

Are the Global Stock Markets Inter-linked? Evidence from the Literature

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Abstract- Opening-up of the financial markets of the world for foreign capital has led to the increased financial integration among different countries. This paper reviews and summarizes the research on the subject of integration and dynamic linkages between stock markets in different parts of the world. Majority of the studies suggested that market integration has increased significantly over the years, within an international context. We find that not many studies have concentrated on the interaction of Indian markets with the foreign markets, and most of the studies concerning Indian have concentrated at the inter-relationship of Indian stock market with those of the Developed nations. Therefore, there is a scope to study the inter-linkages between Indian stock markets and those of the other SAARC nations.

Keywords- Financial integration, dynamic linkages, SAARC Nations

I INTRODUCTION

The present global business environment is presenting a unique set of opportunities and challenges to the business organizations, consumers and the investors. During the last 20 years, the world is living in a new era of globalized economies and capital markets. Companies, and capital, “cross” countries’ borders in order to take advantage of arbitrage opportunities and to cover regional market imperfections (Grubel 1968). As the fruits of economic integration of the world spread across the globe, masses are moving up the value chain. This makes people look for some highly rewarding investment avenues. As a result, a number of new and old investment avenues are getting popular in recent times. Equity markets are one of the most rapidly developing investment avenues, of late. Across the globe, a broad movement towards an equity culture has taken root as traditional bank financing takes a back seat to the emergence of globally interconnected capital markets. Interaction of financial markets is one of the most extensively discussed topics of financial literature. Various factors contributed in this dimension. These include cross border movement of funds, the technological innovations in communications, scientific trading, and settlement systems, and the introduction of innovative financial products. Globalizations also played a pivotal role in increasing the interest in the study of dynamic inter-linkages among financial markets (Hasan, Saleem and Abdullah, 2008).

Levine and Zervos (1996) pointed out that the perfect capital market integration needs the free flow of capital across international borders to equate the price of risk. If there exists any capital controls or other barriers impede the movement of capital, the price of risk tends to be different internationally.

The issue of financial integration has strong implications on financial stability. On the one hand, financial integration would benefit the region through more efficient allocation of capital, a higher degree of risk diversification, a lower probability of asymmetric shocks, and a more robust market framework (Pauer (2005). These effects would help improve the capacity of the economies to absorb shocks and foster development. Moreover, financial integration may also promote financial development and hence enhance economic growth. The suppliers of capital – institutional investors and/or individual savers – receive better returns on their investments. Capital seekers around the world are looking beyond their home country's borders for financial resources. This results in increased integration between the Stock markets throughout the world. On the other hand, intensified financial linkages in a world of high capital mobility may also lead to the financial instability in one country being transmitted to neighbouring countries more rapidly.

The main drivers of these stock market interdependencies are the progressive deregulation of financial markets, the technological improvements and the development of investment institutions, such as insurance companies, pension funds and so on.

Integration is generally opposed to segmentation depending on whether or not barriers to investment exist between countries. Barriers to investment are essential factors that can prevent markets to integrate. Among these factors are exchange rate risks, legal and tax differences, information availability, foreign ownership restrictions, home bias (Stulz, 1981; Errunza and Losq, 1985).

In this way, the financial world is reshaping itself. New market structures and practices are need of time due to financial liberalization and elimination of traditional regulatory barriers and advancement of technology. We are marching towards a globally integrated financial world. Emerging equity markets are attracting the attention of global fund managers because these offer opportunity for

portfolio diversification. The benefits and costs of international portfolio diversification need to be considered by anyone holding a financial Portfolio (Hasan, Saleem, and Abdullah, 2008).

With financial integration, the law of one price to financial assets with the same risk is being tested. If financial markets are not integrated, investors face different expected returns for the same asset (Adjouté, Danthine, 2003), (Baele et al., 2004), (Bekaert, Harvey, 1997). This is because of the fact that source of risk and their price may differ across markets (Kucukcolak, 2008). On the same lines, Adam et al. (2002) argue “financial markets are integrated when the law of one price holds. In perfectly integrated markets, all assets with identical risk exposure also command identical expected returns (Campbell and Hamao, 1992). In addition, a high degree of integration between national markets minimizes the potential benefit from international diversification (Bessler and Yang, 2003).

This paper reviews and summarizes the research on the subject of integration and linkages between stock markets in different parts of the world. There is a fair need to review the literature available on the topic since conflicting signals emerge from the literature about the existence of linkages. While some studies suggest that there exist the linkages between stock markets across the globe, some studies point otherwise. Moreover, a number of studies have focused on the developed nations and the emerging economies, have not received similar amount of attention. The study on hand, tries to reach a conclusion regarding the stock markets of which parts of the globe need to be studied for inter-linkages.

The literature used for the purpose of the study has been chosen based on frequency of being quoted. Hence, we use the frequently quoted studies as the inputs for our study.

The paper is structured in five parts. Part 1 gives the Introduction to the study, part 2 outlines the objectives of the paper, part 3 brings forth the concept of stock market linkages, part 4 deals with the literature available on Global financial markets, part 5 covers the studies on Asian stock markets, part 6 presents the historical work done on the subject in the form of a comprehensive table, and part 7 concludes the paper.

II OBJECTIVES OF THE STUDY

The study aims at the following objectives –

- i. to understand the concept of stock market linkages;
- ii. to review the literature available on the subject of stock market linkages in order to judge the level of integration of global financial markets; and
- iii. to find out the areas of future research in the field of global financial market integration.

III STOCK MARKET LINKAGES

There is no precise definition of capital market integration in the current literature (Adler and Dumas, 1983). However, there is a large body of financial literature which studies the existence of inter-linkages among international capital markets since such linkages have serious implications for

portfolio diversification as well as macroeconomic policies of the countries concerned (Bose, 2005). Stulz (1999) argues that as markets become more integrated, the cost of capital decreases because the removal of investment barriers allows for risk sharing between domestic and foreign agents.

All assets with identical risk exposure also command identical expected returns in perfectly integrated markets (Campbell and Hamao, 1992). Barriers to investment like exchange rate risk, legal and tax differences, information availability, foreign ownership restrictions, can prevent markets from integrating. (Stulz, 1981; Errunza and Losq, 1985). The complete elimination of barriers to financial integration allows firms to choose the most efficient sources and greater financial integration allows a better allocation of capital leading to the most productive investment opportunities to become available to investors, and a reallocation of funds to the most productive investment opportunities takes place.

IV LITERATURE ON INTEGRATION OF GLOBAL FINANCIAL MARKETS

The relationships between international stock markets have become increasingly important since *Grubel (1968)* analyzes the benefits of international diversification. His study was based on empirical data sketching ex post rates of returns from investment in 11 major stock markets. Since then many researchers have studied these relationships within an international context.

The interdependency between financial markets has been at the focus of interest since then. The majority of studies in that early period reach the conclusion that the degree of interdependency between markets is quite low, since the prime factors in the development of financial markets are of domestic nature. Even in those years some studies were published that supported the existence of limited interdependency between markets. These include Agmon (1972) who establishes some degree of interdependency between the markets of the US, UK, Germany and Japan during 1961 until 1966; and Ripley (1973) who finds that there is interdependency but only between those countries that are open to foreign capital investments, in contrast with the isolated markets that do not show any interdependence with the other countries (Glezakos, Merika, Kaligosfiris, 2007).

The interrelationships between seven stock markets, vis-à-vis, Germany, France, Italy, the Netherlands, Belgium, the United Kingdom and U.S.A. over the period 1969–1976 has been investigated by Bertoneche (1979). The results show a trend towards higher segmentation between the various stock exchanges, which means larger opportunities for international diversification.

The studies conducted by Eun and Shim (1989), Hassan and Naka (1996), Peiro et al. (1998) and Aggarwal and Park (1994) give significant conclusions with regard to the impact of US' markets over the other ones. Eun and Shim (1989) find a substantial multi-lateral interaction among the nine largest stock markets in the world. In particular, they documented that news originating in the U.S. market brings

the most influential responses from other national markets. Similar study has been undertaken by Hassan and Naka (1996) who investigate the dynamic linkages among the U.S., Japan, U.K. and German stock market indices using daily data for the 1984 to 1991 period. The research finds significant evidence in support of both short-run and long-run relationships among these four stock market indices. The study observes that U.S. stock market led other stock markets in short-run in the pre and post October 1987 crash, but led all other markets in the long-run in all periods examined. One long-run cointegrating equilibrium relationship has been found among the four stock market indices. This implies a limited role of international diversification for investors with long holding periods. However, because the US-Japan-Germany stock market indices, and Japan-UK-Germany indices are not cointegrated with each other, these indices may yield international portfolio diversification in the long-run. As such, the study could not arrive on any conclusive evidence on international stock market efficiency. Using daily return, Peiro et al. (1998) examine the stock markets of New York, Tokyo, and Frankfurt for the years 1990-1993. By applying non-linear least squares, they found that New York is the most influential stock market and Tokyo is the most sensitive to international innovations. Frankfurt stands in the middle. Aggarwal and Park (1994), on the other hand, examine the daily and overnight transmission of equity prices between the U.S. and Japan. The work finds that U.S. equity prices do not lead Japanese equity prices as both U.S. and Japanese opening equity prices reflect overnight price changes in the other market.

Kanas (1998) analyzes potential linkages between US stock markets and stock markets in UK, Germany, France, Switzerland, Italy and the Netherlands and found that the US does not share long-run relationships with any of these countries. However, contrasting results can be found in Gerrits and Yuce (1999) which finds evidence that the US stock market is cointegrated with Germany, UK, and the Netherlands.

The studies of Koch and Koch (1991), Longin, and Solnik (1995), point towards increase in the degree of international stock market correlation over a period. Koch and Koch (1991) study the evolving of dynamic linkages among the daily rates of return of eight national stock indexes since 1972. The study uses a dynamic simultaneous equations model to describe the contemporaneous and lead/lag relationships across national equity markets over three different years: 1972, 1980, and 1987. Growing market interdependence was revealed within the same geographical region over time. The study concludes that there was a high degree of international market efficiency in the given period. Longin and Solnik (1995) study the correlation of monthly excess returns for seven major countries over the period 1960-90. The study observes that the international covariance and correlation matrices are unstable over time. An explicit modelling of the conditional correlation indicates an increase of the international correlation between markets over the period under study. The study also finds that the correlation rises in periods of high volatility.

Kasa (1992) examines the common stochastic trends in the equity markets of the U.S., Japan, England, Germany, and Canada. He uses Monthly and quarterly data from January 1974 through August 1990 and applies Johansen (1988, 1991) tests for common trends. His study points towards a single common trend, although the stochastic properties and relative importance of this trend differs somewhat from the trend in stock prices. Richards (1995) points out that a major reason for the findings in Kasa (1992) is an inappropriately long lag length used in the estimation process.

Kwan, Sim and Cotsomitis (1995) studies the monthly time series of nine major stock market indices over the period January 1982 to February 1991 to examine for causal linkages. The empirical results indicate that there is adequate evidence to refute the notion of informationally efficient stock markets.

Richards (1995) finds evidence for the predictability of relative returns and the existence of a 'winner-loser' effect across 16 national equity markets and concluded that national stock market indices include a common world component and two country-specific components, one permanent and one transitory.

The relationship between equity markets in the United States, Canada, and Mexico has been studied by Atteberry and Swanson (1997). The study identifies more causal relationships during periods of economic uncertainty than during periods of relative calm. This implies that the potential benefits associated with diversification across equity markets within the North American system appear to be diminished during periods of economic uncertainty. Pan, Liu and Roth (1999) examine linkages between the U.S. and five Asian-Pacific stock markets (Australia, Hong Kong, Japan, Malaysia, and Singapore) during the period from 1988 to 1994. The results of the study indicated that the six stock markets are highly integrated through the second moments of stock returns but not the first moments. Masih and Masih (2001) investigate the dynamic causal linkages amongst nine major international stock price indexes. Results of this study tend to support the contention offered by several studies in the literature of significant interdependencies between the established OECD and the Asian markets, and the leadership of the US and UK markets over the short and long run. It was found that these three markets (US, UK and Japan) have consistently contributed over 75% of global stock market capitalization over the major part of the sample under consideration.

Choudhry (1997) investigates the empirical investigation of the long-run relationship between stock indices from six Latin American markets and the United States using weekly data from January 1989 to December 1993, by applying the unit root tests, cointegration tests, and error-correction models. Results from the unit root tests provide evidence of a stochastic trend in all indices. Results from the cointegration tests indicate the presence of a long-run relationship between the six Latin American indices (with and without the United States index). Error-correction results indicate significant causality among the stated indices.

Janakiraman and Lamba (1998) examine the linkages between the stock markets in the Pacific-Basin region during 1988–96 using a vector autoregression model. The study finds that during 1988–96 the US market influences all other Australasian markets, except Indonesia, and none of these markets exert a significant influence on the US market. An analysis excluding the US market revealed persistent linkages between these markets that can be traced to the indirect influences of the US market. The study indicates that the markets that are geographically and economically close and/or with large numbers of cross-border listings exert significant influence over each other, with markets closing earlier in the day exerting greater influence over markets closing later in the day.

Roca (1999) investigates the price linkages between the equity market of Australia and that of the US, UK, Japan, Hong Kong, Singapore, Taiwan, and Korea using weekly MSCI stock market data covering the period 1974-1995. The study conducted Cointegration test using the Johansen (Journal of Economic Dynamics and Control, 12, 1988) and Johansen and Juselius (Oxford Bulletin of Economics and Statistics, 52, 1990) procedure and Granger-causality tests based on error-correction models and standard vector autoregression models. He found no correlation between Australia and the other markets. However, the Granger-causality and forecast variance decomposition analyses reveal that Australia is significantly linked with the US and the UK. The impulse response analyses further show that Australia responds to shocks from the US and the UK immediately during the first week and this response is completed with a period of four weeks.

The dynamic interdependence of the major stock markets in Latin America (Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela) has been studied by Chen, Firth and Rui (2002) using data from 1995 to 2000. The study finds that there is one cointegrating vector, which appears to explain the dependencies in prices. The results are robust to sensitivity tests based on translating indexes to US dollars (i.e., a common currency for all the markets) and to partitioning the sample into periods before and after the Asian and Russian financial crises of 1997 and 1998, respectively. Results of the study suggest that the potential for diversifying risk by investing in different Latin American markets is limited.

A number of studies have investigated the stock market linkages in Europe. These include Bessler and Yang (2003); Baele and Vennet (2001); Yonghyup (2003); and Aggarwal, Lucey and Muckley (2003). Bessler and Yang (2003) study the dynamic structure of nine major stock markets using an error correction model and directed acyclic graphs (DAG). The results did show that the Japanese market was among the most highly exogenous and the Canadian and French markets among the least exogenous in the nine markets under study. The US market was found to be highly influenced by its own historical innovations, but it was also influenced by market innovations from the UK, Switzerland, Hong Kong, France, and Germany. The study pointed out that the US market is the only market that had a consistently strong impact on price movements in other major stock

markets in the longer-run. Baele and Vennet (2001) investigate the existence of market integration in Europe for the period 1990-2000. Extracting weekly stock returns from the markets of ten European countries and applying a GARCH process, their results suggested that the main driver of European market integration is the reduction of currency volatility within European countries. Yonghyup (2003) examines the recent trend of sector-level returns for four European countries, France, Germany, Italy, and the UK, using "return on assets" of a panel of listed firms of these countries for the period 1988–95. Initial findings suggested that sector returns have converged across countries over time. However, when integration is tested within a capital-asset pricing model framework, the country effect remains strong. The overall result support the view that European capital market integration is under way, but is far from complete. Aggarwal, Lucey and Muckley (2003) examine the integration of European equity markets over the 1985-2002 period using a relatively new cointegrating technique that assesses how the level of integration in equity price levels changes over time. They supplement this technique by two other dynamic techniques that also measure the extent of time-varying integration from complementary perspectives. The three methods agree that there has been an increased degree of integration among European equity markets especially during the 1997-98 periods. The evidence presented in this study also indicated that Frankfurt is the dominant market for equities in Europe.

Glezakos, Merika and Kaligosfiris (2007) examine the short and long run relationships between major world financial markets with particular attention to the Greek stock exchange. The study covers the period of 2000-2006 using monthly data. The study finds out that the US global influence is noticeable on all major world financial markets. It also responds significantly to primarily domestic shocks. Furthermore, our findings suggest that the Athens stock market is strongly affected by the US and the German markets but the influence as the estimation of the impulse response function suggested is completed within a day. This paper also presents a summary of research done on Stock market integration across the globe. However, this summary is mostly focused on the Developed world. Out of the 22 papers quoted in the summary, as many as 18 deal with the Developed world. These papers are ranging from the year 1989 to 2001.

Kucukcolak (2008) measures the integration level of the Turkish equity market with the EU market indices of UK, Germany, France and Greece. The study uses daily data for the period of 2001-2005. The study concludes that in the long run, the Turkish stock market is not co-integrated with its mature counterparts in the EU, in contrast to the Greek market, which is co-integrated.

V LITERATURE ON ASIAN MARKETS

The stock market crash of 1987 holds special relevance in the study of integration of Asian stock markets with those of the Developed world. The crisis originated with the US when within a duration of five trading days in October 1987,

the prices on New York Stock Exchange fell by one-third. This movement was triggered by high trade deficits and proposed takeovers related legislation. The crisis, after originating from the US spread to all major developed markets except Japan. It is worth mentioning here that the stock markets of most of the Nations had peaked up between April and September 1987. The study of Arshanapalli, Doukas, and Lang (1995) supports this argument. They investigate the presence of a common stochastic trend between the U.S. and the Asian stock market movements during the post-October 1987 period. The evidence suggests that the “cointegrating structure” that ties these stock markets together has substantially increased since October 1987. The influence of the U.S. stock market innovations was also found to be greater during the post-October period. The results also indicate that the Asian equity markets are less integrated with Japan's equity market than they are with the U.S. market.

No clear signals seem to emerge from the literature on integration of Asian Stock markets. This observation is driven from the researchers conducted by Ghosh, Saidi and Johnson (1999); Bailey and Stulz (1990); Phylaktis and Ravazzolo (2002), Click and Plummer (2003), Sharma and Wongbangpo (2002), Choudhry and Lin (2004).

Ghosh, Saidi and Johnson (1999) examined the debacle of the Asian-Pacific stock markets by utilizing the theory of cointegration to investigate which developing markets are moved by the markets of Japan and the United States. The empirical evidence suggested that some countries are dominated by the US, some are dominated by Japan, and the remaining countries are dominated by neither during the time period investigated. Similarly, Bailey and Stulz (1990) investigate the US, Malaysia, Korea, Singapore Hong Kong, Japan, Philippines, Taiwan and Thailand market indices from January 1977 to December 1985 using simple correlation analysis to detect interrelations among the markets. The study concluded that the degree of correlation between US and Asian equity returns depended upon the period specification, whether daily, weekly or monthly. This conclusion is supported by the finding that with daily returns, only correlations between the US & Hong Kong, and Japan & Taiwan were significant, where as for monthly returns, correlations between all Asian markets were significant with the exception of the Philippines and Thailand. Similar results have been shown in the study of Phylaktis and Ravazzolo (2002), who examine real and financial links simultaneously at the regional and global level for a group of Pacific-Basin countries by analyzing the covariance of excess returns on national stock markets over the period 1980–1998. The study concludes that financial integration is accompanied by economic integration. The results suggest that economic integration provides a channel for financial integration, which explains, at least partly, the high degree of financial integration. Click and Plummer (2003) examine the stock market integration of Indonesia, Malaysia, the Philippines, Singapore, and Thailand for the period of July 1998 to December 2002, using daily and weekly data. The research concludes that the markets under study are cointegrated whether analyzed using daily and

weekly data. These results are to some extent similar to those produced by Sharma and Wongbangpo (2002), who examine monthly data from January 1986 to December 1996 for the stock markets of Indonesia, Malaysia, Singapore, the Philippines, and Thailand. Sharma and Wongbangpo (2002) find a long-run cointegrating relationship among the stock markets of Indonesia, Malaysia, Singapore, and Thailand, which is not shared by the Philippine stock market. Choudhry and Lin (2004) investigate the change(s) in the long-run relationship(s) between the stock prices of eight Far East countries around the Asian financial crisis of 1997–98. Further tests were conducted to check the change in the influence of the Japanese and the US stock markets in the Far East Region before, during and after the crisis. The study showed that significant long-run relationship(s) and linkage exist between the Far East markets before, during, and after the crisis. The most significant linkage and relationship were found during the crisis period. Results mostly indicated larger US influence in all periods but some evidence of increasing Japanese influence was also shown.

Phylaktis (1999) follows the same methodology as has been mentioned earlier (in this paper) with reference to Masih and Masih (2001) and investigated stock market integration in the Pacific Basin countries after the deregulation of their domestic capital markets. He uses monthly data in all the cases except one wherein quarterly data was used. VAR techniques were used for analyzing the data. The results suggest that the level of integration has increased in the post-liberalization period in Singapore and Taiwan. Also the Japanese market seems to be the most influencing during the period under investigation and the Japanese and US interest rates appear to drive the rates in the other countries.

Huang, Yang and Hu (2000) explore the causality and cointegration relationships among the stock markets of the United States, Japan and the South China Growth Triangle (SCGT) region. The study of 1992-1997 finds that there exists no cointegration among these markets except for that between Shanghai and Shenzhen. The stock returns of the US and Hong Kong markets are found to be contemporaneous.

Siklos and Ng (2001) examine a number of common stochastic trends among stock prices in the US, Japan, Hong Kong, Korea, Singapore, Taiwan and Thailand. The study observes that a single common stochastic trend among Asian and North American markets is a recent phenomenon. The reason is that the stock markets studied were only recently sufficiently liberalized to permit some form of integration to emerge. Also, not only was the 1987 stock market crash significant, but the 1991 Gulf War also signalled a turning point in the degree of stock market integration among the countries studied.

In, Kim, Yoon and Viney (2001) examine dynamic interdependence, volatility transmission, and market integration across selected stock markets during the Asian financial crisis periods 1997 and 1998. The study finds that reciprocal volatility transmission existed between Hong Kong and Korea, and unidirectional volatility transmission from Korea to Thailand. Moreover, the study observes that Hong Kong played a significant role in volatility

transmission to the other Asian markets. The data also indicates market integration in that each market reacted to both local news and news originating in the other markets, particularly adverse news.

Yang and Lim (2002) concludes that only short-term (and no long term) co-movements exist among East Asian stock markets (Hong Kong, Indonesia, Korea, Malaysia and Thailand, the Philippines, Singapore, Taiwan, and Japan). VAR model confirms that shocks or impacts of innovations to a market are very short-lived (often as little as 2days). Moreover, this study found a substantial increase in the degree of interdependence after the 1997 crisis. The study further observed that Taiwan is very independent from other markets. The results obtained in this study also suggested that capital controls might have an impact on the inter-relationships between stock markets in the region.

The studies of Leong and Felmingham (2003) and Jeon et al. (2006) are very relevant in the context of linkages among Asian stock markets. The study conducted by Leong and Felmingham (2003) analyzes the interdependence of five East Asian stock price indices – Singapore Strait Times (SST), Korea Composite (KC), Japanese Nikkei (JN), Taiwan weighted (TW) and Hang Seng (HS) – on daily data from 1990 to 2000. The study reveals that the degree of integration among these five Indices had increased and the opportunities for risk diversification had lessened in the 1990s. Jeon et al. (2006) observe the increase in the degree of financial integration in East Asia in recent times. They further find that the increase is due to the integration with the global market rather than regional counterparts.

Kawai (2005) concludes that the rise in Asian newly industrialized economies' investment contributes to the integration of the East Asian economies through FDI and FDI-driven trade.

Hasan, Saleem and Abdullah (2008) investigated the long-term relationship between Karachi stock exchange and equity markets of developed world for the period 2000 to 2006 by using multivariate Cointegration analysis. Johansen and Juselius multivariate Cointegration analysis, when used in the study indicated that markets are integrated and there exist a long-term relationship between these markets. However pair wise Cointegration analysis shows that Karachi stock market is not cointegrated with equity market of US, UK, Germany, Canada, Italy and Australia. However, the study found Karachi stock exchange to be integrated with France and Japan. Impulse response analysis and variance decomposition analysis indicate that the Karachi stock market is in general independent as most of its shock is explained by its own innovations whereas US and UK markets are exerting some impact on Karachi.

The studies with the Indian perspective have not been conducted in big numbers. However, the works of Nath and Verma (2003); Narayan, Smyth and Nandha (2004); Lamba (2005); Bose (2005), Bodla and Turan (2006) have been cited quite often and are worth the mention here. Nath and Verma (2003) study the interdependence of India, Taiwan and Singapore by employing bivariate and multivariate co-integration analysis for the period of January 1994 to

November 2002. The study finds no co-integration between the stock markets under study.

Narayan, Smyth and Nandha (2004) examined the dynamic linkages between the stock markets of Bangladesh, India, Pakistan, and Sri Lanka using a temporal Granger causality approach by binding the relationship among the stock price indices within a multivariate cointegration framework. In addition, they also examined the impulse response functions. The study observed that in the long run, stock prices in Bangladesh, India and Sri Lanka Granger-cause stock prices in Pakistan. In the short run there is unidirectional Granger causality running from stock prices in Pakistan to India, stock prices in Sri Lanka to India and from stock prices in Pakistan to Sri Lanka. As per the study, Bangladesh is the most exogenous of the four markets, reflecting its small size and modest market capitalization.

Lamba (2005) studied the long-term relationships among South Asian equity markets and the developed equity markets for the period 1997-2003. His findings show that Indian stock markets are influenced by developed equity market of US; UK and Japan while Pakistani and Sri Lankan equity markets were relatively independent from the influence of equity markets of developed markets. His research pointed out that the three South Asian equity markets are becoming more integrated with each other but at a relatively slow pace.

Bose (2005) investigated the interlinkages between the Indian stock market and the stock markets in Asia and the US. The study found that post-Asian crisis and up to mid-2004, the Indian stock market did not function in relative isolation from the rest of Asia and the US as stock returns in India were highly correlated with returns in major Asian markets and was led by returns in the US, Japan, as well as other Asian markets. On the other hand, the Indian BSE Sensex return was also seen to exert some influence on stock returns in some important Asian markets. Despite existing restrictions on capital flows, the Indian market is also seen to belong to the group of Asian markets cointegrated within themselves and with the US market. The degree of integration found between the Indian and other markets in the Asian region is, however, not of a very high order, consequently leaving sufficient room for portfolio diversification and not posing any immediate threat for capital outflows in case of regional crisis.

VI COMPREHENSIVE SUMMARY OF THE LITERATURE AVAILABLE

We cover the comprehensive summary of the literature available worldwide on the subject of integration among financial markets. Table 1 presents as many as 37 studies conducted across different periods of time and covering Asian as well as other countries of the world.

Table 1 about here

VII CONCLUSION

In conclusion, we can mention that the majority of the studies suggested that market integration has increased significantly over the years, within an international context.

There are, however, a number of studies that did not detect any signs of integration. Despite the small number of studies indicating the absence of market integration, there is considerable evidence that the stock market interdependencies exist and become increasingly important as the degree of economic interaction among countries gets higher.

Though most of the studies had initially been conducted for the developed markets like the US, European countries and Japan, recently (post-Asian crisis), the literature has started focusing on emerging Asian markets as well. Quite a few papers address the issue of capital markets integration in emerging economies in the Asia-Pacific basin, with evidences of mixed results, depending on the methodology, data, time period and/or framework used (*Bose, 2005*). However, studies with the Indian perspective are lacking. Whatever studies have been done on India, most of them have concentrated at the inter-relationship of Indian stock market with those of the Developed nations. Same is true in the case of the studies concerned with other Asian markets too, wherein inter-relationship with the Developed rather than Developing nations has remained the cynosure of the studies. With the directions of world trade growing wider and wider day-by-day, the allocation of investments within developing nations is becoming a norm rather than an exception. Because of this, the stock markets of developing nations will start being more inter-related in the times to come. Therefore, there exists a need to study the Indian stock markets in relation with those of the other developing nations. With the advent of regional trading blocks on the global scenario, South Asian Association of Republic Countries (SAARC) holds potential for developing as a Trading Block, in addition to being a political block. As such, there is a scope to study the inter-linkages between Indian stock markets and those of the other SAARC nations.

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S. No.	Author (s)	Year of Study	Period under Study	Markets under Study	Tool(s) used	Results
1	Bertoneche	1979	1969-1976	Germany, France, Italy, Netherlands, Belgium, UK, USA.		Larger opportunities for international diversification
2	Eun and Shim	1989	1980-1985	Australia, Canada, France, Germany, Hong-Kong, Japan, Switzerland, Britain, USA	VAR model Impulse responses	News originating in the U.S. market brings the most influential responses from other national markets
3	Bailey and Stulz	1990	1977-1985	US, Malaysia, Korea, Singapore Hong Kong, Japan, Philippines, Taiwan, Thailand	Simple correlation analysis	The degree of correlation between US and Asian equity returns depended upon the period specification, whether daily, weekly or monthly
4	Koch and Koch	1991	1972, 1980, 1987	Japan, Australia, Singapore, Hong- Kong, Switzerland, Germany, Britain, USA	Dynamic System of Simultaneous Equations	High degree of international market efficiency in the period under study
5	Kasa	1992	1974-1990	U.S., Japan, England, Germany, Canada	Cointegration Tests	A single common trend
6	Aggarwal and Park	1994		USA, Japan		US markets has impact over the Japanese Market
7	Richards	1995	1970-1994	Australia, Austria, Canada, France, Germany, Denmark, Hong-Kong, Italy, USA, Japan, Britain, Sweden, Switzerland, Holland, Norway, Spain	Cointegration Tests	A Nation's stock market indices include a common world component and two country-specific components, one permanent and one transitory
8	Kwan, Sim and Cotsomitis	1995	1982-1991	Nine major stock exchanges	Granger Causality	There is adequate evidence to refute the notion of informationally efficient stock markets
9	Arshanapalli, Doukas, and Lang	1995		Asian stock markets and USA		The "cointegrating structure" that ties the stock markets (under study) together has substantially increased since October 1987. Asian equity markets are less integrated with Japan's equity market than they are with the U.S. market.
10	Longin and Solnik	1995	1960-1990	Seven major countries	International Covariance, Correlation Matrices, Multivariate GARCH	Increase in the international correlation between markets over the period under study. The correlation rises in periods of high volatility
11	Hassan and Naka	1996	1984-1991	USA, Britain, Germany, Japan	Vector error correction model (VECM)	No conclusive evidence on international stock market efficiency
12	Choudhry	1997	1989-1993	Argentina, Brazil, Chile, Colombia, Mexico, Venezuela, USA	Cointegration Tests	The presence of a long-run relationship between the six Latin American indices
13	Atteberry and Swanson	1997		USA, Canada, Mexico		The potential benefits associated with diversification across equity markets within the North American system appear to be diminished during periods of economic uncertainty
14	Peiro et al.	1998	1990-1993	USA, Japan, Germany	Non-linear least squares	New York is the most influential stock market and Tokyo is the most sensitive to international innovations. Frankfurt stands in the middle.

15	Janakiraman and Lamba	1998	1988-1996	Australia, Hong-Kong, Japan, New Zeland, Singapore, USA, Indonesia, Malaysia, Thailand	VAR Models	The markets that are geographically and economically close and/or with large numbers of cross-border listings exert significant influence over each other
16	Ghosh, Saidi and Johnson	1999		Asia Pacific, USA, Japan	Cointegration Tests	Some countries are dominated by the US, some are dominated by Japan, and the remaining countries are dominated by neither during the time period investigated
17	Pan, Liu and Roth	1999	1988-1994	Australia, Hong Kong, Japan, Malaysia, Singapore, USA	Cointegration Tests, GARCH Model	The six stock markets are highly integrated through the second moments of stock returns but not the first moments
18	Roca	1999	1974-1995	USA, UK, Japan, Hong Kong, Singapore, Taiwan, Korea, Australia	Cointegration Tests, Granger Causality Test	Different results for different tests
19	Huang, Yang and Hu	2000	1992-1997	USA, Japan, South China Growth Triangle	Cointegration Tests, Granger Causality Test	There exists no cointegration among these markets except for that between Shanghai and Shenzhen
20	Masih and Masih	2001	1992-1994	USA, Britain, Japan, Germany, S. Korea, Singapore, Hong Kong, Australia	Cointegration Tests	Significant interdependencies between the established OECD and the Asian markets. The leadership of the US and UK markets over the short and long run
21	In, Kim, Yoon, and Viney	2001	1997-1998	Hong Kong, Korea, Thailand	Multivariate VAR-EGARCH model	Reciprocal volatility transmission existed between Hong Kong and Korea, and unidirectional volatility transmission from Korea to Thailand. Hong Kong played a significant role in volatility transmission to the other Asian markets
22	Baele and Vennet	2001	1990-2000	Europe	GARCH	The main driver of European market integration is the reduction of currency volatility within European countries
23	Siklos and Ng	2001		USA, Japan, Hong Kong, Korea, Singapore, Taiwan, Thailand	Cointegration Tests	Single common stochastic trend among Asian and North American markets is a recent phenomenon. The 1987 stock market crash was significant. The 1991 Gulf War also signalled a turning point in the degree of stock market integration among the countries studied
24	Yang and Lim	2002	1990-2000	Hong Kong, Indonesia, Korea, Malaysia, Thailand, Philippines, Singapore, Taiwan, Japan	VAR Technique, Cointegration Tests, Standard correlation tests, Granger-causality test	Substantial increase in the degree of interdependence after the 1997 crisis. Taiwan is very independent from other markets. Capital controls may have an impact on the inter-relationships between stock markets in the region
25	Phylaktis and Ravazzolo	2002	1980-1998	USA, Japan, Pacific-Basin Countries	Multivariate Cointegration Model	Economic integration provides a channel for financial integration, which explains, at least partly, the high degree of financial integration
26	Chen, Firth and Rui	2002	1995-2000	Argentina, Brazil, Chile, Colombia, Mexico, Venezuela	Cointegration Tests, Vector Auto Regressions (VAR) technique	The potential for diversifying risk by investing in different Latin American markets is limited
27	Nath and Verma	2003	1994-2002	India, Taiwan, Singapore	Bivariate and multivariate co-integration analysis	No co-integration between the stock markets under study.

28	Bessler and Yang	2003		Canada, France, UK, Switzerland, Hong Kong, Germany, USA	Error Correction Model and Directed Acyclic Graph	The US market is the only market that had a consistently strong impact on price movements in other major stock markets in the longer-run
29	Aggarwal, Lucey and Muckley	2003	1985-2002	European Stock Exchanges	Dynamic Integration Tests, Multilateral Correlation Analysis, Haldane-Hall Kalman Filter Methodolgy	There has been an increased degree of integration among European equity markets especially during the 1997-98 period
30	Yonghyup	2003	1988-1995	France, Germany, Italy, UK	Integration Tests	European capital market integration is under way, but is far from complete
31	Leong and Felmingham	2003	1990-2000	Singapore, Korea, Japanese, Taiwan, Hong Kong	Integration Tests	The degree of integration among the Indices under study had increased and the opportunities for risk diversification had lessened in the 1990s
32	Narayan, Smyth and Nandha	2004		Bangladesh, India, Pakistan, Sri Lanka	Granger Causality	In the long run, stock prices in Bangladesh, India and Sri Lanka Granger-cause stock prices in Pakistan. In the short run there is unidirectional Granger causality running from stock prices in Pakistan to India, stock prices in Sri Lanka to India and from stock prices in Pakistan to Sri Lanka
33	Choudhry and Lin	2004	1997-1998	USA, Japan, eight Far East countries		Significant long-run relationship(s) and linkage exist between the Far East markets before, during, and after the crisis
34	Lamba	2005	1997-2003	USA, UK, Japan, India, Pakistan, Sri Lanka	Multivariate Cointegration Framework	Indian stock markets are influenced by developed equity market of US; UK and Japan while Pakistani and Sri Lankan equity markets were relatively independent from the influence of equity markets of developed markets. The three South Asian equity markets are becoming more integrated with each other but at a relatively slow pace
35	Bose	2005	1999-2004	Hong Kong, Korea, Malaysia, Singapore, Taiwan, Thailand, India, USA, Japan	Cointegration Tests, Stationary Tests, Granger Causality	Post-Asian crisis and up to mid-2004, the Indian stock market did not function in relative isolation from the rest of Asia and the US as stock returns in India were highly correlated with returns in major Asian markets and was led by returns in the US, Japan, as well as other Asian markets
36	Kucukcolak	2008	2001-2005	UK, Germany, France, Greece, Turkey	Cointegration Tests	In the long run, the Turkish stock market is not co-integrated with its mature counterparts in the EU, in contrast to the Greek market, which is co-integrated
37	Hasan, Saleem and Abdullah	2008	2000-2006	Pakistan, USA, UK, Germany, Canada, Italy, Australia	Cointegration Tests	Karachi stock market is cointegrated with equity market of France and Japan and not with US, UK, Germany, Canada, Italy and Australia