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# Are the Bourses of India and Asian Tiger Cubs Inter Linked?

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## Abstract

The study examines the volatility linkages between India and Asian tiger cubs, i.e., the Philippines, Indonesia, Malaysia, and Thailand. It aims to explore the spillover effects of volatility among these countries' stock markets to provide valuable insights to investors and policymakers. To study the spillover effect, we examined daily returns for the benchmark indices of the stock markets of these countries for an extended period of 17 years from 2002 to 2019. The study period comprises of Whole Study Period, Global Crisis Period, Eurozone Crisis Period, and Rupee Depreciation Period. The methodology comprises of Granger Causality Test, Vector Auto Regression (VAR) model, and GARCH BEKK model. Asian stock markets were worst hit by the Global Financial Crisis and least affected by Eurozone Crisis. The rupee's depreciation period also influenced the returns of Asian stock markets. Bidirectional and unidirectional relationships are observed between India and Asian Tiger cubs for the whole study period, Global Crisis period, Eurozone Crisis Period, and Rupee Depreciation Period. Understanding the causal pattern between economic growth and stock market volatility will allow investors to estimate potential stock market movements. Analysis indicates that the observed capital markets are mutually affected, but not to a greater degree. This leads us to two significant conclusions. Firstly, this means that there are ways for investors to diversify into Indian and Asian Tiger cub stock exchanges. Secondly, national factors (macroeconomic variables) affect capital markets, and market shocks are also affected by information from the past that is specific to the respective markets.

**Keywords:** Asian Tiger Cubs, GARCH BEKK Model, Vector Auto Regression, Impulse Response, Variance Decomposition, Granger Causality.
**JEL Classifications**: G1; G15; C58; C49; N25

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## 1. Introduction

Liberalization has created numerous opportunities for investors to choose and control diverse portfolios around the world. Investors worldwide pay a lot of attention to the internationalization of stock markets. Investors invest in different stock markets to diversify their portfolios and reduce the risk associated with them. The international flavor of the portfolio also results in the convergence of multiple stock markets with each other. The reasons for this convergence range from common economic factors, the transmission of information from one cell to another, the spillover of financial risks, etc. The spillover of financial and economic threats from one economy to another has earned significant attention over the years (Wei-Chong, Loo, Ling, and Ung, 2011; Valls and Chuliá, 2014; Jan and Jebran 2015; Truchis and Keddad, 2016; Jebran and Iqbal, 2016; Yousaf and Ahmed, 2018). Several empirical studies have been prompted by the growing international integration of financial markets to investigate the process by which stock market movements are transmitted across the world. (Bentes, 2015; Paramati, Gupta, and Hui, 2016; Chevallier, Nguyen, Siverskog and Uddin, 2018; Yao, He, Chen and Ou, 2018) These studies analyze how the returns in one stock market impact the other stock markets' returns. These studies further explore their implications for securities pricing, hedging, other trading techniques, and regulatory policy framing. In the aftermath of the global stock market crash of October 1987, the Asian crisis of 1998, the financial crisis of 2008, and various other financial crises which saw significantly correlated price swings across most of the world's stock markets, these concerns have become essential for investors around the globe. (In, Kim, Yoon, and Viney, 2001; Wang and Moore, 2009; Singhania and Anchalia, 2013; Ben Slimane, Mehanaoui and Kazi, 2013; Bala and Takimoto, 2017). With the increased exposure to overseas financial and economic risks, numerous legislation and institutional rules have been formulated to mitigate the cross-market consequences.

Motivated by a renewed interest in understanding the essence of knowledge transmission through markets, the influence of the recent crisis, our study examines the volatility linkages between India and Asian tiger cubs, i.e., the Philippines, Indonesia, Malaysia, and Thailand. For this purpose, we have explored the spillover effects of volatility among these countries' stock markets to provide valuable insights to investors and policymakers. For studying the spillover effect, we have used the stock markets' daily returns for the benchmark indices of the stock markets of these countries for an extended period of 17 years from 2002 to 2019. We have employed a multivariate BEKK-GARCH model, which is considered more robust than the traditional GARCH model. We study inward volatility transfers independently from outward volatility transfers in this article, as well as how they differ across individual Asian bourses. We have demonstrated that an individual Asian stock market's sensitivity to inward volatility shock transmission from other markets is linked to its degree of openness in this way. We found that the strengthening of volatility spillover was not a one-time event (concerning all the four periods of understudy) but continued throughout the study period. Also, the association between the volatility transfers and the degree of openness differs among Asian stock markets. The study also makes an essential contribution to the extant literature in the area. Our analysis also helps investors and portfolio managers recognize the factors that influence the assets' behavior and the characteristics of the different geographical regions they might invest in to prepare a balanced portfolio.

The literature reviewed for the study is discussed in Section 2. The data used for analysis is discussed in Section 3. Section 4 explains the econometric approach for measuring volatility spillover and aspects of the findings. The study's conclusion, followed by policy implications and scope for future research, is given in Section 5,

## 2. Review of Literature

The financial literature offers numerous studies providing information about the spillover effects of volatility among different stock markets. Most of these studies have been performed to study established stock markets, but few studies examine emerging and developing markets. (Bekaert and Harvey,1997; Aggarwal, Inclan and Leal, 1999; Joshi, 2012; Jebran and Iqbal, 2016; Bala and Takimoto, 2017; Chow, 2017; Zhang, Zhuang and Lu, 2020; McIver and Kang, 2020). Connections between mature and emerging financial markets have various consequences for the investment process, but much more during the financial crisis as there is a high degree of co-movement, which is an empirical fact. A review of irregular transmission patterns of volatility between emerging and foreign stock markets during periods of financial instability is essential. The size of their dynamics varies, especially in the case of emerging stock markets. Especially in the context of financial crises, the effectiveness of international portfolio diversification is very significant. (Mathur, Chotia, and Rao, 2016; Xu, Taylor, and Lu, 2018; Quoreshi, Uddi, and Jienwatcharamongkhol, 2019; Spulbar, Trivedi, and Birau, 2020). Emerging stock markets are becoming more relevant. The degree to which the ties between emerging stock markets and developed stock markets are related has ramifications for investors in developing and developed countries. Suppose that emerging financial markets are only weakly integrated with their refined counterparts. In that case, there may be a limited impact of external shocks on emerging markets, and developed market investors may benefit from the inclusion of emerging market stocks in their portfolios, as this diversification can reduce risk. On the other hand, If the emerging stock markets are fully integrated with the existing ones, stock markets volatility in emerging markets will decrease. The volatility of the emerging markets will mainly determine it. The volatility of developed markets and the low cost of emerging domestic investors would benefit from the capital. (Worthington and Higgs, 2004; Li, 2007; Wang and Wang, 2010).

While the empirical finance literature is rich in studies focusing on the transmissions and dynamic ties between significant stock markets, our research differentiates itself in three main respects from these. Financial economists have been drawn to the interplay between developing and developed markets in the last 20 years as the importance of emerging countries has grown. This connection has implications for global integration and financial deregulation. Many studies have looked at the correlation of stock prices across foreign financial markets, for example (Joshi 2011; De and Keddad, 2016; Chow, 2017; Hung, 2019). Little research has been done on the interdependent structure of the Indian and Asian Tiger Cubs. The current study attempts to investigate volatility spillover during the Global Crisis, Eurozone Crisis, and Rupee Depreciation Period based on a review of the existing literature on the linkages between the chosen stock markets. The five emerging Asian markets used in this study are India, the Philippines, Indonesia, Malaysia, and Thailand. Firstly, we analyze India and Asian emerging markets' linkages instead of examining transmissions only between established stock markets. Secondly, we're investigating the long-term relationships between various economies and contrasting the findings based on three financial crises with different sample times using Granger causality and VAR models. Thirdly, we consider own market and cross-market spillovers between Indian and Asian Tiger cubs using the GARCH BEKK model.

## 3. Research Methodology

### *3.1 Data*

The information about the sample stock markets and their benchmark indices is given in below:

Sample Stock Markets

| Group | Countries | Denotations for Return Series | Stock Market Index |
|---|---|---|---|
| India and Asian Tiger Cubs | India | RIndia | Bombay Stock Exchange (Sensex) |
| | Philippines | RPhilippines | Philippine Stock Exchange (PSEI) Composite |
| | Indonesia | RIndonesia | Jakarta Composite Index (JKSE) |
| | Malaysia | RMalaysia | Malaysian Stock Exchange (KLSE Index) |
| | Thailand | RThailand | Stock Exchange of Thailand (SET) |

Source: https://finance.yahoo.com/

The period of the study is from January 2002 to December 2019. The data of the daily closing levels of the benchmark indices have been taken from Yahoo Finance and the respective exchange websites. The periods of the Global Financial Crisis from August 2007 to May 2009, the Eurozone Crisis from January 2010 to December 2012, and the Rupee Depreciation from March 2013 to April 2014 have been studied separately to understand this crisis's impact on the volatility transmission. The return for the stock markets of all countries has been computed by using the following equation:

$$R_t = \ln p_t - \ln p_{t-1} \qquad (1)$$

### *3.2 Descriptive Statistics*

To gain an insight into the nature of the data, we have computed various descriptive statistics as given in Tables 1(a); 1(b); 1(c), and 1(d). This analysis includes descriptive statistics and 17-year returns from January 2002 to December 2019, along with periods of the crises of selected indices. The descriptive statistics include average returns, median returns, return peaks, minimum and maximum returns, return risk, Kurtosis, Jarque Bera, etc. Average annual returns are calculated by multiplying the mean return of the respective index with the number of observations and dividing by the number of years.

Average Annual Returns= (Mean Return * Number of Observations)/ Number of Years Under Study

### *3.3 Unit Root Test*

Root control is an essential prerequisite for the stationary character of the chosen time series. The research tests, through the Augmented Dickey-Fuller test, the zero-hypothesis of a unit root in the selected sequence. The research reports on the ADF root control results for selected stock market studies. In the unit root test, the optimum lag length was reported.

The Dickey-Fuller method requires measuring and running the regression equation hypothesis check. The simplest way of evaluating the root of the unit is with an AR (1) model.

$$u_t = \alpha + \omega u_{t-1} + \varepsilon_t \qquad (2)$$

Where α and ω are parameters, and white noise is assumed. Suppose you have-1< ω <1, you are a fixed series, while if ω =1, you are a non-stationary series. The sequence is explosive if the ω's absolute value is more significant than one. The concept of a stationary sequence, therefore, is that there is strictly less than one total value of ω.

### *3.4 Granger Causality Test*

One way to research causality in a time series between two variables is through Granger causality. The methodology uses empirical evidence to find correlation patterns and is a probabilistic account of causality. This approach considered whether one sequence in the prediction of another was accurate. Consider this approach. The result is that X is induced by Y if the relationship between the two variables is between X and Y. Y is induced by X. The causality of modern associations doesn't need to be accidental. The cause of Granger is based on basic reasoning that does not influence.

We may primarily have three situations: causal in one way or unidirectional; no causal between x and y; and causal in two ways or Bi-direction. Granger tests the priority and content of knowledge but does not imply causality in the more traditional use of the word. Let y and x be time series stationary.

The following equations give an Autoregressive linear model of two variables X and Y

$$X(t) = \sum_{j=1}^{p} A_{11}, jX(t-j) + \sum_{j=1}^{p} A_{12}, jY(t-j) + \epsilon_1(t) \qquad (3)$$

$$Y(t) = \sum_{j=1}^{p} A_{21,} jX(t-j) + \sum_{j=1}^{p} A_{22}, jY(t-j) + \epsilon_2(t) \qquad (4)$$

Here p is the highest numerical interval annotations. X and Y are the time series variables.
$\epsilon_1$ and $\epsilon_2$ are the residuals.

This research focuses on the relationship between the Indian and Asian Tiger Cubs. A Granger-causality study has been performed to determine whether one stock might predict the other.

### *3.5 Johansson Cointegration Test and VAR*

The cointegration test by Johansen is considered to be the most significant among the various tests available. The integration test of Johansen requires very complicated mathematics; the E VIEWS software results are therefore recorded and addressed in the analysis. Johansen's integration test is used to study the long-term balance between the different time series of the same integrated order. The Cointegration test of Johansen is based on a reduced VAR and VECM rating. The evaluation protocol for Johansen's Cointegration seeks to determine the number of long-term and short-term equilibrium ties. The cointegration test by Johansson identifies cointegration relations through the vector self-regression test. If each time series is cointegrated together, then an Error Correction Model will express the VAR model. (Konya, 2004; Johansson, 2008; Johansson and Ljungwall, 2009; Kumar and Khanna, 2018) applied the Johansson Cointegration Test in their research.

$$\Delta X_t = \tau_0 + \tau_1 \Delta X_{t-1} + \tau_2 \Delta X_{t-2} + \ \ldots . + \tau_{k-1} \Delta X_{t-k+1} + \pi X_{t-1} + \varepsilon_t$$

Or

$$\Delta X_t = \tau_0 + \sum_{i=1}^{k-1} \tau_i \, \Delta X_{t-i} + \pi \Delta X_{t-1} + \varepsilon_t \qquad (5)$$

Where $\pi \Delta X_{t-1}$ is the error correction term (ECT), $\pi = \alpha\beta'$ is the coefficient matrix and $\varepsilon_t$ ∽iid (0, ∑).

Unrestricted VAR is used to estimate a matrix α under the co-integrative vector hypothesis test. The error correction model shows the feedback mechanism, and short-term parameters are α-to long-lasting matrix β components. Hypothesis checks on α and α thus defining long-term and short-term dynamics. Equations for VAR:

$$Z_t = C_1 Z_{t-1} + \cdots \ldots . . + C_p Z_{t-p} + B_{yt} + \varepsilon_t \qquad (6)$$

where Zt is a k vector of endogenous variables, it is a d vector of exogenous variables, C_1......, Cp and B are matrices of coefficients to be estimated, and İt is a vector of innovations that may be contemporaneously correlated but uncorrelated with their own lagged values uncorrelated with all of the right-hand side variables.

The versions of the Vector Auto Regression (VAR) are the naturally extended ARMA models. VAR is a complex simultaneous equation alternative with too many arbitrary decisions. In the regular VAR, the variables are endogenous, and the independent variables include only those endogenous variables that are lagged. In the list of independent variables, new words for selected variables are not included. The VAR models are based on the assumption that contemporary developments are not associated with the variables. The order of VAR (represented as p) must be decided before estimating the equation system. Data parameters Schwarz Criterion (SC) and Hannin Quin (HQ) are used for this reason. To minimize the information criterion, the lagged value is chosen.

### *3.6 Heteroskedasticity*

Heteroscedasticity occurs when the standard variable deviations, controlled for a certain time, are not consistent in statistics. The testing of heteroscedasticity is one of the most relevant issues before the implementation of the GARCH methodology. To verify the presence of heteroscedasticity in residuals, the Lagrange Multiplier (LM) test for ARCH effects proposed by Engle (1982) is used. Heteroscedasticity has two forms: conditional and unconditional. Conditional heteroscedasticity determines volatility that, when future high and low volatility intervals are not understood, is non-consistent. It is possible to equate potential periods of high and low volatility with unconditional heteroskedasticity.

### *3.7 ARCH LM Test*

An uncorrelated time series can still be reliable due to the complex conditional variance period. A series of times suggesting conditional heteroscedasticity or self-correlation in the square array is said to have Auto-Regressive Heteroscedastic Conditions (ARCH). The ARCH test is a Lagrange multiplier test for evaluating the intensity of ARCH impact. (Engle,1982)

The study examines the output of the identified Indian and Asian Tiger Cub bourses. To predict the return on the different inventory indices, the ARMA (1,1) residues are being examined.

### *3.8 GARCH BEKK model*

The GARCH (1, 1) BEKK model representation is used to research the transmission of volatility in Asian stock exchanges. The model is Bollerslev's extension of the GARCH model (1986). This model allows conditions and covariance to interact, while the BEKK approach will enable us to assess the transmission of volatility.
Suppose for a bivariate GARCH model, the covariance matrix, its BEKK model is as follows

$$H_{Ij,t} = \begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix}$$

$$H_t = C^{'}C + B^{'H_{t-1}}B + A'\varepsilon'\varepsilon A \tag{7}$$

$$H_t = \begin{bmatrix} c_{11} & c_{12} \\ 0 & c_{12} \end{bmatrix}\begin{bmatrix} c_{11} & c_{12} \\ 0 & c_{12} \end{bmatrix} + \begin{bmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{bmatrix}\begin{bmatrix} \varepsilon_{11,t-1} & \varepsilon_{12.t-1} \\ \varepsilon_{21,t-1} & \varepsilon_{22,t-1} \end{bmatrix} H_{t-1}\begin{bmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{bmatrix} + \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}\begin{bmatrix} h_{1,t-1} \\ h_{2,t-2} \end{bmatrix}\begin{bmatrix} h_{1,t-1} \\ h_{2,t-2} \end{bmatrix}\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \tag{8}$$

C is the matrix of parameters, A is the ARCH effect coefficient matrix, and B is the GARCH effect coefficient matrix. The ARCH effect from the previous return to present conditional variances is analyzed by Matrix A. The GARCH effect from past conditional variance to current conditional variances is investigated by Matrix B. The BEKK model assumes that the matrices of both A and B are diagonal. All the off-diagonal components are thus equal to zero.
The log-likelihood function of the model is written as follows:

$$\ln l\,(\theta) = -\frac{pN}{2}\ln 2\pi - \frac{1}{2}\sum_{i=1}^{p}\left(ln|h_t| + \frac{1}{2}\varepsilon_t^{'}H_t\varepsilon_t\right) \tag{9}$$

where θ is the unknown parameter of the model. N is the number of stock markets. In this N=5. P is the number of observations.

Equations (7), (8), and (9) provide an analysis of the volatility spillovers between the two markets, both concerning the effect of their own and cross-market factors. Also, the BEKK model ensures that the matrix of covariance is positive and definite through construction. The total similarity system uses this equation. Bollerslev and Woolridge (1992) showed that standard errors calculated using this method are resilient even when the normality principle is violated.

The findings of the statistics and econometrics approach applied to the long-term and short-term cointegration of Indian and Asian Tiger Cubs are analyzed. Data were obtained from the secondary time series for this research paper. This study consists of a theoretical framework and further analysis-related fundamental analyses, such as definition statistics, root testing unit, etc. The objective is to explore the nature of cointegration between India and Asia's stock markets in terms of length, stability, and exposure to other internal and external factors affecting stock markets in various economies. The Granger Causality Test, Johansson Cointegration Test, VAR, and GARCH BEKK model are used to achieve this purpose.

## 4. Findings and Results

### *4.1 Descriptive Statistics and Johannsson Cointegration Test*

A summary of 17 years from January 2002 to December 2019 is shown in Table 1(a). Table 1(b) shows summary statistics for the Global Crisis Period, Table 1(c) shows the summary statistic for the Eurozone Crisis Period, and Table 1(d) shows summary statistics for the Rupee Depreciation Period. Descriptive statistics of 5 Asian stock markets are presented in detail in these tables. This includes the average, median, maximum, minimum, default skewness, kurtosis, Jarque Bera, etc. From Table 1(a), positive returns are observed in all the stock markets. Maximum returns are observed in the stock markets of Indonesia, followed by Indian stock markets. Maximum risk measured by standard deviation is observed in Indian stock markets followed by Indonesian stock markets for the whole period. In the time under consideration, the Malaysian stock markets are found to be the least volatile. Table 1(b) negative returns are observed in all the stock markets during the Global Crisis period. The maximum risk is observed in the Indian stock market, followed by the Indonesian stock market for the Global Crisis Period. Table 1(c) positive returns are observed in all the stock markets during the Eurozone Crisis Period. The maximum risk is observed in the Indonesian stock market, followed by the Indian stock market during Eurozone Crisis Period. Table 1(d) shows that positive returns are observed in the Indian, Indonesian, and Malaysian stock markets, and negative returns are observed in the Philippines and Thai stock markets. The maximum risk is observed in the Philippine and Indonesian stock markets during the Rupee Depreciation Period.

The stationary existence of unit root test data tests must be tested. Jarque-Bera Statistics are used to see if the earnings from the stock lists under investigation usually circulate. The findings suggest that the profits are not distributed regularly, which could lead to the stationary problem of managing the income being examined. The Jarque-Bera values are greater than the critical value for all nations, which appears to reject the null of a normal distribution. From the data on kurtosis, it can be concluded that all stock markets are leptokurtic (more than three kurtosis tests). Table 1(a), table1(b), Table 1(c), and Table 1(d) display the function's root test result. According to the Augmented Dickey-Fuller Test, it is found that all return variables are stationary at the point, and therefore normally distributed. It can be concluded that the daily stock indices of selected stock markets are stationary and show fluctuations regularly.

A cointegration test is applied to define the long-term relationship. Table 1(e) observations have been made based on Trace statistics. The Eigenvalue statistic results show that the p values for these statistics are more significant than 0.05, which means the null hypothesis of the test of no cointegration factor cannot be rejected. Hence, we can say that there is no long-term association between the selected Asian stock markets.

**Table 1(a):** Descriptive Statistics whole period: 2002-2019

| | **INDIA** | **PHILIPPINES** | **INDONESIA** | **MALAYSIA** | **THAILAND** |
|---|---|---|---|---|---|
| Mean | 0.05 | 0.04 | 0.06 | 0.02 | 0.04 |
| Annual Average Returns | 14.96 | 11.27 | 16.54 | 4.32 | 9.74 |
| Median | 0.02 | 0.00 | 0.05 | 0.00 | 0.00 |
| Maximum | 15.99 | 9.37 | 7.62 | 4.40 | 10.58 |
| Minimum | -11.81 | -13.09 | -10.95 | -10.22 | -16.06 |
| Std. Dev. | 1.33 | 1.18 | 1.26 | 0.71 | 1.18 |
| Skewness | -0.06 | -0.55 | -0.72 | -0.79 | -0.84 |
| Kurtosis | 13.78 | 10.71 | 11.53 | 16.03 | 17.66 |
| Jarque-Bera | 22753.28 | 11871.62 | 14634.91 | 33691.68 | 42585.15 |
| Probability | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sum | 254.46 | 191.73 | 281.29 | 73.47 | 165.64 |
| Sum Sq. Dev. | 8262.44 | 6589.01 | 7444.97 | 2333.63 | 6495.12 |
| Observations | 4695.00 | 4695.00 | 4695.00 | 4695.00 | 4695.00 |
| Unit root | | | | | |
| ADF P- Value | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **ARCH LM Test** | **209.44*** ** | **54.64*** ** | **160.64*** ** | **65.17*** ** | **521.88*** ** |

Source: Authors' Calculations

Note: *** implies significance at a 1percent level of significance. ARCH-LM test shows Engle's (1982) test for conditional heteroskedasticity calculated for the first lag only.

**Table 1(b)**: Descriptive Statistics Global Crisis Period: 2007-2009

| | **INDIA** | **PHILIPPINES** | **INDONESIA** | **MALAYSIA** | **THAILAND** |
|---|---|---|---|---|---|
| Mean | -0.05 | -0.11 | -0.05 | -0.07 | -0.12 |
| Average Annual Return | -11.46 | -24.18 | -12.62 | -15.25 | -28.16 |
| Median | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Maximum | 7.90 | 9.37 | 7.62 | 4.40 | 7.55 |
| Minimum | -11.60 | -13.09 | -10.95 | -10.22 | -11.09 |
| Std. Dev. | 2.48 | 1.91 | 2.15 | 1.21 | 1.83 |
| Skewness | -0.20 | -0.68 | -0.50 | -1.13 | -0.71 |
| Kurtosis | 4.45 | 9.94 | 7.24 | 14.07 | 9.22 |
| | | | | | |
| Jarque-Bera | 43.46 | 958.59 | 363.62 | 2445.40 | 780.40 |
| Probability | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | | |
| Sum | -22.92 | -48.37 | -25.24 | -30.51 | -56.32 |
| Sum Sq. Dev. | 2813.38 | 1673.37 | 2121.59 | 674.66 | 1530.76 |

Source: Authors' Calculations

**Table 1(c)**: Descriptive Statistics Eurozone Crisis Period: 2010-2012

| | **INDIA** | **PHILIPPINES** | **INDONESIA** | **MALAYSIA** | **THAILAND** |
|---|---|---|---|---|---|
| Mean | 0.01 | 0.08 | 0.07 | 0.03 | 0.08 |
| Average Annual Return | 4.78 | 32.83 | 25.41 | 11.71 | 32.30 |
| Median | 0.00 | 0.04 | 0.08 | 0.03 | 0.07 |
| Maximum | 3.52 | 4.08 | 7.01 | 2.24 | 5.75 |
| Minimum | -4.21 | -5.27 | -9.30 | -3.12 | -5.81 |
| Std. Dev. | 1.08 | 1.02 | 1.20 | 0.59 | 1.11 |
| Skewness | 0.04 | -0.36 | -0.77 | -0.47 | -0.24 |
| Kurtosis | 3.64 | 5.60 | 11.21 | 5.24 | 7.14 |
| Jarque-Bera | 13.29 | 237.03 | 2263.1 | 191.4 | 563.5 |
| Probability | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sum | 9.58 | 65.67 | 50.84 | 23.42 | 64.61 |
| Sum Sq. Dev. | 900.5 | 808.7 | 1110.6 | 272.67 | 955 |
| Observations | 778 | 778 | 778 | 778 | 778 |
| Unit root | | | | | |
| **ADF P- Value** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** |

Source: Authors' Calculations

**Table 1(d):** Descriptive Statistics Rupee Depreciation Period: 2013-2014

| | **INDIA** | **PHILIPPINES** | **INDONESIA** | **MALAYSIA** | **THAILAND** |
|---|---|---|---|---|---|
| Mean | 0.05 | -0.01 | 0.00 | 0.06 | -0.04 |
| Average Annual Return | 15.39 | -3.95 | 0.14 | 17.41 | 10.34 |
| Median | 0.05 | 0.00 | 0.02 | 0.09 | 0.01 |
| Maximum | 3.70 | 5.54 | 4.54 | 3.68 | 4.32 |
| Minimum | -4.05 | -6.99 | -5.75 | -1.88 | -5.37 |
| Std. Dev. | 1.06 | 1.39 | 1.32 | 0.55 | 1.31 |
| Skewness | -0.14 | -0.81 | -0.28 | 0.34 | -0.32 |
| Kurtosis | 4.52 | 7.31 | 5.12 | 10.34 | 5.04 |
| Jarque-Bera | 28.09 | 248.74 | 56.63 | 637.96 | 53.71 |
| Probability | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sum | 15.39 | -3.96 | 0.14 | 17.42 | -10.34 |
| Sum Sq. Dev. | 317.13 | 545.20 | 489.58 | 86.50 | 480.26 |
| Observations | 282.00 | 282.00 | 282.00 | 282.00 | 282.00 |
| Unit root | | | | | |
| **ADF P- Value** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** |

Source: Authors' Calculations

**Table 1(e):** Cointegration Test Results for India and Asian Tiger Cubs

| | | | | |
|---|---|---|---|---|
| Unrestricted Cointegration Rank Test (Trace) | | | | |
| Hypothesized | | Trace | 0.05 | |
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| None | 0.00 | 47.16 | 69.82 | 0.75 |
| At most 1 | 0.00 | 26.53 | 47.86 | 0.87 |
| At most 2 | 0.00 | 12.06 | 29.80 | 0.93 |
| At most 3 | 0.00 | 2.91 | 15.49 | 0.97 |
| At most 4 | 0.00 | 0.08 | 3.84 | 0.78 |
| Trace test indicates no cointegration at the 0.05 level | | | | |
| * denotes rejection of the hypothesis at the 0.05 level | | | | |
| **MacKinnon-Haug-Michelis (1999) p-values | | | | |
| | | | | |
| Unrestricted Cointegration Rank Test (Maximum Eigenvalue) | | | | |
| Hypothesized | | Max-Eigen | 0.05 | |
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| None | 0.00 | 20.63 | 33.88 | 0.71 |
| At most 1 | 0.00 | 14.48 | 27.58 | 0.79 |
| At most 2 | 0.00 | 9.15 | 21.13 | 0.82 |
| At most 3 | 0.00 | 2.83 | 14.26 | 0.96 |
| At most 4 | 0.00 | 0.08 | 3.84 | 0.78 |
| Max-eigenvalue test indicates no cointegration at the 0.05 level | | | | |
| * denotes rejection of the hypothesis at the 0.05 level | | | | |
| **MacKinnon-Haug-Michelis (1999) p-values | | | | |

Source: Authors' Calculations

### *4.2 Granger Causality Test*

There is a need to tie the degree after the cointegration test, and the related course among the stock value records under analysis suits savvy Granger Causality Tests. These tests involve inspecting whether slack estimates of one arrangement for another arrangement have vital insightful power. They have unfounded speculations about the lack of causality for Grangers. The after-effects of these studies are compressed in Table 2. It indicates whether there is massive Granger Causality between different exchanges of securities for the whole study period, Global Crisis Period, Eurozone Crisis Period, and Rupee Depreciation Period. The outcome of a Granger causality check is significant at 5 percent. If the first value is significant and the second value is not substantial in the Granger causality test, we may assume a unidirectional relationship. If the two values are important, then we can assume that the relationship is bidirectional. If the two values are not important, then the variables do not have causality. To check the causal relationship between India and Asian Tiger Cubs, the Granger causality test is used. For the whole study period and Global Crisis Period, a Bidirectional relationship is observed between India and the Philippines. During the Eurozone crisis and the Rupee Depreciation Period, a unidirectional relationship is observed between India and the Philippines.

Similarly, we can study the relationship between all the selected stock markets shown in Table 2. Understanding the causal pattern between economic growth and the stock market will allow investors to estimate potential stock market movements. This is critical for investors when making decisions on asset allocation. This understanding is essential for policymakers to formulate policies that fit the country's economic goals better.

**Table 2:** Granger Causality Estimates between India and Asian Tiger Cubs for Whole and Crisis Periods

| | **Whole Period** | **Global Crisis Period** | **Eurozone Crisis** | **Rupee Depreciation Period** |
|---|---|---|---|---|
| Null Hypothesis | F-Stat | F-Stat | F-Stat | F-Stat |
| RPHILLIPINES does not Granger Cause RINDIA | 6.93<br>(0.01) *** | 4.36<br>(0.01) *** | 1.11<br>(0.32) | 1.41<br>(0.24) |
| RINDIA does not Granger Cause RPHILLIPINES | 96.01<br>(0.00) *** | 19.31<br>(0.00) *** | 32.13<br>(0.00) *** | 10.95<br>(0.00) *** |
| | Bidirectional | Bidirectional | Unidirectional | Unidirectional |
| RINDONESIA does not Granger Cause RINDIA | 2.83<br>(0.06) * | 3.05<br>(0.04) ** | 0.96<br>(0.38) | 6.77<br>(0.01) *** |
| RINDIA does not Granger Cause RINDONESIA | 35.53<br>(0.00) *** | 7.85<br>(0.01) *** | 4.66<br>(0.01) *** | 4.22<br>(0.01) *** |
| | Bidirectional | Bidirectional | Unidirectional | Bidirectional |
| RMALAYSIA does not Granger Cause RINDIA | 4.08<br>(0.02) ** | 1.76<br>(0.17) | 0.87<br>(0.42) | 1.91<br>(0.15) |
| RINDIA does not Granger Cause RMALAYSIA | 32.35<br>(0.00) *** | 10.60<br>(0.00) *** | 11.17<br>(0.00) *** | 8.55<br>(0.00) *** |
| | Bidirectional | Unidirectional | Unidirectional | Unidirectional |
| RTHAILAND does not Granger Cause RINDIA | 1.26<br>(0.285) | 0.87<br>(0.42) | 0.01<br>(0.99) | 3.76<br>(0.02) ** |
| RINDIA does not Granger Cause RTHAILAND | 27.31<br>(0.00) *** | 5.39<br>(0.01) *** | 4.21<br>(0.01) *** | 4.97<br>(0.01) *** |
| | Unidirectional | Unidirectional | Unidirectional | Bidirectional |
| RINDONESIA does not Granger Cause RPHILLIPINES | 82.67<br>(0.00) *** | 15.79<br>(0.00) *** | 39.27<br>(0.00) *** | 8.26<br>(0.00) *** |
| RPHILLIPINES does not Granger Cause RINDONESIA | 5.54<br>(0.00) *** | 2.92<br>(0.05) ** | 0.72<br>(0.48) | 1.16<br>(0.32) |
| | Bidirectional | Bidirectional | Unidirectional | Unidirectional |
| RMALAYSIA does not Granger Cause RPHILLIPINES | 40.17<br>(0.00) *** | 9.62<br>(0.00) *** | 13.63<br>(0.00) *** | 2.21<br>(0.11) |
| RPHILLIPINES does not Granger Cause RMALAYSIA | 6.32<br>(0.00) *** | 7.08<br>(0.00) *** | 3.21<br>(0.04) ** | 0.45<br>(0.64) |
| | Bidirectional | Bidirectional | Bidirectional | No Relation |
| RTHAILAND does not Granger Cause RPHILLIPINES | 84.02<br>(0.00) *** | 9.50<br>(0.00) *** | 23.89<br>(0.00) *** | 7.86<br>(0.00) *** |
| RPHILLIPINES does not Granger Cause RTHAILAND | 9.16<br>(0.00) *** | 3.24<br>(0.04) ** | 5.33<br>(0.01) *** | 0.19<br>(0.83) |
| | Bidirectional | Bidirectional | Bidirectional | Unidirectional |
| RMALAYSIA does not Granger Cause RINDONESIA | 2.33<br>(0.09) * | 4.01<br>(0.01) *** | 0.78<br>(0.46) | 1.76<br>(0.17) |
| RINDONESIA does not Granger Cause RMALAYSIA | 17.08<br>(0.00) *** | 11.38<br>(0.00) *** | 4.49<br>(0.01) *** | 3.18<br>(0.04) ** |
| | Bidirectional | Bidirectional | Unidirectional | Unidirectional |
| RTHAILAND does not Granger Cause RINDONESIA | 9.41<br>(0.00) *** | 3.33<br>(0.04) ** | 3.90<br>(0.02) ** | 2.24<br>(0.11) |
| RINDONESIA does not Granger Cause RTHAILAND | 14.48<br>(0.00) *** | 3.35<br>(0.03) ** | 8.66<br>(0.00) *** | 5.51<br>(0.00) *** |
| | Bidirectional | Bidirectional | Bidirectional | Unidirectional |
| RTHAILAND does not Granger Cause RMALAYSIA | 11.28<br>(0.00) *** | 5.71<br>(0.00) *** | 4.091<br>(0.02) ** | 2.81<br>(0.06) * |
| RMALAYSIA does not Granger Cause RTHAILAND | 3.03<br>(0.05) ** | 2.96<br>(0.05) ** | 0.91<br>(0.40) | 0.10<br>(0.89) |
| | Bidirectional | Bidirectional | Unidirectional | Unidirectional |

Source: Author's Calculations Values in parentheses represent p-values *** implies significance at the 1percent level, ** implies significance at 5percent, and * implies significance at the 10percent level.

***4.3 Vector Auto Regression Analysis***

It was found by the application of the VAR Model that the integration of the stock exchange with the other could be defined if the table value is greater than 1.96. Table 3 shows VAR estimates between India and Asian Tiger Cubs for the whole period. It is observed that the RIndia (Returns in India) at the lag of 1 has an influence on its own returns of each Asian tiger cub stock market under the study. RPhilippines do not stimulate their own returns but stimulate the returns of Indian and Thai stock markets. RIndonesia influences the returns of the Philippine and Malaysian stock markets. RMalaysia influences the returns of Philippine stock markets. Returns in Thailand influence only two Asian Tiger Cubs, namely Indonesia and the Philippines. This proves that all Asian Tiger Cubs' economies are influenced by Indian stock markets.

India is influenced by its own returns and influences the returns of selected stock markets. The Philippines, Indonesia, Malaysia, and Thailand are not influenced by their own returns. Table 4 shows VAR estimates between India and Asian Tiger Cubs for the Global Crisis period. It is observed that the RIndia (Returns in India) at the lag of 1 does not affect its own returns but influences the returns of other stock markets under the study. The Philippines does not stimulate its own returns but stimulates returns of Thai stock markets. Indonesia influences the returns of the Philippine stock markets. Malaysia controls the returns of Thai stock markets. The Thai stock markets do not influence any of the stock market understudies for the Global Crisis Period. Table 5 shows VAR estimates between India and Asian Tiger Cubs for the Eurozone Crisis Period. It is observed that the RIndia (Returns in India) at the lag of 1 does not affect its own returns but influences the returns of the Philippines, Indonesia, and Malaysia under the study. The Philippines stimulates its own returns and stimulates returns of Malaysian and Thai stock markets. Indonesia influences the returns of the Philippine stock markets. Malaysian stock markets do not control any of the stock markets under the study for the Eurozone Crisis Period. Thai stock markets influence the returns of Philippine stock markets. Table 6 shows VAR estimates between India and Asian Tiger Cubs for the Rupee Depreciation Period. RIndia (Returns in India) at the lag of 1 does not affect its own returns but influences the returns of all the stock markets under the study. The Philippines' and Malaysian stock markets do not influence any stock market understudies for the Rupee Depreciation Period. Indonesia influences the stock markets of India and Thailand. Thailand influences the stock markets of the Philippines during the Rupee Depreciation Period.

Figures 1,2,3, and 4 depict the impulse response among the stock markets of India and Asian Tiger Cubs for the whole period, the Global Crisis Period, the Eurozone Crisis Period, and the Rupee Depreciation Period. The figures show the number of days on the x-axis and the shock response on the y-axis. The figures exhibit how many days the shock lasts at the other stock exchange cools down.

Table 3(a) demonstrates the study of variance decomposition in the five bourses. The Table decomposes the returns for a period varying from 1 to 5 days on the five stock exchanges. As presented in Table 3(a), the Variance Decomposition Analysis entails that in Sensex (India), the impact of other stock exchange understudy is negligible. The Table reveals that in the case of the Philippine stock exchange, there is a somewhat visible impact on the Sensex (India) for periods 1 to 5. In the Indonesian stock market, the impact of the Indian stock market is highly significant, and the Philippine stock market is somewhat significant. Table 3(a) also shows a highly significant effect of the Indian stock market on the Malaysian stock exchange from periods 1 to 5.

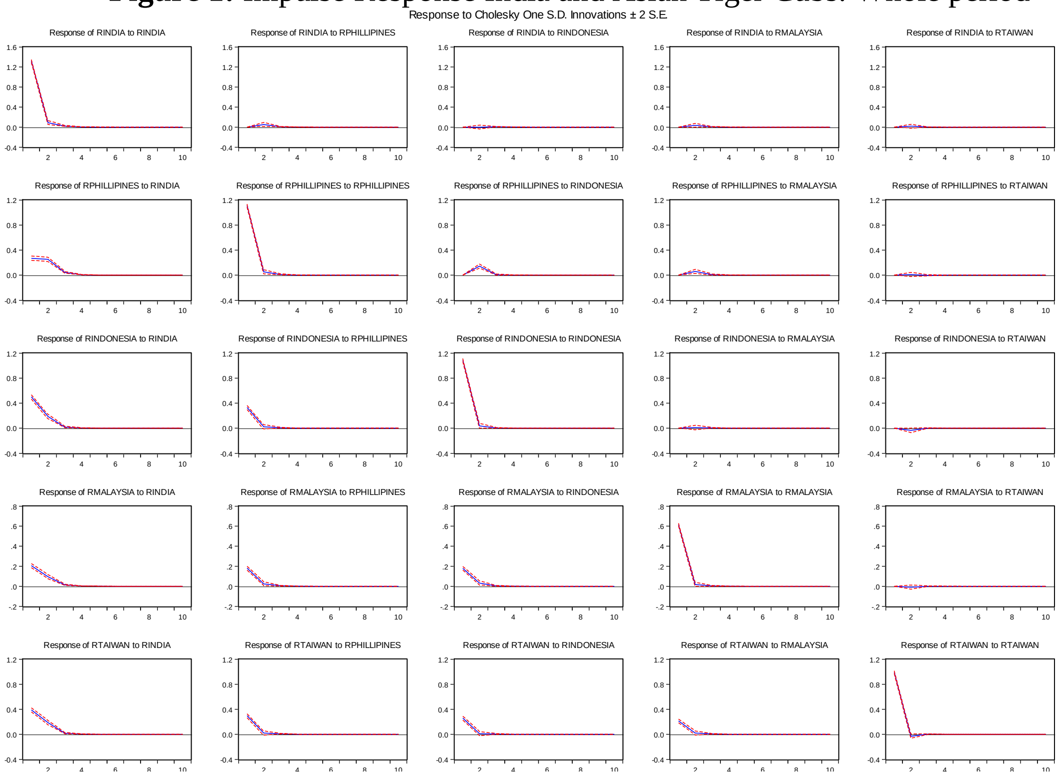
In contrast, the visible impact of Philippine and Indonesian stock exchanges is also there. Lastly, the Thai stock market has a significant impact on the Indian stock market and a somewhat significant impact on Indonesia and Malaysia. Similarly, we can study the variance decomposition in the five bourses for the Global Crisis, Eurozone Crisis, and Rupee Depreciation Period from Table 4(a), Table 5(a), and Table 6(a), respectively.

**Table 3:** VAR Estimates between India and Asian Tiger Cubs: Whole Period

| | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
|---|---|---|---|---|---|
| RINDIA (-1) | 0.06 | 0.11 | 0.12 | 0.05 | 0.09 |
| | -0.02 | -0.01 | -0.02 | -0.01 | -0.01 |
| T Value | [3.36] | [ 8.02] | [ 7.60] | [ 6.28] | [ 5.89] |
| RPHILIPPINES(-1) | 0.04 | -0.01 | 0.00 | 0.01 | 0.04 |
| | -0.02 | -0.02 | -0.02 | -0.01 | -0.02 |
| T Value | [2.31] | [-0.80] | [ 0.21] | [ 0.96] | [ 2.43] |
| RINDONESIA (-1) | -0.01 | 0.09 | 0.02 | 0.02 | 0.03 |
| | -0.02 | -0.02 | -0.02 | -0.01 | -0.02 |
| T Value | [0.48] | [ 5.64] | [ 1.29] | [ 2.30] | [ 1.59] |
| RMALAYSIA (-1) | 0.06 | 0.07 | 0.00 | 0.03 | 0.00 |
| | -0.03 | -0.03 | -0.03 | -0.02 | -0.03 |
| T Value | [1.83] | [ 2.47] | [ 0.13] | [ 1.56] | [ 0.10] |
| RTHAILAND (-1) | 0.00 | 0.11 | 0.04 | 0.01 | -0.03 |
| | -0.02 | -0.02 | -0.02 | -0.01 | -0.02 |
| T Value | [0.16] | [ 6.51] | [ 2.32] | [ 0.94] | [-1.89] |
| C | 0.05 | 0.02 | 0.05 | 0.01 | 0.03 |
| | -0.02 | -0.02 | -0.02 | -0.01 | -0.02 |
| T Value | [2.55] | [ 1.47] | [ 2.74] | [ 0.98] | [ 1.65] |

Source: Author's Calculations * T Value denotes table value

**Figure 1:** Impulse Response India and Asian Tiger Cubs: Whole period




Source: Author's Calculations

**Table 3(a):** Variance Decomposition Analysis: Whole Period

| Variance Decomposition of RINDIA: | | | | | | |
|---|---|---|---|---|---|---|
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.32 | 100.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 1.33 | 99.77 | 0.16 | 0.00 | 0.07 | 0.00 |
| 3 | 1.33 | 99.76 | 0.16 | 0.00 | 0.07 | 0.00 |
| 4 | 1.33 | 99.76 | 0.16 | 0.00 | 0.07 | 0.00 |
| 5 | 1.33 | 99.76 | 0.16 | 0.00 | 0.07 | 0.00 |
| Variance Decomposition of RPHILLIPINES: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.14 | 5.65 | 94.35 | 0.00 | 0.00 | 0.00 |
| 2 | 1.18 | 9.75 | 87.67 | 1.48 | 0.26 | 0.84 |
| 3 | 1.19 | 9.87 | 87.55 | 1.48 | 0.26 | 0.84 |
| 4 | 1.19 | 9.87 | 87.55 | 1.48 | 0.26 | 0.84 |
| 5 | 1.19 | 9.87 | 87.55 | 1.48 | 0.26 | 0.84 |
| Variance Decomposition of RINDONESIA: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.24 | 16.15 | 7.00 | 76.85 | 0.00 | 0.00 |
| 2 | 1.26 | 17.94 | 6.86 | 75.08 | 0.01 | 0.11 |
| 3 | 1.26 | 17.97 | 6.86 | 75.05 | 0.01 | 0.11 |
| 4 | 1.26 | 17.97 | 6.86 | 75.05 | 0.01 | 0.11 |
| 5 | 1.26 | 17.97 | 6.86 | 75.05 | 0.01 | 0.11 |
| Variance Decomposition of RMALAYSIA: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 0.70 | 8.73 | 6.68 | 6.61 | 77.97 | 0.00 |
| 2 | 0.71 | 10.37 | 6.65 | 6.68 | 76.28 | 0.02 |
| 3 | 0.71 | 10.41 | 6.66 | 6.67 | 76.24 | 0.02 |
| 4 | 0.71 | 10.41 | 6.66 | 6.67 | 76.24 | 0.02 |
| 5 | 0.71 | 10.41 | 6.66 | 6.67 | 76.24 | 0.02 |
| Variance Decomposition of RTHAILAND: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.17 | 12.44 | 3.82 | 6.49 | 2.20 | 75.04 |
| 2 | 1.18 | 13.39 | 3.92 | 6.43 | 2.17 | 74.08 |
| 3 | 1.18 | 13.42 | 3.92 | 6.43 | 2.17 | 74.06 |
| 4 | 1.18 | 13.42 | 3.92 | 6.43 | 2.17 | 74.06 |
| 5 | 1.18 | 13.42 | 3.92 | 6.43 | 2.17 | 74.06 |

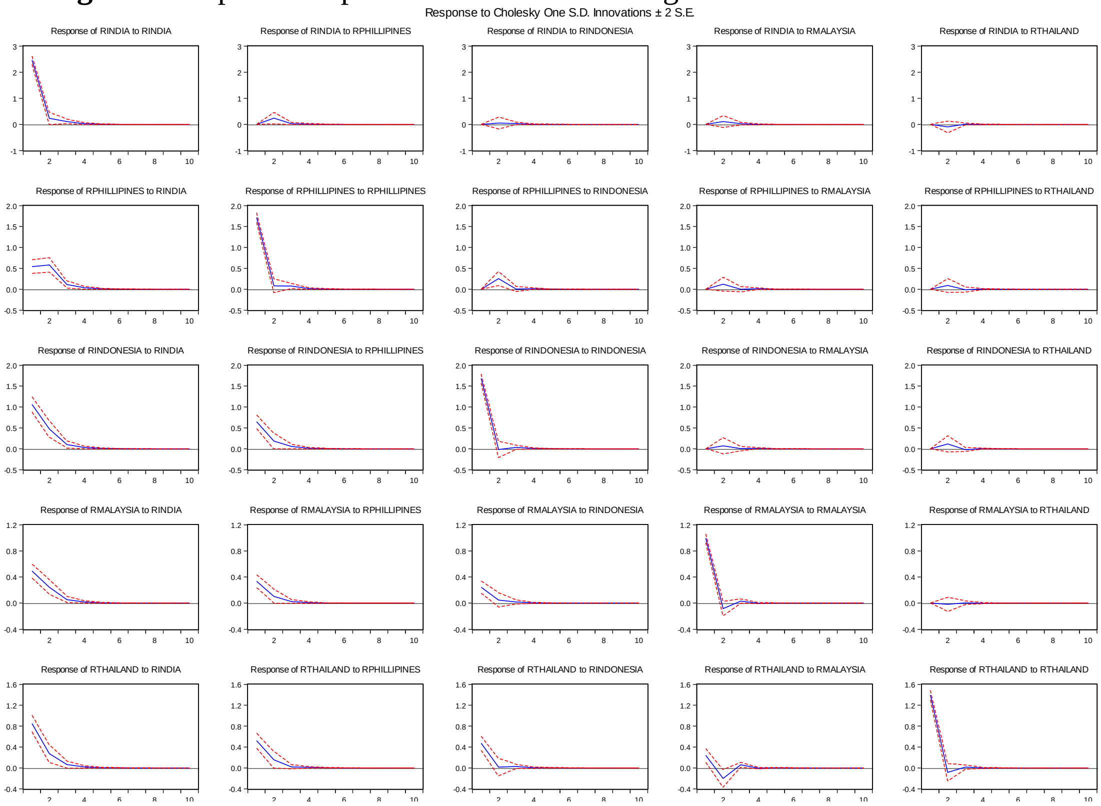
Source: Author's Calculations

**Table 4**: VAR Estimates between India and Asian Tiger Cubs: Global Crisis Period

| | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
|---|---|---|---|---|---|
| RINDIA(-1) | 0.05 | 0.15 | 0.15 | 0.09 | 0.12 |
| | -0.06 | -0.04 | -0.05 | -0.03 | -0.04 |
| T Value | [ 0.89] | [ 3.58] | [ 3.13] | [ 3.16] | [ 2.82] |
| RPHILLIPINES(-1) | 0.12 | -0.04 | 0.09 | 0.06 | 0.12 |
| | -0.07 | -0.05 | -0.06 | -0.03 | -0.05 |
| T Value | [ 1.73] | [-0.71] | [ 1.42] | [ 1.85] | [ 2.37] |
| RINDONESIA(-1) | 0.03 | 0.12 | -0.04 | 0.04 | 0.05 |
| | -0.07 | -0.05 | -0.06 | -0.03 | -0.05 |
| T Value | [ 0.45] | [ 2.22] | [-0.65] | [ 1.27] | [ 1.02] |
| RMALAYSIA(-1) | 0.12 | 0.10 | 0.05 | -0.08 | -0.19 |
| | -0.12 | -0.09 | -0.10 | -0.06 | -0.09 |
| T Value | [ 1.06] | [ 1.21] | [ 0.48] | [-1.45] | [-2.20] |
| RTHAILAND(-1) | -0.07 | 0.06 | 0.08 | -0.01 | -0.06 |
| | -0.08 | -0.06 | -0.07 | -0.04 | -0.06 |
| T Value | [-0.88] | [ 1.08] | [ 1.21] | [-0.36] | [-1.04] |
| C | -0.04 | -0.08 | -0.03 | -0.06 | -0.12 |
| | -0.12 | -0.08 | -0.10 | -0.06 | -0.08 |
| | [-0.31] | [-0.94] | [-0.30] | [-1.11] | [-1.41] |

Source: Author's Calculations * T Value denotes table value

**Figure 2:** Impulse Response India and Asian Tiger Cubs: Global Crisis Period




Source: Author’s Calculations

**Table 4(a):** Variance Decomposition Analysis: Global Crisis Period

| Variance Decomposition of RINDIA: | | | | | | |
|---|---|---|---|---|---|---|
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 2.46 | 100.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 2.49 | 98.69 | 0.93 | 0.04 | 0.18 | 0.16 |
| 3 | 2.49 | 98.64 | 0.94 | 0.07 | 0.19 | 0.16 |
| 4 | 2.49 | 98.63 | 0.94 | 0.07 | 0.19 | 0.16 |
| 5 | 2.49 | 98.63 | 0.94 | 0.07 | 0.19 | 0.16 |
| Variance Decomposition of RPHILLIPINES: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.80 | 8.98 | 91.02 | 0.00 | 0.00 | 0.00 |
| 2 | 1.92 | 17.11 | 80.53 | 1.76 | 0.38 | 0.22 |
| 3 | 1.92 | 17.36 | 80.28 | 1.75 | 0.38 | 0.22 |
| 4 | 1.92 | 17.39 | 80.25 | 1.75 | 0.39 | 0.22 |
| 5 | 1.92 | 17.39 | 80.25 | 1.75 | 0.39 | 0.22 |
| Variance Decomposition of RINDONESIA: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 2.09 | 25.80 | 9.53 | 64.67 | 0.00 | 0.00 |
| 2 | 2.16 | 29.12 | 9.68 | 60.80 | 0.10 | 0.30 |
| 3 | 2.16 | 29.24 | 9.72 | 60.64 | 0.10 | 0.30 |
| 4 | 2.16 | 29.26 | 9.72 | 60.62 | 0.10 | 0.30 |
| 5 | 2.16 | 29.26 | 9.72 | 60.62 | 0.10 | 0.30 |
| Variance Decomposition of RMALAYSIA: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.18 | 17.19 | 8.05 | 4.26 | 70.49 | 0.00 |
| 2 | 1.22 | 20.29 | 8.34 | 4.19 | 67.15 | 0.03 |
| 3 | 1.22 | 20.43 | 8.35 | 4.19 | 67.00 | 0.03 |
| 4 | 1.22 | 20.44 | 8.36 | 4.19 | 66.99 | 0.03 |
| 5 | 1.22 | 20.44 | 8.36 | 4.19 | 66.98 | 0.03 |
| Variance Decomposition of RTHAILAND: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.80 | 22.44 | 8.47 | 6.92 | 1.77 | 60.40 |
| 2 | 1.84 | 23.65 | 8.80 | 6.63 | 2.90 | 58.02 |
| 3 | 1.84 | 23.71 | 8.79 | 6.63 | 2.99 | 57.87 |
| 4 | 1.84 | 23.72 | 8.79 | 6.63 | 3.00 | 57.87 |
| 5 | 1.84 | 23.72 | 8.79 | 6.63 | 3.00 | 57.87 |

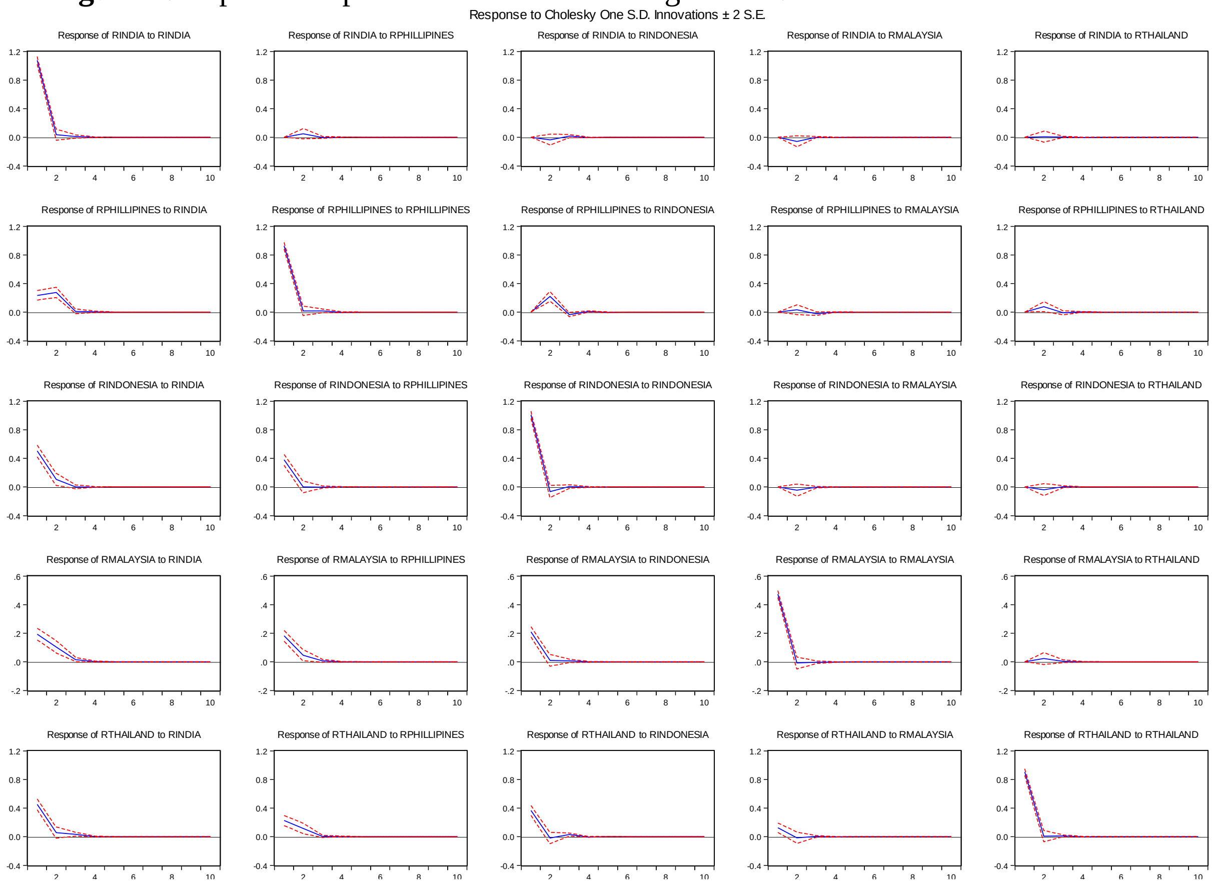
Source: Author’s Calculations

**Table 5**: VAR Estimates between India and Asian Tiger Cubs: Eurozone Crisis Period

| | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
|---|---|---|---|---|---|
| RINDIA(-1) | 0.04 | 0.15 | 0.14 | 0.08 | 0.03 |
| | -0.04 | -0.04 | -0.05 | -0.02 | -0.04 |
| T Value | [ 0.94] | [ 3.99] | [ 2.98] | [ 3.44] | [ 0.79] |
| RPHILLIPINES(-1) | 0.08 | -0.08 | 0.04 | 0.05 | 0.13 |
| | -0.04 | -0.04 | -0.05 | -0.02 | -0.04 |
| T Value | [ 1.91] | [-2.23] | [ 0.85] | [ 2.01] | [ 3.05] |
| RINDONESIA(-1) | -0.01 | 0.18 | -0.03 | 0.01 | -0.01 |
| | -0.04 | -0.04 | -0.05 | -0.02 | -0.04 |
| T Value | [-0.25] | [ 4.59] | [-0.65] | [ 0.25] | [-0.32] |
| RMALAYSIA(-1) | -0.12 | 0.05 | -0.08 | -0.02 | -0.03 |
| | -0.08 | -0.07 | -0.09 | -0.04 | -0.08 |
| T Value | [-1.52] | [ 0.65] | [-0.91] | [-0.55] | [-0.39] |
| RTHAILAND(-1) | 0.01 | 0.09 | -0.04 | 0.03 | 0.01 |
| | -0.04 | -0.04 | -0.05 | -0.02 | -0.04 |
| T Value | [ 0.21] | [ 2.25] | [-0.87] | [ 1.10] | [ 0.17] |
| C | 0.01 | 0.07 | 0.07 | 0.02 | 0.07 |
| | -0.04 | -0.03 | -0.04 | -0.02 | -0.04 |
| | [ 0.19] | [ 1.99] | [ 1.55] | [ 1.06] | [ 1.82] |

Source: Author's Calculations * T Value denotes table value

**Figure 3:** Impulse Response India and Asian Tiger Cubs: Eurozone Crisis Period




Source: Author's Calculations

**Table 5(a):** Variance Decomposition Analysis: Eurozone Crisis Period

| Variance Decomposition of RINDIA: | | | | | | |
|---|---|---|---|---|---|---|
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.08 | 100.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 1.08 | 99.39 | 0.22 | 0.10 | 0.29 | 0.01 |
| 3 | 1.08 | 99.37 | 0.22 | 0.12 | 0.29 | 0.01 |
| 4 | 1.08 | 99.37 | 0.22 | 0.12 | 0.29 | 0.01 |
| 5 | 1.08 | 99.37 | 0.22 | 0.12 | 0.29 | 0.01 |
| Variance Decomposition of RPHILLIPINES: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 0.96 | 6.02 | 93.98 | 0.00 | 0.00 | 0.00 |
| 2 | 1.02 | 12.45 | 82.24 | 4.64 | 0.11 | 0.57 |
| 3 | 1.02 | 12.44 | 82.09 | 4.75 | 0.15 | 0.57 |
| 4 | 1.02 | 12.44 | 82.08 | 4.76 | 0.15 | 0.57 |
| 5 | 1.02 | 12.44 | 82.08 | 4.76 | 0.15 | 0.58 |
| Variance Decomposition of RINDONESIA: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.19 | 17.98 | 10.25 | 71.77 | 0.00 | 0.00 |
| 2 | 1.20 | 18.51 | 10.12 | 71.14 | 0.14 | 0.10 |
| 3 | 1.20 | 18.51 | 10.12 | 71.14 | 0.14 | 0.10 |
| 4 | 1.20 | 18.51 | 10.12 | 71.14 | 0.14 | 0.10 |
| 5 | 1.20 | 18.51 | 10.12 | 71.14 | 0.14 | 0.10 |
| Variance Decomposition of RMALAYSIA: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 0.58 | 11.02 | 9.79 | 12.99 | 66.20 | 0.00 |
| 2 | 0.59 | 13.61 | 10.04 | 12.52 | 63.68 | 0.15 |
| 3 | 0.59 | 13.66 | 10.04 | 12.52 | 63.62 | 0.15 |
| 4 | 0.59 | 13.66 | 10.04 | 12.52 | 63.62 | 0.15 |
| 5 | 0.59 | 13.66 | 10.04 | 12.52 | 63.62 | 0.15 |
| Variance Decomposition of RTHAILAND: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.10 | 16.71 | 4.15 | 11.05 | 1.30 | 66.78 |
| 2 | 1.11 | 16.74 | 5.14 | 10.93 | 1.30 | 65.88 |
| 3 | 1.11 | 16.80 | 5.14 | 10.98 | 1.30 | 65.78 |
| 4 | 1.11 | 16.80 | 5.14 | 10.98 | 1.30 | 65.78 |
| 5 | 1.11 | 16.80 | 5.14 | 10.98 | 1.30 | 65.78 |

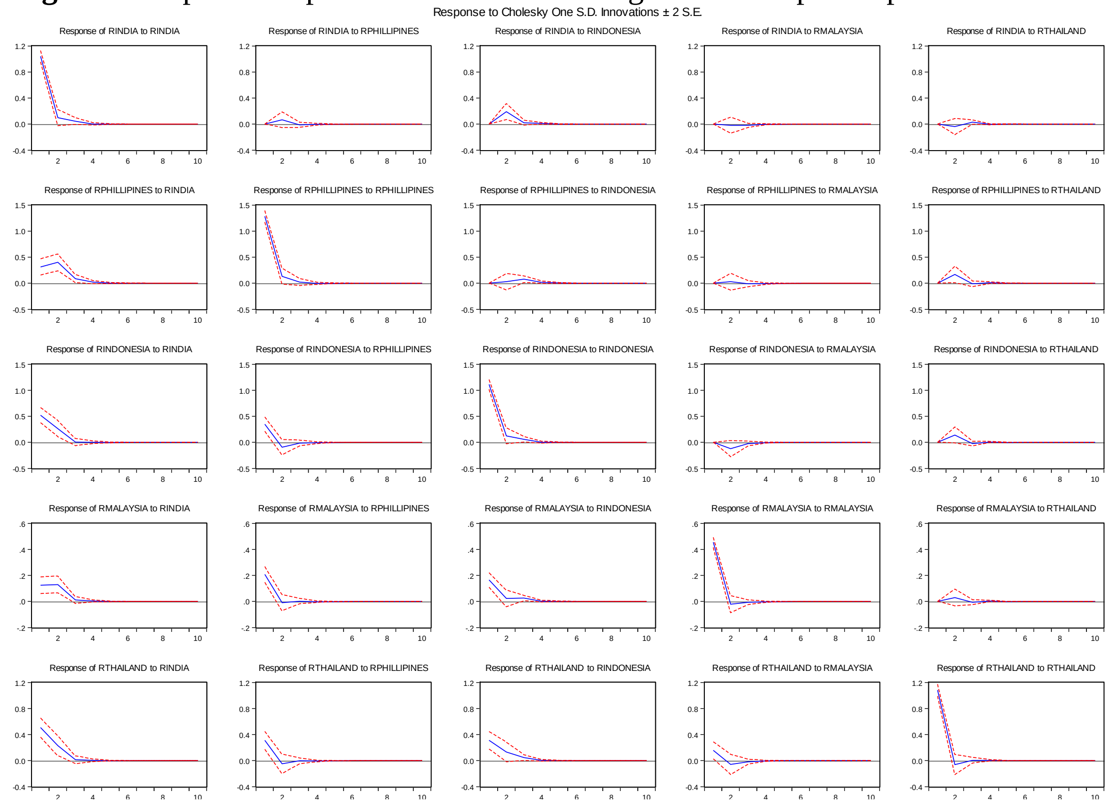
Source: Author's Calculations

**Table 6**: VAR Estimates between India and Asian Tiger Cubs: Rupee Depreciation Period

| | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
|---|---|---|---|---|---|
| RINDIA(-1) | 0.02 | 0.30 | 0.19 | 0.11 | 0.20 |
| | -0.07 | -0.08 | -0.08 | -0.03 | -0.08 |
| T- Value | [ 0.27] | [ 3.51] | [ 2.33] | [ 3.19] | [ 2.44] |
| RPHILLIPINES(-1) | 0.01 | 0.07 | -0.09 | -0.01 | -0.05 |
| | -0.05 | -0.07 | -0.06 | -0.03 | -0.06 |
| T- Value | [ 0.25] | [ 1.06] | [-1.35] | [-0.39] | [-0.74] |
| RINDONESIA(-1) | 0.19 | -0.02 | 0.12 | 0.02 | 0.15 |
| | -0.06 | -0.08 | -0.07 | -0.03 | -0.07 |
| T- Value | [ 3.09] | [-0.26] | [ 1.66] | [ 0.69] | [ 2.02] |
| RMALAYSIA(-1) | -0.03 | 0.01 | -0.31 | -0.06 | -0.11 |
| | -0.14 | -0.18 | -0.17 | -0.07 | -0.17 |
| T- Value | [-0.21] | [ 0.04] | [-1.82] | [-0.76] | [-0.64] |
| RTHAILAND(-1) | -0.03 | 0.15 | 0.13 | 0.03 | -0.06 |
| | -0.06 | -0.07 | -0.07 | -0.03 | -0.07 |
| T- Value | [-0.61] | [ 2.13] | [ 1.84] | [ 0.94] | [-0.80] |
| C | 0.06 | -0.03 | 0.01 | 0.06 | -0.05 |
| | -0.06 | -0.08 | -0.08 | -0.03 | -0.08 |
| | [ 0.95] | [-0.36] | [ 0.09] | [ 1.78] | [-0.63] |

Source: Author's Calculations * T Value denotes table value

**Figure 4:** Impulse Response India and Asian Tiger Cubs: Rupee Depreciation Period




Source: Author's Calculations

**Table 6(a):** Variance Decomposition Analysis: Eurozone Crisis Period

| Variance Decomposition of RINDIA: | | | | | | |
|---|---|---|---|---|---|---|
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.04 | 100.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 1.07 | 96.25 | 0.37 | 3.22 | 0.03 | 0.12 |
| 3 | 1.07 | 96.10 | 0.38 | 3.25 | 0.07 | 0.20 |
| 4 | 1.07 | 96.09 | 0.38 | 3.26 | 0.07 | 0.20 |
| 5 | 1.07 | 96.09 | 0.38 | 3.26 | 0.07 | 0.20 |
| Variance Decomposition of RPHILLIPINES: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.32 | 5.62 | 94.38 | 0.00 | 0.00 | 0.00 |
| 2 | 1.40 | 13.21 | 85.27 | 0.04 | 0.04 | 1.44 |
| 3 | 1.40 | 13.51 | 84.67 | 0.34 | 0.05 | 1.44 |
| 4 | 1.40 | 13.53 | 84.63 | 0.35 | 0.05 | 1.44 |
| 5 | 1.40 | 13.53 | 84.62 | 0.35 | 0.05 | 1.44 |
| Variance Decomposition of RINDONESIA: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.28 | 16.63 | 7.46 | 75.91 | 0.00 | 0.00 |
| 2 | 1.33 | 19.32 | 7.42 | 71.30 | 0.84 | 1.12 |
| 3 | 1.33 | 19.27 | 7.41 | 71.31 | 0.86 | 1.15 |
| 4 | 1.33 | 19.27 | 7.41 | 71.30 | 0.87 | 1.15 |
| 5 | 1.33 | 19.27 | 7.41 | 71.30 | 0.87 | 1.15 |
| Variance Decomposition of RMALAYSIA: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 0.54 | 5.33 | 14.84 | 9.36 | 70.47 | 0.00 |
| 2 | 0.56 | 10.41 | 13.97 | 8.98 | 66.35 | 0.30 |
| 3 | 0.56 | 10.42 | 13.93 | 9.16 | 66.18 | 0.31 |
| 4 | 0.56 | 10.42 | 13.93 | 9.17 | 66.17 | 0.31 |
| 5 | 0.56 | 10.42 | 13.93 | 9.17 | 66.17 | 0.31 |
| Variance Decomposition of RTHAILAND: | | | | | | |
| Period | S.E. | RINDIA | RPHILLIPINES | RINDONESIA | RMALAYSIA | RTHAILAND |
| 1 | 1.29 | 15.58 | 5.89 | 5.86 | 1.51 | 71.17 |
| 2 | 1.32 | 17.88 | 5.76 | 6.58 | 1.64 | 68.13 |
| 3 | 1.32 | 17.87 | 5.75 | 6.69 | 1.66 | 68.03 |
| 4 | 1.32 | 17.87 | 5.75 | 6.69 | 1.66 | 68.03 |
| 5 | 1.32 | 17.87 | 5.75 | 6.69 | 1.66 | 68.03 |

Source: Author's Calculations

### *4.4 GARCH BEKK Analysis*

From these empirical findings in Table 7, we infer that there is good evidence of the GARCH effect and a weaker ARCH effect. Equations display a statistically significant covariation in shocks, which depends on their lags rather than previous errors. Market shocks are also affected by information from the past which is specific to the respective markets. The coefficients from the ARCH calculate the effect of the previous invention. According to its own market volatility spillovers among countries in the group, Malaysia has the biggest ARCH impact (0.41) and (0.31) among 5 markets during the whole period and Rupee Depreciation Period. During the Global Crisis Period, the highest Arch impact is observed in India (0.08). During the Eurozone Crisis Period, the highest Arch impact is observed in Indonesia (0.08). The highest Arch impact seen in Malaysia could be because investors in Malaysia rely more on past information, whereas the same impact during the global crisis in India indicates that it was influenced by all kinds of information coming from developed countries. Likewise, Indonesia has shown this impact during the Eurozone crisis due to a greater inclination towards European currency markets. This proves that, in comparison to other markets, volatility in the markets of Malaysia is more sensitive to past market information than in other markets. In addition to this, it also demonstrates that the Malaysian markets' volatility is more sensitive to past market knowledge than other markets during the Rupee Depreciation Period and less susceptible to the Global Crisis and Eurozone Crisis Period. The lowest ARCH influence is on the Indian stock market (0.04), (0.02), and (0.01) during the whole period, Eurozone Crisis Period, and Rupee Depreciation Period, respectively. The lowest ARCH effect in India evidences the lesser sensitivity of Indian stock markets for the whole period. The relative impact of India is less during the whole period because India is an emerging market where a majority of investors invest in different avenues, which leads to less dependence on previous information. During the Global Crisis Period, the lowest Arch impact is observed in Thailand (0.02), making Thai stock markets less sensitive to the global crisis.

GARCH coefficients analyze the durability of return volatility. For example, periods of high volatility appear to be preceded over a sustained period of time by periods of lower volatility. Since GARCH coefficients prove the presence of a clustering of volatility for all the stock markets in the group. India experiences the highest degree of volatility clustering among the five markets for the whole period (0.96), the Eurozone crisis (0.95), and the Rupee Depreciation Period (0.94). For Malaysia, volatility clustering is highest (0.94) during the Global Crisis and lowest during the whole study period (0.73). Among the five markets, the greatest degree of volatility clustering is seen in India and the least in Malaysia for the whole study period. It implies a higher possibility of the extent of its present volatility movement being related to its previous volatility movement for India than any other country.

According to cross-market volatility spillovers, the highest ARCH effect (0.16) is discovered between the Malaysian and Thai markets for the whole period, indicating that preceding Malaysian stock market information would impact the Thai stock market. During the Global Crisis, cross-market spillovers were highest between India and Indonesia (0.07) and India and the Philippines (0.07). Cross-market spillover was at its peak between Indonesia and Thailand (0.08) during the Eurozone Crisis. The highest ARCH effect discovered between the Indonesia and Thailand markets indicates that preceding Indonesian market information impacted the SET Index market during the Eurozone Crisis Period. Lastly, during the Rupee Depreciation Period, spillover was at its maximum between the Philippines and Malaysia (0.19). From the above results, we gather that Malaysian stock markets are more influenced by their own past shocks and volatility than any other Asian stock market. Also, past information from the Bursa

Malaysian stock exchange would impact the stock exchange in Thailand. The results of the GARCH BEKK model are given in Table 8, and good interdependence between the selected markets can be observed from it. Over time, the United States and European Union have exerted a significant influence on Asian financial markets due to movements of capital. (Caporale, You and Chen, 2019; Sehgal, Pandey and Deisting, 2018) From a policy standpoint, it is critical to examine both global and regional integration of Asian economies. The stability of the home financial system and the ability of the domestic economy to absorb external shocks are affected differently by different degrees and patterns of financial integration. The research indicates no particular connection between the degree of cross-certainty and the area or economic relationships in the world. The degree of business harmony with the rest of the world can be attributed to the level of financial integration achieved in emerging Asia, which thus far has not been consistent among economies.

**Table 7:** GARCH BEKK Estimates between India and Asian Tiger Cubs for Whole and Crisis Periods

| 1 India<br>2Philippines<br>3 Indonesia<br>4 Malaysia<br>5 Thailand | Whole Period coefficients | | Global Crisis Period coefficients | | Eurozone Crisis Period coefficients | | Rupee Depreciation Period coefficients | |
|---|---|---|---|---|---|---|---|---|
| Pair | ARCH | GARCH | ARCH | GARCH | ARCH | GARCH | ARCH | GARCH |
| H11 | 0.04 | 0.96 | 0.08 | 0.83 | 0.02 | 0.95 | 0.02 | 0.94 |
| H22 | 0.05 | 0.92 | 0.07 | 0.86 | 0.05 | 0.84 | 0.12 | 0.75 |
| H33 | 0.05 | 0.94 | 0.07 | 0.89 | 0.08 | 0.87 | 0.05 | 0.80 |
| H44 | 0.41 | 0.73 | 0.03 | 0.94 | 0.03 | 0.93 | 0.31 | 0.39 |
| H55 | 0.06 | 0.90 | 0.02 | 0.89 | 0.09 | 0.88 | 0.02 | 0.86 |
| H12 | 0.04 | 0.94 | 0.07 | 0.84 | 0.03 | 0.89 | -0.04 | 0.84 |
| H13 | 0.04 | 0.95 | 0.07 | 0.86 | 0.04 | 0.91 | -0.03 | 0.87 |
| H14 | 0.12 | 0.84 | 0.05 | 0.88 | 0.03 | 0.94 | -0.07 | 0.61 |
| H15 | 0.05 | 0.93 | 0.04 | 0.86 | 0.04 | 0.91 | -0.02 | 0.90 |
| H23 | 0.05 | 0.93 | 0.07 | 0.87 | 0.06 | 0.85 | 0.08 | 0.78 |
| H24 | 0.14 | 0.82 | 0.05 | 0.90 | 0.04 | 0.88 | 0.19 | 0.54 |
| H25 | 0.05 | 0.91 | 0.04 | 0.87 | 0.07 | 0.86 | 0.05 | 0.80 |
| H34 | 0.15 | 0.83 | 0.05 | 0.91 | 0.05 | 0.90 | 0.13 | 0.56 |
| H35 | 0.06 | 0.92 | 0.04 | 0.89 | 0.08 | 0.87 | 0.03 | 0.83 |
| H45 | 0.16 | 0.81 | 0.03 | 0.91 | 0.05 | 0.91 | 0.08 | 0.58 |

Source: Author's Calculations

**Table 8:** ARCH GARCH coefficients between India and Asian Tigers Cubs for Whole and Crisis Periods

| | Whole Period | | Global Crisis Period | | Eurozone Crisis Period | | Rupee Depreciation Period | |
|---|---|---|---|---|---|---|---|---|
| | Coefficient | Prob. | Coefficient | Prob. | Coefficient | Prob. | Coefficient | Prob. |
| C(1) | 0.07 | 0.00 | 0.07 | 0.53 | 0.04 | 0.30 | 0.08 | 0.25 |
| C(2) | 0.05 | 0.0009* | -0.05 | 0.54 | 0.11 | 0.0028* | 0.06 | 0.46 |
| C(3) | 0.07 | 0.0000* | 0.09 | 0.36 | 0.11 | 0.0038* | 0.03 | 0.66 |
| C(4) | 0.00 | 0.46 | 0.00 | 0.99 | 0.05 | 0.0262* | 0.10 | 0.0018* |
| C(5) | 0.06 | 0.0004* | -0.01 | 0.8306* | 0.13 | 0.0002* | 0.01 | 0.92 |
| C(6) | 0.01 | 0.00 | 0.32 | 0.00 | 0.03 | 0.00 | 0.05 | 0.37 |
| C(7) | 0.00 | 0.00 | 0.08 | 0.01 | 0.02 | 0.00 | 0.06 | 0.01 |
| C(8) | 0.00 | 0.00 | 0.12 | 0.00 | 0.02 | 0.00 | 0.08 | 0.00 |
| C(9) | 0.00 | 0.00 | 0.06 | 0.01 | 0.01 | 0.00 | 0.06 | 0.00 |
| C(10) | 0.01 | 0.00 | 0.07 | 0.00 | 0.02 | 0.00 | 0.06 | 0.03 |
| C(11) | 0.04 | 0.00 | 0.28 | 0.00 | 0.11 | 0.00 | 0.23 | 0.02 |
| C(12) | 0.01 | 0.00 | 0.11 | 0.00 | 0.04 | 0.00 | 0.08 | 0.03 |
| C(13) | 0.00 | 0.05 | 0.08 | 0.00 | 0.02 | 0.00 | 0.08 | 0.00 |
| C(14) | 0.01 | 0.00 | 0.06 | 0.00 | 0.03 | 0.00 | 0.07 | 0.04 |
| C(15) | 0.02 | 0.00 | 0.25 | 0.00 | 0.07 | 0.00 | 0.23 | 0.02 |
| C(16) | 0.00 | 0.00 | 0.07 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 |
| C(17) | 0.01 | 0.00 | 0.06 | 0.00 | 0.03 | 0.00 | 0.10 | 0.02 |
| C(18) | 0.00 | 0.00 | 0.07 | 0.08 | 0.01 | 0.00 | 0.10 | 0.00 |
| C(19) | 0.00 | 0.00 | 0.04 | 0.01 | 0.01 | 0.00 | 0.08 | 0.00 |
| C(20) | 0.06 | 0.00 | 0.07 | 0.00 | 0.05 | 0.00 | 0.20 | 0.12 |
| C(21) | 0.19 | 0.00 | 0.20 | 0.00 | 0.15 | 0.00 | -0.12 | 0.00 |
| C(22) | 0.22 | 0.00 | 0.32 | 0.00 | 0.23 | 0.00 | 0.35 | 0.00 |
| C(23) | 0.23 | 0.00 | 0.27 | 0.00 | 0.28 | 0.00 | 0.23 | 0.00 |
| C(24) | 0.64 | 0.00 | 0.09 | 0.00 | 0.17 | 0.00 | 0.56 | 0.00 |
| C(25) | 0.24 | 0.00 | 0.21 | 0.00 | 0.30 | 0.00 | 0.15 | 0.01 |
| C(26) | 0.98 | 0.00 | 0.95 | 0.00 | 0.98 | 0.00 | 0.97 | 0.00 |
| C(27) | 0.96 | 0.00 | 0.91 | 0.00 | 0.92 | 0.00 | 0.87 | 0.00 |
| C(28) | 0.97 | 0.00 | 0.93 | 0.00 | 0.93 | 0.00 | 0.90 | 0.00 |
| C(29) | 0.85 | 0.00 | 0.97 | 0.00 | 0.97 | 0.00 | 0.63 | 0.00 |
| C(30) | 0.95 | 0.00 | 0.96 | 0.00 | 0.94 | 0.00 | 0.93 | 0.00 |

Source: Authors' Calculations

# 5. Conclusion

The research shows that the annual returns from the stock exchanges in India and Asian Tiger Cubs vary from 4.32 percent to 16.54 percent. Negative returns are observed during the Global Crisis. Positive returns are observed in all the stock markets during the Eurozone Crisis Period. Positive returns are observed in the Indian, Indonesian, and Malaysian stock markets and negative returns in the Philippine and Thai stock markets. Selected Asian stock markets were worst hit by the Global Financial Crisis and least affected by the Eurozone Crisis. The Rupee Depreciation Period also influenced the returns of Asian stock markets. The average annual return on the Jakarta stock exchange (Indonesia) is the maximum out of the five, followed by the Sensex (India), PSEI (Philippines), SET(Thailand), and KLSE(Malaysia), respectively. The application of the Unit-root test (Augmented Dickey-Fuller test) reveals that the return series are stationary. For the whole study period and Crisis periods, the bidirectional and unidirectional relationship is observed between India and the Asian tiger cubs. Understanding the causal pattern between economic and stock market growth would allow investors to be able to estimate future stock exchange trends.

VAR results for the whole study period show that returns in the Sensex at the lag of 1 affect both its own returns and returns in the Philippines' stock markets under the study. The Philippines does not stimulate its own returns but stimulates the returns of Asian Tiger cubs. Indonesia influences the returns of the Indian and Thai stock markets. Malaysia influences the returns of India and Malaysia. Returns in Thailand influence only two Asian Tiger Cubs, namely India and the Philippines. This proves that all the economies influence India under the Asian Tiger Cubs. India is influenced by its own returns and influences the returns of selected stock markets. The Philippines, Indonesia, Malaysia, and Thailand are not influenced by their own returns. VAR estimates between India and Asian Tiger Cubs for the Global Crisis period. It is observed that the returns in Indian stock markets at the lag of 1 do not affect its own returns and the returns of other stock markets under the study. The Philippines does not stimulate its own returns but stimulates the returns of Thai stock markets. Indonesia influences the returns of the Philippine stock market. Malaysia controls the returns of Thai stock markets. Thai stock markets do not influence any of the stock market understudies for the Global Crisis Period. VAR estimates between India and Asian Tiger Cubs for Eurozone Crisis Period. It is observed that the returns in Sensex at the lag of 1 do not affect its own returns but influence the returns of the Philippines, Indonesia, and Malaysia under the study. The Philippines stimulates its own returns and stimulates the returns of Malaysian and Thai stock markets. Indonesia influences the returns of the Philippine stock markets. Malaysian and Thai stock markets do not control any of the stock market understudies for the Eurozone Crisis Period. VAR estimates between India and Asian Tiger Cubs for the Rupee Depreciation Period. The lag of 1 return in Sensex does not affect its own returns but influences all the stock markets' returns under the study. The Philippines and Malaysian stock markets do not influence any stock market understudy for the Rupee Depreciation Period. Indonesia Influences the stock markets of India and Thailand. Thailand influences the stock markets of the Philippines during the Rupee Depreciation Period. Analysis indicates that the observed capital markets are mutually affected, but not to a greater degree. This leads us to two significant conclusions. Firstly, this means that there are ways for investors to diversify into Indian and Asian Tiger cubs' stock exchanges. Secondly, national factors (macroeconomic variables) affect capital markets. Variances Decomposition Analysis reveals that each other's returns significantly differ in their extent of returns on the capital markets under review. The response feature impulse also shows that the shock to India and Asian Tiger cubs somehow affects them.

A strong proof of GARCH impact and weaker ARCH influence from GARCH BEKK analysis. The equations show a statistically significant shock covariation that is based on their delays rather than previous errors. The knowledge of the past, which is unique to the respective markets, often influences market shocks. The research shows that cross-certainty and the field or economic relationships in the world have no specific correlation. This could be due to the degree of commercial peace with the rest of the world. The research also contributes significantly to the existing literature in the field. Our research also aids investors and portfolio managers in recognizing the elements that drive asset behavior as well as the features of the many geographic locations in which they may invest to construct a well-balanced portfolio.

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