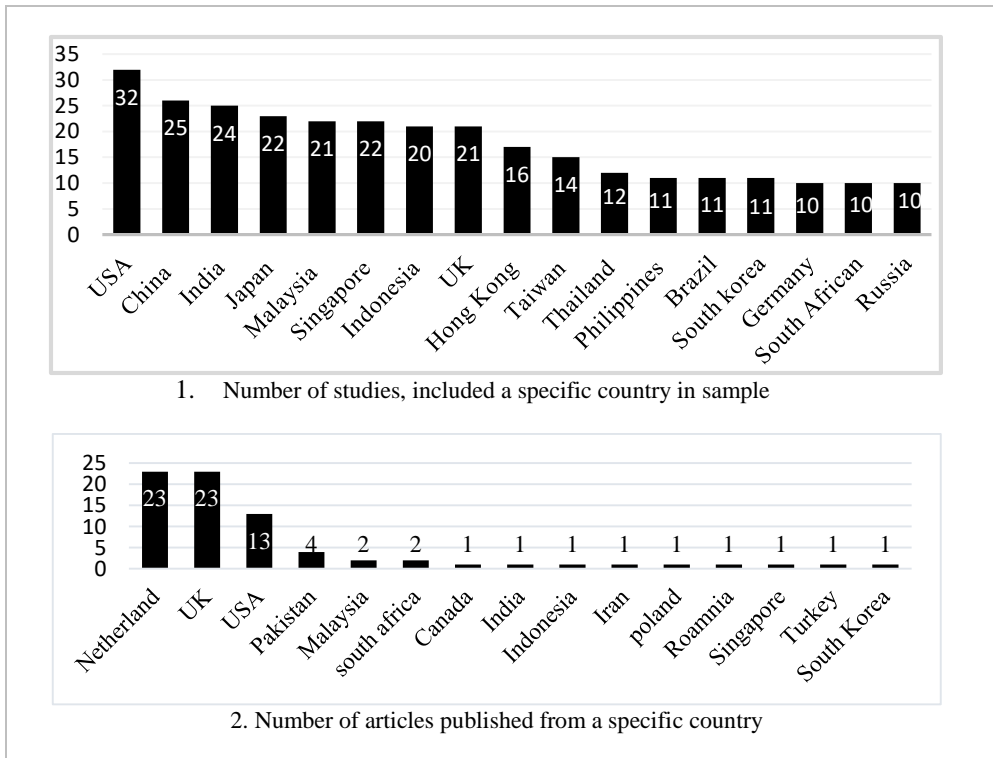


Figure 2: Literature classification

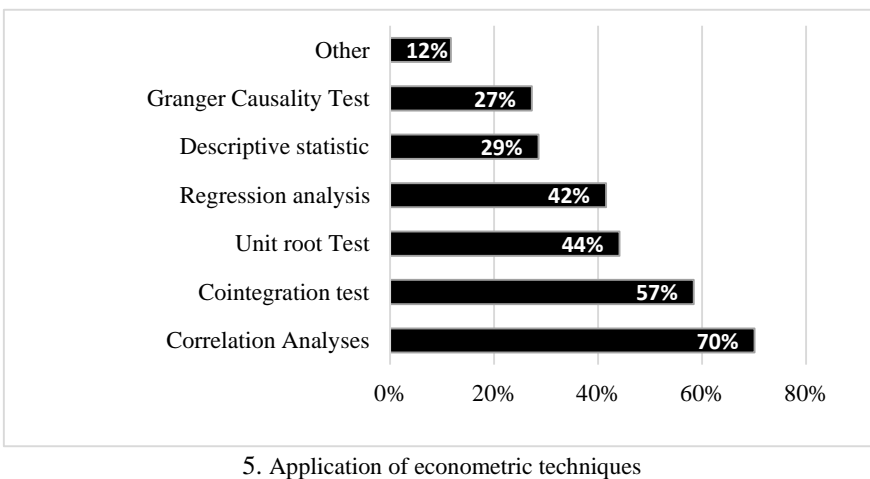
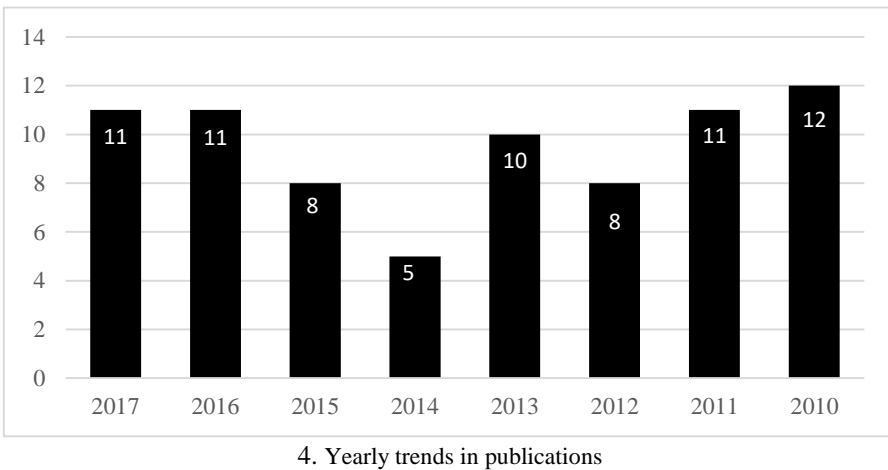
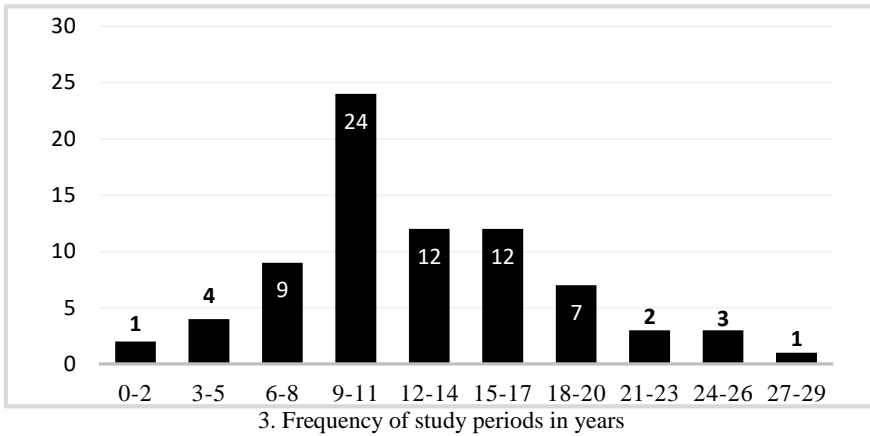
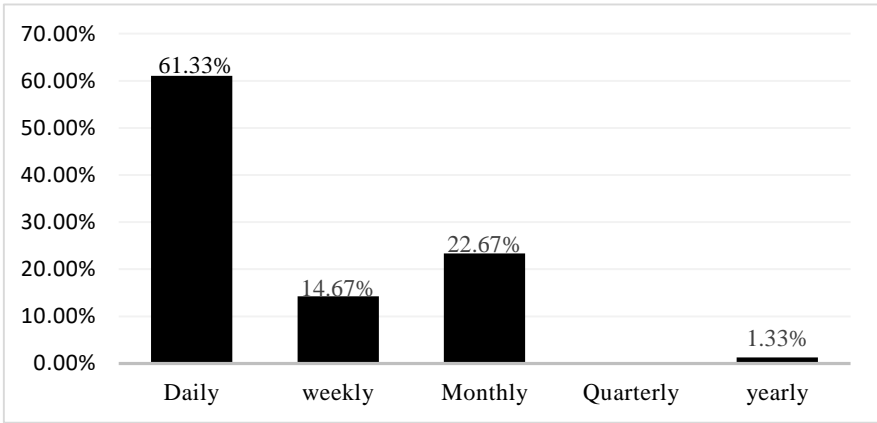
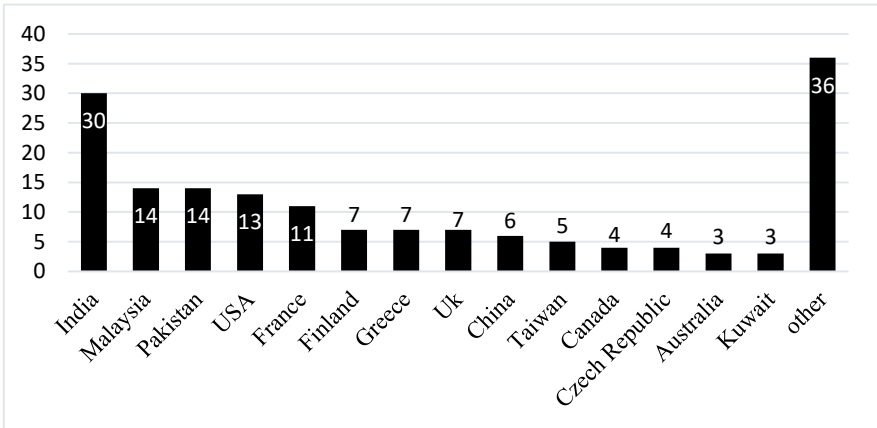


Figure 2 (continued)



6. Data frequencies



7. Research contributions [affiliations], country wise

Figure 2 (continued)

4.1 Most Studied Markets

In this subsection, we present the classification of evidence based on more (less) research focus on various countries, to identify less focused regions. Accordingly, a group of eight (USA, India, China, Japan, Malaysia, Singapore, Indonesia and the UK) stock markets is included in 20 or more studies, followed by Hong Kong researched in a range of 15-20 studies. A group of eight markets (Taiwan, Thailand, Philippines, Brazil, South Korea, Germany, South Africa, and Russia) has been researched in a range of 10-15 studies. Score for all other countries is less than 10. GDP size (USA and China), developmental stage (USA, UK and Japan) and Geographic location (Indonesia and Malaysia), have been considered in the study of the integration of markets—as depicted by the inclusion of countries in study groups. It is important to note that developed and developing, larger GDP as well as Smaller GDP, countries have been researched during the period under review. Certain economic regions—Central Asia, East Europe, GCC, Africa (North, South, and Central), South America—have got less focus in research during the period under review, and offer potential research avenue.

4.2 Countries of Publications

Classification based on published research (origin of publication) is presented in this subsection. According to results, UK is leading with (23) along with Netherland (23), USA (13), Pakistan (4), Malaysia and South Africa (2-each). Publications in developed countries (Western Europe and North America) are far more than developing countries; however, it is encouraging to see South and Southeast Asian region (Pakistan and Malaysia) has shown some progress in academic publishing.

4.3 Study Periods

The study period is an important factor in reliability of results. Data frequency (daily, weekly and monthly) also plays a vital role in the study of long-run equilibrium of two markets. Accordingly, sample periods ranging from 2-29 years. The highest number of studies (24) has used around ten years (9-11), followed by 12-14 years and 15-17 years as sample period (in 12 studies, each), 6-8 years in 9 studies. 19% of studies have used data for less than ten years, while 8% of studies have selected sample period above 20 years. A period ranging from 9-17 years is the most widely used study period during the review period, and it looks reasonable to study long-run equilibrium by using a data period within this range. Empirics suggest the use of 9-17 years' data period as appropriate.

4.4 Publication Trends

Yearly publications determine trends in research. According to results, mixed trends emerge in publications; however, a higher number of publications came on the surface in 2010, 2016, and 2017 (opening and closing years of sample periods). Average publications during the period under review are 9.5, and precisely in earlier 50% of the sample period, publications are more than average; however, this does not establish a pattern—whether increasing trend or decreasing within the sample period. However, publications in the post-financial crisis era are significantly more than the pre-financial crisis era (See Sharma and Seth, 2012, for the pre-crisis era).

4.5 Econometric Techniques

Multiple econometric techniques are used to study long-run equilibrium between stock markets—with pros and cons. Descriptive statistics included 29% of the studies. Correlation (70%), Unit root (44%) [to determine order of integration] and cointegration (57%) tests are leading, followed by regression (42%) and Granger causality (27%). Mixed patterns were found in the application of techniques, during further in-depth analysis; however, some new techniques—Heteroskedastic, ICSS algorithm, Lagrange multiplier, Principal component analysis, and Variance gamma, etc. were used, in addition to traditional cointegration methods—correlation, cointegration, and Granger causality.

4.6 Data Frequencies

Data frequencies include using data with an interval (daily, weekly, monthly, quarterly, Semiannually and annually) and it has implications for results. Researchers are not in agreement as which data frequency is appropriate. According to results, the highest choice is daily data (61%), followed by monthly (23%) and weekly (15%). It is interesting to note that generally an argument is stated that weekly data is more appropriate to study relationship, as against to monthly (because of the big gap); and daily data (on account of too much noise). However, during the period under review, researchers have preferred using daily and monthly data, overwhelmingly, and only 14% of studies have used weekly data. Further analysis reveals that trends in data selection do not reveal any pattern, and mixed trends emerged (all types of data [daily, weekly and monthly] are used in all years).

4.7 Research Contributions

Research contribution, country wise, is calculated, based on affiliations disclosed by authors, to highlight the contributions of the academic/research community. As per results, highest contributions in the research area of market integration have been made by researchers from South and Southeast Asia (India, Pakistan and Malaysia). 30 authors reported affiliation with India, while 14 with Pakistan and Malaysia, each. USA is at number three with 13 authors, followed by France (11), and Finland, Greece, and UK (7 each). A group of six countries (China, Taiwan, Canada, Czech, Australia and Kuwait) has published between 3-6 articles each, during the review period. Other countries contribute to the rest of the studies. South Asian authors have contributed most in published research on market integration, during the period under review.

5. Review of Findings

Findings of the selected studies [only indexed publications] are reported under classifications of economic settings (Developed-Developing); and regional markets (Europe, Africa, Latin America, Middle East and Asia/Pacific). Results of a unique sample BRICS also included. Selected studies are reported in Table 2.

Table 2: Selected studies

Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2010	Gupta & Guidi	Cointegration relationship and time varying co-movements among Indian and Asian developed stock markets	International Review of Financial Analysis	1999-2009	India, Hong Kong, Japan, Singapore	There does not exist any cointegration between markets
2010	Huyghebaert & Wang	The co-movement of stock markets in East Asia. Did the 1997-1998 Asian Financial Crisis really strengthen stock market integration?	China Economic Review	1992-2003	Japan, Singapore, Hong Kong, Taiwan, South Korea, China	There does not exist any cointegration between markets
2010	Mylonidis & Kollias	Dynamic European stock market convergence: Evidence from rolling cointegration analysis in the first euro-decade	Journal of Banking & Finance	of 1999-2009	Germany, France, Spain, Italy	The results show that out of four stock markets used German and French markets have higher convergence.

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Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2010	Ammer <i>et al.</i>	Has international financial co-movement changed? Emerging markets in the 2007-2009 financial crisis	Contemporary Studies in Economic and Financial Analysis	1992-2009	China, India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Taiwan, Thailand, Czech, Egypt, Hungary, Israel, Poland, Russia, South Africa, Turkey, Ukraine, Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay, Venezuela.	There is a cointegration between markets
2010	Masood <i>et al.</i>	Cointegration of Baltic Stock Markets in the financial tsunami: Empirical evidence	International Journal of Business	-	Estonia Latvia Lithuania	There is a cointegration between markets
2010	Ahlgren & Antell	Stock market linkages and financial contagion: A cobreaking analysis	The Quarterly Review of Economics and Finance	1980-2006	Germany, Japan, UK, USA	There is a cointegration between markets
2010	Jawadi <i>et al.</i>	Stock market integration in Mexico and Argentina: are short- and long-term considerations different?	Applied Economics Letters	1987-2008	Argentina, Mexico, USA	There is a cointegration between markets
2010	Karim <i>et al.</i>	The subprime crisis and Islamic stock markets integration	International Journal of Middle Eastern Finance and Management	2006-2008	Malaysia, Indonesia, USA, Japan, UK	There does not exist any cointegration between markets

Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2010	Sbeiti & Alshammari	Integration of stock markets in the GCC Countries: An application of the ARDL bounds testing model	European Journal of Economics, Finance and Administrative Sciences	2002-2006	Qatar, Bahrain, Oman, UAE, Saudi Arabia, Kuwait	There is a cointegration between markets
2010	Modi <i>et al.</i>	The study on co-movement of selected stock markets	International Research Journal of Finance and Economics	1997-2008	Russia, Mexico, Brazil, UK, USA, India	There is a cointegration between markets
2010	Marashdeh & Shrestha	Stock market integration in the GCC countries	International Research Journal of Finance and Economics	2002-2009	Bahrain, Kuwait, Oman, Saudi Arabia, UAE, Qatar	There does not exist any cointegration between markets
2010	Ergun & Nor	The stock market relationship between Turkey and the United States under unionization	Asian Academy of Management Journal of Accounting and Finance	1998-2008	Turkey, USA	There is a cointegration between markets
2011	Caporale & Spagnolo	Stock market integration between three CEECs, Russia and the UK	Review of International Economics	1996-2008	Czech Republic, Hungary, Poland, UK, Russia	There is a cointegration between markets
2011	Demian	Cointegration in Central and East European markets in light of EU accession	Journal of International Financial Markets, Institutions & Money	2001-2009	Hungary, Poland, Czech Republic, Slovakia, Estonia, France, UK, Italy, Germany, Romania	There does not exist any cointegration between markets
2011	Kizys & Pierdzioch	The financial crisis and the stock markets of the CEE countries	Journal of Economics and Finance	1995-2008	Czech Republic, Hungary, Poland, Germany, USA, UK	There is a cointegration between markets
2011	Jayasuriya	Stock market correlations between China and its emerging market neighbors	Emerging Markets Review	1993-2008	China, Thailand, Indonesia, Philippines	There does not exist any cointegration between markets

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Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2011	Karim <i>et al.</i>	The subprime crisis and stock index futures markets integration	The Journal of Risk Finance	2001-2009	Malaysia, USA, Singapore, UK, Japan	There does not exist any cointegration between markets
2011	Agyei-Ampomah	Stock market integration in Africa	Managerial Finance	1998-2007	Botswana, Ivory Coast, Egypt, Ghana, Morocco, Nigeria, South Africa, Kenya, Mauritius	There does not exist any cointegration between markets
2011	Kenourgios & Samitas	Equity market integration in emerging Balkan	Research in International Business and Finance	2000-2009	Turkey, Romania, USA, UK, Germany, Greece, Bulgaria, Croatia, Serbia, Bulgaria	There is a cointegration between markets
2011	Sharma & Bodla	Inter-linkages among stock markets of South Asia	Asia-Pacific Journal of Business Administration	2003-2010	India, Pakistan, Sri Lanka	There is a cointegration between markets
2011	Floros	Dynamic relationships between Middle East stock markets	International Journal of Islamic and Middle Eastern Finance and Management	1997-2007	Egypt, Israel	There is a cointegration between markets
2011	Beaulieu <i>et al.</i>	A cross-section analysis of financial market integration in North America using a four factor model	International Journal of Managerial Finance	1984-2003	North American stock market	There is a cointegration between markets
2011	Subhani <i>et al.</i>	Are the major South Asian equity markets co-integrated?	International Journal of Humanities and Social Science	1995-2011	Pakistan, India, Bangladesh, Nepal	There is a cointegration between markets

Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2012	Karim & Karim	Integration of Asean-5 Stock markets: A revisit	Asian Academy of Management Journal of Accounting and Finance	1988-2010	Malaysia, Indonesia, Thailand, Philippines, Singapore	There is a cointegration between markets
2012	Horvath & Petrovski	International Stock Market Integration: Central and South Eastern Europe Compared	Economic System	2006-2011	Czech Rep, Hungary, Croatia, Poland, Macedonia, Serbia, Europe	There is a cointegration between markets
2012	Neaime	The global financial crisis, financial linkage and correlations in returns and volatility in emerging MENA stock markets	Emerging Market Review	2007-2010	Egypt, Jordan, Kuwait, Morocco, Saudi Arabia, Tunisia, UAE, UK, France, USA	There is a cointegration between markets
2012	Meric <i>et al.</i>	Co-movements of and Linkages between Asian Stock Markets	Business and Economics Research Journal	2001-2011	Australia, Hong Kong, India, Indonesia, Japan, Malaysia, New Zealand, Philippines, Singapore, Shanghai, South Korea, Taiwan, Thailand	There is a cointegration between markets
2012	Burdekin & Siklos	Enter the dragon: Interactions between Chinese, US and Asia-Pacific equity markets, 1995-2010	Pacific-Basin Finance Journal	1995-2010	Hong Kong, Australia, Korea, Singapore, Taiwan, Malaysia, Indonesia, China, New Zealand, Thailand, Philippines	There is a cointegration between markets
2012	Nikkinen <i>et al.</i>	Baltic stock markets and the financial crisis of 2008–2009	Research in International Business and Finance	2004-2009	Estonia, Latvia, Lithuania	There is a cointegration between markets

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Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2012	Batareddy <i>et al.</i>	The stability of long-run relationships: A study on Asian emerging and developed stock markets (Japan and US)	International Journal of Emerging Markets	1998-2008	India, Taiwan, China, Korea	There is a cointegration between markets
2012	Perera & Wickramanayake	Financial integration in selected South Asian countries	South Asian Journal of Global Business Research	1990-2010	Bangladesh, India, Pakistan, Sri Lanka	There is a cointegration between markets
2013	Tiwari <i>et al.</i>	Stock Market Integration in Asian Countries: Evidence from Wavelet multiple correlations	Journal of Economic Integration	2005-2012	India, Japan, China, Malaysia, Hong Kong, Singapore, Korea, Indonesia, Taiwan	There is a cointegration between markets
2013	Tahir <i>et al.</i>	Interdependence of South Asian & developed stock markets and their impact on KSE (Pakistan)	Asian Economic and Financial Review	1999-2011	Pakistan, India, Sri Lanka, Bangladesh, USA, UK, Australia, Japan	There does not exist any cointegration between markets
2013	Guesmi <i>et al.</i>	Does shift contagion exist between OECD stock markets during the financial crisis?	Journal of Applied Business Research	2002-2009	USA, Canada, Finland, France, Germany, Ireland, Italy, Netherland, Spain, Denmark, Norway, Sweden, Japan, Switzerland, UK, Australia, New-Zealand	There is a cointegration between markets
2013	Gjika & Horváth	Stock market comovements in Central Europe: Evidence from the asymmetric DCC model	Economic Modelling	2001-2011	Czech Republic, Poland, Hungary	There is a cointegration between markets

Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2013	Graham <i>et al.</i>	Global and regional co-movement of the MENA stock markets	Journal of Economics and Business	2002-2010	S&P, MENA	There is a cointegration between markets
2013	Palamalai <i>et al.</i>	Stock market linkages in emerging Asia-Pacific markets	Sage open	2000-2013	India, Malaysia, Hong Kong, Singapore, South Korea, Taiwan, Japan, China, Indonesia	There is a cointegration between markets
2013	Ahmad <i>et al.</i>	Eurozone crisis and BRIICKS stock markets: Contagion or market interdependence ?	Economic Modelling	2009-2012	Greece, Spain, Ireland, Portugal, Italy, USA, UK, Japan, Brazil, China, South Korea, South Africa, Russia, India, Indonesia	There is a cointegration between markets
2013	Rajwani & Mukherjee	Is the Indian stock market cointegrated with other Asian markets?	Management Research Review	1991-2011	Hong Kong, Japan, Inodnesia, South korea, Malaysia, China	There does not exists any cointegration between markets
2013	Alexakis & Vasila	On the integration of European capital markets	Managerial Finance	1990-2008	Europe, UK, France, Germany, Sweden, Italy	There is a cointegration between markets
2013	Dhanaraj <i>et al.</i>	Dynamic interdependence between US and Asian markets: An empirical study	Journal of Financial Economic Policy	1999-2009	China, India, Hong Kong, Singapore, South korea, Taiwan, USA	There does not exists any cointegration between markets

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Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2014	Alnodel	The effect of the adoption of international financial reporting standards on capital market integration in the Gulf Cooperation Council Countries	Journal of International Accounting Research Conference	2007-2013	Saudi Arabia, UAE, Oman, Qatar, Kuwait	There does not exist any cointegration between markets
2014	Guesmi & Teulon	The determinants of regional stock market integration in Middle East: A Conditional ICAPM Approach	International Economics	1996-2008	Jordan, Israel, Egypt, Turkey	Markets are cointegrated in the long run.
2014	Dasgupta	Integration and dynamic linkages of the Indian stock market with BRIC – An empirical study	Asian Economic and Financial Review	2003-2012	India, China, Brazil, Russia	No cointegration between BRICS stock markets. Cointegration between Indian and Brazilian markets
2014	Yang <i>et al.</i>	Cointegration analysis and influence rank – A network approach to global stock markets	Physical A: Statistical Mechanics and its Applications	2002-2012	Netherlands, Austria, France, Germany, UK, Norway, Sweden, Switzerland, Russia, Australia, India, Hong Kong, Vietnam, Malaysia, Korea, Japan, China, Singapore, Taiwan, Israel, Brazil, Mexico, USA, South Africa, Argentina, Canada	Markets are cointegrated in the long run.

Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2014	Ong & Ho	Testing for linear and nonlinear Granger noncausality hypothesis between stock and bond: The cases of Malaysia and Singapore.	The Singapore Economic Review	1994-2010	Malaysia, Singapore	Markets are cointegrated in the long run.
2015	Alotaibi & Mishra	Global and regional volatility spillovers to GCC stock markets	Economic Modelling	2005-2013	Saudi Arabia, USA, Qatar, Kuwait, Bahrain, Oman, UAE	Markets are cointegrated in the long run.
2015	Mohanasundaram & Karthikeyan	Cointegration and stock market interdependence: Evidence from South Africa, India and The USA	South African Journal of Economic and Management Sciences	2004-2014	South Africa, India, USA	Markets are not cointegrated
2015	Chien <i>et al.</i>	Dynamic Asian stock market convergence: Evidence from dynamic cointegration analysis among China and the ASEAN-5	Economic Modelling	1992-2013	China, Singapore, Malaysia, Thailand, Philippines, Indonesia	Markets are cointegrated in the long run.
2015	Bentes	On the integration of financial markets: How strong is the evidence from five international stock markets?	Physica A: Statistical Mechanics and its Applications	1999-2014	Portugal, Spain, Japan, UK, USA	Markets are cointegrated in the long run.
2015	Arsyad	Integration between East and Southeast Asian equity markets	Journal of Financial Economic Policy	2003-2013	Hong Kong, Japan, Korea, south Korea, Thailand, china, Vietnam, Indonesia, Singapore, Philippines, Malaysia	Markets are cointegrated in the long run.

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Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2015	Dengjun	Interdependence between Nordic stock markets and financial cooperation	Review of Accounting and Finance	2001-2011	Denmark, Norway, Sweden, Finland	Markets are cointegrated in the long run.
2015	Oanea	Financial markets integration: A vector error-correction approach	The Journal of Economic Asymmetries	2011-2013	Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia	Markets are cointegrated in the long run.
2015	Seth & Sharma	International stock market efficiency and integration: Evidences from Asian and US markets	Journal of Advances in Management Research	2001-2010	India, USA, China, Hong Kong, Indonesia, Malaysia, Japan, Singapore, South Korea, Israel, Pakistan, Taiwan	Markets are cointegrated in the long run.
2016	Caporale <i>et al.</i>	Linkages between the US and European stock markets: Fractional Cointegration Approach	International Journal of Finance & Economics	1996-2009	Europe, USA	Fractional Cointegration among markets
2016	Hussain & Saeed	Cointegration of stock market returns: A case of Asian countries	Pakistan Journal of Applied Economics	1995-2014	Hong Kong, Japan, Singapore, China, India, Indonesia, Korea, Pakistan, Sri Lanka	The results suggest that there is long run cointegration between Asian markets.
2016	Deltuvaite	Investigation of stock market integration in the Baltic Countries	de gruyter	2000-2014	Estonia, Lithuania, Latvia	There is high cointegration
2016	Al Nasser & Hajilee	Integration of emerging stock markets with global stock markets	Research in International Business and Finance	2001-2014	Brazil, Mexico, Russia, Turkey, China	Short-run integration among markets in emerging and developed markets.

Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2016	Fowowe & Shuaibub	Dynamic spillovers between Nigerian, South African and international equity markets	International Economics	2005-2013	South Africa, Nigeria	The results show that South African markets more integrated with world markets than Nigerian markets.
2016	Mensi <i>et al.</i>	Global financial crisis and spillover effects among the U.S. and BRICS stock markets	International Review of Economics & Finance	1997-2003	USA, Brazil, Russia, India, China, South Africa	The research brings the result that there is correlation between markets of USA and BRICS.
2016	Mata & Mora	Nunez Dependence between the Chinese and MILA stock markets	Journal of Chinese Economic and Foreign Trade Studies	2000-2015	China, Peru, Mexico, Colombia, Chile	The relationship between China and the countries Chile, Mexico and Peru is positive, while for the case of Colombia the relationship is negative.
2016	Shahzad <i>et al.</i>	Relationship between developed, European and South Asian stock markets: a multivariate analysis	South Asian Journal of Global Business Research	1998-2015	Pakistan, India, Sri Lanka, USA, UK, Europe	There is a cointegration
2016	Gabriella <i>et al.</i>	Financial integration in Asean-5	Economics and Finance in Indonesia	1999-2015	Indonesia, Malaysia, Singapore, Thailand, Philippines	Increased integration post Financial crisis

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Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2016	Liow	Global financial crisis and cyclical co-movements of Asian financial markets	Journal of Property Investment & Finance	2000-2014	Japan, Hong Kong, Singapore, Korea, Indonesia, Malaysia, Thailand, China, USA, Taiwan, Philippines	Increased integration post Financial crisis
2016	Lee & Goh	Regional and international linkages of the Asean-5 stock markets: A multivariate Garch Approach	Asian Academy of Management Journal of Accounting and Finance	2002-2011	Singapore, Indonesia, Thailand, Hong Kong U.S.A, Philippines, Malaysia	decreased integration post Financial crisis
2017	Tursoy & Faisal	Re-testing for financial integration of the Turkish Stock Market and the US Stock Market: An Evidence from co-integration and error correction models	Romanian Statistical Review	1989-2015	US, Turkey	Very high cointegration Uni-directional from US markets to Turkish stock markets.
2017	Chang <i>et al.</i>	Stock market interactions between the BRICS and the United States: Evidence from asymmetric granger causality tests in the frequency domain	Iranian Economic Review	1997-2012	Brazil, Russia, India, China, South Africa	The result showed that the shocks in USA have impact on BRICS markets except for south Africa.
2017	Chow	Volatility spillovers and linkages in Asian stock markets	Emerging Markets Finance and Trade	1999-2016	China, Hong Kong, Indonesia, Korea, Philippines, Japan, Malaysia, USA, Taiwan, Thailand, UK, Singapore	There does not exists any cointegration between markets

Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2017	Sarwar & Khan	The effect of US stock market uncertainty on emerging market returns	Emerging Markets Finance and Trade	2003-2014	Brazil, Mexico, Chile, Colombia, Peru, USA	The authors found that in case of VIX increase it leads to declines in emerging market returns in all periods.
2017	Bundoo	Stock market development and integration in SADC (Southern African Development Community)	Review of Finance	1999-2011	Botswana, Malawi, Mauritius, Namibia, South Africa, Zambia, USA, Tanzania	There does not exist any cointegration between markets
2017	Fukuda & Tanaka	The impacts of emerging Asia on global financial markets	Emerging Markets Finance and Trade	1992-2016	Japan, USA, China, Hong Kong, South Korea, Singapore, Thailand, Malaysia, Indonesia, Philippines, UK, Germany, France, Taiwan	Spillover from emerging Asian markets to foreign markets were much larger in post crisis period than pre-crisis.
2017	Espinosa-Méndez <i>et al.</i>	Is the virtual integration of financial markets beneficial in emerging markets? Evidence from MILA	Emerging Markets Finance and Trade	2002-2016	Chile, Colombia, Mexico, USA	High cointegration
2017	Dewandaru <i>et al.</i>	Unravelling the financial contagion in European stock markets during financial crises: Multi time scale analysis	Emerging Markets Finance and Trade	1984-2011	Germany, France, UK, Sweden, Switzerland	There exist a cointegration

Years	Authors	Title	Journal Name	Study Period	Sample Countries	Summary Findings
2017	Kumar & Dhankar	Financial instability, integration and volatility of emerging South Asian stock markets	South Asian Journal of Business Studies	2000-2014	India, Pakistan, Sri Lanka, Bangladesh	The authors concluded that south Asian Markets are integrated with international markets.
2017	Boamah	The global financial market integration of selected emerging markets	International Journal of Emerging Markets	1997-2015	Argentina, Egypt, Brazil, Malaysia, Mexico, Singapore, Thailand, Jamaica, Botswana, Ivory Coast, Ghana, Kenya, Mauritius, Nigeria, South Africa, Tunisia, Morocco, India, Indonesia, Zambia, USA	Cointegration of emerging markets with world markets exceeds the integration of regional markets.
2017	Wang <i>et al.</i>	Stock market contagion during the global financial crisis: A multiscale approach	Finance Research Letters	2002-2009	Japan, Brazil, France, UK, Russia, India, Italy, Germany, China, Canada	The result indicates that there is a cross correlation between markets during crisis and pre-crisis.

Evidence favours lack of integration among global markets in post-financial crisis, as opposed to the pre-crisis period. Also, integration between developed and developing markets has been increased. Besides, evidence leads to a significant impact on the integration of markets during the financial crisis. Integration of Chinese market has increased in post subprime crisis era. Finally, Findings suggest that the integration of emerging markets with world markets exceeds the integration of regional markets.

Multiple studies conducted in European region indicate integration of the region. Linkages of European markets have strengthened with USA during the financial crisis period. In developed European markets, high level of integration exists; Results support the convergence of French and German market. Balkan markets are integrated with western Europe and USA. Also, South West European markets (Portugal, Spain) are integrated with global markets. Little contribution of EU accession in the integration of European markets is

documented; however, an increase in correlation in post-European-union era has been documented. Baltic region and Scandinavian markets are integrated within their sub-regions.

BRICS, a unique sample of emerging markets include Brazil, India, Russia, China and South Africa. Evidence leads to the integration of BRICS markets with USA; however, the integration of markets within the group is non-existent—leading to diversification opportunities. In case of the MENA region, moderate comovement with global indexes and a higher degree of integration within the region is documented. In Middle Eastern markets, long-run integration exists. In case of Egyptian and Israeli markets, partial co-movement of the indexes is documented. Saudi Arabia and USA are significant influencers in Gulf markets (GCC). The African region is independent (except South Africa) and variations in indexes are country-specific while USA and Chinese markets influence Latin American region except for Colombia.

Evidence favours the integration of developing (India, Taiwan, China, South Korea, Japan), and developed (USA) markets. Cointegration and Granger causality leads to evidence of integration between East Asian and Far Eastern markets. Results suggest relative dominance of USA over Japan and China; and increased influence of Chinese market than the Japanese market over Asian markets. Evidence favours the integration of Chinese market with the regional as well as global markets. In the case of East Asian markets, first, during the Asian financial crisis, the linkage between markets strengthen except for China. Second, evidence lacks on long-run cointegration among stock markets. In South-East Asian region, results support integration of markets in pre and post 1997 crisis period as well as in post-financial crisis (2007) era. However, Islamic Stock markets of the region shown lack of co-movements. Results favour cointegration in China and ASEAN markets. Also, increased regional and global influence in fluctuations of ASEAN markets is documented. An increase in spillover effects in the post-financial crisis era is found in the ASEAN region. In South Asia, the influence of Indian market on Pakistani and Sri Lankan markets is documented. Evidence is in favour of integration of south Asian markets. Also, long-run integration exists between developed and emerging South Asian markets. Indian market, reports lack of integration with selected regional markets.

6. Conclusion

Past eight years have seen much interest of academicians/researchers in the area of market integrations, as depicted by several studies (published materials). This study documents the developments in the area of market integrations' quantitatively. It is found in the process that some areas—South America, Africa, and Central Asia—have been overlooked/less focused, offering candidacy for potential research plans in the area of portfolio diversification. Overwhelming interest in publishing research from less developed regions, including South Asia and Far East Asia is very encouraging. Publication avenues are concentrated in Western Europe and North America; however, South and Southeast Asia is emerging in research publications.

Review of findings reveals increased integration of markets based on economic groupings and geographic locations. Long-run Integration of regional markets has been reported from South East Asia, South Asia, Middle East, and Europe. However, in the African region, the evidence favours a lack of integration. USA and Chinese markets influence Latin American markets. Influence of Chinese market is increasing. Findings are mixed in case of BRICS (Brazil, Russia, India, China and South Africa) and global markets.

Results of a publication based on past data, especially in social sciences, are a mere indication of past behaviour and no guarantee of repetition, like natural sciences. Published results are very sensitive to research methodology—data frequency, length of period, tests applied (lag and model selections, etc.)—and should be interpreted by taking into account

these details. Hence, repeated studies taking into account multiple angles, with a variety of techniques, as well as, data frequencies are the only way to better understand a particular market.

Future research agenda includes the study of cointegration of markets got less attention, during the period under review, as well as, the re-examination of markets with evidence taking into account multiple variations in research methodology for comparison of results.

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