Analysis of Co-movement in Asia-Pacific Stock Markets Against the Background of the US-China Trade War

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Abstract

This paper employs event study methodology to investigate the impacts of the US-China trade war on stock market co-movements among the Chinese Mainland, Hong Kong, the US, Japan and Singapore, over the period from 3 January 2017 to 3 February 2023. It examines in particular the time-varying stock market co-movement at overall market level and specific sector level. The paper uses the day 6 July 2018 to separate the period into two stages, and identifies structural breaks and spillover patterns of cross-market co-movements at different phases. The empirical results indicate that stock market co-movements at overall market level among Asia-Pacific economies are significantly affected by news releases. The stock market co-movements among Asia-Pacific economies after 6 July 2018 are more sensitive to the news of the US-China trade war, which is particularly true in Communication Services and Industrials. The magnitudes of stock market co-movement between the US and Mainland China in Communication Services, Energy, Industrials and Healthcare tend to be lower because of decoupling.

JEL Classifications: F36; F65; G15.
Keywords: US-China trade war; Asia-Pacific; Event study; Stock market co-movement.

1. Introduction

China has been accused of unfair trading practices and intellectual property theft by the Office of the United States Trade Representative (USTR) since a Section 301 investigation was launched in 2017.[3] The trade tensions between China and the US escalated rapidly when US President Trump signed a memorandum to file a WTO case against China on 22 March 2018, restrict China's investment in key technology sectors in the US, and impose tariffs on Chinese goods to the US. On 6 July 2018, US Customs and Border Protection (CBP) implemented the first China-specific tariffs on imported goods, which officially triggered the US-China Trade War.

As the trade war evolved, both sides engaged in thirteen rounds of negotiations from February 2018, and finally agreed on *Economic and Trade Agreement between the Government of the People's Republic of China and the Government of the United States of America* (hereinafter referred to as "*The Phase One Deal*") in Washington DC on 15 January 2020. This was regarded as a step towards a de-escalation of the US-China trade war and would be of benefit to global trade and investment. However, the US-China decoupling went on. The Biden administration continued some trade policies of the Trump administration to turn tough with China, extending the Entity List, and making efforts to reduce US reliance on critical imports from China.

Major media in China and the US followed the process of negotiation between the two countries and therefore news was continuously disclosed to the public. People were concerned that further escalation of disputes might have influenced investments in Chinese stock markets, since investors are typically risk-averse and attempt to avoid market downturns by diversifying asset portfolios (Hasuike and Mehlawat 2018). Moreover, although tariff measures, imposed by both countries on each other, were aimed at redirecting international trade, they ultimately affect the stock prices of both foreign and domestic firms in related sectors, via global value chains.

As correlations between international markets have increased, as a result of globalisation and higher levels of financial integration (Aloui *et al* 2011), international portfolio diversification and hedging motives have attracted more attention to these integration relationships. Since risk perceptions in certain markets attributed to specific events can influence returns in other markets, one would expect specific events to have an impact on the co-movements between international stock markets.

A trade war is a fierce trade conflict arising from trade protectionism and can significantly affect the business environment. Economic integration in Asia-Pacific region aims to build up not only close trade relationships, but also intertwined financial connections. It is well known that China, the US, Hong Kong, Singapore and Japan are important economies in the Asia-Pacific region, and stock market is a barometer of real economy. Therefore, this paper looks into the stock market co-movement in these 5 economies to analyse the impacts of the US-China trade war on financial integration in the Asia-Pacific region.

The paper uses 6 July 2018 to separate the period from 3 January 2017 to 3 February 2023 into two stages. It introduces event study methodology to the Dynamic Conditional Correlation (DCC) model, and uses the DCC-GARCH model to examine the return series of stock markets, in order to analyse the impacts of news announcements about US-China trade conflicts on the co-movement between stock markets at the overall market level and sector level. This paper establishes symmetric one-trading-week event windows for key events, to observe changes in pairwise co-movement before and after news releases. It also examines potential spillover during different stages after

detecting structural breaks in pairwise series of conditional correlations using the Bai-Perron test.

2. Literature Review

With economic globalisation and technical progress, markets around the world have been further opened. With policies and measures facilitating and promoting cross-border trade and investment, the interdependence of economies has been raised, providing a basis for stock market co-movement. Scholars have conducted empirical research on the co-movement of international stock markets from two perspectives. Some researchers have investigated stock markets co-movement between developed economies or between developed and emerging economies. Others have studied the co-movement changes between international stock markets before and after specific social-economic events.

Rua and Nunes (2009) employ wavelet analysis to examine the co-movements between the stock markets of the US, the UK, Germany and Japan between 1973 and 2007. With daily stock market data from 2000 to 2014, Mensah and Alagidede (2017) use Copula and GARCH models to study the stock market co-movement between four African countries (South Africa, Egypt, Kenya, and Nigeria) and two developed countries (the US and the UK), and find that the co-movement between African countries and developed countries is weak except for South Africa, implying that African markets, with the exception of South Africa, are immune to risk spillover from advanced markets. Thomas *et al* (2018) use a DCC-GARCH model to compare the stock market co-movement between European countries and Asia-Pacific countries, and find that the co-movement between European countries is stronger than that between Asia-Pacific countries.

With regard to the impacts of special social-economic events on international stock markets, most scholars believe that the co-movement of various economies tends to be strengthened during a crisis. Didier *et al* (2012) analyse the relationship between 83 countries and the US stock market during the 2008 financial crisis, investigating reasons for co-movement changes, and suggest that countries with fragile banking systems are more vulnerable to fluctuations in the US market.

Sugimoto *et al* (2014) examine the relative importance of the global and regional markets for African financial markets, particularly during the US financial crisis and the European sovereign debt crisis, following the econometric method introduced by Diebold and Yilmaz (2012). They find that African markets are most severely affected by spillovers from global markets, while regional spillovers within Africa are smaller than global ones, and the aggregated spillover effects of European countries to African markets exceed the corresponding effects of the US. Umer *et al* (2018) employ DCC and BEKK-GARCH models and find that before and after the financial crisis, China, India, Indonesia, Russia, Brazil and Mexico have significant volatility spillover effects, and are affected by the US stock market.

Several papers present empirical research related to the influence of US-China trade wars on stock markets. Huynh and Burggraf (2019) offer the first study to examine the characteristics of co-movement in global stock markets before and after the start of the US-China trade war. They apply a set of different tri-variate Copulas onto stock market indices for several countries and find that co-movements among those markets are symmetric prior to the trade war, but present downside characteristics and heavy tails during the trade war. The methods they choose cannot provide time-varying correlations between markets and therefore they are unable to detect changes in co-movement caused by key event news.

Wang *et al* (2020) employ the event study approach to evaluate cumulative abnormal returns of listed firms in Chinese stock markets to key events of the US-China Trade War in 2018-2019, and conduct cross-section regression analysis over firm-level characteristics. Their empirical results show that firms with higher export exposure to the US have stronger negative market reactions, especially among non-state-owned enterprises. Shi *et al* (2021) investigate time-varying stock market co-movement between the US and China at both market and sector level over the period from 3 January 2017 to 23 January 2020. The study finds that the co-movements between Mainland China, Hong Kong and US stock markets are positively affected by news releases, and the co-movements are significantly enhanced after the official outbreak of the US-China trade war.

The co-movement of stock markets attracts more and more attention all over the world. This paper classifies the relevant literature as follows. Firstly, empirical research methods mainly include VAR models, Granger causality tests, impulse response functions, ECM models, forecast error variance decomposition analysis, ARCH Group Models, Copula functions, and wavelet analysis methods. Secondly, researchers select multiple stock markets to study co-movement, and most of them conclude that there is a certain correlation between different stock markets. Thirdly, most researchers choose one of the most representative stock market indexes for research. Lastly, some scholars have studied a particular past period, whilst others have focused on some special time points to investigate the impacts of specific social-economic events.

Most of the existing studies on the co-movement of different stock markets under the background of the US-China trade war explored changes in the co-movement between China and the US, while this paper examines the impacts of the US-China trade war on co-movement between major stock markets in the Asia-Pacific region, as well as the effects of news announcements at the overall market level and sector level, in order to examine the changes of financial integration in the Asia-Pacific region.

3. Methodology

3.1 The event study regression analysis

The regression analysis below is based on the event study regression analysis of Gourinchas and Obstfeld (2012), who regressed various dependent variables on the event window dummies for four kinds of crises. To compare the news announcement effects before and after the escalation of US-China trade conflicts, we construct an event study regression that distinguishes the announcement effect at two stages of the US-China trade war, specifically, before and after the first-time official implementation of tariffs on 6 July 2018 (see Eq. (1)).

$$y_{it} = a_i + b_{1,s} * d_{1,s} + b_{2,s} * d_{2,s} + \varepsilon_{i,t} \quad (1)$$

Where y_{it} is pairwise dynamic conditional correlations between stock market index returns at overall market level and sector level. The day is denoted Day 0 when the news is released (see the appendix). Considering the limited horizon of our sample, this study adopts the short-window event study of 11 days (5 days before, 5 days after), and integer $s \in [-5,5]$. Stage 1 and Stage 2 are the periods before and after 6 July 2018. $d_{1,s}$ denotes a dummy variable equal to 1 when market i is s day ($s=0$) away from a news at Stage 1, and it equal to 0 if $s \in [-5, -1] \cup [1,5]$. Similarly, denotes a dummy variable equal to 1 when market i is s day ($s=0$) away from a news at Stage 2, and it equal to 0 if $s \in [-5, -1] \cup [1,5]$. a_i, $b_{1,s}$ and $b_{2,s}$ are coefficients. $\varepsilon_{i,t}$ is the residual.

3.2 The estimation of conditional volatility and dynamic conditional correlation

To estimate time-varying co-movement (i.e. volatility linkages) between markets, we employ the Dynamic Conditional Correlation (DCC)-GARCH (1,1) method.

Previous studies show that GARCH models perform better than ARCH models in fitting dynamic volatility (Poon and Granger 2003). In many situations, the GARCH (1,1) model is good enough to generate conditional volatility. Based on the conditional volatility, the DCC model provides a good approximation to a variety of time-varying correlation processes.

Let r_t be a k × 1 vector containing the market index returns. $D_t \equiv \text{diag}\{\sigma_{ii,t}\}$ is a k × k diagonal matrix of conditional standard deviations for stock index return series obtained from a univariate GARCH model. The two-step procedure is followed to estimate conditional standard deviations and correlations. In the first step, the conditional standard deviations in D_t can be obtained from such a univariate GARCH(1,1) model. The second step is to standardise the residuals using the estimated conditional standard deviations from the first step, and also adjust the constant conditional correlations to capture the time-varying conditional correlations using the multivariate GARCH model, as in Bollerslev (1990).

3.3 The examination of structural breaks and spillovers

Finally, we look into the structural breaks of a series of DCCs by applying the Bai-Perron test onto pairwise DCCs. The primary benefit of this test is that it

selects breakpoints endogenously. The general format of the equation is a linear data generating process (DGP) that exhibits B ≥ 0 true breaks in coefficients. Bai and Perron (1998) first propose a method to estimate the number of breaks based on the sequential application of tests for parameter change. Later, Bai (2000) proves that the information criterion approach can be applied in the context of a structural break. However, Bai and Perron (2003) find that the BIC criterion performs poorly when there are no breaks, while the LWZ test fails to detect breaks when these are present.

Therefore, according to their results of testing procedures, they recommend the use of sequential testing for structural break detection. In this paper, we realise the Bai-Perron sequential testing in Eviews with the default setting that maximum breaks are 8, with 10 per cent trimming percentage and 0.05 significance level. After obtaining the identified structural break dates, following the approach used by Hwang *et al* (2013), we explore the detected structural breakpoints of DCCs by investigating spillover effects during different phases of crisis and construct a univariate auto-regressive model (see Eq. (2)):

$$\rho_{ij,t} = c + \varphi_0 \rho_{ij,t-1} + \sum_{n=1}^{q} \varphi_n d_n + \upsilon_{ij,t}, \qquad \upsilon_{ij,t} \sim i.i.N \tag{2}$$

where the dependent variable is the conditional correlation series between two markets, d_n is a dummy variable for the n^{th} break. Each dummy variable takes the value of 1 for the time period starting on the day of a breakpoint and ending a day before the next identified point occurs.

4. Data

In this study, daily closing prices of the China Securities Index 300 Index (CSI 300 Index), the Hang Seng Index (HSI), the S&P 500 Index, TOPIX Index, Straits Times Index (STI), CSI 300 Sector Indices, S&P 500 Sector Indices, Straits Times Index (STI) Sector Indices are used to represent relevant stock markets. All data are obtained from the CSMAR and Investing.com database. The CSI 300 Index is used to represent Mainland China's stock markets because it is a capitalisation-weighted stock market index designed to replicate the top 300 stocks traded on Shanghai Stock Exchange and Shenzhen Stock Exchange. The Hong Kong, US, Singapore, Japan stock markets are reflected by the Hang Seng, S&P 500 Indexes, STI, and TOPIX respectively.

Furthermore, we explore CSI 300 Sector Indices, S&P 500 Sector Indices, Hang Seng Sector Indices and TOPIX Sector Indices. As the sub-index of CSI 300 Index, CSI 300 Sector Index covers 10 categories, i.e. Communication Services, Consumer Discretionary, Consumer Staples, Energy, Financials & Real Estate, Healthcare, Industrials, Information Technology, Materials and Utility. In comparison, 11 sub-indices are derived from the S&P 500 Index. Along with the same classifications for nine sectors, the category of Financials & Real Estate is replaced by two independent categories, i.e. S&P 500 Financials and S&P 500 Real Estate.

A separate comparison of CSI 300 Financials & Real Estate Index with S&P 500 Financials Index and S&P 500 Real Estate Index is biased. Moreover, the utility sector is not considered to be influenced by the US-China trade war.[4] Therefore, the Financial, Real Estate and Utility sectors are excluded from the following analyses. To understand the effects of the US-China trade war on co-movement between corresponding sectors in major Asia-Pacific stock markets, this paper considers four pairs of sub-indices in the following sectors: Communication Services, Energy, Healthcare and Industrials.

The STI has no industry index, so we construct an industry index through its 30 component stocks, which is obtained from the weighted average of the market value of the company. As most of the 30 component stocks are financial and real estate companies, this paper constructs the industry index of energy and communication services. While the ARCH effect of Singapore's energy industry index is not significant, and it cannot be analysed through a DCC-GARCH model, the Singapore industry index in this research only includes the Communication Services industry.

Daily indices prices are adopted in this study because compared to weekly and monthly data, daily data can capture more information (Li and Giles 2015). The sample period is from 3 January 2017 to 3 February 2023, covering the entire intense period of the US-China trade war before and after the signing of the Phase One Deal. Evidence from existing literature indicates that the 2015 Shanghai Stock Exchange Crash caused a long-lasting effect on volatility spillover from the Chinese Mainland to Hong Kong and the US stock markets until the end of 2016 (e.g. Qarni and Gulzar 2018). Therefore, we choose the daily observations from the beginning of 2017 to avoid the remaining effects of the crash. The market return is calculated as the first difference of the natural logarithm of the closing price in local currency for two consecutive trading days (see Eq. (3)).

$$R_t = \ln(P_t) - \ln(P_{t-1}) \tag{3}$$

where, R_t is the market return of the t^{th} day; P_t is the closing price of the t^{th} day. In order to take advantage of all the available points in time and avoid spurious correlations between markets, all common holidays are excluded and the returns corresponding to non-common holidays are replaced by zero when estimating the Dynamic Conditional Correlations.

The descriptive statistics of the daily returns of CSI 300 Index, Hang Seng Index, S&P 500 Index, TOPIX and STI are shown in Table 1. The augmented Dickey–Fuller (ADF) statistic rejects the null hypothesis of unit root at the 1 per cent significance level, indicating that each return series is stationary. This stationarity enables us to work on the time series directly without any further transformation. The strong rejection for each return series suggests the existence of heteroscedasticity and the preference for GARCH models.

Table 1. Descriptive Statistics of Stock Market Indices Returns

	CSI300 Index	Hang Seng Index	S&P500 Index	TOPIX	STI
Mean	0.000219	3.15E-06	0.000595	0.000226	0.000119
Min	-0.0788	-0.636	-0.1198	-0.0561	-0.0721
Max	0.0595	0.0908	0.0938	0.0687	0.0694
SD	0.0121	0.01345	0.012516	0.010558	0.009096
Skewness	-0.171275	0.2467	-0.6644	-0.059432	-0.348
Kurtosis	6.166	7.594326	19.34534	6.530525	14.80622
ADF	-34.659***	-32.098***	-40.281***	-32.294***	-32.902***
JB	549.4348	1156.532***	14567.36***	675.9316***	650.4531***
ARCH	25.12967***	131.7634***	352.5520***	55.53578***	333.5784***

Notes: The JB statistic tests for the null hypothesis of normal distribution.
The ADF statistic tests for the null hypothesis of a unit root in time series.
The ARCH test is performed using chi-square statistics, with the null hypothesis of homoskedasticity.
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

Table 2 to Table 5 summarise the descriptive statistics of selected sector indices derived from the CSI 300 Index, S&P 500 Index, Hang Seng Index, TOPIX Index and STI respectively. The distribution of returns for all selected sectors in all economies rejects the null hypothesis of the ADF statistic and ARCH test at the 1 per cent significance level, ready for the DCC-GARCH model.

Table 2. Descriptive Statistics of Sector Indices Returns
(Sub-Index of CSI 300 Index)

	CNen	CNid	CNco	CNhe
Mean	9.33E-05	5.92E-05	-0.000121	0.000326
Min	-0.77567	-0.088053	-0.094331	-0.066013
Max	0.061353	0.058936	0.073774	0.084471
SD	0.014891	0.013605	0.018001	0.016806
Skewness	-0.172327	-0.070208	-0.0831	-0.04235
Kurtosis	5.940872	5.849221	5.924509	4.15396
ADF	-34.688***	-34.245***	-28.494***	-30.627***
JB	474.9069***	440.7962***	464.7704***	56.23595***
ARCH	26.35595***	10.60147***	19.14204***	2.86014*

Notes: “CN” denotes Mainland China;
“en” – Energy, “id” – Industrials, “co” – Communication services, “he” – Healthcare;
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

Table 3. Descriptive Statistics of Sector Indices Returns (Sub-Index of S&P 500 Index)

	USen	USid	USco	UShe
Mean	0.000137	0.000564	0.000191	0.000755
Min	-0.2008	-0.1145	-0.1044	-0.0999
Max	0.1631	0.1275	0.0920	0.0759
SD	0.021058	0.013961	0.014432	0.0116
Skewness	-0.444342	-0.357568	-0.392461	-0.261125
Kurtosis	17.94022	17.70291	8.995512	14.49379
ADF	-36.503***	-35.883***	-36.175***	-37.683***
JB	12133.32***	11737.20***	1980.456***	7170.583***
ARCH	60.2049***	223.4037***	309.2634***	350.7437***

Notes: "US" denotes the United States;
"en" – Energy, "id" – Industrials, "co" – Communication services, "he" – Healthcare;
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

Table 4. Descriptive Statistics of Sector Indices Returns (Sub-Index of Hang Seng Index)

	HKen	HKid	HKco	HKhe
Mean	1.03E-04	2.50E-04	-0.000334	0.00126
Min	-0.1085	-0.0764	-0.596	-0.1056
Max	0.0934	0.095	0.0602	0.1372
SD	0.016643	0.01598	0.011861	0.027297
Skewness	-0.18534	-0.15657	0.275927	0.242098
Kurtosis	6.745844	5.400832	6.33375	5.422683
ADF	-28.414***	-30.966***	-31.502***	-21.765***
JB	760.3898***	314.5967***	612.7892***	56.23595***
ARCH	16.9889***	58.14658***	76.9236***	105.1461***

Notes: "HK" denotes Hong Kong;
"en" – Energy, "id" – Industrials, "co" – Communication services, "he" – Healthcare;
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

Table 5. Descriptive Statistics of Sector Indices Returns
(Sub-Index of TOPIX Index and STI)

	JPid	JPen	JPhe	JPco	SGco
Mean	0.000407	-7.85E-05	0.000329	0.000223	-0.000238
Min	-0.0678	-0.599	-0.0488	-0.0826	-0.584
Max	0.0749	0.0719	0.0751	0.0535	0.0833
SD	0.013853	0.011954	0.012114	0.011172	0.011574
Skewness	-0.054012	0.218685	0.133485	-0.465457	0.343603
Kurtosis	4.999621	5.363793	5.703598	6.771877	8.438277
ADF	-31.826***	-30.140***	-30.945***	-33.794***	-31.881***
JB	217.2167***	312.7365***	399.7888***	817.5730***	1612.528***
ARCH	39.6095***	5.335409**	26.30179***	63.47689***	158.8124***

Notes: "JP" denotes Japan, "SG" denotes Singapore;
"en" – Energy, "id" – Industrials, "co" – Communication services, "he" – Healthcare;
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

5. Empirical Results

5.1 Event study for stock market co-movements in the Asia-Pacific region at the overall market level

Following common practices in Cao *et al* (2017) and Mohammadi and Tan (2015), this paper examines the time-varying stock market co-movements in major Asia-Pacific economies by using DCC models. Table 6 shows the descriptive statistics of cross-border DCCs among the Mainland China, Hong Kong, US, Japan and Singapore stock markets. The event study analysis of news announcements of the US-China trade war for those DCCs is summarised in Table 7.

Table 6. Descriptive summary of DCCs
between major Asia-Pacific stock markets

	Cor CNUS	**Cor CNJP**	**Cor CNSG**	**Cor CNHK**
Mean	**0.123225**	**0.320744**	**0.36017**	**0.640009**
Min	0.049035	0.138391	-0.002468	0.797168
Max	0.183567	0.517714	0.589478	0.335879
		Cor USJP	**Cor USSG**	**Cor USHK**
Mean		**0.194421**	**0.187109**	**0.199909**
Min		0.156209	-0.06436	0.93552
Max		0.264642	0.34885	0.275396

Notes: "CN" denotes Mainland China, "US" denotes the United States, "HK" denotes Hong Kong,
"JP" denotes Japan, "SG" denotes Singapore;
"Cor" denotes the word "Correlation".

Table 6 shows that the stock market co-movement between Mainland China and Hong Kong is much higher than that between Mainland China and the US. The stock market co-movement between Hong Kong and the US is higher than that between Mainland China and the US. This is consistent with previous research on the Greater China region, that is, the market with higher magnitudes of openness correlate more with international markets. Earlier literature has widely confirmed that, given the long-term financial policy implemented by Chinese government to control capital flows, the Hong Kong stock market is much more mature and international than the mainland stock market. With the gradual liberalisation of financial markets, cross-border investment channels have been developed, and international capital can flow into the securities market of Mainland China through Hong Kong, so the correlation between Mainland China's stock market and foreign stock markets has gradually strengthened. The Hong Kong stock market is closely related to that of Mainland China, which can be explained from the following aspects:

(1) With the more mature capital market in Hong Kong, many of Mainland China's enterprises have themselves listed in the Hong Kong Stock Exchange. The number of "H-share" companies and "red chip" companies listed on the Hong Kong Stock Exchange has increased year by year. These listed companies operating in the mainland face the same environment and policies as those listed in the mainland, so they will be subject to common incentives and shocks. At the same time, their listing on the Hong Kong stock market composes a part of the Hong Kong stock market, and will eventually reflect the volatility in the Hong Kong stock market, so that there is some co-movement between Mainland China and Hong Kong.

(2) The Shanghai-Hong Kong Stock Connect Program and the Shenzhen-Hong Kong Stock Connect Program were officially launched in 2014 and 2016 respectively. These are the connectivity mechanisms between the Mainland and Hong Kong stock markets. The opening of these two channels has established a direct connection between the two stock markets, reducing the investment threshold and transaction costs. Investors in Mainland China and Hong Kong can buy and sell stocks in the two stock markets conveniently and quickly through the two Stock Connect Programs, realising the optimal allocation of funds. This has also unblocked the flow of funds between the two capital markets, which will further strengthen the stock market co-movements between Mainland China and Hong Kong.

(3) US-China trade frictions have escalated since 2018, when the Trump administration imposed huge tariffs on China's exports. The sharp deterioration of the international environment and the rise of Reverse Globalisation have led to greater interdependence between Mainland China and Hong Kong, and the capital market has been impacted by the external environment. Just as the trading volumes of the Shanghai-Hong Kong Stock Connect Program and the Shenzhen-Hong Kong Stock Connect Program have gradually expanded over time, investors tend to increase the amount of investment in each other's stock

markets, which has seen the stock markets in Mainland China and Hong Kong converge.

(4) Many countries lowered their interest rate to combat recession, but tightened their policies towards capital inflows and outflows. Therefore, the financial environment has become tougher and, as capital flows are more sensitive, which so the mutual influence between the Mainland China and Hong Kong stock markets has deepened.

In addition, it can be seen from Table 6 that the stock market co-movements between Mainland China and Japan and Singapore are higher than those between the US and Japan and Singapore, which means that the stock market co-movements between Asian economies are stronger. To some extent, this can help investors and relevant institutions to analyse the international portfolio, make investment decisions and manage risk.

There are several findings regarding the estimates in the event window at Stage 1 (before 6 July 2018) in Table 7.

(1) The respective event regression coefficients between the US and Japan, Singapore and Hong Kong stock markets are negative, while the coefficients between Mainland China and these economies are positive and have bigger absolute values. This means that the co-movements between Mainland China and these economies are higher than those of the US before the formal outbreak of the US-China trade war. The reason might be that China is an important Asian economy, China is geographically close to these Asian economies and is an important trading partner. In addition, the real economy affects the performance of the stock market.

(2) The positive coefficients of Mainland China and Hong Kong have a trend of gradually increasing in the following 4 days since the news announcement of US-China trade conflicts, and reach the peak at the third day. It shows that the stock market co-movement between Mainland China and Hong Kong has increased due to the news release.

(3) The respective negative coefficients between the US and other Asia-Pacific economies decreases noticeably in absolute values at the third day, and declines further by the end of the event window. This implies that magnitudes of stock market co-movements between the US and Mainland China as well as Japan, Singapore and Hong Kong lower after news announcements.

At Stage 2 (after 6 July 2018), there were the following findings:

(1) Although most coefficients are positive, there is no significant stock market co-movement between the US and Mainland China, nor Hong Kong. The coefficients between China and Japan as well as Singapore are higher than those between the US and these economies, which means that the stock market co-movements between Asian economies at Stage 2 are more sensitive to news announcements of the US-China trade war.

(2) From day 0, there are obvious co-movement changes between the US and Hong Kong as well as Mainland China, indicating that the stock market co-movement between China and the US has responded more quickly to the

Table 7. Regression Results under Event Windows of Stage 1 and Stage 2 at the overall market level

Coefficients	Cor USJP	Cor USSG	Cor USHK	Cor CNUS	Cor CNJP	Cor CNSG	Cor CNHK
Intercept	0.19282***	0.18132***	0.19732***	0.12034***	0.31411***	0 .35243***	0.62402***
Stage 1 (before July 6, 2018)							
$d_{1,-5}$	-0.00740	-0.00282	-0.0141	-0.0201*	0.0453*	0.0132	0.0143
$d_{1,-4}$	-0.00245	-0.000594	-0.00634	-0.00803	0.0572*	0.0546	0.0456
$d_{1,-3}$	-0.00248	-0.000694	-0.00631	-0.00870	0.0584*	0.0512	0.0412
$d_{1,-2}$	0.00105	0.00115	-0.00223	-0.00316	0.0588*	0.0708	0.0507
$d_{1,-1}$	-0.000957	-0.000160	-0.00213	-0.00897	0.0581*	0.0553	0.0484
$d_{1,0}$	-0.00916	-0.00118	-0.00527	-0.0117	0.0447*	0.0668*	0.0547*
$d_{1,1}$	-0.0147**	-0.00548	-0.0117	-0.0193	0.0539	0.0549	0.0592
$d_{1,2}$	-0.0154**	-0.00534	-0.0138	-0.0227*	0.0558*	0.0474	0.0589
$d_{1,3}$	-0.00980	-0.00247	-0.00886	-0.0171	0.0688**	0.0635	0.0627*
$d_{1,4}$	-0.00744	-0.00136	-0.00632	-0.0143	0.0494	0.0626	0.0416
$d_{1,5}$	-0.00748	-0.000709	-0.00518	-0.00994	0.0602**	0.0829*	0.0475
Stage 2 (after July 6, 2018)							
$d_{2,-5}$	0.00376*	0.000746	-0.00204	-0.00367	-0.00310	0.000131	0.0166
$d_{2,-4}$	0.00556**	0.00168	-0.00128	-0.00613	0.00189	0.0146	0.0159
$d_{2,-3}$	0.00539***	0.00153	-0.000150	-0.00406	0.00522	0.0177	0.0140
$d_{2,-2}$	0.00785***	0.00299**	0.00574	0.00486	0.0112	0.0117	0.00682
$d_{2,-1}$	0.00565***	0.00292***	0.00398	0.00327	0.00455	0.0205*	0.0217**
$d_{2,0}$	0.00453***	0.00154*	0.000256	-0.000198	0.00869	0.0161	0.0216**
$d_{2,1}$	0.00381**	0.00127	-0.00273	-0.00311	0.0145*	0.0146	0.0280***
$d_{2,2}$	0.00523**	0.00212**	0.00298	0.000241	0.0171*	0.0216	0.0249**
$d_{2,3}$	0.00735***	0.00222**	0.00245	-0.00339	0.0166	0.0227	0.0328***
$d_{2,4}$	0.00216	0.00213*	0.00368	-0.00127	0.0170	0.0368**	0.0271**
$d_{2,5}$	0.00132	0.000380	-0.00109	-0.00209	0.00450	0.00996	0.0164

Notes: "CN" denotes Mainland China, "US" denotes the United States, "HK" denotes Hong Kong, "JP" denotes Japan, "SG" denotes Singapore;
"Cor" denotes the word "Correlation".

news of the trade war. This can be attributed to the significant increase in news coverage and public attention after the official start of the US-China trade war.

(3) It can be seen from the first three columns that the respective coefficients between the US and Japan, Singapore and Hong Kong have an increasing trend in the post-event window, reaching a peak 3-4 days after the news announcement. This means that the relevant news release will also enhance the stock market co-movement between the US and these economies after the start of the trade war.

(4) The stock market co-movements among Mainland China, Japan, Singapore and Hong Kong have also increased after the news release.

5.2 The event study for co-movement among Asian-Pacific stock markets at the sector level

The industry classification adopted by the CSI 300 Index is consistent with the Global Industry Classification Standard (GICS) employed by the S&P 500 index. Taking into account the availability of industry indices and the differences in industry segmentation in Singapore and Japan, we choose the four industry indices of Communication Services, Industrials, Healthcare and Energy to investigate their co-movement. Table 8 summarises the DCC descriptive statistics for Mainland China, Hong Kong, the US, Japan and Singapore in these four sectors. It can be seen that the mean of co-movement between these four industries in different economies is positive. The sector indices co-movement between Mainland China and Japan is higher than that between the US and Japan, and the co-movement between the US and Japan is higher than that between the US and Mainland China.

Table 9 to Table 15 show the regression results of the "event study" at sector level.

Table 9 shows there are negative impacts of news announcements on the stock market co-movement of the US and Mainland China for Communication Services. However, the absolute value of coefficients at Stage 2 is smaller than that at Stage 1, implying the magnitude of impacts on Communications Services lowered after the outbreak of the US-China trade war on 6 July 2018.

The coefficients of the US and Mainland China stock market for Energy and Industrials turned from negative at Stage 1 to positive at Stage 2, and the absolute value at Stage 2 is smaller than that at Stage 1. This implies that the magnitude of impacts of news announcements on Energy and Industrials lowered after the outbreak of the US-China trade war on 6 July 2018.

The coefficients of the US and Mainland China stock market for Healthcare turned from positive at Stage 1 to negative at Stage 2, and the absolute value at Stage 2 is smaller than that at Stage 1. This implies the magnitude of impacts of news announcements on Healthcare lowered after the outbreak of the US-China trade war on 6 July 2018.

It is worth noting that the coefficient of Communication Services at Stage 2 reaches its peak at the second day after the news release; those of Energy, Industrials and Healthcare are at the fourth day.

The fields involved in the US-China trade war have rapidly expanded from economy and trade to science and technology. The US accelerated its steps to decouple from China in various fields. With the escalation of the US-China trade tensions, the US government took many measures to restrict Chinese companies related to the "Made in China 2025" plan. This is a strategic plan issued by the State Council of China in 2015 to facilitate China's ten year industrial development from labour intensive manufacturing to knowledge

Table 8. Descriptive summary of DCCs among Asian-Pacific stock markets at the sector level

	CNJP			
	co	id	he	en
Mean	0.248701	0.265601	0.165735	0.186761
Min	0.044255	0.004466	-0.062329	0.091255
Max	0.522932	0.565099	0.370604	0.369434
	USJP			
	co	id	he	en
Mean	0.104398	0.195436	0.150384	0.107782
Min	0.087036	0.157853	0.143256	-0.065342
Max	0.134347	0.296656	0.163842	0.189281
	CNUS			
	co	id	he	en
Mean	0.060708	0.104568	0.099961	0.14404
Min	-0.149757	0.015856	-0.099265	0.058081
Max	0.162829	0.188848	0.25277	0.205945
	CNHK			
	co	id	he	en
Mean	0.295131	0.612537	0.69146	0.631667
Min	0.181552	0.28251	0.382283	0.300702
Max	0.440358	0.763661	0.814079	0.788752
	HKJP			
	co	id	he	en
Mean	0.248291	0.40901	0.199407	0.243641
Min	0.189984	0.118947	-0.018158	0.136025
Max	0.33771	0.650831	0.405549	0.349566
	HKUS			
	co	id	he	en
Mean	0.04486	0.150465	0.105024	0.215187
Min	-0.22813	0.13565	-0.036562	7.41E-05
Max	0.611624	0.18162	0.208069	0.563883

Notes: “CN” denotes Mainland China, “US” denotes the United States, “HK” denotes Hong Kong, “JP” denotes Japan, “SG” denotes Singapore; “en” – Energy, “id” – Industrials, “co” – Communication services, “he” – Healthcare.

intensive production. The Communication Services, Energy, Industrials and Healthcare are expected to be smarter, greener and advanced, so they are more sensitive to news announcements of the US-China trade war, where we could see the magnitudes of stock market co-movement between the US and China in these sectors falling because of decoupling.

Table 9. Regression Results under Event Windows of Stage 1 and Stage 2: Stock market co-movements between Mainland China and the US at the sector level

Coefficients	CNUS Cor co	Cor en	Cor id	Cor he
Intercept	0.06511***	0.14682***	0.10043***	0.09674***
Stage 1 (before July 6, 2018)				
$d_{1,-5}$	-0.0389***	-0.0371***	-0.0451***	0.0532**
$d_{1,-4}$	-0.0105	-0.0390***	-0.0341*	0.0390
$d_{1,-3}$	-0.00696	-0.0396***	-0.0348*	0.0383
$d_{1,-2}$	-0.00281	-0.0313***	-0.0259	0.0341
$d_{1,-1}$	-0.0123	-0.0373***	-0.0350*	0.0502*
$d_{1,0}$	-0.0302***	-0.0420***	-0.0415***	0.0590***
$d_{1,1}$	-0.0198**	-0.0431***	-0.0477**	0.0536*
$d_{1,2}$	-0.0159*	-0.0429***	-0.0511**	0.0626**
$d_{1,3}$	-0.0225***	-0.0429***	-0.0498***	0.0628**
$d_{1,4}$	-0.0131	-0.0409***	-0.0558***	0.0432
$d_{1,5}$	-0.0155**	-0.0411***	-0.0507***	0.0418*
Stage 2 (after July 6, 2018)				
$d_{2,-5}$	5.14e-05	0.00353	0.00213	-0.0248***
$d_{2,-4}$	0.000512	0.00424	0.00853	-0.0110*
$d_{2,-3}$	-0.000366	0.00719*	0.0123*	-0.0127*
$d_{2,-2}$	-0.00489*	0.00946**	0.0159**	-0.0199**
$d_{2,-1}$	-0.00315*	0.00800**	0.0153***	-0.0251***
$d_{2,0}$	-0.00333*	0.00603**	0.0125***	-0.0253***
$d_{2,1}$	-0.00143	0.00515	0.00788*	-0.0321***
$d_{2,2}$	-0.000312*	0.00673*	0.0117**	-0.0274***
$d_{2,3}$	-0.00135*	0.00534	0.0132**	-0.00937
$d_{2,4}$	-0.00100	0.00932**	0.0148**	-0.00920*
$d_{2,5}$	-0.00369	0.00713*	0.00659	-0.0176**

Notes: "CN" denotes Mainland China, "US" denotes the United States;
"en" – Energy, "id" – Industrials, "co" – Communication services, "he" – Healthcare;
"Cor" denotes the word "Correlation".
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

Table 10 shows that news announcements of the US-China trade war had significantly positive impacts on the stock market co-movement between Mainland China and Japan in Communication Services at Stage 1, with the coefficient reaching the peak at the fifth day after the news releases. However, there is only a significantly positive impact at the second day after the news

Table 10. Regression Results under Event Windows of Stage 1 and Stage 2: Stock market co-movements between Mainland China and Japan at the sector level

Coefficients	Cor co	CNJP Cor en	Cor id	Cor he
Intercept	0.25176***	0.19200***	0.26198***	0.16290***
Stage 1 (before July 6, 2018)				
$d_{1,-5}$	-0.00220	0.0339	0.0173	0.00907
$d_{1,-4}$	0.0395	0.0299	0.0569	0.0570
$d_{1,-3}$	0.0313	0.0226	0.0578	0.0620
$d_{1,-2}$	0.0712***	0.00601	0.0869	0.0591
$d_{1,-1}$	0.0584**	-0.00197	0.0579	0.0544
$d_{1,0}$	0.0308	0.00635	0.0622*	0.0265
$d_{1,1}$	0.0362	0.0130	0.0568	0.00392
$d_{1,2}$	0.0282	0.0197	0.0572	0.0214
$d_{1,3}$	0.0612**	-0.000365	0.0869*	0.0238
$d_{1,4}$	0.0670**	-0.0180	0.0862*	0.0159
$d_{1,5}$	0.0860***	-0.0187	0.112**	0.0225
Stage 2 (after July 6, 2018)				
$d_{2,-5}$	-0.00359	-0.00100	-0.0108	-0.00298
$d_{2,-4}$	-0.00358	0.000216	-0.00150	0.0166
$d_{2,-3}$	-0.00423	0.00353	0.000786	0.0281**
$d_{2,-2}$	0.00841	-0.00181	0.0189	0.0153
$d_{2,-1}$	0.00682	-0.00277	0.00662	0.00931
$d_{2,0}$	0.00423	-0.000757	0.0134	0.0145
$d_{2,1}$	0.00748	-0.00300	0.00770	0.0151
$d_{2,2}$	0.0154*	-0.000203	0.00875	0.0178
$d_{2,3}$	0.00472	0.000137	0.00806	0.0289**
$d_{2,4}$	-0.0114	-0.00540	0.00163	0.0278**
$d_{2,5}$	-0.00822	-0.00132	0.00430	0.0120

Notes: "CN" denotes Mainland China, "JP" denotes Japan;
"en" – Energy, "id" – Industrials, "co" – Communication services, "he" – Healthcare;
"Cor" denotes the word "Correlation".
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

release at Stage 2, and the magnitude is smaller than that at Stage 1, which might suggest Japan's decoupling from China in Communication Services, following the US.

There are no significant impacts of news announcements of the US-China trade war on the stock market co-movement between Mainland China and Japan in Energy.

The news announcement of the US-China trade war has significant positive impacts on the stock market co-movement between Mainland China and Japan in Industrials at Stage 1, and the coefficient reaches the peak at the fifth day after the news release. However, there is no significant impact at Stage 2, which again might suggest Japan's decoupling from China, in Industrials.

There is no significant impact of news releases on the stock market co-movement between Mainland China and Japan in Healthcare at Stage 1. However, there are significant positive impacts at the third and fourth day after the news release at Stage 2, which might be affected by enhanced China-Japan cooperation in Healthcare after the outbreak of the US-China trade war.

Table 11 shows there is only a significant positive impact on the stock market co-movement between the US and Japan in Communication Services at the fifth day after the news release at Stage 1. However, there is a significant positive impact in the continuous 3 days after the news release, implying the stock market co-movement between the US and Japan in Communication Services is more sensitive to the news of the US-China trade war at Stage 2.

The coefficients of stock market co-movement between the US and Japan in Energy turned from significant and positive at Stage 1 to significant and negative at Stage 2, and remained significant in the continuous 5 days after the news release at Stage 2. This implies the stock market co-movement between the US and Japan in Communication Services is more sensitive to the news release at Stage 2.

There is a significant negative impact of news releases on stock market co-movement between the US and Japan in Industrials at Stage 1, where the coefficient reached the peak at the fifth day after the news release. However, there is a significant positive impact in Industrials in the continuous 3 days after news release at Stage 2, implying the stock market co-movement between the US and Japan in Industrials is more sensitive to the news release at Stage 2.

There is a significant negative impact of news releases on stock market co-movement between the US and Japan in Healthcare on the day of news releases at Stage 1. However, the coefficients turned positive and reached the peak at the third day after the news release at Stage 2, implying the positive impacts of news release on stock market co-movement between the US and Japan in Healthcare lasts longer at Stage 2.

As can be seen from Table 12, there is a significant negative impact of news releases on stock market co-movement between Mainland China and Singapore in Communication Services. Although there is a significant negative impact in the continuous 5 days after the news releases at Stage 2, the magnitude

Table 11. Regression Results under Event Windows of Stage 1 and Stage 2: Stock market co-movements between Japan and US at the sector level

Coefficients	USJP Cor co	Cor en	Cor id	Cor he
Intercept	0.10773***	0.11778***	0.19149***	0.14812***
Stage 1 (before July 6, 2018)				
$d_{1,-5}$	-0.00204	0.0278**	-0.0179	-0.00117
$d_{1,-4}$	-5.07e-05	0.0230	-0.00476	-0.00135
$d_{1,-3}$	-0.00152	0.0256	-0.00555	-0.00110
$d_{1,-2}$	0.00377	0.0208	-0.00390	-0.000730
$d_{1,-1}$	0.000684	0.0225	-0.00273	-0.000842
$d_{1,0}$	0.00222	0.0223*	-0.0194*	-0.00267*
$d_{1,1}$	0.000236	0.0330**	-0.0239*	-0.00272
$d_{1,2}$	-0.000572	0.0313*	-0.0251*	-0.00308
$d_{1,3}$	0.00391	0.0219	-0.0232*	-0.00252
$d_{1,4}$	0.00909	0.0292*	-0.0205	-0.00127
$d_{1,5}$	0.0111*	0.0310**	-0.0203*	-0.00144
Stage 2 (after July 6, 2018)				
$d_{2,-5}$	0.00430**	-0.0110**	0.00541	0.000932*
$d_{2,-4}$	0.00421**	-0.0129***	0.00937**	0.00152***
$d_{2,-3}$	0.00449**	-0.0141**	0.00785*	0.00153**
$d_{2,-2}$	0.00558***	-0.0240***	0.0135***	0.00133**
$d_{2,-1}$	0.00634***	-0.0175***	0.00891**	0.000977*
$d_{2,0}$	0.00457***	-0.0133***	0.00839***	0.000883*
$d_{2,1}$	0.00433***	-0.0151***	0.00656*	0.000760
$d_{2,2}$	0.00606***	-0.0193***	0.0103***	0.00104*
$d_{2,3}$	0.00555***	-0.0178***	0.0134***	0.00164***
$d_{2,4}$	0.00229	-0.0147***	0.00629	0.000205
$d_{2,5}$	0.00121	-0.0156***	0.00391	0.000115

Notes: "US" denotes the United States, "JP" denotes Japan;
"en" – Energy, "id" – Industrials, "co" – Communication services, "he" – Healthcare;
"Cor" denotes the word "Correlation".
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

is smaller than at Stage 1, implying the stock market co-movement between Mainland China and Singapore in Communication Services is more sensitive to the news release and the impact lasts longer at Stage 2.

There is no significant impact of news release on stock market co-movement between the US and Singapore in Communication Services at Stage 1. However,

the coefficient reached the peak at the first day after the news release at Stage 2, implying the stock market co-movement between the US and Singapore in Communication Services is more sensitive to the news release after 6 July 2018.

Table 12. Regression Results under Event Windows of Stage 1 and Stage 2: Stock market co-movements between Singapore and Mainland China, the US, Japan, and Hong Kong in Communication Services

Coefficients	CNSG Cor co	USSG Cor co	JPSG Cor co	HKSG Cor co
Intercept	0.13685***	0.06493***	0.19852***	0.18799***
Stage 1 (before July 6, 2018)				
$d_{1,-5}$	-0.0134	0.00723	-0.00177	0.0635
$d_{1,-4}$	-0.0154	-0.00675	0.00606	0.106**
$d_{1,-3}$	-0.00426	-0.0111	0.00356	0.113**
$d_{1,-2}$	-0.0124	-0.00940	0.0140*	0.108**
$d_{1,-1}$	-0.00621	-0.00739	0.0121	0.131***
$d_{1,0}$	-0.00388	0.00288	0.00453	0.123***
$d_{1,1}$	-0.0229**	-0.00594	0.00322	0.0879
$d_{1,2}$	-0.0190*	-0.00220	0.00175	0.0848
$d_{1,3}$	-0.0252**	0.0114	0.0148*	0.106**
$d_{1,4}$	-0.0176	0.00334	0.0172**	0.0953**
$d_{1,5}$	-0.0225**	-0.00287	0.0197***	0.124***
Stage 2 (after July 6, 2018)				
$d_{2,-5}$	-0.000695	0.000876	-0.000593	-0.0197
$d_{2,-4}$	-0.00538*	0.00163	0.00247	0.0229
$d_{2,-3}$	-0.00609*	0.00357	0.00437	0.0163
$d_{2,-2}$	-0.00501	0.00246	0.00793***	0.0154
$d_{2,-1}$	-0.00676**	0.00140	0.00465**	0.0163
$d_{2,0}$	-0.00355	0.00238	0.00536***	0.0137
$d_{2,1}$	-0.00505*	0.00735***	0.00518**	0.00479
$d_{2,2}$	-0.00834***	0.00526*	0.00610**	0.0182
$d_{2,3}$	-0.00556*	0.00202	0.00610**	0.0373**
$d_{2,4}$	-0.00395*	0.00366	0.00456*	0.0333*
$d_{2,5}$	-0.00617*	0.00697**	0.00548**	0.0166

Notes: “CN” denotes Mainland China, “US” denotes the United States, “HK” denotes Hong Kong, “JP” denotes Japan, “SG” denotes Singapore;
“co” – Communication services;
“Cor” denotes the word “Correlation”.
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

There is a significant positive impact of news release on stock market co-movement between Japan and Singapore in Communication Services 3-5 days after the news announcement at Stage 1, while there is a significant positive impact on the day of news releases and the following 5 days at Stage 2. This implies the stock market co-movement between Japan and Singapore in

Table 13. Regression Results under Event Windows of Stage 1 and Stage 2: Stock market co-movements between Mainland China and Hong Kong at the sector level

	CNHK		
Coefficients	Cor co	Cor en	Cor id
Intercept	0.28685***	0.61872***	0.60458***
Stage 1 (before July 6, 2018)			
$d_{1,-5}$	-0.000431	0.0118	-0.00743
$d_{1,-4}$	-0.00238	0.0126	0.0335
$d_{1,-3}$	-0.00453	0.0115	0.0243
$d_{1,-2}$	0.00037	0.00245	0.0428
$d_{1,-1}$	-0.0165	0.00699	0.0305
$d_{1,0}$	-0.00219	0.03	0.026
$d_{1,1}$	0.00567	0.0206	0.0396
$d_{1,2}$	0.00592	0.0163	0.042
$d_{1,3}$	0.00336	0.0303	0.0448
$d_{1,4}$	-0.0131	0.00355	0.0254
$d_{1,5}$	0.0023	0.011	0.039
Stage 2 (after July 6, 2018)			
$d_{2,-5}$	0.0174***	0.0235*	0.00923
$d_{2,-4}$	0.0192***	0.0231*	0.000728
$d_{2,-3}$	0.0230***	0.02	0.0138
$d_{2,-2}$	0.0125*	-0.0000843	0.0305**
$d_{2,-1}$	0.0210***	0.0233*	0.0198*
$d_{2,0}$	0.0216***	0.0249**	0.0227**
$d_{2,1}$	0.0193***	0.0349***	0.0139
$d_{2,2}$	0.0129*	0.0294**	0.013
$d_{2,3}$	0.0212***	0.0445***	0.0144
$d_{2,4}$	0.0216***	0.0118	0.00958
$d_{2,5}$	0.0191***	0.00812	0.0181

Notes: "CN" denotes Mainland China, "HK" denotes Hong Kong;
"en" – Energy, "id" – Industrials, "co" – Communication services;
"Cor" denotes the word "Correlation".
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

Communication Services is more sensitive to the news release after 6 July 2018.

There is a significant positive impact of news releases on stock market co-movement between Hong Kong and Singapore in Communication Services, but the magnitude of impact at Stage 2 is smaller than at Stage 1.

Table 14. Regression Results under Event Windows of Stage 1 and Stage 2: Stock market co-movements between Hong Kong and Japan at the sector level

	HKJP		
Coefficients	Cor co	Cor en	Cor id
Intercept	0.24379***	0.25079***	0.39811***
Stage 1 (before July 6, 2018)			
$d_{1,-5}$	0.00776	0.00405	-0.0304
$d_{1,-4}$	0.00823	-0.0213	0.0538
$d_{1,-3}$	0.0072	-0.0197	0.0549
$d_{1,-2}$	0.0104	-0.0266	0.0850**
$d_{1,-1}$	0.0049	-0.0242	0.0576
$d_{1,0}$	0.0105	-0.0207	0.0248
$d_{1,1}$	0.0105	-0.00319	-0.00345
$d_{1,2}$	0.0106	-0.00293	-0.00122
$d_{1,3}$	0.0113	-0.0188	0.0348
$d_{1,4}$	0.0105	-0.0231	0.0481
$d_{1,5}$	0.0161*	-0.03	0.0736*
Stage 2 (after July 6, 2018)			
$d_{2,-5}$	0.00459***	-0.0172**	0.00963
$d_{2,-4}$	0.0104***	-0.00737	0.0114
$d_{2,-3}$	0.00872***	-0.00264	0.0148
$d_{2,-2}$	0.00750***	-0.0151	0.0123
$d_{2,-1}$	0.00806***	-0.0118	0.0122
$d_{2,0}$	0.00927***	-0.0153**	0.0214*
$d_{2,1}$	0.00732***	-0.0223***	0.0284**
$d_{2,2}$	0.00762***	-0.0167**	0.0345**
$d_{2,3}$	0.0121***	-0.0097	0.0279*
$d_{2,4}$	0.00890***	0.000382	0.0286*
$d_{2,5}$	0.00695**	-0.0155*	0.00575

Notes: "HK" denotes Hong Kong, "JP" denotes Japan;
"en" – Energy, "id" – Industrials, "co" – Communication services;
"Cor" denotes the word "Correlation".
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

In conclusion, the respective stock market co-movements between Singapore and Mainland China, the US, Japan and Hong Kong in Communication Services are more sensitive to news announcements of the US-China trade war after 6 July 2018.

Table 15. Regression Results under Event Windows of Stage 1 and Stage 2: Stock market co-movements between Hong Kong and the US at the sector level

	HKUS		
Coefficients	Cor co	Cor en	Cor id
Intercept	0.04555***	0.19976***	0.14985***
Stage 1 (before July 6, 2018)			
$d_{1,-5}$	-0.022	-0.0322	0.000799
$d_{1,-4}$	-0.0105	-0.0159	0.00487
$d_{1,-3}$	-0.011	-0.0167	0.00451
$d_{1,-2}$	0.0225	-0.00707	0.00399
$d_{1,-1}$	0.017	-0.022	0.00498
$d_{1,0}$	-0.0068	-0.0219	0.00387
$d_{1,1}$	0.0169	-0.0152	0.00357
$d_{1,2}$	-0.00181	-0.019	0.00184
$d_{1,3}$	-0.0172	-0.0185	0.00252
$d_{1,4}$	0.0098	-0.0183	-0.00087
$d_{1,5}$	0.000886	-0.0206	0.000261
Stage 2 (after July 6, 2018)			
$d_{2,-5}$	-0.00484	0.0312***	-0.000623
$d_{2,-4}$	0.0116**	0.0353***	0.00214**
$d_{2,-3}$	-0.00606	0.0345***	0.00159
$d_{2,-2}$	-0.00423	0.0381***	0.00310***
$d_{2,-1}$	-0.00539	0.0373***	0.00163*
$d_{2,0}$	-0.00378	0.0308***	0.00158**
$d_{2,1}$	-0.00298	0.0370***	0.0000497
$d_{2,2}$	0.00493	0.0472***	0.000441
$d_{2,3}$	-0.00364	0.0562***	0.00234**
$d_{2,4}$	-0.00229	0.0571***	0.00257**
$d_{2,5}$	0.00205	0.0371***	0.00224**

Notes: "US" denotes the United States, "HK" denotes Hong Kong;
"en" – Energy, "id" – Industrials, "co" – Communication services, "he" – Healthcare;
"Cor" denotes the word "Correlation".
Asterisks denote rejection of the null hypothesis at *10%, **5%, and ***1% significance levels.

Table 13 indicates that the stock market co-movement between Mainland China and Hong Kong in Communication Services at Stage 2 is stronger than at Stage 1, which is reflected in the fact that the coefficient changes from insignificant to significant, and the absolute value increases. At Stage 2, both Communication Services and Industrials have significant changes on the day of news release, and Energy industry has significant changes on the third day after the news release. This means the stock market co-movement between Mainland China and Hong Kong in these three sectors strengthened after 6 July 2018, with Communication Services more sensitive to the news release of the US-China trade war.

In Table 14, the magnitude of stock market co-movement between Hong Kong and Japan in Communication Services at Stage 2 is lower than at Stage 1. At Stage 2, the news release has a significant positive impact on the co-movement of the Communication Services, Energy and Industrials sectors, reaching the peak on the third, fourth and second days respectively. This implies that news releases enhanced the stock market co-movements between Japan and Hong Kong in these three sectors.

Table 15 shows that there is no significant impact of news releases on stock market co-movement between the US and Hong Kong in Communication Services. There is an insignificant impact in Energy at Stage 1 compared with a significant positive impact at Stage 2, and the coefficient reaches its peak on the fourth day at Stage 2. There is an insignificant impact of news releases on stock market co-movement between the US and Hong Kong in Industrials at Stage 1. However, there is a significant positive impact in Industrials on the day of news releases at Stage 2, and the coefficient reaches its peak on the fourth day after the news announcement. This means that stock market co-movements between Hong Kong and the US in Energy and Industrials are more sensitive to news announcements after the outbreak of the US-China trade war.

5.3 Structural break and spillover patterns of co-movement

In terms of breakpoints, we can see that after the US imposed tariffs on Chinese goods for the first time on 6 July 2018 (i.e. the official start of the US-China trade war), the date of August 2018 was found between Mainland China and the US, the US and Japan. This means that the notable deterioration of US-China relations in July 2018 led to a series of structural changes in the relationship between Mainland China and the US, the US and Japan. The following breakpoints come mainly at the end of 2018 and the beginning of 2019. Given the news released during the period from December 2018 to March 2019, there were continuous signs of alleviating US-China tensions, including a temporary truce agreed by both sides, reduction of US-specific tariffs and an extension of China-specific tariffs deadline.

These positive signals might activate stock markets in the Asia-Pacific region. However, after April 2019 positive interaction changed, and the main

breakpoint occurred in May 2019. In the following months, although there was news of confrontation and negotiation between the US and China, the situation deteriorated after July 2019. US President Trump threatened to impose tariffs on Chinese goods worth more than $300 billion in mid-July and early August 2019. At the end of 2019 and the beginning of 2020, trade tensions between China and the US eased. On 13 December 2019, President Trump said that China and the US had agreed the Phase One Deal, which may cause the co-movements between Mainland China and the US, and Singapore, to have the test dates of 16 December 2019 and 18 December 2019 respectively.

At the same time, the co-movements between Japan and Mainland China as well as the US have the test date of 6 December 2019. Subsequently, on 14 July 2020, US President Trump announced the signing of the "Hong Kong Autonomy Act" to impose sanctions on Chinese entities and individuals who help restrict Hong Kong's autonomy. This might lead to the deterioration of US-China relations and cause the co-movement between the US and Hong Kong to have the test date of 22 July 2020.

After US President Biden's inauguration on 20 January 2021, a series of measures including strengthening the US-Japan alliance, promoting the transfer of supply chains, and dealing with China's "unfair trade practices", caused the appearance of test dates in the first quarter of 2021. The fact that the US issued a notice on the continuation of the national emergency with respect to the threat from securities investments that finance certain companies of China on 9 November 2021 might have continued the trade tension between China and the US, which led to the detection date of November 2021. The last breakpoints between Mainland China, the US and Japan occurred on 28 June 2022, which may be related to the announcement issued by the 48th Group of Seven (G7) Summit, which condemned China on the topic of "human rights". At the same time, the US issued an entity list to strengthen cooperation with the G7 on 21st century challenges including those posed by China.

Regarding the regression results shown in Table 16, the volatility spillover between the Mainland China and US stock markets occurs from the second breakpoint on 28 August 2018. By comparison, spillovers between the Hong Kong and US stock markets are more significant, as the estimate of variable in the "USHK" column is positive and significant. We notice that spillovers across stock markets in Mainland China and the US are more in line with turning points of US-China relations, compared with Hong Kong and the US. This finding is consistent with the spillover effect that Nong (2021) finds in connectedness of economic policy uncertainty between Mainland China and the US under the effects of the US-China trade war.

The factors driving the spillover effects between Mainland China and Hong Kong, as well as Hong Kong and the US, may be more complex, given other disturbances seen in Hong Kong at the time. Comparing all the spillover effects, we find that the spillover effect between the Mainland China and Hong Kong stock markets is the most obvious. There are few structural breaks in the co-

Table 16. Structural Breakpoints in DCCs and Structural Change at Different Stages

	CNUS	USHK	CNSG	USSG	CNJP	USJP	CNHK	HKJP	HKSG
breaks	5	8	7	6	6	7	6	2	6
	date	date	date	date	date	date	date	date	date
1st	8/14/2017	8/14/2017	2/07/2018	9/06/2017	2/07/2018	1/11/2018	11/22/2017	10/30/2017	2/07/2018
2nd	8/28/2018	3/16/2018	9/26/2018	10/11/2018	12/28/2018	8/14/2018	6/28/2018	3/31/2021	10/12/2018
3rd	12/16/2019	11/29/2018	5/16/2019	5/24/2019	12/06/2019	4/17/2019	9/06/2019		5/28/2019
4th	4/20/2021	8/05/2019	12/18/2019	3/10/2020	7/30/2020	12/06/2019	8/05/2020		3/10/2020
5th	6/28/2022	7/22/2020	8/13/2020	1/28/2021	8/24/2021	7/30/2020	3/09/2021		1/20/2021
6th		2/26/2021	3/16/2021	11/29/2021	4/13/2022	11/12/2021	3/08/2022		12/21/2021
7th		11/12/2021	1/26/2022			6/28/2022			
8th		6/28/2022							
Regression Equation: $\rho_{ij,t} = c + \varphi_0\rho_{ij,t-1} + \sum_{n=1}^{q}\varphi_n d_n + \upsilon_{ij,t}$									
φ_0	0.960***	0.964***	0.953***	0.957***	0.932***	0.944***	0.940***	0.542***	0.951***
φ_1	*0.000347*	*0.000945**	*0.00630****	*-0.0000806*	***0.00887****	*-0.000503*	***0.00951****	**0.0127****	*0.00478****
φ_2	**0.00208*****	*0.000739**	**0.00942*****	0.000385*	0.00489***	0.000466	0.00924***	0.00326	**0.00790*****
φ_3	0.00122***	0.00156***	0.00581***	0.000282*	0.00849***	-0.000296	0.00614***		0.00536***
φ_4	0.000484	**0.00195*****	0.00883***	**0.000506*****	0.000479	**0.000868***	0.00123		0.00672***
φ_5	-0.00184***	0.000925*	0.000604	-0.000394**	0.00639***	-0.000604*	0.00484**		-0.00474***
φ_6		-0.000493	-0.00129	-0.0000154	0.00147	0.000736*	0.00827***		-0.000205
φ_7		0.000642	0.00323**			-0.00109**			
φ_8		-0.00178***							

Notes: "CN" denotes Mainland China, "US" denotes the United States, "HK" denotes Hong Kong, "JP" denotes Japan, "SG" denotes Singapore; Significance levels: *10%, **5%, and ***1%.
The detected breakpoints in the period from July 6th, 2018 to the outbreak of epidemic are underlined. The highest estimates of dummy variables in each column are shown in bold.

movement between Hong Kong and Japan. US President Biden's inauguration and a series of measures to strengthen Japan-US alliances, might have led to changes in the stock market between Hong Kong and Japan in March 2021, where the spillover effect is significantly reduced. Although the structural breakpoint dates of Hong Kong and Singapore are more consistent with those of Mainland China and Singapore, the breakpoint dates of Mainland China and Singapore are generally earlier than those of Hong Kong and Singapore. It is reasonable to believe that the stock market linkage between Mainland China and Singapore is more sensitive than that between Hong Kong and Singapore.

The regression results in Table 16 show that the period from 3 January 2017 to 3 February 2023 can be divided into three stages. The first stage comes before the start of the US-China trade war (before 6 July 2018); the second stage is after the start of the US-China trade war and before the emergence of the COVID-19 pandemic (at the end of 2019 and the beginning of 2020); and the third stage is the stage of both trade war and pandemic.

Comparing the spillover effects of the three stages, it is found that the spillover effects between the markets after the start of the trade war are greater than those before the start of the trade war, that is, the spillover effects between the major stock markets in the Asia-Pacific region are strengthened because of the start of the US-China trade war. However, the spillover effect of Stage 3 has decreased significantly, which means co-movement between the markets has decreased. Therefore, it is reasonable to believe that the occurrence of COVID-19 reduced the economic vitality and also the co-movement between major stock markets in the Asia-Pacific region.

6. Conclusions And Implications

This paper focuses on the impact of news announcement of the US-China trade war on the co-movement among major stock markets in the Asia-Pacific region. It uses the DCC-GARCH (1,1) model to evaluate the time-varying co-movement of the stock markets in Mainland China, Hong Kong, the US, Japan and Singapore at both the overall market level and sector level, over the period from 3 January 2017 to 3 February 2023. The paper uses 6 July 2018 to separate the period into two stages, and identifies structural breaks and spillover patterns of cross-market co-movements at different phases.

The empirical results based on event study methodology indicate that stock market co-movements at the overall market level among Asia-Pacific economies are significantly affected by news releases. The stock market co-movements among Asia-Pacific economies after 6 July 2018 are more sensitive to news of the US-China trade war, which is particularly the case with Communication Services and Industrials. The magnitudes of stock market co-movement between the US and Mainland China in Communication Services, Energy, Industrials and Healthcare tend to fall because of decoupling. The structural breakpoint analysis shows that most breakpoints among Asia-Pacific stock markets come

after 6 July 2018, and the spillover changes with the escalation or mitigation of US-China trade tensions.

Based on these findings, stock market investors in Mainland China, the US, Hong Kong, Japan and Singapore should care more about the risk brought by the co-movement among these markets at the overall market level and sector level, and make careful decisions on portfolio investments. As China and the US are the two most powerful economies in the world, their cooperation will benefit economic integration in the Asia-Pacific region and the world economy. A solution to the US-China trade war is required and appreciated.

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Appendix: Dates of News

Date of Day 0	News
2017-8-18	USTR announces initiation of Section 301 Investigation of China
2018-3-22	Trump signs a memorandum directing to file a WTO case against China for its discriminatory licensing practices, to restrict investment in key technology sectors, and to impose tariffs on Chinese products
2018-4-3	Under Section 301 Action, USTR releases proposed tariff list on Chinese products
2018-4-16	The US Bureau of Industry and Security (BIS) bans Chinese telecom company ZTE
2018-5-29	The US reinstates tariff plans including products related to “Made in China 2025” plan
2018-6-18	Trump directs USTR to identify US$200 billion worth of Chinese goods for additional 10 per cent tariffs, and threatens to impose tariffs on another products worth US$200 billion
2018-7-6	The US implements first China-specific tariffs: 25 per cent tariffs on products worth US$34 billion
2018-7-10	The US threatens to impose tariffs on US$200 billion of Chinese imports
2018-8-3	China announces tariffs of 5 per cent, 10 per cent, 20 per cent and 25 per cent on US products (worth US$60 billion)
2018-8-8	USTR finalises second tranche of tariffs on Chinese products, and China announces a reciprocal 25 per cent additional tariff
2018-8-23	The US and China implement second round of tariffs. China files second WTO complaint against the US Section 301 tariffs
2018-9-18	China announces retaliation for US tariffs on Chinese goods
2018-12-14	China temporarily lowers tariffs on US autos and continues buying US soybeans. The USTR claims to postpone the date of tariffs on products worth US$200 billion from 1 January 2019 to 2 March 2019
2019-3-31	China extends the suspension of additional tariffs on US autos and auto parts

2019-5-10	The US increases tariffs on Chinese goods (worth US$200 billion) from 10 per cent to 25 per cent as the US and China failed to reach a deal following the end of the first day of the 11th round of high-level trade talks
2019-5-13	China announces an increase in tariffs on US$60 billion worth of US goods from 1 June 2019. China launches tariff exemption system
2019-5-16	The US BIS adds Huawei and its affiliates on its Entity List
2019-7-9	The US exempts 110 Chinese products from 25 per cent tariffs, and issues licenses to American Huawei suppliers
2019-7-16	Trump threatens tariffs on US$325 billion Chinese goods
2019-8-6	The US declares China is a currency manipulator. Chinese companies suspend new US agricultural product purchases
2019-8-13	The US delays tariffs on certain products and removes items from the list. The US BIS amends the Export Administration Regulations (EAR).
2019-8-23	China announces US$75 billion in tariffs on US goods. Trump threatens tariff increases on Chinese goods
2019-10-11	The 13th negotiation between US and China made progresses
2019-12-13	US and China agree *the Phase One Deal*
2020-1-13	The US officially drops China's currency manipulator label
2020-1-15	The US and China sign *the Phase One Deal* in Washington DC
2020-2-4	Trump delivers his third *State of the Union* address and states that the current US-China relations are at their best
2020-2-10	The USTR announces a notice of product exclusions and revisions under the list of additional tariffs on US$34 billion of products. The USTR issues an announcement to amend a key exemption principle in the trade remedy law and plans to cancel special treatment for 25 economies including China. The US Department of Justice accuses Huawei, some of its subsidiaries, and its CFO of violating the US Unfair Business and Corrupt Organizations Act and using illegal means to misappropriate the intellectual property rights of others.
2020-2-25	US Agriculture Secretary Perdue and US Trade Representative Lighthizer announce that China has begun to take multiple actions to implement the agricultural part of *the Phase One Deal*
2020-3-3	US Treasury Secretary Mnuchin and Federal Reserve Chairman Powell host a conference call with G7 finance ministers and central bank governors, pledging to use all appropriate policy tools to achieve strong, sustainable growth and guard against downside risks. The Federal Reserve announced an emergency interest rate cut of 50 basis points to a range of 1 per cent to 1.25 per cent.
2020-3-6	The USTR releases annual reports on the WTO compliance of China
2020-3-9	The US S&P 500 index plummeted 7 per cent shortly after opening, triggering the first-level circuit breaker mechanism and suspending trading for 15 minutes
2020-3-12	The US S&P 500 index plummeted 7 per cent shortly after opening, triggering the first-level circuit breaker mechanism and suspending trading for 15 minutes
2020-3-16	The US S&P 500 Index plummeted 7% that day, triggering the first-level circuit breaker mechanism and suspending trading for 15 minutes
2020-3-18	The US S&P 500 Index plummeted 7 per cent that day, triggering the first-level circuit breaker mechanism and suspending trading for 15 minutes
2020-3-20	The USTR announces a new batch of exclusion announcements for products under the US$200 billion list of goods subject to additional tariffs

2020-3-27	Trump officially signs a US$2.2 trillion economic stimulus bill in response to the new coronavirus epidemic
2020-3-31	The USTR releases *the 2020 National Trade Estimate Report on Foreign Trade Barriers*
2020-4-24	FCC requires four Chinese telecommunications service providers to self-certify why FCC should not revoke their operating licenses in the US
2020-5-18	The US Department of Commerce announces that it will strengthen restrictions on Huawei's use of US semiconductor technology
2020-5-20	Trump administration submits *United States Strategic Approach to The People's Republic of China* to Congress
2020-5-25	The US Department of Commerce's BIS issues a notice to include nine Chinese entities related to human rights violations in the Xinjiang Uyghur Autonomous Region on the Entity List
2020-5-29	Trump delivers a speech on China at the White House press conference. Key points are to eliminate the special status granted to Hong Kong
2020-6-3	The US Department of Transportation announces that it will suspend all Chinese airlines starting from 16 June given the Chinese government's failure to permit U.S. carriers to implement scheduled passenger air services to and from China and to exercise the full extent of bilateral rights
2020-6-24	The San Francisco Court of the US issues an arrest warrant and puts three suspects on the wanted list for stealing DRAM technology trade secrets from Micron, a major American storage manufacturer
2020-6-29	The US State Department issues a statement saying that as China advanced national security legislation in Hong Kong, the US will end the export of US-made defence equipment to China on that day and will impose restrictions on defence and dual-use technologies exported to Hong Kong. The same restrictions apply in mainland China
2020-7-14	Trump announces at a press conference in the Rose Garden of the White House that he has signed *the Hong Kong Autonomy Act* and will impose sanctions on Chinese entities and individuals that help restrict Hong Kong's autonomy. At the same time, Trump issues an executive order announcing the end of special treatment for Hong Kong
2020-7-17	Attorney General Barr remarks on China policy at the Gerald R. Ford Presidential Museum
2020-7-20	The USTR announces a new batch of exclusion announcements for products under List A of US$300 billion in additional tariffs, adding 64 new excluded products and revising the descriptions of five historical excluded products
2020-7-21	The US suddenly asks China to close its Consulate General in Houston within 72 hours
2020-7-24	China decides to revoke the establishment and operation license of the US Consulate General in Chengdu and requires it to close within three days
2020-8-11	The US Customs and Border Protection (CBP) issues a notice requiring that goods produced in Hong Kong and exported to the US must be marked to indicate that their origin is "China" after 25 September 2020
2020-9-15	The US chip controls on Huawei issued on 15 May officially comes into effect. The US CBP issues a statement banning the import of cotton, clothing, real hair products, computer parts, and other goods from six Chinese companies or institutions.
2020-10-23	The USTR and USDA release a report on the implementation of the agricultural part of *the Phase One Deal*
2020-11-20	The US State Department's Office of Policy Planning releases *Elements of the China Challenge*, listing ten tasks that the US needs to accomplish to respond to China's rise
2020-12-10	The FCC requires state broadband and wireless companies to remove network equipment of Huawei and ZTE. FCC also initiates the process of revoking China Telecom's authorisation to operate in the US

2020-12-28	The US Department of the Treasury's Office of Foreign Assets Control (OFAC) publishes the Frequently Asked Questions related to Executive Order (E.O.) 13959, "Addressing the Threat from Securities Investments that Finance Communist Chinese Military Companies"
2021-1-11	The New York Stock Exchange delists three Chinese operators, China Mobile, China Unicom and China Telecom, and officially stops their stock trading
2021-3-17	The FCC states that it will revoke the licenses of China Union Americas, Pacific Networks, and their wholly-owned subsidiary ComNet, to provide telecommunications services in the US
2021-3-31	The US State Department issues *the Hong Kong Policy Act Report*
2021-4-21	The US Senate Foreign Relations Committee approves the *Strategic Competition Act of 2021*
2021-5-12	The Semiconductors in American Coalition (SIAC), composed of 64 chip manufacturers and upstream and downstream manufacturers around the world, announces its establishment
2021-6-3	Biden issues a new executive order barring American investment into Chinese firms with purported ties to defence or surveillance technology sectors
2021-6-8	The US Senate passes *the United States Innovation and Competition Act of 2021* to compete with China
2021-7-9	BIS adds 23 Chinese entities to its Entity List
2021-7-23	China announces its decision to impose sanctions on seven American citizens and entities using its new anti-foreign sanction law
2021-8-25	The US grants licenses authorising suppliers to sell chips to Huawei for its growing auto component business
2021-9-2	The WTO rejects all four accusations made by China against US solar panel policies
2021-9-24	The leaders of Australia, India, Japan, and the US convene in person as "the Quad" to recommit to the region that is a bedrock of their shared security and prosperity – a free and open Indo-Pacific
2021-10-26	The FCC revokes China Telecom America's services authority
2021-11-9	The White House issues a notice on the continuation of the national emergency with respect to the threat from securities investments that finance certain companies of China
2021-12-2	The US Securities and Exchange Commission (SEC) has adopted amendments to finalide the rule implementing the submission and disclosure requirements in *the Holding Foreign Companies Accountable Act* (HFCAA)
2021-12-16	BIS adds 34 Chinese entities on the Entity List
2022-1-1	The Regional Comprehensive Economic Partnership Agreement (RCEP) officially comes into effect
2022-1-21	The US Department of Transportation further modifies the decision on the suspension of 44 US flights to China
2022-1-27	FCC revokes the 214 license of China Unicom Americas
2022-2-18	*Indo-Pacific Strategy of the United States* was released
2022-3-18	FCC revokes the telecommunications license of Chinese communications company Pacific Networks and its wholly-owned subsidiary ComNet
2022-3-28	The US Senate passes *the American Competes Act of 2022*
2022-4-5	The US approves arm sales to Chinese Taipei

2022-4-27	The USTR releases *the 2022 Special 301 Report* on the protection and enforcement of intellectual property rights
2022-5-12	The 28th Japan-EU regular summit developed a blueprint for cooperation in a wide range of areas including trade, technology and supply chains to reduce dependence on China
2022-5-16	BIS plans to increase penalties for export control violations
2022-5-23	*The Indo-Pacific Prosperous Economic Framework* (IPEF) is launched
2022-6-1	*US-Taiwan Initiative on 21st-century Trade* is launched
2022-6-14	The Minerals Security Partnership (MSP) is established to catalyse public and private investment in responsible critical minerals supply chains globally
2022-6-21	The *Uyghur Forced Labor Prevention Act (UFLPA)* takes effect
2022-6-24	Australia, Japan, New Zealand, the UK, and the US establish the Partners in the Blue Pacific (PBP)
2022-6-28	The 48th G7 Summit issued a communiqué, criticizing China. The US releases a fact sheet to strengthen cooperation with the G7 on 21st century challenges including those posed by China
2022-6-30	The US Navy launches the 28th edition of the biennial Rim of the Pacific (RIMPAC), the world's largest international maritime exercise
2022-7-15	The US approves arm sales to Chinese Taipei
2022-7-27	The US Senate and House of Representatives passed *the CHIPS and Science Act of 2022*
2022-8-2	Speaker Pelosi arrived in Taiwan prompting military drills
2022-8-9	The Chinese People's Liberation Army announces that it will continue to organise practical joint exercises around the Taiwan Island
2022-8-10	Biden signed *the CHIPS and Science Act of 2022*
2022-8-24	BIS adds another seven China entities to its export control list
2022-8-26	The US' Public Company Accounting Oversight Board (PCAOB) reached an agreement with the China Securities Regulatory Commission (CSRC) and Ministry of Finance (MOF)
2022-8-31	The US chip manufacturers NVIDIA and AMD received notices requiring them to stop exporting two cutting-edge artificial intelligence chips to China
2022-9-2	The USTR received requests for continuation of China 301 tariffs
2022-9-3	The US approves arm sales to Chinese Taipei
2022-9-12	Biden signed *Executive Order on Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy*
2022-9-20	The FCC adds two Chinese telecom companies and their wholly-owned subsidiary to a list of threats to US national security
2022-9-29	The US Department of Treasury imposes sanctions on two Chinese companies for participating in the Iranian oil trade
2022-10-7	The US Department of Commerce implements new export controls on advanced computing and semiconductors to China
2022-10-12	The US released *National Security Strategy*
2022-10-20	The US released *the CFIUS Enforcement and Penalty Guidelines*
2022-10-27	The US Department of Defence released reports, pointing out that the Pentagon would implement a national defence strategy focusing on China

2022-11-8	The White House issues a notice on the continuation of the national emergency with respect to the threat from securities investments that finance certain companies of China
2022-11-23	The USTR extends exclusions of COVID-related products from China Section 301 tariffs
2022-11-25	The FCC announces that five Chinese companies will be banned from selling equipment in the US
2022-11-29	The Indo-US joint training exercise "YUDH ABHYAS 2022" to be conducted in Uttarakhand
2022-12-6	The US approves arm sales to Chinese Taipei
2022-12-7	The hTSMC holds a moving ceremony at its new factory in Arizona
2022-12-15	BIS adds 36 Chinese entities to its Entity List. PCAOB gains access to audit documents of US-listed Chinese companies.
2022-12-23	Biden signed into law H.R. 7776, the "James M. Inhofe National Defense Authorization Act for Fiscal Year 2023"
2022-12-29	The US approves arm sales to Chinese Taipei
2023-1-11	The House of Representatives established the Select Committee on the Strategic Competition Between the US and China

Source: https://www.china-briefing.com/news/the-us-china-trade-war-a-timeline/
https://www.china-briefing.com/news/us-china-relations-in-the-biden-era-a-timeline/
http://cifer.pbcsf.tsinghua.edu.cn/info/1093/2565.htm
https://ustr.gov/about-us/policy-offices/press-office/press-releases/

Endnotes

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3. The earliest Section 301 investigation was based on Section 301 of the U.S. Trade Act 1974, which authorises the US President to take all appropriate action, including retaliation, to obtain the removal of any act, policy, or practice of a foreign government that violates an international trade agreement or is unjustified, unreasonable, or discriminatory, and that burdens or restricts U.S. commerce. The name of Section 301 investigation is kept later although the U.S. Trade Act was updated.

4. US-China trade war: which sectors are most vulnerable in the global value chain? – RaboResearch. Retrieved at https://www.rabobank.com/knowledge/d011318389-us-china-trade-war-which-sectors-are-most-vulnerable-in-the-global-value-chain

References

Aloui R, Aiessa M S B and Nguyen D K (2011) 'Global financial crisis, extreme interdependences, and contagion effects: the role of economic structure?', *Journal of Banking & Finance*. 35(1), 130-141.

Bai J and Perron P (1998) 'Estimating and testing linear models with multiple structural changes', *Econometrica,* 66, 47-78.

Bai J (2000) 'Vector Autoregressive Models with Structural Changes in Regression Coefficients and in Variance-covariance Matrices', *Annals of Economics and Finance,* 1(1), 303-339.

Bai J and Perron P (2003) 'Computation and analysis of multiple structural change models', *Journal of Applied Econometrics,* 18, 1-22.

Bollerslev T (1990) 'Modelling the coherence in short-run nominal exchange rates: a multivariate generalized arch model', *Review of Economics and Statistics,* 72, 498-505.

Cao G, Zhang M and Li Q (2017) 'Volatility-constrained multifractal detrended cross-correlation analysis: cross-correlation among Mainland China, US, and Hong Kong stock markets', *Physica A-statistical Mechanics And Its Applications,* 472, 67-76.

Didier T, Love I and Peria M S M (2012) 'What explains comovement in stock market returns during the 2007–2008 crisis?', *International Journal of Finance & Economics*, 17(2), 182-202.

Diebold F X and Yilmaz K (2012) Better to Give Than to Receive: predictive directional measurement of volatility spillovers, *International Journal of Forecasting*, 28, 57-66.

Gourinchas P-O and Obstfeld M (2012) 'Stories of the twentieth century for the twenty-first', *American Economic Journal*, Macroeconomics, 4, 226-265.

Hasuike T and Mehlawat M K (2018) 'Investor-friendly and robust portfolio selection model integrating forecasts for financial tendency and risk-averse', *Annals of Operations Research,* 269, 205-221.

Huynh T L D and Burggraf T (2019) 'If worst comes to worst: co-movement of global stock markets in the US-China trade war', Social Science Electronic Publishing. Available at: https://doi.org/10.2139/ssrn.3466245

Hwang E, Min H G, Kim B H and Kim H (2013) 'Determinants of stock market comovements among US and emerging economies during the US financial crisis', *Economic Modelling,* 35, 338-348.

Li Y and Giles D E (2015) 'Modelling volatility spillover effects between developed stock markets and Asian emerging stock markets', *International Journal of Finance and Economics*, 20, 155-177.

Mensah J O and Alagidede P (2017) 'How are Africa's emerging stock markets related to advanced markets? Evidence from copulas', *Economic Modelling,* 60, 1-10.

Mohammadi H and Tan Y (2015) 'Return and volatility spillovers across equity markets in Mainland China, Hong Kong and the United States', *Econometrics,* 3, 215-232.

Nong H (2021) Have Cross-Category Spillovers of Economic Policy Uncertainty Changed During the US-China Trade War? *Journal of Asian Economics*, 74, 101312.

Poon S H and Granger C (2003) 'Forecasting volatility in financial markets: A review', *Journal of Economic Literature,* 41, 478-539.

Qarni M O and Gulzar S (2018) Return and Volatility Spillover across stock markets of China and its Major Trading Partners: Evidence from Shanghai Stock Exchange Crash, *Business and Economic Review*, 10, 1-20.

Rua A and Nunes L C (2009) 'International comovement of stock market returns: a wavelet analysis', *Journal of Empirical Finance,* 16(4), 632-639.

Shi Y, Wang L and Ke J (2021) 'Does the US-China trade war affect co-movements between US and Chinese stock markets?', *Research in International Business and Finance,* 58, 101477.

Sugimoto K, Matsuki T and Yoshida Y (2014) 'The global financial crisis: an analysis of the spillover effects on African stock markets', *Emerging Markets Review,* 21(6), 201-233.

Thomas N M, Kashiramka S and Yadav S S (2018) 'The nature and determinants of comovement between developed, emerging and frontier equity markets: Europe versus Asia-Pacific', *Thunderbird International Business Review,* 61(2), 291-307.

Umer U M, Coskun M and Kiraci K (2018) 'Time-varying return and volatility spillover among EAGLEs stock markets: a multivariate GARCH analysis', *Journal of Finance and Economics Research,* 3(1), 23-42.

Wang X, Wang X, Zhong Z and Yao J (2020) 'The impact of US–China trade war on Chinese firms: evidence from stock market reactions', *Applied Economic Letters,* 28(7), 579-583.