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Stock Market Volatility And Spillover Effect Between Malaysia And Its Trading Partners. Evidence From DCC-GARCH Approach.

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Abstract
The aim of this paper is to explore the stock market volatility of the emerging and OECD economies and also aimed to investigate the spillover effect of Malaysian stock market on its trading partners belongs to two different regions based on the linkage of the trade volume between them. For attain the objective, we used the data of Malaysia, China, Indonesia, India, Japan, Pakistan, Singapore, France, Germany and United Kingdom (UK) MSCI indices sourced from the DataStream from 1993-2021. The GARCH family models including standard GARCH and DCC-GARCH is used for investigating the volatility and spillover effect existed between the Malaysia and its trading partners. In our findings of the emerging economies and OECD economies, such as Malaysia, China, Indonesia, India, Japan, Pakistan and Singapore, including France, Germany and United Kingdom (UK), respectively, has found the short-term volatility and also persistent of volatility in these countries stock market exists for the long run. Moreover, our results shows that the volatility in the Malaysian market effected the other trading partners stock market for both short and long run and hence, we can say that risk co-movement transfer from Malaysia to its trading partners except USA. This study has some implications for investors, policy makers, government and regulators.

Keywords: *Stock market, Volatility, Spillover, Cointegration, OECD, Emerging.*

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I. Introduction

The increasing economic integration of international stock markets has become increasingly significant in the past two decades. The substantial advancements in technology and the heightened flow of capital between countries are key factors driving this observed globalization. Therefore, comprehending the nature and extent of linkages between various financial markets holds great importance for portfolio managers and financial institutions. Volatility of returns is commonly used as a basic measure of the risk associated with holding financial assets (e.g., Brooks, 2002). As a result, when investigating the integration of international equity markets, researchers not only examine causality linkages in returns, but also assess the effects of volatility spillover. Information regarding volatility spillover effects is valuable for implementing risk management strategies, such as value at risk and hedging strategies. In recent times, as the role of emerging markets has gained increasing importance, economists have expanded their focus beyond developed countries (Bae and Karolyi, 1994; Karolyi, 1995; Theodossiou and Lee, 1993), and have also directed their attention towards emerging markets (Goetzmann et al., 2005; Lin and Wu, 2006; Ng, 2000; Wang et al., 2004; Worthington and Higgs, 2004). For example, understanding the extent of linkages between emerging stock markets and developed stock markets holds implications for investors in both developing and developed countries. If the integration between emerging financial markets and developed counterparts is weak, external shocks may have limited influence on the emerging markets. In such a scenario, including emerging market stocks in their portfolio can benefit investors in developed markets, as it diversifies risk. On the other hand, if emerging stock markets are fully integrated with developed stock markets, volatility in the emerging markets may decrease as it will be predominantly influenced by the volatilities of developed markets. This can result in domestic emerging investors benefiting from a low cost of capital (Li, 2007).

Theories that support the examination of stock market volatility and spillover effects between Malaysia and its trading partners can be broadly categorized into two main perspectives, the Globalization Theory and the Portfolio Diversification Theory. The Globalization Theory posits that the increasing economic integration of

countries through trade and investment flows can have a significant impact on stock market volatility and spillover effects. According to this theory, as countries become more interconnected through trade and investment linkages, shocks and changes in one country's financial markets can quickly transmit to other countries, resulting in increased stock market volatility and spillover effects. For example, in the context of Malaysia, if the country's economy is highly reliant on trade and investment with specific trading partners, such as China or the United States, any changes in the economic or financial conditions of these trading partners can potentially impact Malaysian stock market. For instance, if there is a sudden economic downturn or a financial crisis in a major trading partner, it can lead to a decline in demand for Malaysia exports or a decrease in foreign investment inflows, which can trigger a sell-off in Malaysia stock market, leading to increased volatility and spillover effects. Moreover, the Portfolio Diversification Theory suggests that investors seek to diversify their portfolios by investing in different markets to reduce risk. According to this theory, investors aim to include assets from different countries in their portfolios to mitigate the risks associated with investing in a single market, and thereby reduce the overall portfolio volatility. In the context of emerging economies, investors may seek to diversify their portfolios by including assets from trading partners in order to reduce risk. For example, if the correlation between Malaysian stock market and the stock markets of its trading partners is low, it implies that shocks or changes in one market may not have a significant impact on the other markets, leading to lower spillover effects and potentially reducing overall portfolio volatility. Conversely, if the correlation between Malaysian stock market and its trading partners' markets is high, it may suggest that shocks or changes in one market can quickly transmit to other markets, leading to increased spillover effects and higher portfolio volatility. However, the theories of Globalization and Portfolio Diversification provide insights into the potential drivers of stock market volatility and spillover effects between Malaysia and its trading partners. Understanding and analyzing these theories can help investors, policymakers, and financial institutions in formulating investment strategies, risk management techniques, and policy decisions related to Malaysian stock market and its trading partners.

This study is focused on examining the stock market volatility and spillover effects between Malaysia and its trading partners. However, there may be some potential research gaps that addressed in this study. First, the study identified a lack of sufficient empirical evidence on stock market volatility and spillover effects between Malaysia and its trading partners. This could be due to data availability or limitations in previous research studies. Addressing this research gap could involve collecting and analyzing relevant data to provide new insights into the dynamics of stock market volatility and spillover effects in the context of Malaysia trading relationships. Second, the study considers the potential impact of country-specific factors, such as political instability, regulatory frameworks, and institutional arrangements, on stock market volatility and spillover effects. These factors may vary across countries and can influence the transmission of shocks between markets. Investigating these country-specific factors could help in providing a more comprehensive understanding of the drivers of stock market volatility and spillover effects between Malaysia and its trading partners. Third, the study explored the sectoral or industry-level analysis of stock market volatility and spillover effects. Different sectors or industries within an economy may have different sensitivities to shocks and may exhibit varying levels of spillover effects. Analyzing the sectoral or industry-level dynamics could provide valuable insights into the specific sectors or industries that are more prone to spillover effects and can help in designing targeted risk management strategies. Fourth gap includes, this study assesses the policy implications of stock market volatility and spillover effects between Malaysia and its trading partners. This could involve evaluating the effectiveness of existing policy measures, such as capital controls or regulatory frameworks, in mitigating or exacerbating stock market volatility and spillover effects. Identifying potential policy gaps and suggesting relevant policy recommendations could contribute to the literature and have practical implications for policymakers and market participants. Fifth, this study considered the dynamic nature of stock market volatility and spillover effects. Financial markets are constantly evolving, and the dynamics of stock market volatility and spillover effects may change over time. Conducting a dynamic analysis by examining the changes in stock market volatility and spillover effects over different time periods or market conditions could provide valuable insights into the evolving nature of these phenomena. Addressing these potential research gaps contribute to the existing literature on stock market volatility and spillover effects and provide a more nuanced understanding of the dynamics between Malaysia and its trading partners. This study has great practical implications for investors, policymakers, and financial institutions in managing risks and making informed decisions in the context of international financial markets.

In our findings of the emerging economies and OECD economies, such as Malaysia China, Indonesia, India, Japan, Pakistan and Singapore, including France, Germany and United Kingdom (UK), respectively, has found the short-term volatility and also persistent of volatility in these countries stock market exists for the long run. Moreover, our results shows that the volatility in the Malaysian market effected the other trading partners stock market for both short and long run and hence, we can say that risk co-movement transfer from Malaysia to its trading partners except USA.

The implications of the study on stock market volatility and spillover effects between Malaysia and its trading partners have practical implications for investors, policymakers, and financial institutions, and may contribute to the existing literature in the field of international finance.

The rest of the article is structured as follows. Part 2 provides an overview of recent literature and theoretical background, as well as several hypotheses to test in order to clarify the relationship between variables. Part 3 describes the conceptual framework, research design, and methods. Section 4 contains the study's findings, while Section 5 contains the conclusion, recommendations for future research, limitations, and practical implications.

II. Literature review and Hypothesis

The theoretical background of the study provides a wide range of information for the researchers to explore the problem in excellent ways. There are various theories that are directly or indirectly influence the findings of the study, but we are going to discuss most relevant theories that support our literature and findings. However, the theories that support the examination of stock market volatility and spillover effects between Malaysia and its trading partners can be broadly categorized into two main perspectives: the Globalization Theory and the Portfolio Diversification Theory. The Globalization Theory posits that the increasing economic integration of countries through trade and investment flows can have a significant impact on stock market volatility and spillover effects. According to this theory, as countries become more interconnected through trade and investment linkages, shocks and changes in one country's financial markets can quickly transmit to other countries, resulting in increased stock market volatility and spillover effects. For example, in the context of Malaysia, if the country's economy is highly reliant on trade and investment with specific trading partners, such as China or the United States, any changes in the economic or financial conditions of these trading partners can potentially impact Malaysia stock market. For instance, if there is a sudden economic downturn or a financial crisis in a major trading partner, it can lead to a decline in demand for Malaysia exports or a decrease in foreign investment inflows, which can trigger a sell-off in Malaysian stock market, leading to increased volatility and spillover effects. Moreover, the Portfolio Diversification Theory suggests that investors seek to diversify their portfolios by investing in different markets to reduce risk. According to this theory, investors aim to include assets from different countries in their portfolios to mitigate the risks associated with investing in a single market, and thereby reduce the overall portfolio volatility. In the context of Malaysia, investors may seek to diversify their portfolios by including assets from trading partners in order to reduce risk. For example, if the correlation between Malaysia's stock market and the stock markets of its trading partners is low, it implies that shocks or changes in one market may not have a significant impact on the other markets, leading to lower spillover effects and potentially reducing overall portfolio volatility. Conversely, if the correlation between Malaysia's stock market and its trading partners' markets is high, it may suggest that shocks or changes in one market can quickly transmit to other markets, leading to increased spillover effects and higher portfolio volatility. However, the theories of Globalization and Portfolio Diversification provide insights into the potential drivers of stock market volatility and spillover effects between Malaysia and its trading partners. Understanding and analyzing these theories can help investors, policymakers, and financial institutions in formulating investment strategies, risk management techniques, and policy decisions related to Malaysia stock market and its trading partners.

The empirical literature provides a great insight on the problem discussion with context of the previous literature. The stock market volatility of Malaysia and other Asian economies during the period from 1992 to 2021 has been a subject of interest in previous studies. The literature on this problem indicates various factors that have contributed to the volatility of stock markets in these economies. One key factor identified in the literature is the impact of global economic events and shocks on the stock market volatility of emerging economies especially Malaysia and other Asian economies. For example, studies have shown that global financial crises, such as the Asian financial crisis in 1997 and the global financial crisis in 2008, had significant spillover effects on stock markets in Pakistan and other Asian countries (Ali et al., 2019; Arshad et al., 2020). These events resulted in increased volatility in stock markets, as they disrupted global trade, investment flows, and economic growth, leading to heightened uncertainty and risk aversion among investors. Another factor contributing to stock market Volatility in Malaysia and other Asian economies is domestic economic and political events. For instance, changes in macroeconomic indicators, such as inflation, interest rates, and exchange rates, can impact stock market volatility (Iqbal et al., 2019; Javid et al., 2020). Political events, such as changes in government, geopolitical tensions, and policy uncertainty, can also have a significant impact on stock market volatility (Khan et al., 2018; Safdar et al., 2020). These factors affect investor sentiment and confidence, leading to fluctuations in stock prices and trading volumes.

Furthermore, market-specific factors, such as market liquidity, trading volumes, and investor sentiment, have also been found to influence stock market Volatility in Malaysia and other Asian economies (Shahzad et al.,

2018; Tariq et al., 2019). For instance, studies have shown that higher trading volumes and liquidity can lead to increased volatility, as large transactions and trading activities can trigger price movements and affect market stability. Similarly, changes in investor sentiment, such as shifts in risk appetite and market expectations, can also impact stock market volatility. The literature on stock market Volatility in Malaysia and other Asian economies also discusses the implications of this volatility on various stakeholders, including investors, portfolio managers, and policymakers. For example, heightened stock market volatility can pose challenges for investors and portfolio managers in terms of managing risk and making informed investment decisions. It can also impact the performance of financial institutions and affect the stability of the overall financial system. Policymakers may need to implement measures to mitigate excessive stock market volatility and promote market stability, such as regulatory reforms, market surveillance, and investor protection mechanisms. Moreover, previous studies on the stock market volatility of Pakistan and other Asian economies during the period from 1992 to 2021 highlight the role of global economic events, domestic economic and political events, and market-specific factors in influencing stock market volatility. The literature also discusses the implications of this volatility on various stakeholders and the potential need for policy interventions to promote market stability. Further research in this area can provide valuable insights into the dynamics of stock market Volatility in Malaysia and other Asian economies and contribute to a better understanding of the factors driving stock market performance in these regions.

The spillover impact of Malaysia stock market on other economies, including Pakistan, Indonesia, India, China, US, UK, Germany, and France, has been a subject of interest in the literature. Previous studies have examined the linkages and transmission mechanisms between Malaysia's stock market and these economies, shedding light on the potential spillover effects. The literature suggests that there are several channels through which spillover effects can occur. One key channel is the financial integration and interconnectedness among the stock markets of these economies. For instance, studies have shown that changes in Malaysia stock market can have spillover effects on other Asian economies, such as Malaysia, Indonesia, and India, due to the close financial linkages and investment flows between these countries (Hassan et al., 2017; Shahbaz et al., 2020). These spillover effects can occur through cross-border portfolio investments, foreign direct investments, and changes in investor sentiment. Another channel through which spillover effects can occur is through global economic events and shocks that impact multiple economies simultaneously. For example, studies have shown that global financial crises, such as the global financial crisis in 2008, can have spillover effects on stock markets worldwide, including Pakistan and other economies (Ahmed et al., 2018; Hussain et al., 2019). These events can disrupt global trade, investment flows, and economic growth, leading to contagion effects on stock markets across different countries. Moreover, changes in macroeconomic variables, such as exchange rates, interest rates, and inflation, in Pakistan can also have spillover effects on other economies, including China, US, UK, Germany, and France (Ali et al., 2018; Masood et al., 2019). For instance, changes in Malaysia exchange rate can affect its trade competitiveness and impact the exports and imports of other countries, leading to spillover effects on their stock markets. Similarly, changes in interest rates and inflation in Pakistan can impact global financial markets and trigger spillover effects on other economies. The spillover impact of Malaysia stock market on other economies can have implications for various stakeholders, including investors, policymakers, and financial institutions. For investors, understanding the spillover effects can help in managing risk and making informed investment decisions, particularly for those with cross-border investments. Policymakers may need to monitor and manage the potential spillover effects to maintain financial stability and market integrity. Financial institutions, including banks and other financial intermediaries, may also need to consider the potential spillover effects in their risk management practices. Moreover, previous studies highlight the spillover impact of Malaysia stock market on other economies, including Malaysia, Indonesia, India, China, US, UK, Germany, and France. These spillover effects can occur through financial integration, global economic events, and changes in macroeconomic variables, and can have implications for investors, policymakers, and financial institutions. Further research in this area can provide valuable insights into the dynamics of stock market spillover effects and contribute to a better understanding of the interconnections among global stock markets. On the ground of the previous literature, we developed the following hypothesis.

H1: *Malaysia and its trading partners has long run volatility***.**

H2: *There is significant spillover effect between Malaysia and its trading partners.*

III. Material and methods

Data and sample collection.

To meet the research objective of the study, we selected the data of MSCI indices stock market return of 11 economies belongs to two different regions, emerging and OECD from 1993 to 2021. The countries are selected on the basis of the trade volume existed between Malaysia and the selected economies. The stock return is calculated by the (closing price-opening pricing)/ opening price of the MSCI index of the selected economies stock markets.

Methods of Analysis

According to the (Engle III & Rosenberg, 1995) that ARCH model has the one drawback that the moving average instead of autoregression. From this new concept, which includes the lagged conditional variance term used as the autoregressive term. This concept was developed by the (Bollerslev, 1986) for the first time in his paper and generated the new concept in Family of GARCH model. According to (Bollerslev, 1986) that GARCH (p, q) model concept is based on a phenomenon that conditional variance of a time series depends on the squared residuals . It is possible to estimate heteroscedasticity by using the GARCH model specifications. (Bollerslev, 1986) shows that all GARCH models are martingale difference models, all expectations are erroneous. As a result, the GARCH (p, q) model can be viewed as a simplified variant of a more sophisticated dynamic structure for time-varying conditional second order moments. In order to determine the tendency for clustering of volatility, it is possible to analyses financial data using GARCH models. According to (R. F. Engle & Mustafa, 1992), A GARCH model's conditional mean, is stated as an explicit function of condition variance. GARCH-M is the name given to this type of model. The GARCH (p,q)-M Model can be used to represent stock returns. A significant instrument in asset pricing and financial risk management, the GARCH family of volatility models has emerged since then. Various econometric studies have been conducted on volatility estimate and forecasting the work of (R. F. Engle & Bollerslev, 1986; R. F. Engle & Mustafa, 1992; Nyoni, 2018). Moreover, with the addition of the ARCH models, others GARCH models such as GARCH-Means Model, IGARCH model, Threshold GARCH models are used to capture the stock volatility in different time period.

In order to increase the GARCH model's ability to capture return properties, alternative models were devised. On the other hand, the optimal model for capturing volatility has not been determined in previous studies. Simple GARCH (p,q) models have been found to be more effective in some studies than more complex ones. Each gadget has its own performance characteristics that are dependent on the market and usage conditions. The measurement of the error terms is the main drawbacks of these forecasting models that should be improved with respect to time.

Our goal is to find the most accurate model for Malaysia's stock market. Two models, one symmetric and one asymmetric, will be compared (EGARCH and TGARCH). To find out if the Malaysian stock market's movements are affected by the difference stock markets crisis, we'll also conduct study. When comparing results from before the crisis, during the crisis, and after the crisis, we can conclude the results in the form of the co-movement.

Volatility clustering, as captured by GARCH modeling, is one of the specific characteristics of stock market returns. Therefore, we use the following GARCH (1,1) model to estimate time-varying volatility for r_t , a country's stock market return:

$r_t = \alpha + \beta r_{t-1} + \epsilon_t$ where, $\epsilon_t | I_t \sim N(0, \sigma_t^2)$ and (1)

$$\sigma_t^2 = \omega_0 + \omega_1 \epsilon_{t-1}^2 + \omega_2 \sigma_{t-1}^2. \quad (2)$$

Equation (1) indicates the average model equation while Equation (2) indicates the conditional uncertainty that tracks transient fluctuations of the stock market, capturing the conditional volatility that capsulate the time-variable uncertainties in the financial markets of our study. Our aim is to examine both volatility and co-movement. To do so, we divide our sample into three central regions, developed, emerging and OECD economies, to gain insights on how risks are transmitted across the three regions. We not only examine the co-movement of Malaysia with its neighboring markets in the Asia region as well as in the developed economy of the Europe, but also examine other regions.

(Adas & Tussupova, 2016) used daily stock price data from January 2006 to April 2011 to examine the impact of the financial crisis on different economies such as China, Japan, India and US stock market. The subject of stock market volatility is extensive. Empirical studies utilizing GARCH, and ARCH models capture the stock market's volatility. Many different geographical areas are covered in this research. (Mittnik, Robinzonov, Spindler, & Finance, 2015; Mootamri, 2011; Ou & Wang, 2011; Wei-Chong, See-Nie, Ung, & science, 2011) focus on developed countries (United States, United Kingdom, Germany, and Japan) stock market research. When it came to these studies, the frequency data employed was completely different. In addition to (Abdalla & Finance, 2012; Alshogeathri, 2011; Mishra & Business, 2010; Wong & Kok, 2005) there have been several research on the stock market in developing countries.

According to a number of studies, researchers have discovered that GARCH family models are the most accurate when it comes to predicting stock market volatility (Hung, Lee, & Liu, 2008). These models are useful for conditional distributions of the tail thickness and also shows the importance of the skewness of the return. The Fat-tailed density measured with the help of the asymmetric GARCH model improved the conditional variance estimation.

The Generalized Autoregressive Conditional Heteroscedasticity model referred as GARCH was developed from the foundations of the ARCH for the first time (R. J. J. o. B. Engle & Statistics, 2002). The univariate GARCH models are not appropriate for many analyses due to the assumption of the volatility's constant over some period of time among the variables. Univariate GARCH does not captured the volatility among multiple time series data (Pesaran & Pesaran, 2010). Dynamic correlations are not also captured but it only captures the linear correlation. This gap should be fulfilled by the constant conditional correlation (cc) GARCH model, but it also has the weakness of detecting the dynamic correlation. To detect the dynamic correlation on different time domain (R. J. J. o. B. Engle & Statistics, 2002) developed the model based on the constant conditional correlation model.

For our study we selected the DCC-GARCH model that is developed by the (R. J. J. o. B. Engle & Statistics, 2002) that is useful for the time varying volatility and detecting the correlation between the stock markets of different economies. The (R. J. J. o. B. Engle & Statistics, 2002) model is based on the Gaussians distribution that is not a proper method for the different time series or heavy tailed distribution but (Pesaran & Pesaran, 2010) used a model that is Multivariate distribution called DCC-GARCH method that is suitable for the multiple time series. To answer our research question we used the DCC-GARCH model as used by previous studies(Najeeb, Bacha, Masih, & Trade, 2015(Jaffar, 2018 #1195(Buriev, 2018 #1196(Jaffar, 2018 #1195(Buriev, 2018 #1196).The general Equation of the DCC-GARCH are given below,

$$H_t = D_t R_t D_t$$

In this equation H_t represents the conditional variance and where D_t represents the diagonal matrix that having conditional variance, R_t is the time varying correlation matrix. The conditional variance for the Assets that represents H_t are estimated firstly by univariate GARCH (X, Y) model. TheD_t matrix can be represented by $D_t = diag\left(\sqrt{h_t^x}, \sqrt{h_t^y}\right)$, that is used for the conditional standard deviation of the time series t , that function obtained from the by univariate GARCH (X, Y) model that is given below,

$$h_t = c + ae_{t-1}^2 + bh_{t-1}$$

In above equation c represents the constant with h_t is denoted the conditional variance, with a and b two different parameters that is useful for capturing the ARCH and GARCH effect. Time varying conditional correlation is represented by $R_t = [\rho_{xy,t}]$ matrix.

$$R_t = diag\{Q_t\}^{-1} Q_t \, diag\{Q_t\}^{-1}$$

In the above equation unconditional correlation is represented by the function $Q_t = [q_{xy,t}]$ for the e_t matrix. The time-varying correlation estimator is extracted by calculating:

$$Q_t = (1 - \alpha - \beta)\bar{Q} + \alpha e_{t-1} e'_{t-1} + \beta Q_{t-1}$$

$$\rho_{xy,t} = \frac{q_{xy,t}}{(\sqrt{q_{x,t}}, \sqrt{q_{x,t}})}$$

In the above equation $\bar{Q}$ is used for the unconditional correlation of the standardized residuals and model means reverting if $\alpha + < 1$.

IV. Findings and Discussions

Table 4.1: Descriptive statistics

Description	Mean	Maximum	Minimum	Std. Dev.
MALAYSIA	0.01	23.26	-24.16	1.26
CHINA	0.00	14.04	-14.46	1.79
FRANCE	0.02	10.36	-13.15	1.32
GERMANY	0.02	11.13	-13.34	1.37
INDIA	0.04	16.42	-13.74	1.46
INDONESIA	0.04	16.83	-19.15	1.76
JAPAN	0.01	13.06	-10.44	1.29
PAKISTAN	0.01	14.20	-15.73	1.65
SINGAPORE	0.01	10.97	-9.83	1.19
UK	0.01	9.26	-11.50	1.09
USA	0.03	11.04	-12.92	1.15

In the above table 4.21, the Malaysian stock market index has average return that is positive 0.011207, with maximum value of 23.26283 and minimum -24.1591, the second lowest in the selected markets group. Positive return of Malaysia indicates the positive performance of the Malaysian stock market in the selected timeframe. China has the negative mean value of -0.00242, with maximum 14.03612 and minimum -14.4569, the

lowest value in the group. It means that China stock market performance is low due to the average stock market return in the respective time period and indicated the loss in the selected timeframe. France, Germany, Pakistan, Indonesia, UK and USA have the positive average return, it means that these markets perform well due to the market structure. The Indian Stock market has average return of 0.039839, the highest average return in group during the selected period, it means that Indian Stock has approximately 4% average return earned on their investment during that period.

Table 4.2: Correlation Matrix

	MAL	CHI	FRA	GER	IND	INDO	JPN	PAK	SING	UK	USA
MAL	1.00										
CHI	0.33	1.00									
FRA	0.16	0.28	1.00								
GER	0.16	0.29	0.86	1.00							
IND	0.19	0.34	0.29	0.26	1.00						
INDO	0.31	0.37	0.20	0.20	0.28	1.00					
JPN	0.25	0.41	0.28	0.26	0.25	0.28	1.00				
PAK	0.09	0.08	0.05	0.05	0.12	0.08	0.07	1.00			
SING	0.42	0.54	0.37	0.36	0.38	0.43	0.43	0.10	1.00		
UK	0.18	0.30	0.85	0.78	0.28	0.21	0.29	0.05	0.38	1.00	
USA	0.04	0.17	0.54	0.55	0.18	0.09	0.13	0.02	0.21	0.52	1.00

Stock return are below to the value 0.80, indicates weak co-movement and there is lack of the multi-collinearity. In our correlation matrix the value of Correlation between pair France and UK in above 0.80, indicating the strong co-movement existed between these country stock markets return in the sample selected, both countries belong to the OECD economies.

GARCH Volatility

Table 4.3: Results Standard GARCH Model for Volatility

Mean Equation				
	Constant(α)	P-Value	Lag (1) (β)	P-value
Malaysia	0.0203	0.0088	0.1145	0.0000
France	0.0565	0.0000	-0.0089	0.4687
Germany	0.0638	0.0000	-0.0141	0.2622
India	0.0641	0.0000	0.1000	0.0000
Japan	0.0393	0.0008	0.0258	0.0442
Pakistan	0.0417	0.0026	0.1032	0.0000
Singapore	0.0291	0.0028	0.0499	0.0000
UK	0.0356	0.0001	-0.0028	0.8180
USA	0.0630	0.0000	-0.0286	0.0270
Indonesia	0.0634	0.0000	0.1050	0.0000
China	0.0363	0.0193	0.1244	0.0000

Variance Equation						
	Constant (ω)	P-value	ARCH (1) (ω1)	P-value	GARCH (1) (ω2)	P-value
Malaysia	0.0051	0.0000	0.0896	0.0000	0.9112	0.0000

France	0.0239	0.0000	0.0884	0.0000	0.8976	0.0000
Germany	0.0242	0.0000	0.0903	0.0000	0.8961	0.0000
India	0.0237	0.0000	0.0988	0.0000	0.8937	0.0000
Japan	0.0385	0.0000	0.0988	0.0000	0.8794	0.0000
Pakistan	0.0610	0.0000	0.1355	0.0000	0.8488	0.0000
Singapore	0.0129	0.0000	0.1025	0.0000	0.8916	0.0000
UK	0.0149	0.0000	0.0885	0.0000	0.8979	0.0000
USA	0.0174	0.0000	0.1041	0.0000	0.8821	0.0000
Indonesia	0.0294	0.0000	0.0899	0.0000	0.9038	0.0000
China	0.0371	0.0000	0.0863	0.0000	0.9023	0.0000
Note: The Mean equation is: $r_t = \alpha + \beta r_{t-t} + \epsilon_t$ where, $\epsilon_t \vert I_t \sim N(0, \sigma_t^2)$ and the Variance equation is: $\sigma_t^2 = \omega_0 + \omega_1 \epsilon_{t-1}^2 + \omega_2 \sigma_{t-1}^2$. r_t represents the stock return of a particular country. The level of significance is 1%, 5%, and 10%, respectively						

In the given table, the output of univariate GARCH to estimate the volatility for each stock market are given. Univariate GARCH is very useful to estimate the Volatility in each stock market individually. The Univariate GARCH value are estimated on the basis of the Standard GARCH that is given in table with means and variance equation. First Columns indicated the coefficient for the mean equation, while second column are related to the variance equation. The results of GARCH model are given in table. Our results shows that all the coefficient of Malaysia stock return is positive and significant, Malaysia average stock return is 0.023 and its past value significantly at 1% level of significance predicts the Malaysian stock by 0.1145. It means that its past value is also useful for predicting the current value of the stock return the coefficient of the constant variance term is significant and positive from both ARCH and GARCH term, it means that the time varying volatility include the constant 0.005 plus its past value0.91 and a component that depend on the past error 0.89. The ARCH term (ω1) (also known ARCH Alpha) is also significant, it means that short term volatility is found in Malaysian Stock return, while GARCH term (ω2) (also known as GARCH Beta value) is also statistically significant, it means that persistent of volatility in the Malaysian stock market exist for the long run. Hence, the sum of both ARCH and GARCH term is also large, indicating the effect of the shock remains in forecasting variance for long period of time in the future. Similarly, in case of China, Indonesia, India, Japan, Pakistan and Singapore, all the coefficient of these countries stock return is positive and significant, It means that its past value is also useful for predicting the current value of the stock return the coefficient of the constant variance term is significant and positive from both ARCH and GARCH term. The ARCH term (ω1) is also significant, it means that short term volatility is found in these countries Stock return, while GARCH term (ω2) is also statistically significant, it means that persistent of volatility in these countries stock market exists for the long run. Hence, the sum of both ARCH and GARCH term is also large, indicating the effect of the shock remains in forecasting variance for long period of time in the future. While in case of the OECD some countries including France, Germany and United Kingdom (UK) results shows that its past value is not useful for predicting the current value because results are not significant at any acceptable significant level but short term and long term both type of the volatility existed in the stock return of these countries. In these countries stock return persistent in the volatility for long run is founded. France, Germany and UK economies are developed economy and has the strict control on the rules and the management point of view.

Spillover effect

Table 4.4: Results DCC-GARCH Model for Spillover effect

Pair	*DDC Alpha (γ1)*	*P-value*	*DCC Beta (γ2)*	*P-value*
Malaysia-France	0.0139***	0.0000	0.9693***	0.0000
Malaysia- Germany	0.0124***	0.0004	0.9695***	0.0000
Malaysia- India	0.0131***	0.0000	0.9806***	0.0000
Malaysia-Japan	0.0125***	0.0022	0.9772***	0.0000
Malaysia- Pakistan	0.0100**	0.0252	0.9569***	0.0000
Malaysia-Singapore	0.0274***	0.0000	0.9584***	0.0000
Malaysia-UK	0.0142***	0.0001	0.9629***	0.0000
Malaysia- USA	-0.0051	0.2684	0.4602	0.5760
Malaysia-Indonesia	0.0160***	0.0000	0.9780***	0.0000
Malaysia-China	0.0071***	0.0000	1.0015***	0.0000
Note. **The level of significance is 1%, 5%, and 10%,** representing ***, ** and * respectively.				

Similarly, if DDC Alpha (γ1) value is not significant, it means that there is not short term persistence found between two stock market, where as the DCC Beta (γ2) shows the long-term persistence between the two stock markets. In our results, pair Malaysia-France DDC Alpha (γ1) is significant, indicated the short-term spillover impact of Malaysian indices over France index. DCC Beta (γ2) also in this pair significant that indicated the long-term spillover impact of Malaysian index over France. From the Malaysia-France pair, we can conclude that there is dynamic relationship existed between two stock markets. Our results also shows that the volatility in the Malaysian stock market effect the volatility in stock market of France for both short and long period of time. Similarly, Malaysia- Germany, Malaysia- India, Malaysia-Japan, Malaysia- Pakistan, Malaysia-Singapore, Malaysia-UK, Malaysia-Indonesia and Malaysia-China pairs DDC Alpha (γ1) and DCC Beta (γ2) is significant, indicating the short- and long-term persistence in the volatility between Malaysia and other group pairs. Malaysian stock market indices have the short term and long-term spillover impact on all the selected countries except USA. In case of Malaysia-USA pair, the DDC Alpha (γ1) and DCC Beta (γ2) is not significant, it means that there is not dynamic relationship existed between these two stock markets. From our results, we can summarize that the volatility in the Malaysian market effected the other trading partners stock market for both short and long run and hence, we can say that risk co-movement transfer from Malaysia to its trading partners except USA.

V. Conclusion and Recommendations

In our findings of the emerging economies and OECD economies, such as Malaysia China, Indonesia, India, Japan, Pakistan and Singapore, including France, Germany and United Kingdom (UK), respectively, has found the short-term volatility and also persistent of volatility in these countries stock market exists for the long run. France, Germany and UK economies are developed economy and has the strict control on the rules and the management point of view. Moreover, our results shows that the volatility in the Malaysian market effected the other trading partners stock market for both short and long run and hence, we can say that risk co-movement transfer from Malaysia to its trading partners except USA. The pattern of volatility change due to the crisis and other pandemics. The Crisis in the regions can change the spill over effect of the economies. The trade agreements between the countries can play a vital role in the cointegration between the economies. The implications of the study on stock market volatility and spillover effects between Malaysia and its trading partners multifaceted and have relevance for various stakeholders, including investors, policymakers, and financial institutions. The study's findings provided valuable insights for investors, both in Pakistan and its trading partners, in managing their portfolio risks. Understanding the dynamics of stock market volatility and spillover effects can help investors in making informed investment decisions, diversifying their portfolios, and implementing effective risk management strategies to mitigate potential losses during periods of heightened market volatility or spillover effects. The study's results highlighted the potential benefits of diversifying investment portfolios across different markets, particularly in the context of Pakistan and its trading partners. If the stock markets of Pakistan and its trading partners are found to be weakly integrated, it could present diversification opportunities for investors to reduce their overall portfolio risk by including assets from different markets. On the other hand, if the markets are fully integrated, it could imply that the volatility in the emerging markets is largely determined by the developed markets, and domestic investors in emerging markets may benefit from a low cost of capital. The study's findings have policy implications for regulators and policymakers in Pakistan and its trading partners. The study could also provide insights into the effectiveness of existing policy measures, such as capital controls or regulatory frameworks, in managing stock market volatility and spillover effects. The study's results provided insights for financial institutions, such as banks, asset managers, and other financial intermediaries, in managing their risks

and exposures related to stock market volatility and spillover effects. Understanding the linkages between different financial markets can help financial institutions in developing appropriate risk management strategies, pricing financial products, and optimizing their investment portfolios. Moreover, the study's findings contributed to the existing literature on stock market volatility and spillover effects, particularly in the context of Pakistan and its trading partners. The research added to the body of knowledge by providing new insights, empirical evidence, and potential explanations for the dynamics of stock market volatility and spillover effects in this specific context. This could help in advancing the theoretical and empirical understanding of international financial markets and their interdependencies. Some future studies should be conducted on the risk co-movement and the granger causality checking between these economies.

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