## INDIAN STOCK MARKET'S INTEGRATION WITH MAJOR WORLD MARKETS BEFORE AND AFTER SUB-PRIME CRISIS

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### Abstract

*During the late 20th century, globalization started gaining importance throughout the world. Globalization opened the Indian economy for rest of the world which caused Indian economy as well as stock market, to be integrated with the rest of the world. In the year 2007, the world faced the Subprime crises. Due to this, Indian economy also experienced many chances, just like rest of the world. So this paper studies the effect of the Subprime Crises on Indian stock market. This paper is to determine whether Indian stock market was more co-integrated and co-related with the stock market of other countries, before Subprime Crises or it has become more co-integrated and co-related after the Subprime Crises. To study the effect the data of closing price of all the stock markets is divided into two parts: in one part the data of before Subprime Crises is taken i.e. between the years May 2001 to October 2008 and in the other part the data is of after Subprime Crises i.e. between the years November 2008 to April 2016. Then we tried to find out the co-integration and co-relation of Indian stock market with the stock market of other countries. Form our study we concluded that before subprime crises Indian stock market was more co-integrated with stock market of most of the major countries of the world and was also correlated. After subprime crisis Indian stock market is no or less co-integrated with their stock market. However, the correlation has increased since subprime crisis.*

*Index Terms—Stock Market, Co-Integration, subprime crisis, Dickey-Fuller, Correlation*

### I. INTRODUCTION

Globalization gained significance at the end of the 20th Century. Indian business scenario has undergone a dramatic transformation since then. There were more investment opportunities in India. With that the financing options were also gone up. Apart from all this the dependence on

capital market has increased. Since then, the financial markets have gained importance. Now the stock market is considered as a measure of national economic growth. It encourages and mobilizes domestic savings along with banks and other financial institutions. With globalization, the dependence of one countries' stock market on the other countries' stock market have also increased. There are many factors which affects this dependence like maximizing investment return, technological advancements in telecommunications, deregulation of markets, etc.. Whenever any major change occur in any economy or stock market of any country it also affects almost all the other countries. It's just the magnitude of impact of change on other country which varies. It is also true that different countries are correlated and co-integrated with different countries.

One such major change in the world was in the year 2007, the world was hit by the Mortgage or Subprime Crisis. The crisis occurred because who had poor credit ratings also got high-risk mortgages and later they failed in paying back their loans. Everyone predicted the property value will appreciate over time. Initially when everyone wanted to buy the house and the demand was more than supply, the property values went up like anything.  This happened until one day, when borrowing became much more costly, only few people were able to buy a house. As relatively less number of buyers were left, the real estate market begin to fell down. This caused house prices to fall down as well. When the house prices begin to fall, the subprime borrowers were going to suffer. Not only they were not able to pay their existing debt, they were stuck having to pay a much larger mortgage payment. Due to this those borrowers were not able to payback their house payments. So the financial institutions lost their money that they invested because the borrower were not able to pay the loan payment. During that time the stock market value of almost all the countries throughout the world declined because of it. The major reason of the crisis was USA but it impacted the whole world, not for a small period but for quite some time. Although, by the July 2013, the stock market as a whole has recovered from this crisis, some issues still remains.

The subprime crisis was major game changer for Indian economy as well just like throughout the world it changed the economy. The Indian economy was resilient enough not to be as influenced by the crisis as other. So this paper is an attempt to check whether cointegration of Indian stock market with other stock markets have changed over the last 15 years. This paper is to check where the Subprime crisis has changed the correlation and cointegration of countries like USA, UK, France, China, Russia, Brazil, Japan, Germany with India or not. This would help in determining how much will it impact on Indian stock market if any such change or event occur in these countries.


## II. LITERATURE REVIEW

The true process of financial market integration is dynamic and difficult to measure, and a wide range of empirical methodologies have been used to analyze the issue. The most basic technique has been the use of unconditional cross-country correlations on equity prices and returns. In recent years, there has been an extensive scientific interest and research on testing and

measuring interdependence of stock markets (Corhay et al., 1993, and Koch and Koch, 1993). For this various econometric methodologies have emerged over the years. Early attempts to test for international linkages of equity markets have mostly focused on atheoretical VAR models (King and Wadhwani 1990, Koch and Koch 1993, Eum and Shim 1993) and generally found rising cross-market correlations and growing regional interdependence.

Previous work has shown the lack of interdependence across national markets, supporting the benefits of international diversification (Grubel, 1968, Solnik, 1995). Bracker, Docking, and Koch (1999) have found a statistically significant relationship between bilateral import dependence and the degree of stock market integration. King and Whadhawani (1990), King, Sentana and Whadhawani (1994), Karolyi and Stulz (1996), and Bekaert and Harvey (2000) investigate time-varying linkages between international stock markets and find that correlations have increased when global factors dominate domestic ones. In addition, several authors have documented that correlations are much higher when markets go simultaneously down, further reducing the insurance effect from international diversification as in Longin and Solnik (2001). Correlation between stock market returns provides an alternative to complex modeling methodology, such as time-series models, asset pricing models etc., for checking evidence of integration, mainly due to its simplicity.

A very few studies evidence on the determinants of stock market co-movement has been presented by Pretorius (2002), which examined ten emerging stock markets for the period 1995–2000 by employing a cross-section and a time-series model. The major findings showed that only bilateral trade and the industrial production growth differential were significant for explaining the correlation between two countries on a cross-sectional basis. Similar results were achieved by the time-series regression.

Since Grubel's work (1968), which expounded the benefits from international portfolio diversification, the relationship among national stock markets has been analyzed in a series of studies, such as Granger and Morgenstern (1970), Ripley (1973), Lessard (1974), (1976), Panton, Lessig, and Joy (1976), and, more recently, Hilliard (1979). Despite the divergent empirical methods used, these studies generally found that (i) correlations among returns to national stock markets are surprisingly low, (ii) national factors play an important role in the return-generating process. These findings were often cited as evidence supporting international, as opposed to purely domestic, diversification of investment portfolios. As noted, the previous literature was mainly concerned with showing that the interdependence of share price movements is much less pronounced among countries than within a country. Consequently, relatively little attention was paid to the structure of interdependence among national stock markets.

Careful examination of international stock market movements in recent years suggests that there exists a substantial degree of interdependence among national stock markets. Furthermore,

unexpected developments in international stock markets seem to have become important news events that influence domestic stock markets.

A significant number of papers have examined the international integration of equity markets from the perspective of increasing correlations in their returns over time. The argument here is that if the correlation structure demonstrates instability over time, then, assuming that the trend is towards increased correlation, this indicates greater integration. Early papers, such as Panton, Lessig, and Joy (1976) and Watson (1980) found stability, but the preponderance of literature indicates that there is instability in the relationship (see, e.g., Fischer & Palasvirta, 1990; Longin & Solnik, 1995; Madura & Soenen, 1992; Makridakis & Wheelwright, 1974; Maldonado & Saunders, 1981; Meric & Meric, 1989; Wahab & Lashgari, 1993) and that this is determined primarily by real economic linkages between countries (see, e.g., Arshanapalli & Doukas, 1993; Bachman, Choi, Jeon, & Kopecky, 1996; Bodurtha, Cho, & Senbet, 1989; Bracker & Koch, 1999; Campbell & Hamao, 1992; Roll, 1992). Other literatures uses cointegration to measure the degree of international integration in equity markets. Cointegration has an intuitive appeal to researchers of integration. Bernard (1991) points out that a necessary condition for complete integration is that there be $n_1$ cointegrating vectors in a system of n indices. In this vein, Kasa (1992) examines the major equity markets over the 1974–1990 period and finds a single cointegrating vector indicating low levels of integration, while Chan, Gup et al. (1992) examine the Asian markets and find in favour of segmentation, as do Allen and Macdonald (1995). Chan, Gup, et al. (1997) expanded their previous study and find a decrease in integration during the 1980s.

Several studies which used multivariate GARCH, vector auto-regression (VAR), Unit root test, and various co-integration tests report that during periods of financial crisis the stock market co-movement is greater than before the crisis occurred. Liu et al. (1998) employs a vector autoregressive analysis to examine the dynamic structure of international transmission in stock returns for six countries – the U.S, Japan, Hong Kong, Singapore, Taiwan and Thailand – for the period 1985-1990 capturing the October 1987 stock market crash. They conclude that the degree of interdependence among the Asian-Pacific markets increased substantially after the 1987 stock market crash and where the U.S market possesses an influential role affecting these markets. In addition, the risk reduction benefits of international portfolio diversification have been reduced due to the higher interdependence that has been observed in these markets. Similarly, Arshanapalli et al. (1995), conclude that the co-integration structure that links these markets increased substantially after the 1987 collapse. However, Longin & Solnik (1995) examines the correlation for seven major European countries over the period 1960-90 indicating that not only is the international covariance and correlation matrices unstable over time, but that correlation rises in periods when the conditional volatility of markets is large. Another type of studies has provided evidence on which markets dictates over other markets. An early study by Eun & Shim (1989) highlights the influence and power that the U.S stock market has on the stock markets of eight other developed countries. Findings indicate that a substantial amount of interdependence exists, where the U.S stock market represents the most influential world economy having by far a

dominant position when it comes to producing valuable information that affects world stock markets. Empirically they found that innovations in the US stock market were rapidly transmitted to the rest of the world, whereas innovations in other markets did not have much effect on the US market.

## III. RESEARCH METHODOLOGY AND ANALYSIS

In this analysis, the ADF Unit Root Test is used to check where the stock indices for all the nine countries are non-stationarity or not. As we are studying the effect of stock market of other countries on Indian stock market before subprime crises and after subprime crises, we have divided the data into two parts: in one part the data of before Subprime Crises is taken i.e. between the years May 2001 to October 2008 and in the other part the data is of after Subprime Crises i.e. between the years November 2008 to April 2016 and we have done all the tests on both the series. Since the series of stock indices contain a trend, both a constant and a trend is included in the regression in order to perform the unit root tests. The results for the ADF Unit Root Tests for the first set of data i.e. closing price of indices of the countries from May 2001 to October 2008 are summarized in Table 1 while for the second set of data i.e. closing price of indices of the countries from November 2008 to April 2016 are summarized in Table 2:

Table 1: *ADF Unit Root Test Results on Stock Indices for Each Stock Market from* May 2001 to October 2008

| Country | Prob. | ADF Test Statistic | 1% critical value | 5% critical value | 10% critical value |
|---|---|---|---|---|---|
| India | 0.7054 | -1.131321 | -3.433529 | -2.862831 | -2.567504 |
| USA | 0.5890 | -1.389255 | -3.433531 | -2.862832 | -2.567504 |
| Germany | 0.6573 | -1.243938 | -3.433528 | -2.862830 | -2.567503 |
| Japan | 0.7227 | -1.087733 | -3.433528 | -2.862830 | -2.567503 |
| UK | 0.6395 | -1.283032 | -3.433533 | -2.862832 | -2.567505 |
| France | 0.4582 | -1.647006 | -3.433528 | -2.862830 | -2.567503 |
| China | 0.7812 | -0.923392 | -3.433528 | -2.862830 | -2.567503 |
| Brazil | 0.7434 | -1.033058 | -3.433528 | -2.862830 | -2.567503 |
| Russia | 0.6228 | -1.318961 | -3.433531 | -2.862532 | -2.567504 |

Table 2: *ADF Unit Root Test Results on Stock Indices for Each Stock Market from* November 2008 to April 2016

| Country | Prob. | ADF Test Statistic | 1% critical value | 5% critical value | 10% critical value |
|---------|-------|--------------------|--------------------|--------------------|---------------------|
| India | 0.4360 | -1.690439 | -3.433543 | -2.862837 | -2.567507 |
| USA | 0.7979 | -0.870504 | -3.433543 | -2.862837 | -2.567507 |
| Germany | 0.6800 | -1.192092 | -3.433543 | -2.862837 | -2.567507 |
| Japan | 0.7304 | -1.67745 | -3.433543 | -2.862837 | -2.567507 |
| UK | 0.2163 | -2.173455 | -3.433543 | -2.862837 | -2.567507 |
| France | 0.2825 | -2.010304 | -3.433543 | -2.862837 | -2.567507 |
| China | 0.1861 | -2.257726 | -3.433543 | -2.862837 | -2.567507 |
| Brazil | 0.0886 | -2.621915 | -3.433543 | -2.862837 | -2.567507 |
| Russia | 0.1897 | -2.247278 | -3.433543 | -2.862837 | -2.567507 |

The null hypothesis of a unit root (i.e. non-stationarity of the series) is rejected if the t-statistic of ADF test shown in column 3 is less than the critical values (in Table 1 and Table 2 critical values for 1%, 5% and 10% significance level are also shown). As we can see, all ADF test statistics are greater than the 1%, 5% and 10% critical values which indicates that null hypothesis of the test should be accepted. Therefore, we can concluded that the daily stock indices are not stationary series for each country.

Having concluded that all the time series are non-stationary, we can go through with the cointegration and correlation tests.

For finding the cointegration between Indian stock market and the stock markets of other countries for the two sets of data, we have used Johansen Cointegration Test. The results for the Johansen Co-integraion Tests for the data of closing price of indices of the countries from May

2001 to October 2008 are summarized in Table 3 while for closing price of indices of the countries from November 2008 to April 2016 are summarized in Table 4:

Table 3: Johansen Cointegration Test *Results on Stock Indices for Each Stock Market from* May 2001 to October 2008

| Country | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob. |
|---|---|---|---|---|
| USA | 0.010600 | 22.09411 | 15.49471 | 0.0044 |
| Germany | 0.005469 | 11.40693 | 15.49471 | 0.1877 |
| Japan | 0.007548 | 16.71995 | 15.49471 | 0.0325 |
| UK | 0.006699 | 14.34109 | 15.49471 | 0.0740 |
| France | 0.006469 | 13.77813 | 15.49471 | 0.0892 |
| China | 0.001868 | 4.456010 | 15.49471 | 0.8635 |
| Brazil | 0.007638 | 15.80271 | 15.49471 | 0.0449 |
| Russia | 0.009046 | 19.82978 | 15.49471 | 0.0104 |

Table 4: Johansen Cointegration Test *Results on Stock Indices for Each Stock Market from* November 2008 to April 2016

| Country | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob. |
|---|---|---|---|---|
| USA | 0.003715 | 8.488330 | 15.49471 | 0.4148 |
| Germany | 0.006099 | 14.57832 | 15.49471 | 0.0684 |
| Japan | 0.004495 | 10.59227 | 15.49471 | 0.2379 |
| UK | 0.003303 | 8.700445 | 15.49471 | 0.3938 |
| France | 0.007363 | 17.93730 | 15.49471 | 0.0210 |
| China | 0.003956 | 10.02724 | 15.49471 | 0.2786 |
| Brazil | 0.005639 | 11.73821 | 15.49471 | 0.1699 |

| Russia | 0.004548 | 10.99450 | 15.49471 | 0.2118 |
|--------|----------|----------|----------|--------|

The null hypothesis of cointegration between the two series is rejected if the trace statistic shown in column 3 is less than the 0.05 critical, which means that there is no cointegration between the two countries. .Also for prob value greater than 0.005 also shows that the null hypothesis is rejected.  As we observe, trace statistic for Dow Jons (USA), Nikkei (Japan), BVSP (Brazil), MICEX (Russia) are greater than the 0.05 critical values, and their prob values are also less than 0.005, indicating that null hypothesis of the test is accepted. It means that, there was a cointegration of Indian stock market with these during the period of May 2001 to October 2008. Also we observe from the table 4 that trace statistic for CAC (France) is greater than the 0.05 critical value and its prob value is more than 0.005, indicating that null hypothesis of the test is accepted for CAC time series. It means that, there was a cointegration of Indian stock market with CAC (France) during the period November 2008 to April 2016.

After finding the cointegration between Indian stock market and other countries stock market, we determined the correlation between them again for both the periods i.e. from May 2001 to October 2008 and from November 2008 to April 2016. For this we made the correlation matrix. A series is as much as directly correlated to each other as their correlation is closer to one and is not correlated if the value is closer to zero. If the value of correlation is negative for two series, it shows that they are inversely correlated. The correlation matrices are shown in the Table 5 and Table 6.

Table 5: Correlation Matrix *Results on Stock Indices for Each Stock Market from* May 2001 to October 2008

|  | *India Close* | *Dow jons Close* | *DAX Close* | *Nikkei Close* | *FTSE Close* | *CAC Close* | *Shanghai Close* | *BVSP Close* | *Russia Close* |
|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| India Close | 1.0000 | | | | | | | | |
| Dow jons Close | 0.8771 | 1.0000 | | | | | | | |
| DAX Close | 0.8546 | 0.9322 | 1.0000 | | | | | | |
| Nikkei Close | 0.7646 | 0.8724 | 0.8599 | 1.0000 | | | | | |
| FTSE Close | 0.7835 | 0.9139 | 0.9600 | 0.9192 | 1.0000 | | | | |

| CAC Close | 0.7117 | 0.8861 | 0.9455 | 0.9103 | 0.9859 | 1.0000 | | | |
| Shanghai Close | 0.7729 | 0.7506 | 0.7753 | 0.5268 | 0.6318 | 0.6135 | 1.0000 | | |
| BVSP Close | 0.9803 | 0.8760 | 0.8454 | 0.7389 | 0.7679 | 0.6876 | 0.7538 | 1.0000 | |
| Russia Close | 0.9640 | 0.8722 | 0.8324 | 0.8379 | 0.7994 | 0.7293 | 0.7122 | 0.9541 | 1.0000 |

Table 6: Correlation Matrix *Results on Stock Indices for Each Stock Market from* November 2008 to April 2016

| | *India Close* | *Dow jons Close* | *DAX Close* | *Nikkei Close* | *FTSE Close* | *CAC Close* | *Shanghai Close* | *BVSP Close* | *Russia Close* |
|---|---|---|---|---|---|---|---|---|---|
| India Close | 1.0000 | | | | | | | | |
| Dow jons Close | 0.9121 | 1.0000 | | | | | | | |
| DAX Close | 0.9344 | 0.9678 | 1.0000 | | | | | | |
| Nikkei Close | 0.8796 | 0.8843 | 0.9342 | 1.0000 | | | | | |
| FTSE Close | 0.8438 | 0.9176 | 0.8893 | 0.7437 | 1.0000 | | | | |
| CAC Close | 0.8738 | 0.8224 | 0.9160 | 0.9085 | 0.7999 | 1.0000 | | | |
| Shanghai Close | 0.4586 | 0.2273 | 0.3733 | 0.4837 | 0.1585 | 0.5368 | 1.0000 | | |
| BVSP Close | -0.0637 | -0.2504 | -0.2428 | -0.3779 | 0.0560 | -0.0920 | 0.1275 | 1.0000 | |
| Russia Close | 0.7296 | 0.6561 | 0.6600 | 0.4992 | 0.7174 | 0.6213 | 0.4164 | 0.3445 | 1.0000 |

As we can observe from the Table 5 that during the period May 2001 to October 2008, Indian index is highly correlated to indices of all the studied countries as correlation value for all the countries is close to one. However, this correlation value of Indian share market index with the indices of other countries even become closer to one, except for Shanghai (China), BVSP (Brazil), MICEX (Russia) whose value decreases during the period of November 2008 to April 2016 (in

Table6). This shows that the correlation between Indian share market index and other countries share market index, except for Shanghai (China), BVSP (Brazil), MICEX (Russia), have increased during November 2008 and April 2016.

## IV. CONCLUSION

This paper has analyzed the co integration and correlation of Indian stock market with the major economies of the world like USA, UK, France, China, Russia, Brazil, Japan and Germany. From this study it is evident that after the subprime crisis occurred during the year 2007-08, the Indian stock market have become less or no co-integrated with the other major countries except for stock market of France i.e. CAC. This also shows that we have improved our market's independency over the rest of the world. This paper also provide empirical evidence that shows that the correlation between Indian stock market and other countries stock market except for stock market for Shanghai (China), BVSP (Brazil) and MICEX (Russia) have increased after the subprime crisis. Indian stock market is now more or less linked with major economies of the world. India's trade relationship with the world have increased and hence market's dependence. As the Indian stock market has become less co-integrated and more co-related with the major economies of the world, it also shows that Indian stock market is relatively more depend and has influence of these countries for a shorter run. In the long run, India stock market has become less depended of these countries' stock market after the subprime crises.

REFERENCES

1. Grubel, H. G., (1968), "Internationally Diversified of Investments Portofolios: Welfare Gains and Capital Flows", American Economic Review, 58, pp. 1299-1314.

2. Corhay, A., A.T. Rad and J.P. Urbain (1993), "Common Stochastic Trends in European Stock Markets". Economics Letters, 42, pp. 385–390.

3. Koch, P. D. and Koch, T. W., (1993), "Dynamic Relationships Among the Daily Levels of National Stock Indeces",. International Financial Market Integration, Stansell SR (Ed.). Blackwell: Oxford, 299–328. King, M. and Whadhawani, S., (1990), "Transmission of Volatility Between Stock Markets", Review of Financial Studies, 3, pp. 3-33

4. Eun, C. S. and S. Shim, 1993. International Transmission of Stock Market Movements. In S. R. Stansell, ed. International financial market integration. Blackwell. 259-77.

5. Grubel, H. G., (1968), "Internationally Diversified of Investments Portofolios: Welfare Gains and Capital Flows", American Economic Review, 58, pp. 1299-1314.

6.  Solnik, B. H., (1994), "Why not Diversify Internationally Rather than Domestically?", Financial Analysts Journal, January-February, pp. 3-25. Taylor, M. P., and Tonks, I., (1989), "The Internationalization of Stock Markets and the Abolition of U.K Exchange Control", Review of Economics and Statistics, 71, pp. 332–336.

7.  Bracker, K., Docking, D.S. and Koch, P. D., (1999), "Economic Determinants of Evolution in International Stock Market Integration", Journal of Empirical Finance, 6, pp. 1-27.

8.  King, M., Sentana, E. and Whadhawani, S., (1994), "Volatility and the Links Between National Stock Markets", Econometrica, 62, pp. 901-934.

9.  Karolyi, G. and Stulz, R., (1996), "Why Do Markets Move Together? An Investigation of U.S.-Japan Stock Return Comovements Using ADR's", Journal of Finance, 51, pp. 951-986.

10. Bekaert, G. and Harvey, R. C., (2000), "Foreign Speculators and Emerging Equity Markets", Journal of Finance, 55, pp. 565-614.

11. Longin, F. and Solnik, B., (2001), "Extreme Correlation of International Equity Markets", Journal of Finance, 56, pp. 649-676.

12. Pretorious, E. (2002), Economic determinants of emerging Stock Market Interdependence. Emerging Markets Review, 3, 84-105.

13. Grubel, H. G., (1968), "Internationally Diversified of Investments Portofolios: Welfare Gains and Capital Flows", American Economic Review, 58, pp. 1299-1314.

14. Panton, D. B., Lessig, V. P., & Joy, O. M. (1976). Comovement of international equity markets: A taxonomic approach. Journal of Financial and Quantitative Analysis, 11, 415–32.

15. Watson, J. (1980). The stationarity of inter-country correlation coefficients: A note. Journal of Business Finance and Accounting, 7, 297–303.

16. Fischer, K. P., & Palasvirta, A. P. (1990). High road to a global marketplace: The international transmission of stock market fluctuations. The Financial Review, 25, 371–394.

17. Longin, F. M., & Solnik, B. (1995). Is the correlation in international equity returns constant?: 1960– 1990. Journal of International Money and Finance, 14, 3– 26. Madura, J., & Soenen, L. (1992). Benefits from international

18. Madura, J., & Soenen, L. (1992). Benefits from international diversification: Across time and country perspectives. Managerial Finance, 18, 1– 14.

19. Makridakis, S. G., & Wheelwright, S. C. (1974). An analysis of the interrelationships among the major world stock exchanges. Journal of Business Finance and Accounting, 1, 195– 215.

20. Maldonado, R., & Saunders, A. (1981). International portfolio diversification and the intertemporal stability of international stock market relationships, 1957– 78. Financial Management, 10, 54– 63.

21. Meric, I., & Meric, G. (1989). Potential gains from international portfolio stability and seasonality in international stock market relationships. Journal of Banking and Finance, 13, 627–640.

22. Wahab, M., & Lashgari, M. (May, 1993). Covariance stationarity of international equity markets returns: Recent evidence. Financial Review 28, 239– 260.

23. Arshanapalli, B., & Doukas, J. (1993). International stock market linkages: Evidence from the pre- and post- October 1987 period. Journal of Banking and Finance, 17(1), 193– 208.

24. Bachman, D., Choi, J. J., Jeon, B. N., & Kopecky, K. (1996). Common factors in international stock prices: Evidence from a cointegration study. International Review of Financial Analysis, 5(1).

25. Bodurtha, J. N., Cho, D. C., & Senbet, L. W. (1989). Economic forces and the stock market: An international perspective. Global Finance Journal, 1, 21– 46.

26. Bracker, K., & Koch, P. D. (1999). Economic determinants of the correlation structure across international equity markets. Journal of Economics and Business, 51, 443– 471.

27. Campbell, J. Y., & Hamao, Y. (1992). Predictable stock returns in the United States and Japan: A study of longterm capital market integration. Journal of Finance, 47, 43– 70.

28. Roll, R. (1992). Industrial structure and the comparative behaviour of international stock market indices. Journal of Finance, XLVII47, 3 – 41.

29. Bernard, A. (1991). Empirical implications of the convergence hypothesis. CEPR Working Papers.

30. Kasa, K. (1992). Common stochastic trends in international stock markets. Journal of Monetary Economics, 29(1), 95– 124.

31. Chan, K., Gup, B., et al. (1992). An empirical analysis of stock prices in major Asian markets and the United States. The Financial Review, 27, 289– 307.

32. Chan, K., Gup, B., et al. (1997). International stock market efficiency and integration; A study of 18 Countries. Journal of Business, Finance and Accounting, 24, 803–813

33. Allen, D., & Macdonald, G. (1995). The long run gains from international equity diversification; Australian evidence from cointegration tests. Applied Financial Economics, 5, 33–42.

34. Liu, Y.A., Pan, M.S., Shieh, J.C.P. (1998), International Transmission of Stock Price Movements: Evidence from the U.S. and Five Asian-Pacific Markets. Journal of Economics and Finance, 22(1), 59-69.

35. Arshanapalli, B., Doukas, J., Lang, L.H.P., (1995), Pre and post-October 1987 stock market linkages between U.S. and Asian markets. Pacific-Basin Financial Journal, 3, 57-73.

36. Eun, C.S., Shim,S., (1989), International Transmission of Stock Market Movements. The Journal of Financial and Quantitative Analysis, 24(2), 241-256.

37. Dickey, D.A., & Fuller W.A. (1979). Distributions of the estimators for auto-regressive time series with a unit root, Journal of American Statistical Association, 74, 427 - 431.