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HOW CHINA_USA POLITICAL TENSIONS AFFECT STOCK MARKET RETURN OF CHINA AND THE USA? A QUANTILE VAR CONNECTEDNESS APPROACH

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Abstract:

Political risk plays the predominant role, which not only affects the behavior of the stock price, but also provides important investing signals. Where disentangling the connectedness between the political uncertainty and the reaction of the stock market exhibits valuable implications is a tentative issue for the investors and academics, especially in nowadays Asian region. The market capitalizations of stock markets the in China and USA occupy the worldwide first and second place, respectively. Thus, this study intends to explore the connection between stock market and political relationship between the USA and China. To examine the interaction between political risk, proxied by the political risk index (China_USA PRI), and the Shanghai Stock Exchange Composite Index and Dow Jones Industrial Index from December 1990 to July 2022, we calculate a novel measure, spillover effect index that proposed by Diebold and Yilmaz (2009, 2014), based on quantile vector autoregression (QVAR) scheme. Three quantiles, 075, 0.50, and 0.25 are applied and viewed as the friendly (bullish), normal (normal), and tension (bearish), respectively. Some empirical findings are proposed in the following. First, our main findings are that the extent of entire linkages under 0.25 (bearish), 0.50 (normal), and 0.75 (bullish) quantiles, are 7.8%, 0.9%, and 1.1%, respectively, showing that the asymmetric connectedness is found for different market conditions. Second, the evidence of net directional connectedness is 3.4% for China, -0.5% for USA, and -2.9% for China_USA PRI under the 0.25 quantile, those are -0.1% for China, 0.1% for USA, and 0.0% for China_USA PRI under 0.50, and those are -0.3% for China, 0.2% for USA, and 0.1% for China_USA PRI, respectively. Based on these findings, the implications are that the equity market in China is net transmitter and the equity market in USA and China_USA PRI are net receiver when the market conditions and political relationship are bearish and tension. However, when market condition and political relationship improve, the equity market in China turn in the net receiver, the equity market in USA is net transmitter, and the China_USA PRI either is the net receiver or no effect. Third, deeply scrutinizing the subtle time-varying characteristic of the connectedness, the linkages between the China_USA PRI and stock markets in China and USA not only varying by the time, but also further manifest when surrounding the unfavorable market status and the political relationship, especially from the 2010 to 2016. Capturing the net receiver and transmitter roles, played by the stock markets in USA and China and the political relationship, possess dominant investing implication, that is, investors are required to allocate the assets to other unaffected by these two world biggest economics conflicts

such as the real assets investment. On the contrary, investors can focus on the sector that benefit from the market and political relationship exhibits the better states.

Keywords: *Capital Markets; Political Tensions; Quantile VAR; Connectedness*

JEL: C30, F51, G1

I. Introduction

Experiencing a sequence of the unexpected events such as the Iraq war, Hong Kong protest for the independent, Russia invades the Ukraine, the global stock markets reveal the fluctuations pattern. Among these exogenous shocks, the policies and attitude of government play the important role that do affect the financial market performance, resulting in the uncertainty, dubbed political risk, turbulences the market. Thus, the political risk attracts abundance attention from the practitioners and academics, recently. The significantly connection between the political risk and other various asset markets can be found (Filippou et al., 2018; Hillier and Loncan, 2019), and with cost of capital of firm (Pham, 2019; Obenpong, 2022).

The connection between the capital market and the political risk indeed has been confirmed in previous studies. Disentangling the role, played by the political uncertainty, can effectively reduce the drastically loss when the various asset markets sensitive to the political risk, including the stock, currency, oil and so on. Worth to note that accompany with the Chinese economic rapidly growth recent two decades, the political relationship between the USA and China also presents the subtle changing (Du et al., 2017; Cai et al., 2022). Therefore, this study intends to re-examine the connectedness among the equity market in USA, Chinese stock market and political relationship between the USA and China.

Some preceding studies discuss the linkages between political risk and stock market performance. For instance, Perotti and van Oijen (2001) advocate that there has the general tendency of changes in political risk obviously influencing the excess returns of the developing markets. Lehkonen and Heimonen (2015) show that the not only the democracy can affect the equity markets, but also the uncertainty in the political risk impacts the stock return. Dimic et al. (2015) claim that the political risk does affect the stock market whatever in developed, emerging, and frontier markets. Specifically, this research consistently finds out the political risk has the negative association with the stock markets. Positive return can be obtained when the political risk decreasing. Similar findings can be obtained recent papers (Balcilar et al., 2018; Belkhir et al., 2019).

However, the relationship between the stock market and the political risk based on the early data where economics of some markets have rapidly grown and further exhibits different status from previous, such as China. According to the Leippold et al. (2022), in 2020 October, the total market capitalization of Chinese equity market has reached to a historical high of more than USD 10 trillion relative to the bubbling stock market during 2015, inducing it occupies second place in the world following by the USA, since recovery from the COVID-19 crisis. Therefore, we intend to re-examine the links between the political risk and the stock market in the China and USA by using the further long-run datasets, the purpose of this study.

The co-movement phenomenon between the Chinese and USA stock markets has been confirmed in existing study. For instance, Loh (2013) finds that the stock markets in Asia-Pacific region co-moves with those in the Europe and USA, but the structure of the co-integration presents the different states during pre- and post- crisis. Wang and Guo (2020) contend that the stock market of China links to several stock markets in G20, which including the USA, while the connection presents the time-varying effect. In addition, since Trump win the president election in the USA, a series of tariff policy has been exerted to against the trade deficit problem, especially with China, and such policies induce the increasing volatility in both stock markets (Shi et al., 2021; Wang et al., 2021). The political relationship can influence the stock market

performance but also co-move with the stock price, resulting in the different patterns of connection between the stock markets in the China and USA can be observed. State in another way, the economic policies of USA toward to the China is changing by time and vice versa. From this viewpoint, exploring the connectedness between the stock markets in USA and China and the political relationship is further prominent. We conjecture that the behavior of stock price in both countries not only presents the connectedness, but also it exhibits the time-varying phenomenon. Following by the first purpose, therefore, this study attempts to investigate the time-varying linkage among both USA and Chinese stock market and the political relationship, the second purpose of this study.

To tackle noted above issues, we exploit Shanghai Stock Exchange Composite Index and Dow Jones Industrial Index to proxy the Chinese and USA stock markets from the December 1990 to July 2022, respectively. In addition, the political relationship index (China_USA PRI) is used and regarded as the indicator to measure the political relationship between the China and USA. To detect the connection among these indices, a novel spillover effect index, proposed by Diebold and Yilmaz (2009, 2014), is calculated under the quantile vector autoregression (QVAR) scheme. Three quantiles, 075, 0.50, and 0.25 are applied and viewed as the friendly (bullish), normal (normal), and tension (bearish), respectively. Moreover, we also use the network diagram to visualize the connection among these three indices.

Our main findings are summarized as follows. From the static perspective, the results of total spillover index of 0.25, 0.50, and 0.75 quantiles, are 7.8%, 0.9%, and 1.1%, respectively, indicating that the asymmetric connectedness is found for different market condition. The findings of net directional connectedness are 3.4% for China, -0.5% for USA, and -2.9% for China_USA PRI under the 0.25 quantile, those are -0.1% for China, 0.1% for USA, and 0.0% for China_USA PRI under 0.50, and those are -0.3% for China, 0.2% for USA, and 0.1% for China_USA PRI, respectively. The implications of these findings are that the equity market in China is net transmitter and the equity market in USA and China_USA PRI are net receiver when the market condition and political relationship are bearish and tension. However, when market condition and political relationship improve, equity market in China turn in the net receiver, the equity market in USA is net transmitter, and the China_USA PRI either is the net receiver or no effect. Second, from the dynamic viewpoint, the linkages between the China_USA PRI and stock markets in China and USA not only changing by the time, but also further obvious when facing up the unfavorable market condition and the political relationship especially from the 2010 to 2016.

Adding some contributions.

The remaining sections are organized as follows. Section II presents the literature; Section III displays the data and methodology. The empirical results and discussion and policy implications are shown on Sections IV and V, respectively. The conclusion is demonstrated on the final section.

II. Review of Literature

This section summarized the preceding literatures related with our studies issues. First, we list some studies regarding with the impact of political risk on the different market or economic growth. Next, some political risk measures papers are provided. Finally, we also display some papers related with discussing the connection political relationship and stock markets between the China and USA.

First, Bailey and Chung (1995) discuss the impact of two uncertainty factors, the political and exchange rate uncertainties, on the stock market in Mexican. Both risks significantly influence the risk premium of the stock market. Diamonte, Liew, and Stevens (1996) explore the relationship between the political risk and stock returns in the developed and emerging markets and find that the stock returns are significantly influenced by the political risk, especially in the emerging markets. Perotti and van Oijen

(2001) investigate the indirect impact of privatization on local stock markets in emerging countries under the political risk framework. Günay (2016) explores the impact of the internal political risk on the Turkish equity market from the 2001 to 2014. Applying various econometric approach, the BIST100 index experiences several structure breakings, the political risk affects the index presents the various patterns, especially the market is further sensitive to the political events than the past data. For the different markets, recently, applying a measure of political risk relative to the United States, Filippou, Gozluklu, and Taylor (2018) describe unexpected political conditions, noting that political risk is priced in a cross-section of currency momentum and includes informational factors beyond other risks. Global Political Environment Impacts Profitability of Momentum Strategies in Forex Markets. Du et al. (2017) uses the VAR model to examine the connection between the political risk and the bilateral trade in China from 1990 to 2013. Their results show that political shocks affect the exports to China is short term about 2 months. Cai et al. (2022) investigate the effects of the political risk on the oil price between the USA and China and find that the political tension between these two countries induces the instability in the oil market.

Besides, the Balcilar et al (2018) investigate the shocks of political risk on return and volatility dynamics in the BRICS stock markets with the nonparametric causality-in-quantiles tests. Their findings show that connection between geopolitical risks (GPRs) and return and volatility is heterogenous for BRICS capital markets. The GPRs influence the volatility is further apparent than the return that below the median. Hillier and Loncan (2019) examines the effect of political uncertainty on performance of equity market in Brazil, exploiting an exogenous shock to political stability in Brazil and find that firms are affected by this shock, implying that political connectedness and exposure to foreign capital are factors that direct political risk to asset prices, increasing the cost of equity capital in times of political instability. Similar findings can be obtained in (Kehkonen and Heimonen, 2015; Dimic et al., 2015; Belkhir et al., 2019; Pham, 2019; Obenpong, 2022).

Note that the arising extent of political risk is found for the developed market over than for the emerging market in recent decade, obtained by the empirical evidence. Erb, Harvey, and Viskanta (1996) exploit four measures, related with the country risk, to research whether future stock returns can be predicted by these measures. Based on their findings, predictability to the future stock performance can be obtained for these four measures. Meanwhile, Clark (1997) derives theoretical model to evaluate the political uncertainty for the investment from the foreign. Hereafter, Clark and Tunaru (2001) construct another novel approach that gauges the effect of political uncertainty for the investment. Their model simultaneously accounts to that political risks not only are multivariate, but also related among countries. Based on the newspaper coverage frequency, recently, Baker (2016) proposes a new indicator of economic policy uncertainty (EPU), which covers amplify newspaper articles. Capturing the hot news from the newspapers, the indicator of dynamic policy-related economics contributes further real gauge. Employing firm-level data, the findings reveal that policy uncertainty relates to greater equity price risk and for the macro level, innovations in policy uncertainty signal decreases in investment, output, and employment in the United States and, in a panel vector autoregressive setting, for 12 major economies. Afterward, Ashraf and Shen (2019) follow Baker (2016) examine the bank-level data from 17 markets from 1998 to 2012 and show that government economic policy uncertainty has significant positive association with interest rates

on bank gross loans. These studies consistently indicate that the political risk indeed correlated with the performance of the stock markets.

Needless to say, the market capitalization of stock market in the USA indeed occupies the major place in recent decades, however, the Chinese equity market has gradually become the second largest markets since 2015. According to Leippold et al. (2022), in 2020 October, the total market capitalization of Chinese equity market has arrived a unprecedented high since recovery from the COVID-19 crisis (Pan and Mishra, 2018; Chen, Ni, and Tong, 2022). In addition, as noted on the last section, the co-movement phenomena between the Chinese and USA stock markets indeed exist (Loh, 2013; Wang and Guo, 2020). Based on this evidence, the co-movement of the stock markets in both countries unveils the importance of exploring their connection under the different political risk. For example, since Trump win the president election in the USA, a series of tariff policy has been imposed to against the trade deficit problem with China, and such policies induce the increasing volatility in both stock markets. For example, Shi et al. (2021) assert that the co-movement between the stock markets in China and USA not only is affected by the trade war, but also reveal the structure changings results, especially accompanying the news announcement further manifest. In addition, from the politics and business evaluation of the conflict, the trade war also has been argued in preceding studies (Lukin, 2019; Chen et al. 2020; Wang et al. 2021). Mover early political events such as the Tiananmen Square event and Belgarde Bombing event urge the political relationship between both countries goes worse, resulting in the global oil and economic suffering the loss from conflicts (Cai et al., 2022). Therefore, introducing the political uncertainty to explore the reactions in both stock markets occupy the important place. Following note above discussion, this study main purpose is to explore the connection among the political relationship (risk) and stock markets in the USA and China markets by using the popular spillover index, proposed by Diebold and Yilmaz (2009, 2014).

III. Data and Methodology

(1) Data

We use Shanghai stock price index, Down&Jone30 stock price index and political relation index (PRI as a proximate for political tensions) in our study. Due to data availability, the time period spans from December 1990 to July 2022. Both Shanghai and Down&Jone30 stock price indexes are from the Wind database website. The PRI is from the Center for US-China Relations at Tsinghua University, and mainly describes the political relations between China and its twelve major trading partners. Based on the information from the website that we can see this PRI is divided into six sections, ranging from -9 to 9, which classify the political relations as confrontation (-9), rival, disharmonious, common, harmonious, and friendly (9). Interested readers can refer to the following website: http://www.tuiir.tsinghua.edu.cn. Table 1 reports summary of statistics of the variables. We find the mean market return from China is about 0.03829% monthly or 0.145% annually and this is higher than that of the USA (0.02855% monthly or 0.114% annually). Interesting that we find the mean of the PRI is -0.434037 and this means political relation between China and the USA on the average never being better over this sample period of 1990~2022. By looking at Figure 1 and we find this negative relation significant increased since 2017 after China become the second largest economy among the world and only one position behind the USA. Figure 1 also shows the stock market returns for both China and the USA and we found that the exogenous shock induces both

markets reveal the volatile patterns. In particular, the stock market in the USA is further uncertainty than that in China for all period except the results during pre-1996 for Chinese stock market. Besides, the political relationship index overall fluctuates around the zero till 2016. Afterward, drastically drop can be obtained. Based on these initial results, we use further robust econometric method to disentangle the connection among the USA and Chinese stock markets and political relationship.

[Insert Table 1 and Figure 1]

(2) Methodology – Quantile Vector Autoregressive Model (QVAR)

This study assesses how China_USA political tensions affect stock market returns of both China and the USA using Quantile connectedness approach. Let $y_t = (y'_{1t}, y'_{2t}, \ldots, y'_{Nt})'$ represent the variables studied. The general form of quantile vector autoregression (QVAR) is simply shown on Equation (1):

$$y_t = \mu_{(\tau)} + \sum_{j=1}^{p} \Phi_{j(\tau)} y_{t-j} + \upsilon_{t(\tau)} . \qquad (1)$$

Let the $\tau \in (0,1)$ presents the quantile subscript, $\mu_{(\tau)}$ is constants vector and $\upsilon \sim (0, \sum)$ is the error term vector with the property of random sample, while Φ is the coefficient matrix of $n \times n$. Due to exploring the variation among the variables of interest, the Equation (1) is transformed as:

$$y_t = \sum_{j=1}^{p} A_i \upsilon_{t-i(\tau)} \qquad (2)$$

The coefficient matrix A_i follows the following formula: $A_i = \Phi_1 A_{i-1} + \Phi_2 A_{i-2} + \cdots + \Phi_j A_{i-j}$. The A_0 represents the identity matrix of n × n, and $A_i = 0$ when $i < 0$.

Assuming that variable y_t is influenced by an exogenous events, the forecast error variance decomposition (FEVD) approach under the QVAR scheme tackles the dependence of the orthogonal decomposition result on the order of the variable (Tiwari et al., 2022). Therefore, the QFVAR can be displayed as:

$$Q_\tau(y_t | f^*_{t-1}) = \sum_{j=1}^{p} B_{j(\tau)} \upsilon_{t-j(\tau)} \qquad (3)$$

where $f^* = (1, f_{t-1}')'$ and $B_{j(\tau)} = \Phi_{1(\tau)} B_{j-1(\tau)} + \Phi_{2(\tau)} B_{j-2(\tau)} + \ldots$ for $j = 1,2,\ldots$.

The h-step-ahead forecast error variance of y_i explained by y_j is shown as FEVD. It reveals the varying level of variable that is influenced by remaining variables in the system. The dynamic connectedness is unveiled by the variation in the parameters under different quantiles because of the shocks present the heterogenous to the system. From this basis, spillover effect index can be formed by the proportion of FEVD which not only gauges the direction of information spillover among the factors of interest in the network, but also the intensity of the information is obtained. The FEVD is shown on the Equation (4).[1]

[1]. Following the Tiwari et al. (2022), we use the criterion of Schwartz information criterion (SIC) select the lag length is 20. The forecast horizon and the rolling-window period are 10 month and 40, respectively.

$$\text{FEVD} = \frac{\omega_{\text{ii}}^{-1} \sum_{\text{l}=0}^{\text{h}} (\acute{\text{e}}_{\text{j}} \text{B}_{\text{l}(\tau)} \Omega \text{e}_{\text{i}})^2}{\sum_{\text{l}=0}^{\text{h}} \acute{\text{e}}_{\text{j}} \text{B}_{\text{l}(\tau)} \Omega \acute{\text{B}}_{\text{l}(\tau)} \text{e}_{\text{j}}} \qquad (4)$$

where e_j chooses the predicted variable, e_i is a selection vector with its component set to 1 and 0 otherwise, for $\text{i}, \text{j} = 1, \ldots, \text{m}$. B is a shock matrix that equivalent the coefficient matrix multiplied by a nonorthogonal QVAR model. ω_{ii} is the standard deviation of υ_i, and $\sum$ represents a covariance matrix of disturbance vector υ_t. H represents the predictive period, I is the lag order of the perturbing vector in Equation (3). The variance decomposition matrix $\mathbb{A}$, which is $m \times m$ matrix composed by FEVD in Equation (4), can be used to characterize the risk of the spillover effect between different variables, using a fluctuation spillover method as a framework of risk infection analysis (Diebold and Yilmaz, 2009; 2014), as follows:

$$\mathbb{A}_{(\tau)}^{(h)} = \begin{bmatrix} \theta_{1\leftarrow 1,(\tau)}^{(h)} & \theta_{1\leftarrow 2,(\tau)}^{(h)} & \cdots & \theta_{1\leftarrow m,(\tau)}^{(h)} \\ \theta_{2\leftarrow 1,(\tau)}^{(h)} & \theta_{2\leftarrow 2,(\tau)}^{(h)} & \cdots & \theta_{2\leftarrow m,(\tau)}^{(h)} \\ \vdots & \vdots & & \vdots \\ \theta_{m\leftarrow 1,(\tau)}^{(h)} & \theta_{m\leftarrow 2,(\tau)}^{(h)} & \cdots & \theta_{m\leftarrow m,(\tau)}^{(h)} \end{bmatrix} \qquad (5)$$

Defining the $\theta_{j\leftarrow i,(\tau)}^{(h)} \equiv FEVD(y_{jt}; \mu_{it(\tau)}, h)$, it uncovers the extent of risk contagion from variables *i* to *j*. Thus, the sum of the first row in $\mathbb{A}$ presents that the total extent of contagion from other variables in the system, indicating the potential of risk bearing ability of the variable. Based on the $\mathbb{A}_{(\tau)}^{(h)}$, the contagion from the variable *j* to *i* is defined and exhibited:

$$O_{i\leftarrow j,(\tau)}^{(h)} = \theta_{i\leftarrow j,(\tau)}^{(h)} \qquad (6)$$

When there are more links between the variables, other variables are more likely to spread to variable *i* through spillover effects. In order to measure the overall impact of different variables on a single variable, we can calculate the degree of variable *i* in the spillover network, as shown:

$$FROM_{i\leftarrow\cdot,(\tau)}^{(h)} = \sum_{j=1,j\neq i}^{m} \theta_{i\leftarrow j,(\tau)}^{(h)} \qquad (7)$$

Meanwhile, the information of the variable *i* easily spreads to other variables. Attempt to gauge a single variable shock on other variables, we can evaluate the degree of variable *i*, as shown:

$$TO_{\cdot\leftarrow i,(\tau)}^{(h)} = \sum_{j=1,j\neq i}^{m} \theta_{i\leftarrow j,(\tau)}^{(h)} \qquad (8)$$

Hence, the total net directional connection of variable *i* can be formed as:

$$NET_{i\leftarrow i,(\tau)}^{(h)} = TO_{\cdot\leftarrow i,(\tau)}^{(h)} - FROM_{i\leftarrow\cdot,(\tau)}^{(h)} \qquad (9)$$

Note that $NET_{i\leftarrow i,(\tau)}^{(h)} > 0$ means the variable *i* has a net information contagion to the entire system. The higher magnitude of $N_{i\leftarrow i,(\tau)}^{(h)}$ is, the higher positive contributions of the variable *i* to systematic risks is. Thus, *i* plays the net transmitter role in the entire system. By contrast, $N_{i\leftarrow i,(\tau)}^{(h)} < 0$ shows that the

variable i receives the net contagion from the system. Higher magnitude of $N_{i\leftarrow i,(\tau)}^{(h)}$ is, the greater negative contributions to the system is, Thus, i plays the net receiver role in the full system. Finally, the total spillover index (*TSI)* of the entire system is given by:

$$\mathrm{TSI}_{(\tau)}^{(h)} = \mathrm{m}^{-1} \sum_{i=1}^{m} \theta_{i\leftarrow\cdot,(\tau)}^{(h)} \qquad (10)$$

The value of *TSI* signals that association among various variables in the system. Higher value of the TSI, showing that the connecting level in the system is high. The system suffers the instability when the market is turbulence. From this point, the direction and extent of the contagion effect for one variable could trigger the market bearing the risk. The net transmitter or receiver also contributes the significant uncertainty to full system. [2]

IV. Empirical Results and Policy Implications

In this section that we first conduct three conventional unit root tests of the ADF, PP and KPSS, then we use Quantile VAR to assess the how Political tensions affect the stock market returns of the China and the USA.

A. Results from Unit Root Test

Table 2 reports results of unit roots for these three variables. Based on results from the unit root tests we find these both stock market returns of China and the USA are stationary in level and China_USA PRI is nonstationary in level but become stationary after taking the first-differenced. Therefore. we use the first differenced of PRI and the stock market price returns of both China and the USA for our connectedness analysis.

[Insert Table 2]

B. Static and Dynamic Spillover (Connectedness) Analysis

1. Static Perspective

This subsection presents the results of the static connectedness among the equity market in USA, Chinese stock market, and China_USA PRI on Table 3. The connections among three examined indices are divided into three different quantiles which proxy the various political atmosphere. That is, the τ =0.25, τ =0.5, and τ =0.75 present the political relationship tension (market bearish), normal (market normal), and improvement (market bullish), respectively. Afterward, the findings of dynamic connection of the corresponding indices for each noted above measure under different quantiles are shown on Figures 2 to 4.

[Insert Table 3]

From the Table 3, the findings of total connection index (TSI) under the 0.25, 0.5, and 0.75 quantiles are 7.8%, 0.9%, and 1.1%, respectively. The magnitude under 0.25 quantile exhibits the highest value, showing that existence of linkages between the political relationship and the stock markets in both countries is

[2]. This study also calculates the net directional pairwise connectedness index (NDPC), the calculation of this measure is similar to that of the NET measure. For detail, see Tiwari et al. (2022).

confirmed and further obvious when the political relationship for both countries goes worse, resulting in the negative price effect in the stock markets for the USA and China.

Next, the results of the "FROM" for each index under the 0.25 quantile respectively are 9% for China, 8.5% for USA, and 5.7% for China_USA PRI, those of the corresponding indices under the 0.50 quantile respectively are 1.3%, 1.2% and 0.2%, and those of the corresponding indices under the 0.75 quantile separately are 1.5%, 1.4%, and 0.4%. These results further show that both stock markets can be affected by each other and the political relationship, and the political relationship also can be influenced by the stock markets in both countries. In addition, in line with the results of TCI, the highest value for each index is obtained under the 0.25 quantile. That is to say, the stock markets in USA and China experience negative price effect surrounding the circumstances of political tensions between the USA and China.

On the contrary, the findings of the "TO" also show the similar results. The value for each index under 0.25 quantile is 12.4% for China, 8% for USA, and 2.8% for China_USA PRI, that for each index under the 0.5 quantile is 1.2% for China, 1.3% for USA, and 0% for the China_USA PRI, and that for each index under 0.75 quantile is 1.2% for China, 1.6% for USA, and 0.5% for China_USA PRI. Consistently, the highest values for each index are observed under the 0.25 quantile. The worse political relationship arises the various pattern impact from the stock markets, especially the shocks from the Chinese stock market is 12.4% which is the highest value. Additionally, the USA market demonstrates the different pattern when the market is normal and bullish. In comparison with other two indices under the 0.5 and 0.75 quantiles, the evidence in USA is over than other two indices, where the Chinese markets with the lower values under these two quantiles.

To explore the net directional connectedness, the "NET" measure that the values of the "FROM" are deducted by the "TO" is exploited. From the Table 3, again, the highest values of "NET" is found for the 0.25 quantile. The values of the "NET" of China, USA, and China_USA PRI are 3.4%, -0.5%, and -2.9%, respectively. Positive and negative values represent the shock net transmitter and net receiver, respectively. Therefore, the Chinese stock market transmits the shock in the system, and the USA and China_USA PRI are the net receiver. However, the equity market in USA is net transmitters, and the Chinese stock market is net receiver when the market and political relationship is normal and strong. Meanwhile, the China_USA PRI is the net transmitter only for the market and political relationship is better. Besides, the results of "NDPC" which examines the pairwise connection among three indices reveal the similar evidence to support findings. Thus, the connection between the two stock markets and the political tension index exists among the three market conditions.

In short, based on above findings, the equity market in China is net transmitter and the equity market in USA and China_USA PRI are net receiver when facing up the market turbulence and political tension. The equity market in USA plays the role of the net transmitter, and the equity market in China is net receiver when the market is normal and bullish status. For the China_USA PRI, no effect can be found when the market is normal, but it plays the net transmitter role when market and political relationship are well.

2. Dynamic Spillover Analysis

This subsection presents the results of dynamical connection measures among the three indices, including the stock market in USA and China, and the China_USA PRI index. We first show the total connection index over our examine period under three different quantiles. Next, the "NET" measure, noted on the last subsection, is displayed under the corresponding quantiles over full period and the "NPDC" also is demonstrated.

[Insert Figure 2]

Figure 2 shows time varying TSI under the 0.25, 0.50, and 0.75 quantiles and the corresponding results are respectively shown on Panels (a), (b) and (c). The TSI displays the similar time-varying patterns for all panels, where the panel (a) reveals higher values relative to other two panels, implying that when further closer linkages relative to those of other two quantiles i.e. closer connection is observed when the political tensions or market is bearish. Specifically, the sharply increased trend can be found after subprime crisis period till 2010, slightly reducing to the 22% at 2014, then rising to the highest point 40% at 2017, and then reduce to persist the interval from 13% to 20%. Next, from the panel (b), the extent of connection under the normal period (0.50 quantile) locates in 5% to 10% interval except the out bounded region before 2009 and between the 2010 to 2011. Finally, the results of panel (c) under 75% quantiles present the lower values at entire period relative to the political tensions period, as shown on Panel (a), can be obtained and the declined patterns can be observed after 2015, which is from 25% at 2015 to 11% at the end of examined period.

[Insert Figure 3]

Next, the values of "NET" measures over the full examined period is drawn on Figure 3. Similar with the Figure 2, the results under different states are demonstrated on the panel (a) for 0.25 quantile, panel (b) for 0.50 quantile, and panel (c) for 0.75 quantile. From the panel (a), the China stock market mainly is the net transmitters, especially from the 2010 to 2018. The equity market in USA is the net receiver before 2011 and then turns to the net transmitter till 2020. The political relationship index between the China and USA is the net receiver for most time after 2010. Considering the evidence of panels (b), the equity market in China mainly plays the net receiver from 2008 to 2016, the equity market in USA is the net receiver before the subprime crisis, and the China_USA PRI is net transmitter from the 2000 to 2016. The results of panel (c) reveal similar findings with those of panel (b), however, the extent of the net effect further is obtained.

[Insert Figure 4]

Moreover, the pairwise connection between each pair indices, including the equity market in China vs USA stock market, Chinese stock market vs China_USA PRI, and China_USA PRI vs USA stock market, are shown on the Figure 4. Panel (a) presents the results under the 0.25 quantile; the equity market in China obviously plays the transmitter role not only for the equity market in USA especially from the 2009 to 2016, but also for the China_USA PRI. Interestingly, on the political relationship for the Chines stock market again becomes the net transmitter after 2020 although their transmitting shock ability slightly

weak relative to that during the 2009 to 2016. As for USA stock market vs China_USA PRI, most of the positive values are obtained during the 2010 and 2020, indicating that the equity market in USA is the net transmitter relative to the China_USA PRI. These results disclose that the spillover effect from the China to USA stock markets is confirmed, Chinese stock market can also affect the political relationship between the China and USA, and the equity market in USA can affect the political relationship between both countries. For the results on Panel (b), the equity market in China plays the different role associated with the exogenous events over examined period. However, apparent negative value region is obtained from the 2008 to 2019 for the equity market in China vs China_USA PRI and that is observed for the equity market in USA vs China_USA PRI before 2010, implying that the equity market in USA receives the shocks from the political relationship and transmits the shocks to Chinese stock market after 2008 till 2019. Similar results are also found for the Panel (c), however, the influencing extent further clearly can be observed when the market condition and political relationship become well. Worth to note that, the equity market in USA transmit the shock to the China_USA political relationship after 2010, showing that the stock market reaction induces the political connection changes.

In short, the connectedness between the China_USA PRI and stock markets in both countries not only exhibit the time-varying effect, but also further manifest when facing up the unfavorable market condition and the political relationship especially from the 2010 to 2016. To further unveil linkages among these indices, we provide the network analysis summarized the results and the possible exogenous events in the following two subsections.

C. Network Analysis

To simplify the connection among the Chinese and USA stock markets and the China_USA PRI, we provide the network diagram to summarize noted above findings.

The results under the 0.25, 0.50, and 0.75 quantiles, are respectively displayed on panels (a), (b) and (c). Note that the green and red colors represent the net transmitter and receiver, respectively, and the extent of the connecting is presented by the line thickness.

[Insert Figure 5]

First, under the 0.25 quantile, three indices present the inter-connection between each other. The Chinses stock market transmit the shocks to the China_USA and the PRI transmit the shocks to the equity market in China, indicating that the bidirectional spillover effect exists under the market and political relationship go worse, however, the effect for the equity market in China is apparent. In addition to the results between the equity market in USA and the PRI and the equity market in China also reveal the bidirectional linkages, but the extent is weak. Second, under the 0.50 quantile, the bidirectional connection only is present between the USA and Chinese stock markets. Adding the finding in Table 3, this evidence explicitly shows that the political relationship between both countries do not influence the stock market when the interaction between China and USA persists the normal diplomacy. Third, under the 0.75 quantile, similar results are obtained, however, the level of USA stock market links the equity market in China is stronger than that of the equity market in USA connects the PRI. Based on these results, we find that the extreme positive and negative events trigger that Chinese stock markets links to the political relationship and to the equity market in USA.

D. Discussions and Policy Implications

Following the Cai et al. (2022), the relationship between the China and USA experiences several different states, including the political tensions, normal relationship, and friendly interaction. For instance, the China obtains the permanent normal trade with the USA after President Clinton sign the US-China relationship Act in October in 2000, triggering the economic in China start to growth. In next year, the China is allowed to participate in the World Trade Organization in 2001 that is the cornerstone which let the China rapidly economic development in the future. Thus, the relationship between the USA and China experiences the unprecedented well circumstance. However, an important information, signaled by the USA trade deficit, induces that the ''US 'Pivots' Toward Asia'' in the 2011. Afterward, when Trump win the president election of America in 2016, the conflicts between US and China are becoming more explicit. Besides, there also some other exogenous events lead the political tensions such as the deputy of China's human right and the Hong Kong independent problem. Moreover importantly, the trade conflict between the USA and China further accelerates the relationship goes worse. For example, a series of the tariffs adjust driven the harm to import and export sectors in both countries and impact to stock markets in both countries negatively fluctuate. Therefore, the political interaction between both countries dramatically declines and almost touch the bottom since US and China construct the Diplomacy. In comparison with these shocks, our results robustly provide supportive evidence to insight the connection between the stock markets and the political relationship. Some implications are shown in the following. Based on noted above findings, bidirectional connections can be obtained among these three indices, however the affecting extent for each index demonstrates the different pattern. The equity market in China is net transmitter and the equity market in USA and China_USA PRI are net receiver when facing up the market turbulence and political tension. This evidence indicates that the investors are required to allocate the assets to other unaffected by these two world biggest economics conflicts such as the real assets investment. On the contrary, investors can focus on the sector that benefit from the market and political relationship exhibits the better states. From the viewpoint of government of USA and China, although the attitude and the policy in both countries are different without doubt, both should proceed the fiscal policy to reduce the harm to the export and import oriented firms, resulting in the wealth of countries persist certain levels.

V. Conclusions

Political risk plays the important role which not only affects the behavior of the stock price, but also provides the important investing signals. Besides, as we know the market capitalizations of stock markets the in China and USA occupy the worldwide first and second place, respectively. Thus, this study intends to disentangle the connection between stock market and political relationship between the USA and China. Examining the data from the December 1990 to July 2022 with the spillover index based on the QVAR framework, we propose some empirical findings and show as follows.

The main findings are that the results of total spillover index under 0.25, 0.50, and 0.75 quantiles, are 7.8%, 0.9%, and 1.1%, respectively, showing that the asymmetric connectedness is found for different market condition. The evidence of net directional connectedness are 3.4% for China, -0.5% for USA, and -2.9% for China_USA PRI under the 0.25 quantile, those are -0.1% for China, 0.1% for USA, and 0.0% for

China_USA PRI under 0.50, and those are -0.3% for China, 0.2% for USA, and 0.1% for China_USA PRI, respectively. Based on these findings the implications are that the equity market in China is net transmitter and the equity market in USA and China_USA PRI are net receiver when the market condition and political relationship are bearish and tension. However, when market condition and political relationship improve, the equity market in China turn in the net receiver, the equity market in USA is net transmitter, and the China_USA PRI either is the net receiver or no effect. Second, from the dynamic viewpoint, the linkages between the China_USA PRI and stock markets in China and USA not only changing by the time, but also further obvious when facing up the unfavorable market condition and the political relationship especially from the 2010 to 2016. Disentangling the net receiver and transmitter roles, played by the stock markets in USA and China and the political relationship, provide the certain level applications for the investors, financial institutions and academics when facing up different exogenous events.

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Table 1. Description of Statistics.

	CHINA_USA	D&J30 Return	Shanghai Return
Mean	-0.434037	0.002855	0.003829
Median	0.300000	0.004234	0.001697
Maximum	3.300000	0.043930	0.285371
Minimum	-8.300000	-0.100318	-0.126720
Std. Dev.	2.793554	0.015343	0.041277
Skewness	-1.653640	-1.603572	1.642246
Kurtosis	4.883262	11.01532	12.47693
Jarque-Bera	228.7387	1176.970	1588.642

The asterisks ***,** and *indicate the 1, 5, and 10% significance levels.

Table 2. Unit Root Test Results

	Level			Differenced		
	ADF	PP	KPSS	ADF	PP	KPSS
CHINA_USA	0.326	0.5021	0.739***	-10.895***	-17.782***	0.532**
D&J30RSHANGHAIR	-16.483***	-16.445***	0.1462	-12.612***	-64.555***	0.012
	-12.279***	-13.614	0.273	-11.282***	-86.646***	0.093

The asterisks ***, ** and *indicate the 1, 5, and 10% significance levels, respectively.

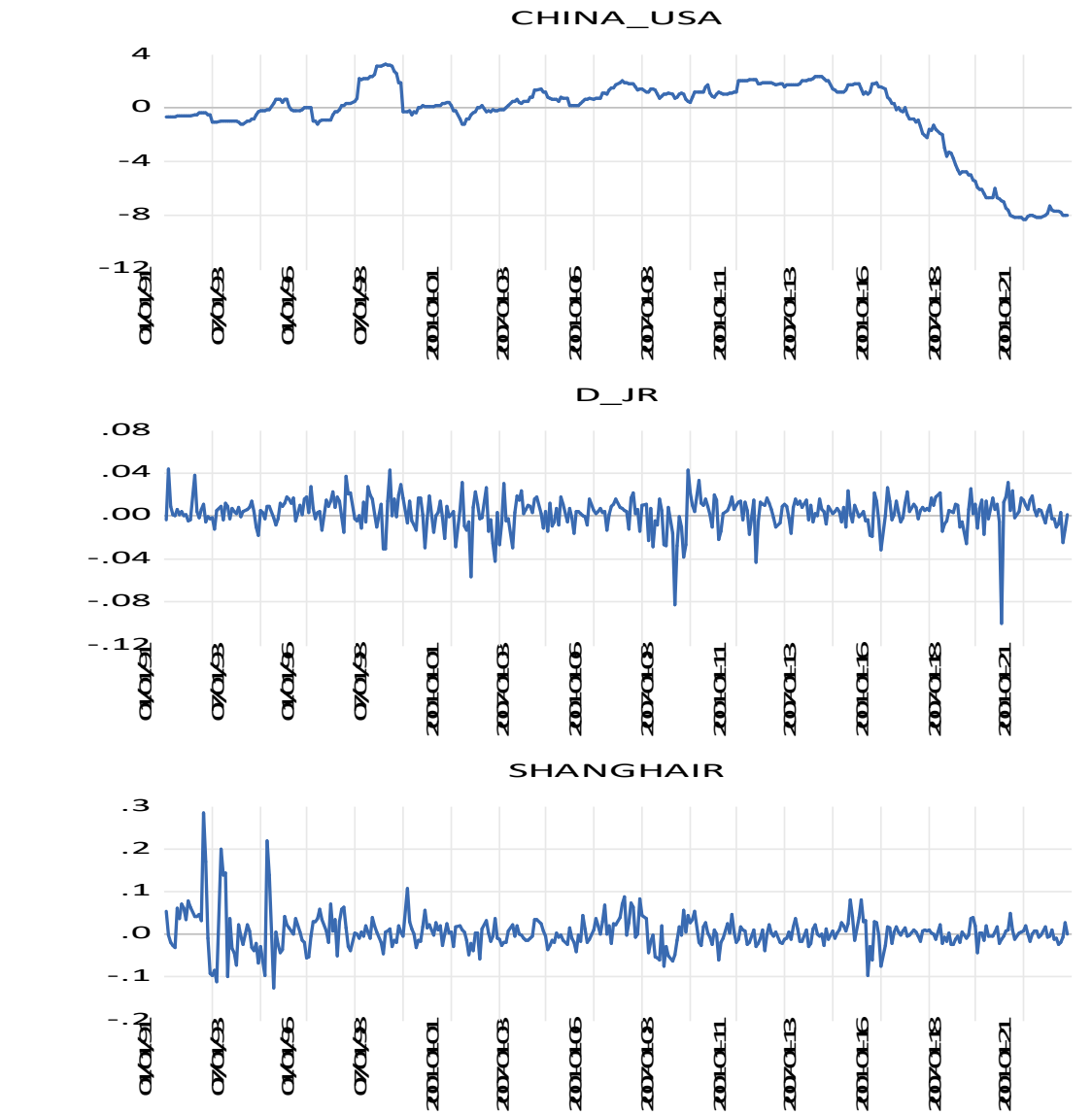


Figure 1. Shanghai Return, D&J30 Return and China_USA(PRI)

Table 3: The Results of Static Connections among Stock Markets in China and USA and the Political Relationship Index under 0.25, 0.50 and 0.75 Quantiles.

Panel (a). Connectedness Matrix ($\tau = 0.25$)

	Shanghai R	D&J R	China_USA	FROM
Shanghai R	91	7	2	9
D&J R	7.7	91.5	0.8	8.5
China_USA	4.7	1	94.3	5.7
Contribution TO others	12.4	8	2.8	23.2
NET directional connectedness	3.4	-0.5	-2.9	TSI
NPDC transmitter	2	1	0	7.8

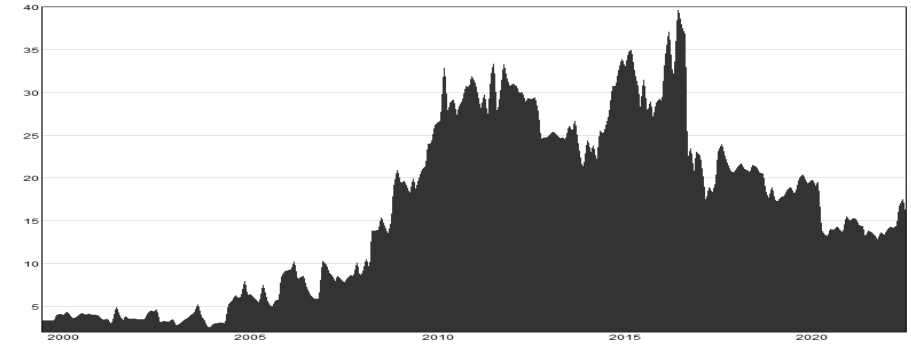
Panel 2 (b). Connectedness Matrix ($\tau = 0.5$)

	Shanghai R	D&J R	China_USA	FROM
Shanghai R	98.7	1.2	0.1	1.3
D&J R	1.1	98.8	0.1	1.2
China_USA	0.1	0.1	99.8	0.2
Contribution TO others	1.2	1.3	0.2	2.7
NET directional connectedness	-0.1	0.1	0	TSI
NPDC transmitter	1	1	1	0.9

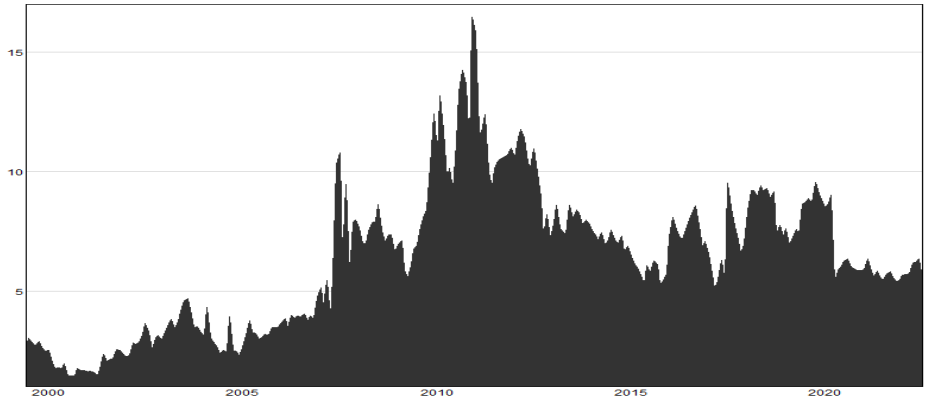
Panel (c). Connectedness Matrix ($\tau = 0.75$)

	Shanghai R	D&J R	China_USA	FROM
Shanghai R	98.5	1.2	0.3	1.5
D&J R	1.2	98.4	0.4	1.4
China_USA	0.2	0.2	99.6	0.4
Contribution TO others	1.2	1.6	0.5	3.3
NET directional connectedness	-0.3	0.2	0.1	TSI
NPDC transmitter	1	1	1	1.1

(a) $\tau = 0.25$



(b) $\tau = 0.50$



(c) $\tau = 0.75$

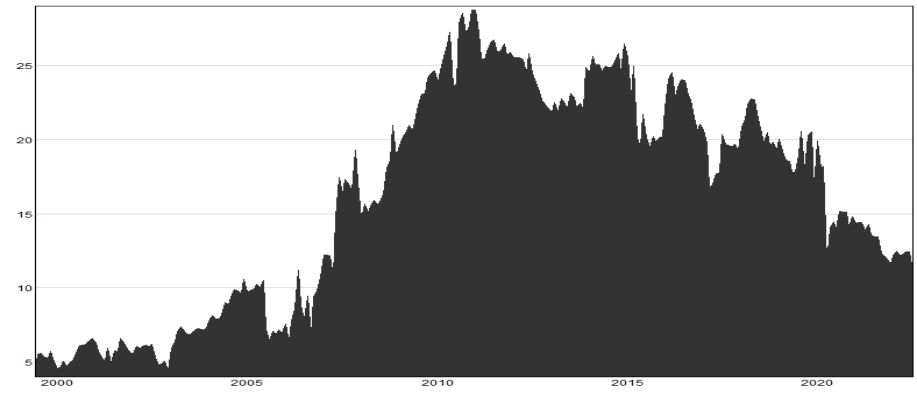
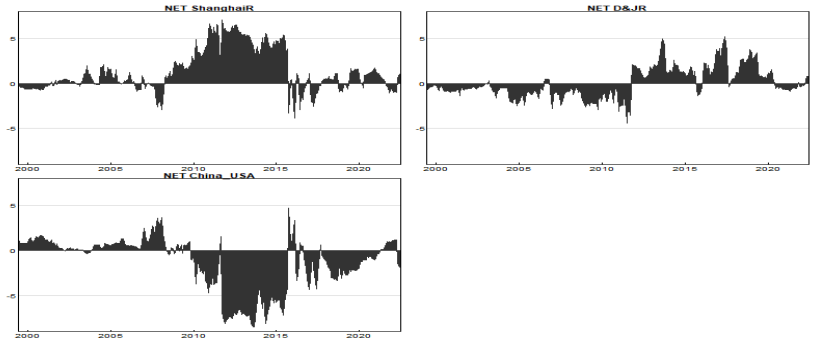
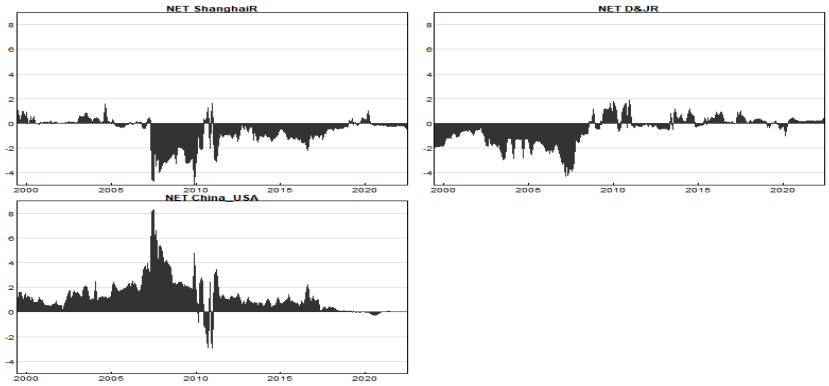


Figure 2. Total Risk Spillover Index (TSI) at Quantile Levels

(a) $\tau = 0.25$



(b) $\tau = 0.50$



(c) $\tau = 0.75$

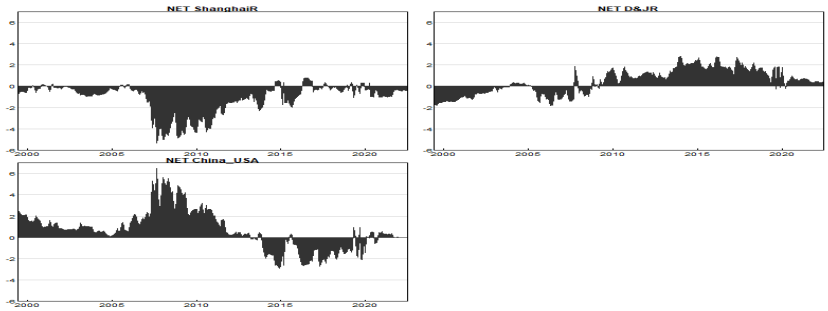
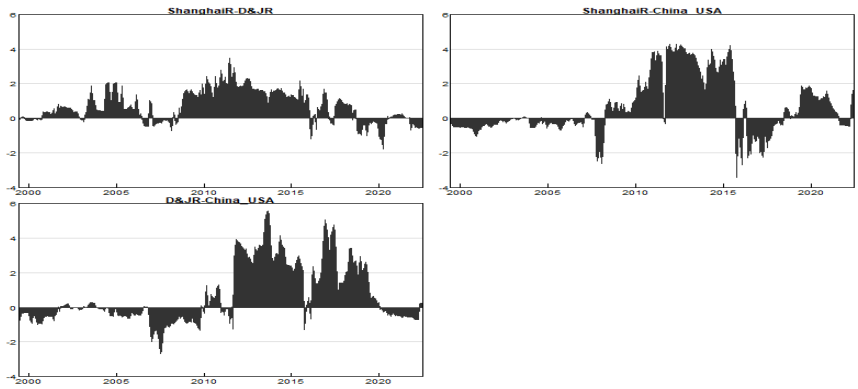
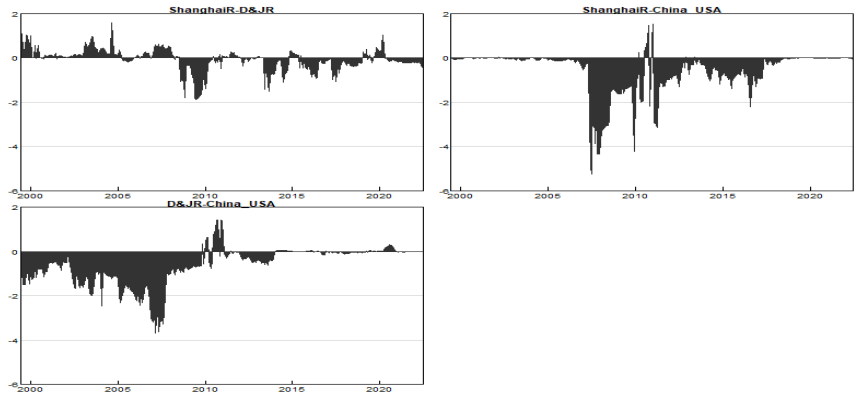


Figure 3. The Net Return Spillover Index at Quantile Levels

(a) $\tau = 0.25$



(b) $\tau = 0.50$



(c) $\tau = 0.75$

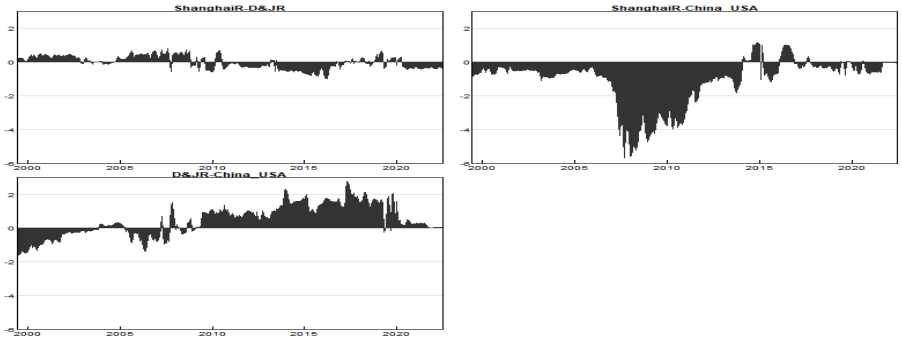
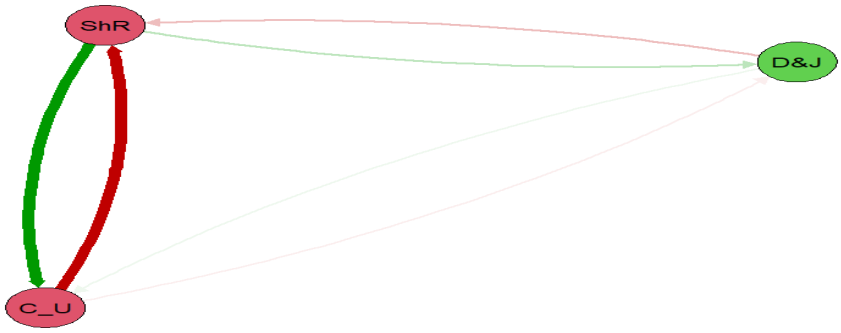
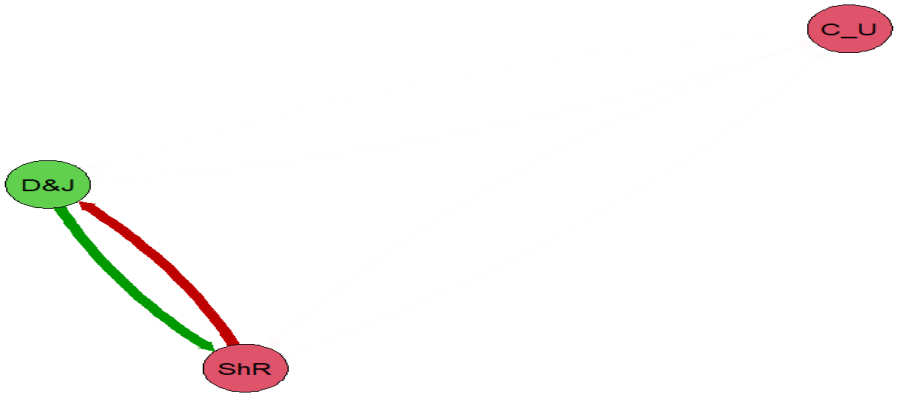


Figure 4. The Net Pairwise Return Spillover Index at Quantile Levels

(a) $\tau = 0.25$



(b) $\tau = 0.50$



(c) $\tau = 0.75$

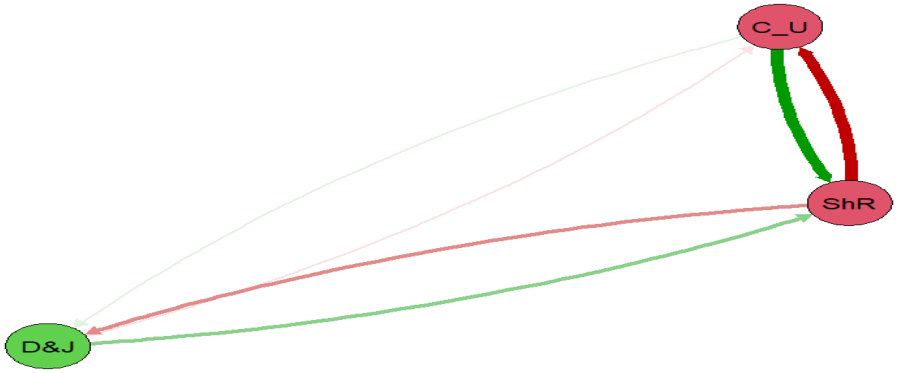


Figure 5. Network Visualizations for Quantile Level Spillovers

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The author's research interests: Relating to the banking and finance sector and the goal of helping the banking industry develop sustainably.

Article title: Banking human resources before the development of artificial intelligence AI

Research area of the article: Human resources of the banking industry before the impact of artificial intelligence

Word count: 6747

The background of the article, new contributions to the research field: The report offers suggestions for how to improve the standard and prepare the workforce by commenting on the state of human resources in the banking sector as they currently stand under the effect of the development of AI. The ability to adapt and develop the banking sector sustainably is provided by digital transformation.

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