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# STUDY ON STOCK MARKET INTEGRATION & CONTAGION EFFECT (WITH SPECIAL REFERENCE TO INDIA WITH ASEAN-3)

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***Abstract:*** *The study had two main facets; first set explores the 'contagion effect' and second facet target upon 'Stock Market Integration'. As per the claim of literature contagion hit the hardest to those economies which are through trade/finance linked. The purpose of the study is to catch the eyes on the potentials of Indian relative to Thailand, Indonesia and Malaysia stock markets as due to its trade linkage or economic tie ups which do effect the key institutions as well. The literature gives the perspective that emerging markets must have highest potentials to be less integrated and consequently less contagion effect. As low correlations, low co-movements and low dependence levels are proved among different emerging stock markets worldwide which support the benefit of international diversification. In turn this motivates global investors to park their funds in such sort of markets to avoid the 'Diversification Crisis'. The empirical investigations for linkage among financial crisis & contagion effect enable the better understanding of dynamics or potentials of different stock markets beside with the assessment of market deepening linkage. The integration or significant co-movements among different stock market is a result of strong economic ties, policy co-ordination, similar investment cultures, Financial innovations and Technological progress.*

***Key Words:*** Stock Market Integration, Contagion Effect, Global Investors, Common-Movements, Dependence levels.

***JEL Classification:*** *A11, F02, G01, G11.*

## INTRODUCTION

### Stock Market

It is a spot where shares of pubic recorded companies are being exchanged. A stock trade encourages stock merchants to exchange organization stocks and different securities. A stock may be purchased or sold just in the event that it is recorded on a trade. In this way, it is the meeting spot of the stock purchasers and vendors.

The monetary markets overall confronting the powerful money related turmoil, reclamation of trust in the worldwide financial framework is a definitive test lying with the markets. Whenever fall or close crumple of a few key establishments

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happened amid the anxiety period the confidence in global financial institutions badly shake which needs to be get restored again. The Global Financial Stability Report (GFSR 2008) anticipated that capital worth of $ 675 billion would be required by the major worldwide banks over coming years; at exactly that point supportable Global strength could be accomplished.

**Stock Market Integration**

The money related liberalization attained by a large portion of the nations around the globe, technological advancement in communications and trading systems by creating more opportunities for portfolio investments, the integration took place. The World Stock Markets have turned out to be all the more nearly interlinked in spite of the uniqueness of particular business sector and nation profile.

The Globalization for securities of business sector is bringing strong consideration towards securities exchanges throughout the world and one vibrant question is being discussed that whether there prevails any policy implications which can make good the contagion effect prevailing due to integration or globalization across countries. 'The Modern Portfolio hypothesis' expressed that merits joined in portfolios enhanced when relationship between's the benefits incorporated into the portfolio are low. While the connection between's advantages returns of created markets expanding amid or after a period range, the world securities exchanges are expressed to be integrated.

The common movements in stock markets depict the deteriorating Wealth exposures on side of international investors which re-assure the country risk. On such basis, three hypotheses were stated to be as:

- Market Segmentation: The lesser scale of market segmentation tends to integrate one stock market with the other.
- Contagion Effect: International stock markets proven to be more integrated when followed some common turbulence in the markets.
- Common properties: The economic links which are strong & widespread among countries nations inside of same landmass or inside of the same time zone.

**Contagion Effect**

According to World Bank definition contagion involves general process of shock transmission across countries in stable & crisis periods. Although contagion effect needs not be necessarily link up with crisis itself. Propagation is connected with negative and positive overflow impacts. The spread of crisis constitutes the engendering of stuns between nations. It considers the co-developments activated by regular stuns. Accordingly, Contagion is being translated as the adjustment in

transmission which happens amid time of money related turmoil and is based upon cross-market connection.

In wide sense, contagion happens due to spread of financial panics. The Financial contagion evolve when crisis transmit across stock markets and are un-explained by changes in fundamentals. At the point when impressive increment of cross country co-developments happens, contagion is being clarified.

From The working paper arrangement of 'National Bureau of Economic Research' (NBER 2011) it was being studied that how and why emergency spread so fiercely crosswise over nations/financial parts. The study distinguished between US particular element, worldwide money related component and local variable for estimating of 415 nation area value portfolios crosswise which were worked upon in the study were:

- 'Globalization Hypothesis' = Through trade & financial linkages the economies being integrated, are proven to be hardly hit by contagion.
- 'Wakeup call Hypothesis' = The crisis related to one country/segment/ sector which gives novel information inciting speculators to reassesses the defenselessness of other business sector or nations, that turns out to create a situation of financial turmoil which in turn spread crisis across markets & borders.

## LITERATURE REVIEW

### Review for Contagion Effect

Chattopadhyay (2014) analyzed that there was no long run co-mix of created markets such as USA, UK, Japan, Singapore & Hong kong with Indian Stock Market. The worldwide emergency two subsamples that is September 1, 1999 to September 14, 2008 and second one as September 15, 2008 to August 3, 2012 were made to test the causality. It was demonstrated that subprime emergency had the impact of Asian markets, American markets and UK markets on the Indian securities exchange before the emergency however after the emergency BSE showcase generally affected the other created markets with the exception of Japan. Indian securities exchange' worth stayed high because of significance of Indian economy during the crisis even. The 'wait and watch' policy of India proved the elasticity of Indian economy that helped in confidence- building among the foreign investors during such crisis period. Between S&P 100 and BSE Sensex the one sided causality was proved which showed that US economy is very important to Indian economy while the reverse was not true. The long run relationship between such chose tests of business sectors didn't exist, which re-affirm the causality results. The outcomes inferred were that different markets did not impact the Indian securities exchange.

Chittedi (2014) investigated that during the crisis & after the crisis volatility period of 1996-2011 there was a persistent hike in correlation for stock market indices in BRICS and in such situation international diversification didn't prove to be a wise investment strategy. Diversification done via investments in regional blocks was proved to be lower which was re-confirmed through the contagion effect prevalence. The Diversification technique could have been won if such markets work freely. When the local country crisis information, converted to be public news, investor decision had herd behavior and withdrew money from economies which put the circumstance of money related turmoil.

Arouri *et al.* (2010) stated that there was nil co-integration in between the emerging stock exchanges for example, Argentina, Mexico, South Korea and Thailand with that of US Stock business sector. And consequently it implied that there was nil contagion between the US and emerging countries for long run. The absence of dependence revealed that there was no pivotal reliance of four chose developing business sector on the US market developments aside from South Korea amid the time of beginning from 1987 till 2007. After 2008 there were noteworthy causal impacts from US on developing business sector returns with the exception of Argentina and Mexico where no proof of linkage existed. Therefore, every shock which affected the US stock market was dynamically transmitted to developing stock markets at-least for short term.

Bleaney and Vargas (2007) examined the growth patterns which were regional & time varying to countries. Growth was recorded to be highly contagious within region due to trade. The data base for 101 countries over period starting from 1960 till 1999 was used of having five year average growth rates with having pooled ordinary least square method. The growth of trading partners or neighbors captured regional patterns which were time varying even if nil growth contagion was there. So the existence regional growth patterns made the variables significant for such growth regression. The noteworthy variables considered were: Population growth rate, Investment Ratio, Trade openness, Inflation rate and secondary school enrolment ratio.

**Reviews for Integration in Stock Markets**

Hamori (2010) found that Germany, UK and USA were closely linked or integrated while Japan was independent or non-integrated with other countries. The VAR (Vector Auto regression) model and LA-VAR (Lag-Augmented Vector Auto regression) methods were being used for forecasting & estimation of integration across returns. In prior studies it was demonstrated Japanese securities exchange was not completely incorporated with world securities exchanges; the present study showed the same.

Morana (2007) elaborated the role-play of financial/economic integration for stock market contagion among G-7 countries. It explicitly expressed that

incorporation being an indicator influenced the worldwide emergency through common response of stock markets and on the other side financial integration played its due role through financial shock spillover or spread. And such spillover effect induced the synchronization in stock markets dynamics that is Contagion effect. It was accomplished that the prospective benefits of global portfolio diversification among North America, Europe and Asian Pacific did not exhaust.

Floros (2005) stated that prospective for investing in mature or developed markets was limited. The market linkages through dependencies and co-integration were examined for FTSE-100, S&P500 and Nikkei 225 stock indices. For the countries UK, Japan and USA the money related markets were observed to be co-coordinated. Further the Granger causality existed bi-directional for Nikkei 225 and FTSE-100 stock index and unidirectional fundamental relationship prevailed for Nikkei225 and S&P 500. Therefore, the Asian and European markets were being strongly affected from the US stock market.

Chan *et al.* (1997) expressed that when confinements were forced on remote proprietorship and cross- country speculations, it implied the integration of one stock market with the other. When financial turbulence exists in markets through contagion effect and the common properties prevailing in stock markets, it mentioned the higher degree of commonalties. The sampled eighteen stock markets had proved the same facts stated above.

**Table 1**
**Stock Exchange and Stock Indices**

| *Country Name* | *Stock markets* | *Indexes* | *Pricing of Indexes* | *Market capitalization (In USD)* |
|---|---|---|---|---|
| India | BSE (1957) | Sensex | 24,382.71 | 1700 Billion |
| | NSE (1992) | Nifty | 7414.35 | 1650 Billion |
| Thailand | Stock Exchange of Thailand (1975) | SET Index | 1371.05 | 319.82 Billion |
| Indonesia | Indonesia Stock Exchange (1912) | IDX Composite | 5048 | 2095 billion |
| | | Jakarta Islamic IndexLQ-45 | 5366<br>6145 | |
| Malaysia | Bursa Malaysia Berhad (1964) | FBMKLCI | 1720.890 | 189 Billion |

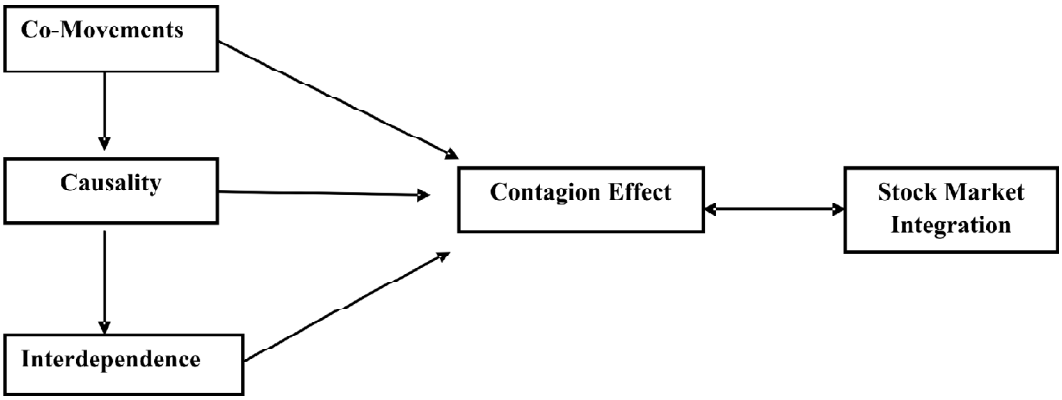
## RATIONALE OF STUDY

The Regional collaboration is an initial step for financial and economic integration among the nations. The ultimate policy decision originated at national levels across the globe that is of liberalizing financial market (Equity) which developed the world finance manifold. Over the globe the mix force on cross-country securities exchanges, gave the worldwide financial specialists enough chances to differentiate

their portfolios well crosswise over nations. Be that as it may, such kind of coordination begins as a center explanation behind money related turmoil during the crisis which is stated to be 'Contagion effect'. On the other side literature guaranteed that if two markets say an extensive increment in co-developments amid emergency compared with period of stability. As per the standpoint of stock exchanges is concerned, if co-integration prevails those stock markets are termed to be effective. On the other path around from the viewpoint of worldwide financial specialists such co-mix ends up being a definitive issue as they fail to diversify their portfolios in such kind of coordinated securities exchanges. The ideal situation for speculators is to have less coordinated markets. Therefore, this study is an attempt to distinguish the scope of integration in distinctive securities exchanges.

## CONCEPTUAL FRAMEWORK

As the literature review signified, the study is covering concepts broadly: Contagion Effect and Stock Market Integration. Through this criterion the contagion effect among stock market returns can be proved. And such contagion effect is directly indicative of Stock Market Integration. As literature claimed that only integrated stock markets are going to have contagion effect among them or the dis-integrated stock markets are safe from such contagion effect.




In earlier studies the contagion effect was being studied through co-movements (Chang *et al.,* 2015: Rui and Andreia, 2011: Morana, 2007: Metin and Muradoglu, 2001) through dependence levels (Chittedi, 2014: Bianconi *et al.,* 2013: Durante and Foscolo, 2013: Arouri *et al.,* 2010) and through causality (Goh *et al.,* 2005: Worthington *et al.,* 2003: Islami and Welfens, 2013: Floros, 2005).

The further claim from literature was that due to capital controls and lack of access to global financing dis-integrated economies were being immune from contagion effects (Dornbusch *et al.,* 2000). The foreign ownership restriction and

less degree of segmentation with more cross-country stock investing configure the integration levels across markets (Chan *et al.*, 1997).

The global financing made stock markets more exposed towards the risk of 'crisis spread'. But earlier studies had stated that whenever crisis spread the highly integrated markets are more at loss due to highest chances of having co-movements. Thus such co-movements make the stock markets incompetent for global investors to invest in so.

## RESEARCH OBJECTIVES

The study has been conducted to undertake the following objectives:

[1] To state the long run relationship across the stock markets of India with Thailand, Indonesia and Malaysia.

[2] To identify the cause and effect relationship in between the stock markets selected.

[3] To state the integration status for the stock markets of India across Thailand, Indonesia and Malaysia.

## RESEARCH METHODOLOGY

The study covers quantitative objectives which will be based on empirical testing using the secondary data for the period 2005-2015. As per the definition of contagion effect crisis spread doesn't link to crisis itself, which means if markets showing co-movements without any crisis framework is said to be contagion effect as well. For such empirical analysis the Benchmark stock indexes of countries that are India with Indonesia, Malaysia and Thailand are to be used. In the securities exchanges of these nations the pretty much reconciliation is demonstrated through the tests over stock indexes for Common-movements, Dependence levels and causality approach. The co-efficient is done in twofold analysis: the first one will evaluate the common movements through long run relationship across selected stock markets whereas the second examination is about the causal relationship across such markets. For testing the long run relationship between the securities exchanges the Johansen Co-Integration method is utilized.

For analysis all of the ten countries included in ASEAN were taken into consideration. Out of those countries chosen for comparison with India are Indonesia, Thailand and Malaysia. The rationale behind choosing such countries is their competitive & compatible status of comparison with that of India. The share of Global Investment of these countries in India is commendable as per the Foreign investment data of Central Depository of Securities limited (CDSL) in the year 2015. As per the ongoing debate of financial analysts the Global investment is the channel or source which portfolio managers or Industries do follow to state the prospects of their investment in coming times.

**Hypothesis**

$H_{01}$: There is a Unit root or the data under consideration is Non-stationary.

$H_{02}$: There is no co-integration in between the stock market of India with Thailand, Indonesia and Malaysia.

$H_{03}$: There is no causal relationship status among the stock markets of India with Thailand, Indonesia and Malaysia.

## EMPIRICAL ANALYSIS

The pragmatic analysis over the two stock markets involved three fold analyses that are Stationarity test, Co-Integration test and Granger causality test.

**$H_{01}$**: There is a Unit root or the data under consideration is Non-stationary.

The ideal situation for johansen co-integration to apply is that at level data must be non-stationary. But for Granger causality Stationarity needs to be proven at 1st or 2nd difference.

### Unit Root Results (2005-2015)

The first step in analyzing the common movements requires the data to be stationary in time series analysis involving sample period of 2005 till 2015. Whereas for applying Johansen co-integration test data needs to be non-stationary at level, otherwise the model could not be applied.

As per Table 2 the index of India such as Nifty the ADF Value of -1.480330 with p Value 0.5437 signify that there is moderate probability that data do has unit root or is non-stationary. Which means the analysis is required to be done on 1st difference point with ADF Value -49.72094 but p value is almost 0.000 showing that null hypothesis needs to be rejected which state that data do possess unit root. Therefore the data of Nifty is stationary at 1st difference point which fulfills the condition of Johansen model to apply over such stock market.

For Thailand the index such as Set indicates the p value is 0.7863 at t-statistic of -0.907899 which means data has strong probability to have unit root which might lead to acceptance of null hypothesis. But at 1st difference p value is recorded to be at 0.0001 value with t-statistics of -50.29974 signifying that series data doesn't possess any unit root leading to rejection of Null Hypothesis.

For the Index of Indonesia (LQ45) indicates the ADF value of -2.611832 at P value of 0.2750 which indicates that data is actually Non-stationary at level. But at 1st and 2nd difference the ADF of -32.14817 and -21.37955 respectively at p value of 0.0000 indicates the rejection of hypothesis leading data to be stationary at such point.

For the index of Malaysia (FBMKLCI) the ADF value of -2.216384 at the P value of 0.4796 lead to acceptance of hypothesis which constitute data to be non-stationary

at level. On the other hand data is stationary at 1st and 2nd difference with p value 0.0000 leading acceptance of hypothesis. Hence the condition to apply Johansen model are justified.

The first Hypothesis of stationarity is accepted which is a pre-condition for Johansen model to be applied. But for Granger causality to apply the first Hypothesis of unit root is being rejected at 1st and 2nd difference as data is stationary at such point.

**Table 2**
**Unit Root Test on Indices**

| *Variables* | *Level (ADF Test)* | | *1st Difference (ADF Test)* | | *2nd Difference (ADF Test)* | |
|---|---|---|---|---|---|---|
| | *t-statistics* | *P value* | *t-statistics* | *P value* | *t-statistics* | *P value* |
| India (Nifty) | -1.480330 | 0.5437 | -49.72094 | 0.0001 | -22.82957 | 0.0000 |
| Thailand (Set) | -0.907899 | 0.7863 | -50.29974 | 0.0001 | -26.33850 | 0.0000 |
| Indonesia (LQ45) | -2.611832 | 0.2750 | -32.14817 | 0.0000 | -21.37955 | 0.0000 |
| Malaysia (FBMKLCI) | -2.216384 | 0.4796 | -54.49775 | 0.0000 | -18.67648 | 0.0000 |

*Note:* Null Hypothesis: the series has unit root
*MacKinnon (1996) one-sided p-values.

## Johansen Co-Integration Test

The co-integration test helps to identify the long run movements across the indices of selected stock markets. Such long run movements will place the occurrence of co-movements in between the stock markets. For establishing the Johansen model the trace statistics and Max-Eigen value statistics are considered for analysis.

**$H_{02}$:** There is no co-integration in between the stock market of India with Thailand, Indonesia and Malaysia.

**Table 3**
**Johansen Co-integration Test Results (2005-2015)**

| *Nifty and* | *No. of Hypothesized CE (s)* | *Trace Statistics* | *Critical Value* | *Prob. Value* | *Max-Eigen Value Statistics* | *Critical Value* | *Prob. Value* |
|---|---|---|---|---|---|---|---|
| Set | None | 11.78970 | 15.49471 | 0.0872 | 10.88117 | 14.26460 | 0.1602 |
| | At most 1 | 0.908536 | 3.841466 | 0.3746 | 0.908536 | 3.841466 | 0.3405 |
| LQ45 | None | 32.21772 | 15.49471 | 0.0001 | 30.55720 | 14.26460 | 0.0768 |
| | At most 1 | 1.660515 | 3.841466 | 0.1975 | 1.660515 | 3.841466 | 0.3746 |
| FBMKLCI | None | 26.41873 | 15.49471 | 0.0008 | 24.93734 | 14.26460 | 0.0007 |
| | At most 1 | 1.481388 | 3.841466 | 0.2236 | 1.481388 | 3.841466 | 0.2236 |

*Note:* Significance at the 0.05 level

In table 3 the co-integration between Nifty with set indicates the trace statistics of 11.78970 with probability of 0.0872 & Maximum Eigen value depict the same result at probability of 16.02%. These values show the result that there is no Co-integration across the indices due to acceptance of the null hypothesis. The same is being supported via Eigen values & the critical values.

When Indonesian stock market was compared with Indian market, it was shown through LQ45 and nifty that with trace statistics value of 32.21772 at probability of 0.0001 leading to rejection of hypothesis which indicates that there is no co-integration. So, common movements for long run are found out across these two stock markets.

The Malaysian stock markets' Index such as FBMKLCI being compared with Nifty stated the trace statistics of 26.41873 with p value of 0.0008 leads to rejection of hypothesis which states that there is a co-integration across these markets.

So, it was found out from 2005 till 2015 the co-integration for stock markets of India with that of Indonesia and Malaysia are proven but if Thailand market is considered, the common movements for long run or co-integration was not found.

**Granger Causality Test**

The causal influence between the selected markets is ascertained. Through such analysis the dependence and independence levels of stock markets could be stated. The cause and effect relationship across these stock markets is ascertained as per following:

**Table 4**
**Pair-wise Granger Causality Tests for Total time period (2005-2015)**

| *Null Hypothesis* | *Observation* | *F-Statistic* | *Prob.* |
|---|---|---|---|
| SET does not Granger Cause NIFTY | 2681 | 3.94884 | 0.0194 |
| NIFTY does not Granger Cause SET | | 3.39647 | 0.0336 |
| LQ45 does not Granger Cause NIFTY | 2677 | 7.31912 | 0.0007 |
| NIFTY does not Granger Cause LQ45 | | 7.62533 | 0.0005 |
| FBMKLCI does not Granger Cause NIFTY | 2708 | 11.9702 | 7.E-0.6 |
| NIFTY does not Granger Cause FBMKLCI | | 0.21121 | 0.8096 |

*Note:* Significant at 5% Level

In the table 6 causal relationship is elaborated which depicts that stock market of Thailand doesn't granger cause the Nifty with p value of 0.0194 leading to rejection of such hypothesis. Thereby, SET does have an impact and causal status upon nifty but with short run linkage. Whereas Nifty does not granger cause set with p value 0.0336 which is less than standard limit constituting rejection of hypothesis. Overall Set and Nifty does have a short run linkage across the time period selected.

The Indonesian Index (LQ45) and Nifty both do granger cause each other as P value of LQ45 causing Nifty is 0.0007 and vice versa causality is 0.0005 leading to rejection of hypothesis. So, there is a causality status in between the stock markets of Indonesia and India.

On the other side stock markets' index of Malaysia and India states that FBMKLCI doesn't lead to a causality status on Nifty with p value 7.E-0.6 meaning thereby the acceptance of hypothesis. Same happened with Nifty causality on FBMKLCI which means nifty also doesn't have any cause-impact status with that of Malaysia market index.

## LIMITATIONS OF STUDY

Due to data non-availability the selection of ASEAN countries are limited to three only which could be extended in coming time if data is subscribed from official websites of respective stock exchanges. Moreover, the study is limiting on interdependence only whereas contagion effect could be extended towards forecasting the prices as well.

## CONCLUSION

As a hub of global investment the Southeast Asian countries are securing their place in Global Investment share and ASEAN do consist the developed Southeast Asian countries. It's an astonishing area to extract the stock market properties of different nations of such region. As per the literature emerging markets do have less integration which exposed out portfolio diversification benefit due to less contagion effect across such markets. In this study it is found out that there is no co-integration across the stock markets of Thailand and India for long run but definitely these stock markets are proven to be interdependent for short run which indicates good news for investors. Whereas the Indonesia and Malaysia are actually co-integrated with India for long run but India do share its interdependence and short run impact with Indonesia only but Malaysia is free from such relation. It indicates that Indonesia although by sharing long run relationship with India eventually had interdependence status as well for short run too. But Malaysia by being co-integrated for long run doesn't share the interdependence status with India which somewhat might create dilemma for investors. Broadly, these stock markets are found to have common movements for sampled time frame that means these two markets do have highest chance to have contagion effect. The existence of co-integration leads to less diversification benefit leading these markets to be less attractive for global investors to invest.

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## APPENDICES – I

**Table 7**
**The Major Contributions**

| *Author's Name (Year)* | *Objectives* | *Tools used* | *Main Findings* |
|---|---|---|---|
| Chattopadhyay (2014) | To explore the Dynamics of Indian stock market. | ✓ Correlation Testing<br>✓ Unit root tests<br>✓ Johansen Integration<br>✓ Granger Causality | Indian market is not integrated or influenced from the world markets such as UK, USA and other Asian markets. The impact of world markets on Indian stock market are short lived. |
| Hamori (2003) | Empirically analyze the interdependence of stock prices in Germany, Japan, UK & USA. | VAR: Vector Auto regression.<br>LA-VAR: Lag-Augmented Vector Auto regression. | Germany, USA & UK were closely linked while Japan was proven to be independent from the influence of other countries. |
| Floros (2005) | To empirically analyze the short & long term relationships among stock prices in US, Japan and UK. | ✓ Johansen Co-integration<br>✓ Granger Causality. | The mature markets were proven to be more integrated that is S&P500, Nikkei 225 & FTSE -100 than the emerging markets. |
| Worthington *et al.* (2003) | Examine the price linkages among Asian equity markets | Multivariate co-integration and level VAR procedures conducted. | There was a significant causal linkage between the Asian equity markets. |

*Source:* Literature