Mean and Volatility spillover in Asian Economies: Evidence from Trade War

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Abstract

This study aims to assets the mean and volatility spillover due to trade war (between US and China) on the Asian markets using GARCH in mean evidencing that portfolio opportunity exists for the investors in these markets. These markets may offer diversification benefit to the investors that fear the negative ramifications of stock markets of the economies in US and China. The study creates a composite variable to test the impact of trade war. The composition of variable is based on Bilateral Tariffs, Trade policy and Economic policy uncertainty of US only. It means the study covers the US side only for the creation of trade war variable. The findings of the study reveal no mean or volatility spillover exists. The study has implications for the investors and the policy makers.

Key words: Asian Markets, Trade War, GARCH,

Introduction:

Financial markets serve as an economic gauge. The increase in market volatility is a major source of concern for policymakers and investors (Becketti & Sellon, 1989). Because high volatility implies more market risk. It may cause investors to make different decisions. Volatility is threatening the system's economic viability, according to policymakers. Several studies have been conducted to study the mean and volatility spillover between markets because of various events. The probability of spillover has increased because of global financial market integration. For example, the 2008 financial crisis affected markets all across the world, and a similar situation existed during the period of Covid-19.

The objective of the study is to take into account the issue of trade war between US and China and intends to check its impact on the financial markets. The subject of trade war between US and China has been discussed in the literature for a long time (Hughes, 2005) and there are various reasons that are explained that trigger this issue. Few major reasons include, protectionism, imposition of trade tariffs (Itakura, 2020). The after effects of this issue are not limited to the two countries (USA or China) only but the ramifications can be seen throughout the world. The focus of this study is to check the impact of trade war on selected Asian economies only. The selection of countries for the underlying study is based for the receptiveness of trade war effects by these countries as suggested in the literature.

We use stock market data (Daily average closing price) of four Asian countries; these include Pakistan, India, Bangladesh and Srilanka. Trade War is a composite variable based on three proxies as suggested by the literature. The data of three proxies (Details of variables and data source are

provided in Appendix A) is obtained for USA. Yearly and monthly data is converted into daily in eviews to perform the analysis. The period of Study is from 01012014 to 31 December 2022.

There are studies that investigated the impact of Trade War on global markets, for instance, Amiti et al (2020) studied the impact of trade war on US firms. Wang et al (2021) investigated the impact of Trade War on Chinese markets. Other studies highlight the importance of global financial impact of Trade War (Huynh & Burggraf, 2019). Trade War has far-reaching impact on the Asian economies keeping in view

The context of globalization and integrated economies. Further, according to a book by Rahul Nath Chaudhry, these countries are highlighted as highly receptive to trade war effects. Moreover, this study also seeks to investigate how Asian stock markets respond to the trade war. If the EMH holds true and the Asian stock market result in no volatility and spillover, it shows that the markets have already discounted the information. No study was found that discusses the impact of trade war by creating a composite variable. Creation of composite variable give multidimensional coverage to the variable.

The findings of the study reveal that no means and volatility spillover exists in the market. Although the Garch Term shows that the volatility and the persistence of volatility exists in the markets yet no spillover was found.

Theoretical Background:

Realist theory of international trade explains the linkage between the trade war and the stock markets. The theory explains that in the international system, states become rational utility maximizers. Their prime purpose is to protect their security and chances of survival. In that context, states may favor trade with political allies in contrast to the adversaries. This may cause to disproportionately benefit the partner countries at their expense (Zeng et al, 2022).

Moreover, investors adjust their portfolios to such economic conditions in order to make portfolio decisions that are better resistant in these circumstances (Bouri et al, 2013). The stocks of these markets, which are having no implications of the trade war and instead are getting the benefit due to trade diversion may play role of safe havens for the investments. However, an empirical evidence is necessary for the investors to rely on this hypothesis. International portfolio theory provides justification for it.

Related Studies;

Bandyopadhyay and Rajib, (2018) studied the impact of US china trade war on the US soybean futures market. Rahman and Rahman (2019) highlighted the influence of China on the Asian region is a huge challenge to USA. It can be a game changer geopolitically for the US economy. To counter this challenge, USA keep on taking different steps.

(Itakura, 2020) investigates the impact of US-China Trade war on the selected economies. The study uses the CGE (Computable general equilibrium) model of global trade to test this impact.

The method of the study was simulation analysis to understand the impact of trade war on tariffs, investment and productivity. The findings of the study reveal that the gross domestic product (GDP) of the counties (US and China) is reduced due to this war. The study also investigates the impact of global value chains to generate trade responses and found these values chains to play a substantial role in creating the strong trade responses by the countries under war.

(Lu & Zhou, 2023) states that physical proximity leads increase in the sensitivity of getting an exposure to the crisis. The firm uses US-China Trade war shocks to test its impact on the firms in China's stock market to find whether the firms that have spatial proximity have reduced their market value or not due to this event. The findings of the study reveal that the market value of the firms is significantly reduced and there is a spillover effect that can be seen on to the peer organizations.

(Jiang et al., 2023) studied the reaction of exporters because of trade protection due to trade war between US and China. The findings of the study reveal that the exports to China by US decreased and the reduction was made in the quantity and not due to change in price. The study also found that the trade shocks due to trade war led the countries to divert exports to other countries.

van der Linden and Łasak, (2023) discuss the causes and the consequences of the trade restricting measures between US and China. The study highlights many causes such as US allegations on china for unfair trade practices, technology theft etc. the study reveals that these allegations turned into battle for leadership for the country. Although USA has long history of technological development, however this position is now be challenged by China.

Lastly, (Rahman et al., 2023) studied the impact of trade war on Asian economies using a neural network approach. The study provides a strong rationale for Asian economies as an effectees of trade war. The findings of the study reveal that there is a need to give importance to the neural network analysis in order to lessen the impact of trade war.

Keeping all the above study in view, the visibility of Asian stock markets in the context of trade lacks in the literature. The literature also does not provide any evidence regarding the composite variable in order to view the issue in a macro perspective. Therefore, this study intends to study the impact of trade war and its mean and volatility spillover on the Asian Markets.

Methodology:

The study takes in to account US data to investigate the impact of trade war on Asian Economies. The reason for selecting the Asian stock markets has been established by two sources first the study conducted by Rahman and Rahman (2019) who highlighted the importance of Asian region in the event of US China Trade war. In addition, a book by Rahul Nath Choudhry where the author clearly stated that the South Asian economies are more receptive to trade war. It is to be noted that all the variables to create a composite variable of Trade war are for US. For instance, EPU and Services Trade Restrictiveness index both are taken for USA and bilateral Tarrifs are tariffs imposed by USA to Chinese imports. The data for EPU is obtained from policyinsight.com, for TTRI is obtained from OECD. The data for bilateral trade is also available for WITs database.

Time-period for the study is 2014 to 2022. (Detailed Table for proxy related information is provided in appendix).

Trade War Composition

For trade war, a composite variable is created for this study. Economic policy uncertainty (a news based indicator for USA), Bilateral Tariffs (Imposed by US to Chinese Imports) and Trade Policy (measured through Trade Tariff Restrictiveness index). These proxies were then used to create a composite variable through principal component analysis in eviews software.

Trade Related Proxies:

Due to its accuracy in predicting stock market returns, EPU has been utilized widely in the literature. Christou et al (2017) discovered that EPU had a detrimental effect on the US stock market return. Ongan and Gocer (2020) explains how the EPU of the US and China affects the balance of bilateral trade. According to the analysis, China's growing unpredictability benefits the US-China trade balance.

Tam (2018) found the negative impact of increase in EPU of US markets on other economies such as china. (Chen et al., 2023) studied the impact of EPU on the stock market returns, during the US-China Trade war and Covid-19 period.

Zhang and Li (2022) found that the trade policy uncertainty (categorical component of EPU) could be used to predict the US stock returns during the recession period. Wang et al (2022) found that during the period of financial crisis, EPU has shown superior predictive performance. Guo et al (2023) shows that the impact of EPU to predict the carbon futures. The findings of the study showed that prediction could be made with the help of categorical EPU however; the prediction ability of single categorical epu is not robust.

Besides EPU index, other proxies include bilateral tariffs and trade tariff restrictiveness index are also used to measure the impact of trade war in the literature. For instance, Fugazza and Nicita (2013) used TTRI as it provides the uniform tariff rate that yields the same level of imports as differentiated structure of restrictions. It is accounted for its more narrow trade policy coverage (as it includes only tariffs). As in the case of Bilateral Tarrifs Benguria (2019) found the dissected the impact of trade war on US exports by studying the bilateral tariffs. The findings of the study revealed that trade war has amplified repercussions on the US markets as the country possess limited ability to direct its exports to the other markets. (The operational definitions of the variables are explained with their sources in Table 4)

Analysis Tool

Principal Component Analysis:

The underlying study has used Principal component analysis (PCA) methodology in order to create a Trade War index in order to investigate the impact of Trade War on the financial markets. PCA technique in eviews allows the weights to be automatically created for each Trade War component.

GARCH

The underlying study employs Liu and Pan's (1997) ARMA-GARCH model to calculate the mean and volatility spillover caused by the trade war on financial markets. Two steps are taken to carry out this approach. The return series is modelled in the first stage and mean and return volatility spillover is assessed in the second.

First step:

$$\omega_{k,t} = \tau_o + \tau_1 . \omega_{k,t-1} + \tau_2 . \vartheta_{k,t} + \tau_3 . \varepsilon_{k,t-1} + \varepsilon_{k,t}, \varepsilon_{k,t} \sim N(0 , \vartheta_{k,t})$$

$$\vartheta_{k,t} = \emptyset_0 + \emptyset_1 \vartheta_{k,t-1} + \emptyset_2 \varepsilon^2_{k,t-1}$$

Where $\omega_{k,t}$ denotes the daily stock market returns at time t and $\varepsilon_{k,t}$ denotes the residual or unexpected return. It is also goes by the name "error term". The ARMA(1,1) GARCH structure is used in the model to correct the data's autocorrelation.

Standardized residuals are obtained in order to determine the mean return and volatility spillover effects on the financial markets. To get the desired outcomes, this equation's square from the first stage is then replaced.

Second Step

$$\omega_{j,t} = \tau_{j,o} + \tau_{j,1} . \omega_{j,t-1} + \tau_{j,2} . \vartheta_{j,t} + \tau_3 . \varepsilon_{j,t-1} + \gamma_j \varepsilon_{k,t}, \varepsilon_{j,t} \sim N(0 , \vartheta_{j,t})$$

$$\vartheta_{j,t} = \emptyset_{j.0} + \emptyset_{j,1} \vartheta_{j,t-1} + \emptyset_{j,2} \varepsilon^2_{j,t-1} + \varphi_{j,2} e^2_{k,t}$$

Where the trade war's standardized error term $\varepsilon_{k,t}$ captures the effects of the trade war's mean return and volatility spillover. The square of the standardized error term, which is contained in the conditional volatility equation and has the following definition, is used to investigate the exogenous variable $e^2_{k,t}$ and is defined as

$$e_{k,t} = e_{k,t} / \sqrt{\vartheta_{k,t}}$$

Discussion

Table 1 shows, the lowest value of the standard deviation among the returns of the countries is for Bangladesh (0.07%). Maximum return in a day for the stock market returns is of Bangladesh as well 11.45%. The values for TWR series also returns. This series combines the results of the PCA analysis on the three proxies (Bilateral trade, Trade Policy and EPU). The skewness exhibits asymmetric behavior; it has a positive value for all stock markets other than India and a positive

value for the TWR series. Kurtosis provides an explanation of the data's shape (or, more specifically, the bell curve's pointiness). For all of the series, it is also positive and greater than 3, demonstrating that all the series have fat tails and high peaks.

Table 2 shows the ARCH effect for all the series. The result in the table show that the significant value means that the ARCH effect exists in all the series. Therefore, ARMA GARCH model can be applied. If the ARCH value is not significant then other model would be selected and the selection of GARCH model would not have been appropriate.

Table 3 shows the mean and volatility spillover due to trade war to the Asian Stock markets. The mean returns γ_1 of all the countries show significant results except Bangladesh. It means that only the returns of Bangladesh stock market can be predicted through the pattern of past prices.

It is also possible to day that this market is inefficient. The insignificance of other nation's stock markets demonstrates the impossibility of predicting present returns from historical prices. For all series exhibiting volatility persistence, the Garch Term γ_2 is important.

The error term γ_3 is also significant for all the series showing that for the purpose of correction in the future what will be the direction of the two series and all the statics values (beta values) are negative showing that if the increase the trade war shall cause the market to move in the opposite direction.

The GARCH term δ_1 is significant for all the series indicating the persistence of volatility. The residual term δ_2 is significant for all the series show that volatility can be forecasted by taking into account the behavior of past prices. In order the check the volatility in the long-run the summation of $\delta_1 + \delta_2$ is obtained. If it is equals to one, it means volatility persists in the long run. This is the case only in the trade war series. The sum is close to 0.96. δ_3 shows the volatility spillover only exists in Srilanka Market where as mean spillover exists in $\gamma_3$exists in all the markets.

The mean spillover ϑ insignificant for all the series. It shows no mean spillover exists from Trade War to the Asian Markets. The volatility spillover δ_3 is significant only for Srilanka. It shows Asian markets have no mean and volatility spillover from due to Trade War, and offers a diversification benefit for the investors suffering due to trade war in the economies that are parties to the trade war. The findings show harmony with the

previous study. (Balistreri et al., 2018) found that although the trade war results are negative for both USA and China yet other countries experience positive impact due to trade diversion effects. Another study by(Lin, 2023) used to check the spillover effects of China US trade War on the Southeast Asian Economies. The findings of the study reveal that the third party country would tend to have the impact of trade war by gaining the spillover effect of the trade war. The research found that these countries are optimal choice for US and China as to avoid the tariffs.

Kumagai et al (2021) studied the economic impacts of US China Trade War on the Asian Economies. The findings of the study reveal that some Asian economies take the benefit from this war. The study further states as the war is bilateral, only the concerned parties get affected by it.

Lastly,(Rahman et al., 2023) used neural network approach in order to investigate the impact of Trade War on the Asian Economies. The findings of the study reveal that inconsistencies exists in the linkages. It means that there is an impact of trade war on the Asian economies and due attention must be paid to the neural evidence in the policy determination and the trade agreements.

Conclusion:

The focus of the study was to find out the mean and volatility spillover in the Asian economies due to trade war. The findings reveal that either no spillover mean or volatility exists showing a diversification opportunity for the investors in the economies that are parties to the trade war. This study will help the investor community and the policy makers to understand the geo-political environment and respond to this type of global issues and strengthen international trade relations. As (Kwan, 2020) found that the result of trade war brings no winner. Instead, both the economies are finding substitutes and thus ultimately benefitting their allies. For instance many multinational corporations shifting from China to South East Asian and other regions in order to avoid spiked tariffs.

A key limitation of the study includes in the scope of this study. It focuses on the South Asian economies, which reduces its generalizability. However, it is insightful if the focus is on the Asian part, thus future research may be done of other blocs that may be affected due to trade war.

Lastly, this study can be extended in numerous ways for instance; this composite variable of trade war solely depicted US data. It means Economic policy uncertainty data, trade policy data was of

USA. The data of bilateral tariffs was also of those tariffs imposed by US to Chinese imports. Future studies may consider the same from the Chinese Perspective. In addition to this, other regions such as Europe, other economies in Asian region, and other blocks may also be studied as US and China are the world leaders and globalization and financial integrations will cause its systemic impact to spread globally. Finally, other markets may also be explored such as currency market, cryptocurrency market, commodity market etc. More advance techniques such as VAR-GARCH, BEKK-GARCH, DCC GARCH and Copula methods may also be used.

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Table 1: Descriptive Statistics

	INDR	PAKR	SRIR	TWR	BNR
Mean	-0.000217	-0.000267	-0.000336	-0.004042	0.000108
Median	-0.000236	-0.000345	0.000108	0.000254	9.50E-06
Maximum	0.093477	0.056366	0.092367	1.056775	0.114557
Minimum	-0.160522	-0.078011	-0.08477	-1.354987	-0.059432
Std. Dev.	0.010262	0.00945	0.009603	0.093613	0.007206
Skewness	-1.223952	-0.377418	-0.35849	-1.277913	1.634448
Kurtosis	31.53243	8.82595	16.89389	42.10625	30.76753

Table 2: Arch Effect

Sr No	Series	LR Statistic	Significance	Model
1	Trade War	609.0321	0	ARMA-GARCH
2	Bangladesh	341.4986	0	ARMA-GARCH
3	Srilanka	243.1203	0	ARMA-GARCH

	Trade War	P-value	Pak	P-value	India	P-value	Bangladesh	P-value	Srilanka
γ_0	0.059326	0.0912	0.160801	0.0052	0.124144	0.0267	0.194351	0	0.007889
γ_1	0.965383	0	-0.000744	0.1035	-0.000429	0.3337	-0.000694	0.0056	-0.000353
γ_2	-0.415531	0	0.45977	0	0.470877	0	0.447167	0	0.888355
γ_3			-0.120045	0.0273	-0.156126	0.005	-0.100999	0.0639	-0.298761
ϑ			-0.000505	0.7814	0.000291	0.8863	0.000283	0.8039	-0.000231
δ_0	0.00724	0	3.84E-06	0	2.44E-06	0	1.92E-06	0	5.28E-05
δ_1	0.15	0.0013	0.13695	0	0.098314	0	0.190375	0	0.149877
δ_2	0.6	0	0.822525	0	0.872357	0	0.780026	0	0.596066
δ_3	0	1	1.95E-08	0.9224	1.41E-07	0.4621	2.22E-08	0.7833	-2.02E-06
4	India	237.295	0	ARMA-GARCH					
5	Pakistan	93.59945	0	ARMA-GARCH					

Table 3: Mean and Volatility Spillover due to Trade War to the Asian Stock Markets

Table 4: Definitions of Variables

Variable Name	Definition	Reference
Economic Policy Uncertainty	It is calculated based on the news.	Belke et al (2018)
Trade Policy	It is calculated by using TTRI (Trade Tariff Restrictiveness Index).	Fugazza and Nicita (2013) Kee et al (2008,2009)
Bilateral Tariffs	These are tariffs between the two countries	Benguria (2019)
Stock Returns	=ln (current price/previous day price)	

The above table shows the definitions of the variables used for the purpose of the study where economic policy uncertainty, trade policy and bilateral tariffs are used to measure trade war and stock returns is the dependent variable, these returns are calculated separately for each country's market.