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Behavioral Finance Analysis of the Spillover Effect of Major Health Emergencies on Shipping and China's Investment Market

Sijie Han[1,a,*]

[1]*Zhejiang University of Finance and Economics, Hangzhou, Zhejiang, China*
a. 1837548775@qq.com
**corresponding author*

Abstract: Cross-market risk conduction is an important risk source in the global investment market. In recent years, the global market risk linkage cause-d by major public health emergencies has attracted much attention. This paper selects the COVID-19 epidemic as an example, and uses the shipping market as a representative indicator of the global economy to try to analyze the complete path of the epidemic impact from the global economy to the Chinese stock market. From the perspective of behavioral finance, it analyzes the role of investor sentiment in this risk linkage. The empirical results show that the transmission of epidemic risk between Chinese stock markets deviates from the global economic fluctuations but has regularity, and the momentum effect brought by investors ' overconfidence and overreaction makes the stock market reaction short-term and volatility amplification. Risk aversion and limited attention make the market volatility caused by the deterioration of the epidemic greater than the mitigation. This paper creatively conducts a full-path study on the transmission of epidemic risk between macro-economic and stock markets, and uses behavioral finance theory to quantitatively verify the impact of investor sentiment, which provides a theoretical basis for cross-market risk transmission research.

Keywords: risk spillover, behavior finance, cross-market investment, VAR model

1. Introduction

The process of globalization has made world trade more and more close, and risk transmission has become very complicated. Risk control between markets has become a difficult point for cross-market investment. In recent years, major public health emergencies have posed a huge threat to global economic stability and become the largest global risk events, and their impact on global market risk linkage has received extensive attention.

Existing research shows that the market pressure caused by public emergencies will lead to obvious risk spillover effects between investment markets, and lead to a sharp rise in market uncertainty. However, most of the research focuses on the analysis of the transmission of risk between markets, does not explain the path of major health emergencies from macro events to the investment market, and the analysis of the impact of investor sentiment remains in the description of behavioral finance theory.

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In view of this, this paper attempts to use the real-time response of the shipping market to the global economy to index the global economic fluctuations. Through the study of the spillover effect between the shipping market and the Chinese stock market, this paper explores the full path of the impact of major public health emergencies on the Chinese investment market, and quantitatively analyzes and verifies the operation mechanism of investor sentiment fluctuations from the perspective of behavioral finance.

In the following context, this paper will first review the literature and form the research hypothesis of this paper, and give the research design and data.

2. Literature Review

This paper reviews the stages of major public health emergencies, the spillover effects of events on cross-market investment and the theoretical framework of behavioral finance in spillover effects.

2.1. Research on the periodic law of major public health emergencies

As one of the major public health emergencies, scholars have conducted a lot of mathematical research on its characteristics, such as multiple linear regression method [1], deep machine learning model [2], gray wolf optimization algorithm [3], accurately summarize the regularity of epidemic development. It is worth noting that Linzhang et al. found that the number of confirmed cases of the epidemic will appear four growth modes : exponential, power exponential, sub-exponential and sub-linear function [4].

2.2. Inter-market spillover effect under major emergencies

Financial risk contagion carries the connotation of spillover benefits [5], which is reflected in both domestic and international markets. During major public emergencies, there are different degrees of spillover effects between a domestic money market, investment market, commodity market.

2.3. Behavioral finance explanation of spillover effect

Scholars have found that the spillover effect caused by irrational behavior is reflected in both a country 's market and the national market. In a country market, Dash and Maitra et al. found that the consistency or synergy between investor sentiment and stock returns during the crisis is higher, that is, the stock market linkage phenomenon during the crisis is more likely to be transmitted through investor sentiment [6]. Based on the mixed frequency analysis, Fang et al. found that the rise of investor sentiment significantly improved the correlation between stock and bond markets [7].

3. Research methods

3.1. Spillover effect model

Based on the generalized VAR framework (hereinafter referred to as KPPS) of Koop, this paper expands and constructs the generalized vector autoregressive framework, obtains the variance decomposition spillover index between markets, examines the spillover intensity and direction of information between markets, and constructs the spillover index matrix.

The first step is prediction error variance decomposition. Using the $\theta_{ij}^{g}(H)$ represents the forward H-step prediction error variance decomposition of KPPS, for H = 1, 2,..., we obtain :

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$$\theta_{ij}^{g}(H) = \frac{\sigma_{jj}^{-1}\sum_{h=0}^{H-1}(e_i' A_h \sum e_j)^2}{\sum_{h=0}^{H-1}(e_i' A_h \sum A_h' e_i)^2} \quad (1)$$

The second step is to construct the spillover index based on the volatility of KPPS variance decomposition. The total spillover index, can be expressed as :

$$S^{g}(H) = \frac{\sum_{i,j=1,i\neq j}^{N}\tilde{\theta}_{ij}^{g}(H)}{\sum_{i,j=1}^{N}\tilde{\theta}_{ij}^{g}(H) = 1} \times 100 \quad (2)$$

3.2. Impulse response function

The impulse response function measures the impact of an additional standard deviation on the disturbance term on the current and future values of the endogenous variable. Its vector moving average model (VMA) can be expressed as:

$$y_t = \phi_0\varepsilon_t + \phi_1\varepsilon_{t-1} + \cdots + \phi_P\varepsilon_{t-p} + \cdots \quad (3)$$

$\phi_p = (\phi_p, ij)$ is the system matrix, p = 0,2,.... The y_j's response function caused by the pulse of pair is: ϕ_0, ij, ϕ_1, ij, ϕ_2, ij... …

4. Empirical test

4.1. Data Selection

This paper makes an in-depth analysis of the transmission of risk shocks caused by the novel coronavirus pneumonia epidemic (hereinafter referred to as the " epidemic ") between the macro economy and the Chinese investment market and explores the path of investor sentiment. The sample interval is from January 3,2020 to November 30,2022, that is, the WHO 's continuous statistical release of the diagnosis of the global novel coronavirus pneumonia epidemic.

In the data sample, this paper selects the growth rate of the number of daily confirmed cases published by the WHO official website to represent the development trend of the epidemic, and selects the Baltic shipping index (BDI index) as the representative variable of the shipping market. The BDI index was released by the Baltic Exchange in 1774 and is the most authoritative bulk cargo shipping index in the world. The Shanghai Composite Index is selected as the representative variable of China 's stock market in the study of cross-market conduction spillover effect.

When calculating the spillover effect, in order to ensure data synchronization, this paper retains date-consistent data. In order to reduce errors, the logarithm of all yields is taken and multiplied by 100 when calculating the model.

4.2. Empirical Analysis

(1) Analysis of cross-market financial risk transmission under the impact of major public emergencies

According to the number of daily confirmed cases published on the WHO official website, the growth rate of daily confirmed cases was calculated. By comparing its growth pattern, the epidemic development was divided into four stages, namely outbreak period, peak period, mitigation period and elimination period. The corresponding time intervals are from January 1,2020 to February 9,2020, from February 10,2020 to December 20,2020, from December 21,2020 to September 4,2022, and from September 5,2022 to November 30,2022.

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This paper estimates the total marginal net spillover effect between the epidemic growth rate, the shipping BDI index and the Shanghai Composite Index in four time intervals to explore how the impact caused by the epidemic has a real impact on the global economy and transmitted to the Chinese stock market. In table 1, the response of China 's stock market to the economic impact of the epidemic is more intense and rapid than that of the shipping market, and the impact is digested faster. This paper regards the shipping market as a quantitative index of the actual impact of the epidemic on the global economy. It can be seen that the impact of the new coronavirus epidemic on the global economy has a certain degree of continuity, while the response of the Chinese investment market to the impact is short-term and strong volatility.

Table 1: Analysis of the COVID-19 Epidemic Index and the Total Marginal Net Spillover Effect of Shipping Market and Chinese Stock Market.

period	Outbreak Period			Peak Period			Mitigation Period			Elimation Period		
Index	Covid19	BDI	SZ	Covid19	BDI	SZ	Covid19	BDI	SZ	Covid19	BDI	SZ
Covid19	0.35	-0.02	0.02	1.21	0.76	0.05	0.99	-1.58	-2.16	0.24	56.01	13.44
BDI	-1.10	0.65	0.18	0.01	0.74	-0.11	0.00	0.80	-0.04	0.00	0.40	0.22
SZ	-1.65	0.03	0.33	0.01	0.00	0.29	0.00	0.04	0.29	0.00	-0.29	0.01
Net	-2.75	0.93	1.82	-0.79	0.86	-0.07	3.74	-1.5	-2.24	-69.45	55.5	13.95

(2) Behavioral finance analysis of the impact of investor sentiment in risk transmission

This paper attempts to use behavioral finance to analyze the role of investor sentiment in risk transmission and verify it with pulse effect.

First of all, the momentum effect caused by investors ' overconfidence and overreaction promoted the strong risk fluctuation of Chinese stock market in the early stage of the epidemic. DHS and BSV theories believe that the momentum effect can be explained by overconfidence and overreaction from the perspective of behavioral finance. This theory is also reflected in the empirical test of the pulse effect in Figure 1 (a). During the outbreak period, the shipping BDI market did not show a positive response to the impact of the outbreak, but the Shanghai Composite Index produced a positive response and continued to push higher. The direction of volatility lost relevance, but then fell back to the midline.

Secondly, investors ' risk aversion and limited attention make the risk fluctuation response of China 's stock market to the deterioration news during the outbreak period greater than that of the later epidemic mitigation news. China 's investment market has a short history of development, with retail transactions accounting for 85 % and high risk aversion characteristics. The pulse diagram (a) (b) of Figure 1 shows that the Chinese stock market has a panic response to the outbreak of the news and gradually eases. The pulse diagram (c) shows that the stock market 's volatility response approaches 0 under the good news during the remission period of the epidemic.

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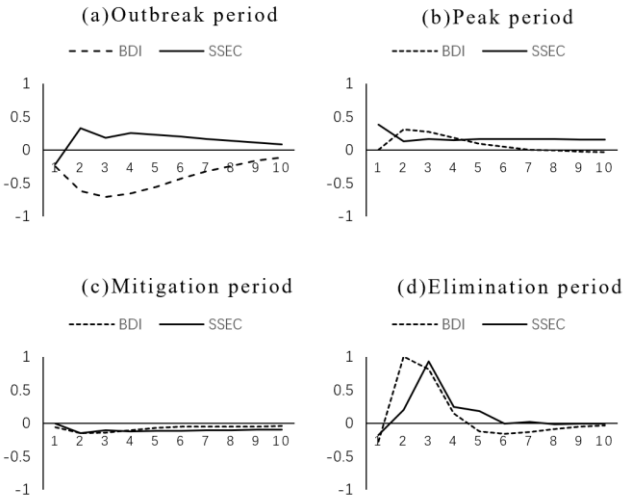

Figure 1: Response of BDI and SSEC to Covid-19 during Four Periods.

5. Conclusions

Taking the COVID-19 epidemic as an example, this paper attempts to analyze the whole path of major health emergencies impacting China 's investment market through the global economy and quantitatively analyzes the role of investor sentiment in this risk linkage from the perspective of behavioral finance.

The study found that: First, the impact of the COVID-19 epidemic on the world economy has a sustained impact, but the linkage effect between China 's investment markets has short-term and risk amplification. Second, the momentum effect brought by investors ' overconfidence and overreaction makes the stock market 's response short-term and volatility amplification. Risk aversion and limited attention make the market volatility caused by the deterioration of the epidemic greater than the mitigation.

This paper has the following implications: First, the outbreak of major health emergencies has great destructiveness and strong regularity, and the study of its economic impact can produce a better preventive effect for its risk prevention. Second, China 's investment market started late and its development is not yet mature. Therefore, we should not only understand the principle of irrational behavior from a theoretical perspective, but also improve the rational investment level of investors from the aspects of policy and theoretical guidance, and calmly face the impact of economic events.

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