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Risk Analysis of Stock Markets in Belt and Road Initiative Member Countries

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Abstract: This study employs the "Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroskedasticity Connectedness" model to analyze stock market interconnectedness among Belt and Road countries. Building on existing literature, it extends the conclusions of previous research. The findings reveal a strong and relatively stable correlation between the stock markets of the fifteen member countries of the Belt and Road Initiative. In particular, during public emergencies, these markets exhibit stronger volatility correlation and heightened risk linkage Nevertheless, the interconnectedness remains generally stable, with market spillovers recovering swiftly even in the face of unexpected events. As the world's second largest economy, China plays a pivotal role in the Belt and Road Initiative, particularly in ensuring the stability of the region's stock market.

Keywords: China; Belt and road; Stock market; Linkage; Risk

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1. Introduction

The Belt and Road Initiative (BRI), referring to the *Silk Road Economic Belt* and the *21st Century Maritime Silk Road*, is an international cooperation strategy launched by China [1]. By leveraging existing bilateral and multilateral mechanisms, as well as regional cooperation platforms, China and participating countries aim to promote economic growth and enhance trade relations through peaceful development. The initiative seeks to strengthen economic and cooperative ties with international partners, working towards the creation of a community of shared interests, common destiny, and mutual responsibility, characterized by political trust, economic integration, and cultural inclusiveness [2,3].

China maintains significant capital flows with BRI countries. From 2013 to 2022, the total trade volume between China and BRI partner nations reached a cumulative $19.1 trillion, with an average annual growth rate of 6.4%. Over the same period, two-way investments exceeded $380 billion, with China's outward foreign direct investment (FDI) accounting for more than 63% of the total [1]. Stock markets serve as vital indicators of a

country's economic health, and the economic and trade relationships between China and BRI countries are closely intertwined [4–6]. Therefore, analyzing the correlations between these stock markets holds considerable significance.

Previous research has examined stock market linkages among BRI and other major economies. One study investigated the long-run cointegration and globalization of stock markets by applying cointegration tests and vector error correction models to data from G7 countries. The results indicated that, at the time, financial globalization was relatively weak, with the U.S. stock market playing a dominant role in influencing global market trends [7]. National stock markets often exhibit dynamic relationships with international markets. For instance, one study applied a dynamic conditional covariance (DCC)-generalized autoregressive conditional heteroskedasticity (GARCH) model to examine the linkages between Pakistan's domestic stock market and those of its key trading partners, including China, Indonesia, Malaysia, the UK, and the U.S. The findings confirmed that Pakistan's stock market is closely integrated with the global financial system [8].

Financial markets can exhibit extreme behaviors, particularly during periods of global crises. For instance, the impact of the COVID-19 pandemic on global financial markets has been both profound and enduring [9,10]. Such large-scale global emergencies are inherently unpredictable, and their effects on financial markets tend to be both far-reaching and long-lasting [11,12]. Moreover, the close interconnectedness of financial markets plays a significant role in the transmission of risk across borders [13]. Major unexpected public events not only disrupt global financial systems but also influence the degree of stock market linkages between countries [14,15]. One study analyzed exchange rate trends and stock market returns of G7 countries during the COVID-19 period using wavelet coherence and partial wavelet coherence (PWC). The findings indicated that stock market linkages among G7 countries were notably stronger during this crisis period [16]. Therefore, it is critical to examine the implications of stock market linkages and volatility spillovers across countries during major global emergencies.

Although there is evidence of correlations among the stock markets of BRI partner countries, the specific patterns and dynamics of these relationships remain inconclusive. Building upon existing research, this paper aims to investigate the stock market linkages among BRI countries. The objective is to identify strategies that can enhance high-quality cooperation, facilitate policy coordination, promote unimpeded trade, and advance financial integration within the BRI framework.

To examine the stock market linkages between China and BRI member countries, this paper utilizes daily stock index data obtained from the Wind database. The dataset includes stock market indices for China and 14 selected BRI countries: Japan, Indonesia, Malaysia, Thailand, Vietnam, Israel, Mexico, Egypt, the Czech Republic, Russia, Greece, Poland, the Philippines, and India. The sample period spans from September 10, 2009, to December 28, 2023.

2. Empirical analysis

The following chart presents the daily time series of the logarithmic returns for the stock markets of the 15 BRI member countries, covering the period from September 10, 2009 to December 27, 2023, as selected for this study.

The study analyzed the selected data using descriptive statistics, as shown in **Table 1**, which is a result of ADF. Among the indices, India's sensex30 index of had the highest average return, coupled with relatively low volatility, making it the strongest performer in the sample. In contrast, the ASE Composite Index of Athens, Greece and Russia's RTS Index underperformed during the period from September 2009 to the end of 2023. Both indices recorded negative average logarithmic returns, with the RTS Index exhibiting the highest volatility, followed closely by the ASE Composite Index. Additionally, all 15 indices in this study displayed negative skewness, indicating that the data distributions are skewed

to the right, with long tail extending *from the right to the left, indicating the mean of the data is consistently lower than the median. Furthermore, th*e Mexican MXX index had the lowest kurtosis value at 7.89, but all 15 indices demonstrated excess kurtosis, indicating a greater presence of extreme values in the data.

Table 1. Descriptive analysis

Variable	Sample size	Average value	Maximum	Minimum	Standard deviation	Median	Skewness	Kurtosis
rASE	1683	-0.03706	18.5557	-18.948	2.881444	0.024468	-0.20472	9.525944
rCASE30	1683	0.073116	16.62845	-19.5579	2.277752	0.138888	-0.69309	14.68419
rCSI500	1683	0.02654	13.53313	-27.2902	2.449329	0.090064	-1.30375	16.60183
rJCI	1683	0.064388	9.704225	-22.7485	1.61283	0.125327	-2.47337	33.93509
rKLCI	1683	0.010704	5.822782	-16.8678	1.027379	0.023736	-2.75725	49.7213
rMXX	1683	0.035843	6.891491	-9.58418	1.366733	0.069346	-0.55864	7.894857
rNK225	1683	0.065938	10.56462	-15.9544	1.827567	0.075713	-0.71768	10.67273
rPSI	1683	0.050396	12.34504	-31.7833	1.817329	0.091859	-3.26411	62.63964
rPX	1683	0.011377	7.369186	-22.1634	1.575506	0.059647	-2.41139	31.18811
rRTS	1683	-0.01311	17.48016	-50.15	3.025085	0.139058	-3.29969	52.98996
rSENSEX30	1683	0.085881	11.5731	-23.2632	1.599604	0.119098	-1.71052	34.49404
rSET	1683	0.041553	9.439616	-17.9814	1.511456	0.093266	-1.6111	20.88644
rTA100	1683	0.040777	7.228176	-14.9716	1.401053	0.09172	-1.31086	15.67683
rVNI	1683	0.043955	9.321913	-11.2553	1.867563	0.141179	-0.66998	8.739174
rWIG	1683	0.035857	7.243126	-17.6382	1.65767	0.081091	-1.38363	16.21342

Based on the time series return data of 15 indices processed previously, this paper employs R to analyze the risk spillover relationship among stock market indices of various countries using the DCC-GARCH-Connectedness model.

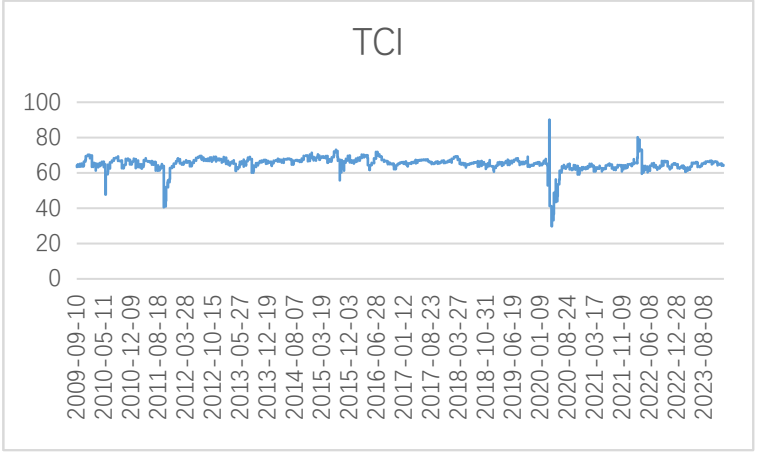

Figure 1. Total connectedness index.

3. Conclusion

This paper investigates the stock market linkages among the Belt and Road countries using the DCC-GARCH-

Connectedness model, building on insights from existing literature to enhance the findings. These results reveal that the stock market connections among the fifteen selected BRI member countries are strong and stable. The main conclusions of this paper are as follows:

The stock markets of the 15 selected BRI member countries are highly interconnected, particularly during public emergencies when the volatility correlation increase, and risk interconnectedness intensifies. While stock market linkages among BRI countries are generally stable, any surge in spillover effect during public emergencies is often met with swift policy responses, enabling country to quickly restore these effects to their original level. In addition, Malaysia, the Philippines and the Czech Republic emerge as significant sources of risk spillovers due to stock market volatility. Additionally, as the world's second-largest economy, China plays a crucial role in the BRI's high-quality development. Within the stock markets analyzed in this paper, China serves as a stabilizing force, absorbing risks and helping mitigate volatility in stock market returns.

The findings of this study carry important implications for stock investors and policymakers. Public emergencies can intensify risk spillovers across national stock markets, underscoring the need for BRI member countries to collaborate in mitigating the effects of such events and stabilizing investor confidence. International organizations involved in the BRI should play an active role in responding to public emergencies, using various measures, such as financial assistance, to stabilize the stock markets of countries experiencing heightened risk spillovers. In summary, this paper thoroughly analyzes the stock market risk spillover effect among the "Belt and Road" countries, offering empirical insights into the risk transfer mechanism of the 15 member countries nations. The findings provide valuable guidance for policymakers in these countries and serve as a reference for investors and regulators in predicting stock market risk spillover. Overall, this research offers fresh perspectives for policy makers while establishing a foundational basis for anticipating stock market risks.

Disclosure statement

The author declares no conflict of interest.

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