

Study on Globalization of Shipping Stocks Pricing Based on a DC-MSV Model

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Abstract

DC-MSV and GC-MSV models are established to study the dynamic correlation and risk spillover effects among domestic and foreign shipping stocks price for the evaluation of pricing globalization. The empirical analysis adopting MCMC algorithm shows that the dynamic correlations rose between A stocks and their H counterparty index and shipping stocks, which relate to the gradually opening up investment threshold. However, the dynamic correlations did not go up between domestic shipping stocks and their oversea counterparties. A shipping stocks' price is Granger cause of their H stocks and the forward risk spillover effects are stronger, which means shipping stocks are mainly priced in domestic market. Further opening up will make China a global shipping asset pricing center, following the global shipbuilding and shipping center.

Keywords

Shipping Stock Pricing, DC-MSV, Time-Varying Correlation, Volatility Spillover Effect

1. Introduction

1.1. Research Background

A-share investment continued to open to the outside world, especially the interconnection policy, which strengthened the linkage between A-shares, Hong Kong stocks and US stocks, and promoted the global pricing of A-shares. The flow of funds between A-shares and Hong Kong stocks has become an important factor affecting the rise and fall of the stock prices of the two cities, and is an important tracking indicator for investors. However, most AH stocks still have valuation differences. The rise and fall of A-shares and Hong Kong stocks and US stocks are not in sync, and the ups and downs are even more different, indi-

cating that the globalization of A-share pricing is still in the process of gradual progress.

In order to study the globalization of A-share pricing, it is necessary to analyze the linkage relationship between stocks at home and abroad, and the predecessors have done a lot of research on this. The study measures the linkage level of stock markets at home and abroad from the initial static correlation and risk spillover effects [1], turning to dynamic correlation to evaluate the evolution of linkage relationship [2], then analyzes the impact of major investment open policy on the sudden change of linkage structure [3], especially the evolution of the linkage between Shanghai-Hong Kong Stock Connect and Shenzhen-Hong Kong Stock Connect [4], to assess the effectiveness of the policies. But the evolution of the linkage is also affected by multiple factors, for example, global economic crisis [5], A-share stock disaster [6], changes of interest rates and exchange rates [7] etc. These factors affect the global stock market's rise and fall through profit, interest rate, risk appetite and so on. In addition, in order to better fit the linkage relationship, the study shifts from linear to nonlinear [3]; risk spillover effect research shifts from symmetric spillover to asymmetric spillover [8]. In the research object, the main focus is on the linkage between international stock markets [5], the linkage between domestic and overseas stock markets [1], especially the linkage between A-shares and Hong Kong stocks. [7] [9] [10]; the research target shifts from the general index to the industry [9].

1.2. Research Method

In terms of research methods, models such as GARCH, Copula, VAR, and double difference are mainly used. These studies provide useful references for financial market opening, market risk transmission, and global stock investment.

But these studies ignore the underlying causes of global stock market linkages, which can lead to erroneous methods and sample selection. The stock price is determined by the combination of profit and discount rate. The financial capital flow makes the discount rate convergence, thus promoting the stock price linkage. However, the differentiation of earnings may also lead to the weakening of stock price linkage. Therefore, it is necessary to select assets with global profit changes as the research object. At the same time, global capital flows are an expected and gradual process, especially in countries where financial markets are gradually opening up. This has led to a gradual evolution of linkages rather than static or structural abrupt changes. In addition, combined with the price-guided relationship and risk spillover effects, the impact of open investment on A-share pricing can be analyzed and evaluated.

This study selects shipping companies with global convergence (global management, global pricing, high profitability and price), using DC-MSV and GC-MSV models to analyze the price linkage evolution process and risks of A-shares, Hong Kong stocks, and US-related companies. Spillover effect, explore the gradual process of globalization of A-share pricing.

2. Market Characteristics and DC-MSV Model

2.1. Stock Pricing and Model Selection

According to DDM (Dividend Discount Model), stock price (V) is the sum of the dividend (D_t) discounted values. For the shipping industry with strong cycle and the shipping company operating globally, the market freight rate is the same, so the profit changes are similar. In the process of opening up China's capital market, the discount rate (r) of capital requirements at home and abroad converges, leading to the convergence of stock price fluctuations at home and abroad. The formula is as follows:
$$V = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}.$$

The overall earnings changes of listed companies at home and abroad may not converge. As far as the entire market is concerned, there are differences in earnings fluctuations due to the different macroeconomic environment and economic structure. Only when the macro environment changes drastically will earnings changes converge, such as financial crises. As far as the industry is concerned, market fragmentation and trade barriers lead to differences in profitability. Only a few industries with global operations and strong cycles will achieve the same profit, which is the ideal target for studying the global evolution of stock market pricing.

2.2. GC-MSV and DC-MSV Model

Financial markets typically use ARCH and SV models to analyze asset price correlations and risk spillovers. GU & LU [11] has proved DCC-GARCH model can be used in Shanghai, Shenzhen and Hong Kong Stock Information Spillover Effects and Dynamic Correlation. However, the SV model has two random perturbation terms, which is more suitable for volatility than the ARCH model. The multivariate SV model is also more suitable for studying the fluctuation relationship of different assets. SV model was used less due to the difficulties in model estimation. By the applying of MCMC, the problem has been far more improved. DC-MSV model (dynamic condition correlation coefficient MSV model) is the generalization of DCC-GARCH model to SV model. DC-MSV and GC-MSV model (MSV model with Granger causality) [12] are suitable for studying the dynamic correlation of price and volatility spillover effect, and already applied in stock market, futures market and mutual impacted markets.

Considering the gradual process of China's capital market to the outside world, the DC-MSV model is established to study the dynamic correlation between the stock prices of domestic and overseas shipping stocks, to examine the evolution of global pricing; to establish a GC-MSV model, and to examine the static correlation and risk spillover effects of shipping stocks at home and abroad in stages. The wavelet coefficient matrix of the GC-MSV model is introduced into the DCC-MSV model to establish an improved binary DC-MSV model. The

model can simultaneously estimate the Granger causality of the dynamic correlation coefficient and volatility of the sequence as follows:

$$\begin{cases} Y_t = \Omega_t \varepsilon_t \\ h_{t+1} = \mu + \Phi(h_t - \mu) + \eta_t \\ q_{t+1} = \psi_0 + \psi(q_t - \psi) + \sigma_\rho v_t \\ \rho_t = \frac{\exp(q_t) - 1}{\exp(q_t) + 1} \end{cases}$$

wherein, $Y_t = (y_{1t}, y_{2t})$ is a two-dimensional rate of return sequence; $\Omega_t = \text{diag}(\exp(h_t/2))$; $\varepsilon_t \sim i.i.d.N(0, \Sigma_\varepsilon)$ or $\varepsilon_t \sim t(0, \Sigma_\varepsilon, \nu)$, according to the DIC criterion, a distribution hypothesis with a good fitting effect is selected; $\Sigma_{\varepsilon,t} = \begin{pmatrix} 1 & \rho_t \\ \rho_t & 1 \end{pmatrix}$ is a time-varying correlation coefficient matrix, ρ_t indicates dynamic correlation; $h_t = (h_{1t}, h_{2t})$ is a potential volatility sequence; $\mu = (\mu_1, \mu_2)$ is a mean vector of potential volatility equation, $h_0 = \mu$; $\Phi = \begin{pmatrix} \phi_{11} & \phi_{12} \\ \phi_{21} & \phi_{22} \end{pmatrix}$ is a matrix of volatility persistence coefficients, examining volatility persistence and volatility spillover effect; $\eta_t \sim i.i.d.N(0, \Sigma_\eta)$, $\Sigma_\eta = \text{diag}(\sigma_{\eta 1}^2, \sigma_{\eta 2}^2)$ is the covariance matrix of random vector η_t ; q_t represents correlation function, $q_0 = \psi_0$; σ_ρ is the standard deviation of the correlation coefficient, $v_t \sim i.i.d.N(0, 1)$; the constraint to $-1 \leq \rho_t \leq 1$ is done by Fourier transform.

GC-MSV model can be shown as below:

$$\begin{cases} Y_t = \Omega_t \varepsilon_t \\ h_{t+1} = \mu + \Phi(h_t - \mu) + \eta_t \end{cases}$$

wherein, $\Sigma_\varepsilon = \begin{pmatrix} 1 & \rho_\varepsilon \\ \rho_\varepsilon & 1 \end{pmatrix}$ is a covariance matrix, ρ_ε indicates a static correlation.

The parameter estimation methods of the GC-MSV and DC-MSV models include generalized moment estimation method, maximum likelihood estimation method, and Bayesian estimation method. The Bayesian estimation method based on MCMC algorithm has become the mainstream estimation method because of simple programming and high computational efficiency. The MCMC algorithm obtains a complex posterior distribution inference in a high-dimensional parameter space by simulating a Markov chain whose stationary distribution is a posterior conditional distribution approximation. Under weak conditions, the chain converges to its stationary distribution, so the posterior amount can be estimated from the simulated results. According to the method of constructing Markov transfer kernel, MCMC sampling methods include Gibbs sampling, Griddy-Gibbs sampling, Metropolis-Hasting sampling and various mixed sampling methods. In this paper, the MCMC algorithm based on Gibbs sampling is used to estimate the parameters of GC-MSV and DC-MSV models.

3. Empirical Analysis

3.1. Linkage between AH Stock Index and Shipping Stocks

AH stocks are the same companies listed on the mainland and Hong Kong stock markets, with the same earnings and different investors. It is an ideal target for studying the impact of market opening (liquidity flows) on stock prices. The AH stock index was selected, as well as the largest shipping companies in China: AH shares of COSCO Shipping Holding, COSCO Shipping Energy and COSCO Shipping Development. The weekly closing price data of both markets were used to study the stock price fluctuation relationship. The natural logarithmic difference is made to the eight weekly closing price series, and the yield series is obtained and expanded by 100 times, and then the mean value is obtained. The basic statistical characteristics are shown in **Table 1**.

To study the dynamic correlation and volatility spillover effects of AH shares, a DC-MSV model was established. Where ρ_t represents the dynamic correlation coefficient; \varnothing_A , \varnothing_H represent the volatility persistence; \varnothing_{AH} and \varnothing_{HA} represent the volatility spillover effect, respectively. Using Winbugs software and MCMC method to estimate the dynamic correlation and volatility spillover effect of the weekly yield of Hang Seng AH stock index from January 2006 to June 2019, iterative 100,000 times and burn the first 10,000 times. **Table 2** shows some of the parameters estimation results. The MC error of all models is much smaller than the standard error, indicating that the parameter estimation results converge. The edge posterior distribution kernel density estimation curves of each parameter are smooth and have obvious single-peak symmetry characteristics, indicating that the error of the parameter Bayesian estimation value is small.

Table 1. AH stock index and basic statistical characteristics of weekly yields of AH shares of three shipping companies.

Name	Mean Value	SD	Skewness	Kurtosis	J-B Probability
AH Stock Index A	0.00	4.15	-0.21	6.19	0.00
AH Stock Index H	0.00	3.70	-0.03	5.46	0.00
COSCO Shipping Energy A	0.00	6.27	0.09	9.39	0.00
COSCO Shipping Energy H	0.00	7.21	-0.12	6.37	0.00
COSCO Shipping Development A	0.00	6.02	0.57	6.81	0.00
COSCO Shipping Development H	0.00	7.41	0.02	6.73	0.00
COSCO Shipping Holding A	0.00	6.95	0.39	7.97	0.00
COSCO Shipping Holding H	0.00	8.30	-0.1	9.07	0.00

Source: The weekly closing price data of both markets and weekly yields of AH shares of three shipping companies from January 2006 to June 2019.

Table 2. Parameter prior distribution and parameter estimation results of DC-MSV model of Hang Seng AH stock index yield.

Parameter	Prior Distribution	Mean Value	SD	MC Error	Confidence Interval (2.5%, 97.5%)
μ_S	N(0, 25)	0.4802	0.1682	0.0047	(0.1509, 0.8093)
μ_E	N(0, 25)	0.0007	0.1744	0.0048	(-0.3402, 0.3433)
\varnothing_A	beta(20, 1.5)	0.9461	0.0266	0.0015	(0.8686, 0.9802)
\varnothing_H	beta(20, 1.5)	0.9642	0.0249	0.0013	(0.8999, 0.9959)
\varnothing_{AH}	N(0, 0.1)	0.0969	0.0457	0.0025	(0.038, 0.2224)
\varnothing_{HA}	N(0, 0.1)	0.0748	0.0543	0.0028	(0.0060, 0.2157)

Source: Weekly yield of the weekly yield of Hang Seng AH stock index from January 2006 to June 2019.

Using Winbugs software and MCMC method to analyze the weekly yield of COSCO Shipping Energy AH shares from June 2002 to June 2019, and the yield of AH shares from COSCO in December 2007-2019, July-20-19, 2007 In June, the dynamic correlation and volatility spillover effect of COSCO Shipping Holding AH stocks yields were iterated 100,000 times and burn the first 20,000 times. Some parameter estimation results are shown in **Table 3**. All model parameter estimation results converge, and the error of the parameter Bayesian estimation value is small.

3.2. Linkage between a Stock and Foreign Shipping Stocks

To study the globalization of A-share pricing, it is necessary to study the relationship between A-shares and foreign countries. In order to reduce the impact of research company differences on stock price fluctuations, shipping companies with global management, global pricing, profitability and price are selected as the research targets: COSCO Shipping Holding, COSCO Shipping Development, OOCL and Maersk as the carrier, COSCO Shipping Energy can be used as a bulk carrier with Star Bulk, China Merchants Steamship (China Merchants Energy) and Frontline as oil carriers, respectively analyzing the stock price linkage relationship and risk spillover effects. The natural logarithmic difference is made to the weekly closing price series, and the yield series is obtained and expanded by 100 times, and then the mean value is obtained. The basic statistical characteristics are shown in **Table 4**.

The DC-MSV model is established respectively, ρ_t represents the dynamic correlation coefficient, $\varnothing_A, \varnothing_F$ respectively represent the volatility persistence; $\varnothing_{AF}, \varnothing_{FA}$ represent the volatility spillover effect, respectively. Using Winbugs software and MCMC method to analyze the dynamic correlation and volatility spillover effects of representative shipping companies at home and abroad (the same time in the main business), iterative 100,000 times, burn the first 20,000 times, some parameter estimation results are shown in **Table 5**. All model parameter estimation results converge, and the error of the parameter Bayesian estimation value is small.

Table 3. Parameter prior distribution and parameter estimation results of DC-MSV model of Shipping AH stocks yields.

Object	Parameter	Prior Distribution	Mean Value	SD	MC Error	Confidence Intervals (2.5%, 97.5%)
Cosco Shipping Energy AH	\varnothing_A	beta(20, 1.5)	0.9627	0.0173	0.0001	(0.9189, 0.9872)
	\varnothing_H	beta(20, 1.5)	0.9791	0.0082	0.0000	(0.9609, 0.9932)
	\varnothing_{AH}	N(0, 0.1)	0.0640	0.0303	0.0015	(0.0213, 0.1405)
	\varnothing_{HA}	N(0, 0.1)	0.0463	0.0182	0.0001	(0.0148, 0.0864)
Cosco Shipping Development AH	\varnothing_A	beta(20, 1.5)	0.8912	0.0498	0.0027	(0.7743, 0.9649)
	\varnothing_H	beta(20, 1.5)	0.9579	0.1857	0.0032	(0.9004, 0.992)
	\varnothing_{AH}	N(0, 0.1)	0.1884	0.0872	0.0047	(0.0589, 0.39)
	\varnothing_{HA}	N(0, 0.1)	0.0912	0.0519	0.0025	(0.0147, 0.2161)
Cosco Shipping Holding AH	\varnothing_A	beta(20, 1.5)	0.8103	0.0603	0.0035	(0.6725, 0.919)
	\varnothing_H	beta(20, 1.5)	0.8925	0.0572	0.0031	(0.7574, 0.9811)
	\varnothing_{AH}	N(0, 0.1)	0.3608	0.1162	0.0067	(0.1515, 0.62)
	\varnothing_{HA}	N(0, 0.1)	0.2193	0.1229	0.0067	(0.0342, 0.5158)

Source: Weekly yield of COSCO Shipping Energy AH shares from June 2002 to June 2019, and the yield of AH shares from COSCO in December 2007-2019, July-20-19, 2007 In June.

Table 4. Basic statistical characteristics of weekly yields of representative domestic and foreign shipping stocks.

Company Name	Mean Value	SD	Skewness	Kurtosis	J-B Probability
Cosco Shipping Development A	0.00	6.52	0.75	5.87	0.00
Cosco Shipping Holding A	0.00	5.73	-0.05	6.95	0.00
OOCL	0.00	6.68	0.03	4.91	0.00
Maersk B	0.00	5	0.28	6.89	0.00
Cosco Shipping Energy A	0.00	6.90	-0.05	7.89	0.00
Star Bulk	0.00	8.4	-0.18	9.23	0.00
China Merchant Steamship	0.00	5.56	0.34	6.47	0.00
Frontline	0.00	9.17	-0.55	13.17	0.00

Source: Weekly yields of 8 shipping companies from January 2006 to June 2019.

3.3. Dynamic Correlation Analysis

AH stock pricing is gradually getting in line. According to the DC-MSV model parameter estimation results, the dynamic correlation coefficient of the AH stock index return rate is shown in **Figure 1**. The correlation coefficient of AH shares is between 0.4 and 0.9, indicating that there is a strong positive correlation. The correlation coefficient shows an upward trend, indicating that A-share pricing is gradually aligning with Hong Kong in **Figure 1**.

The correlation coefficient is on the rise and is closely related to economic

Table 5. Parameter prior distribution and parameter estimation results of DC-MSV model for shipping AH stock yield.

Object	Parameter	Mean Value	SD	MC Error	Parameter	Mean Value	SD	MC Error
Cosco Shipping Development and OOCL	\varnothing_A	0.9634	0.0214	0.0010	\varnothing_{AF}	0.0706	0.0415	0.0019
Cosco Shipping Development and Maersk	\varnothing_F	0.9694	0.0155	0.0006	\varnothing_{FA}	0.0604	0.0315	0.0013
Cosco Shipping Holding and OOCL	\varnothing_A	0.9485	0.0373	0.0018	\varnothing_{AF}	0.1149	0.0823	0.0041
Cosco Shipping Holding and Maersk	\varnothing_F	0.9580	0.0229	0.0010	\varnothing_{FA}	0.0730	0.0410	0.0019
Cosco Shipping Energy & Star Bulk	\varnothing_A	0.9736	0.156	0.0004	\varnothing_{AF}	0.0384	0.0365	0.0008
China Merchant Steamship & Frontline	\varnothing_F	0.9722	0.16	0.0005	\varnothing_{FA}	0.0408	0.0263	0.0006
	\varnothing_A	0.9216	0.0462	0.0016	\varnothing_{AF}	0.1439	0.0969	0.0034
	\varnothing_F	0.8890	0.0448	0.0024	\varnothing_{FA}	0.2222	0.0882	0.0048
	\varnothing_A	0.9945	0.0037	0.0010	\varnothing_{AF}	0.0092	0.0068	0.0002
	\varnothing_F	0.9842	0.0071	0.0003	\varnothing_{FA}	0.0365	0.0154	0.0006
	\varnothing_A	0.9825	0.0079	0.0003	\varnothing_{AF}	0.0235	0.0115	0.0004
	\varnothing_F	0.9912	0.0043	0.0002	\varnothing_{FA}	0.0251	0.0118	0.0004

Source: Weekly yields of 8 shipping companies from January 2006 to June 2019.

**Figure 1.** The dynamic correlation of the AH stock index is on the rise.

linkage, risk transmission and capital flow. On the one hand, global economic cycle convergence and risk contagion have increased correlations, such as the global economic boom in 2006 pushed the stock market into a bull market, the 2008 subprime crisis led to a global stock market crash, China's 4 trillion investment in 2009 and the US QE boosted global stock market rebound. On the

other hand, the opening of A-share investment has increased the correlation. For example, in 2006, the threshold for QFII investment was lowered. At the end of 2012, the RQFII quota increased from 70 billion yuan to 270 billion yuan. In 2013, the QFII quota increased from 80 billion US dollars to 150 billion US dollars. In 2014, Shanghai-Hong Kong Stock Connect was opened, 2016 Shenzhen-Hong Kong Stock Connect was opened, RQFII was increased to 500 billion yuan in 2017, and A-shares were included in the MSCI index in 2018.

The relationship shows staged fluctuations and is related to domestic economic and financial policies. For example, at the end of 2008, China launched a 4 trillion investment plan. The A-shares rebounded first and led to a decline in correlation. In 2011-2013, China's monetary tightening and economic downturn weakened the correlation. In 2015, A-share financing and securities lending pushed the bull market, and the correlation weakened. The AH fluctuation correlation of the three shipping companies shown in **Figure 2** is also on the rise, and the AH stock pricing is gradually getting in line. A-share shipping stocks are dominated by retail investors, with high valuations and lack of short-selling mechanisms, resulting in a low correlation between AH stocks. However, after the interconnection of the mainland and Hong Kong stock markets in 2014 and 2016, the correlation increased significantly.

In **Figure 3**, the dynamic correlation between A-share container shipping stocks, there is no upward trend in the correlation between A-shares and overseas shipping stocks. In the transportation sector, the dynamic relationship among COSCO Shipping Development before the reorganization with OOCL and Maersk has not been improved. Neither the dynamic relationship among COSCO Shipping Holding after the reorganization with OOCL and Maersk.

In the bulk sector, the correlation between COSCO Shipping Development and Star Bulk, which is shown in **Figure 4** either representative domestic and foreign companies, has not improved. In terms of oil transportation, the correlation between the representative domestic and foreign companies, the China Merchant Steamship and Frontline has not increased. This is related to the inability

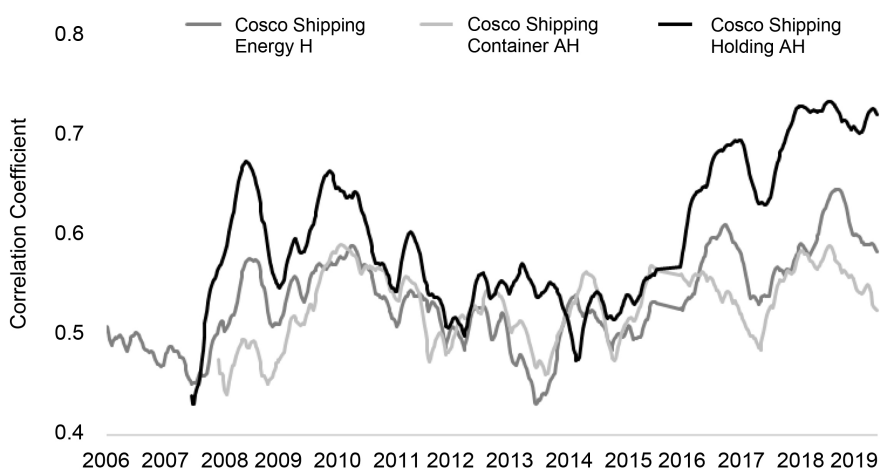


Figure 2. The dynamic correlation of shipping AH shares rises in stages.

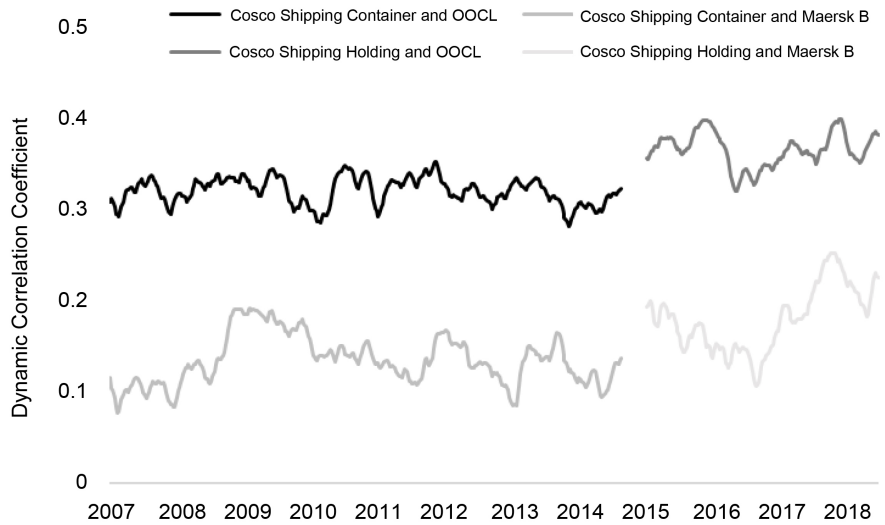


Figure 3. Dynamic correlation between A-share container shipping stocks and overseas container shipping stocks.

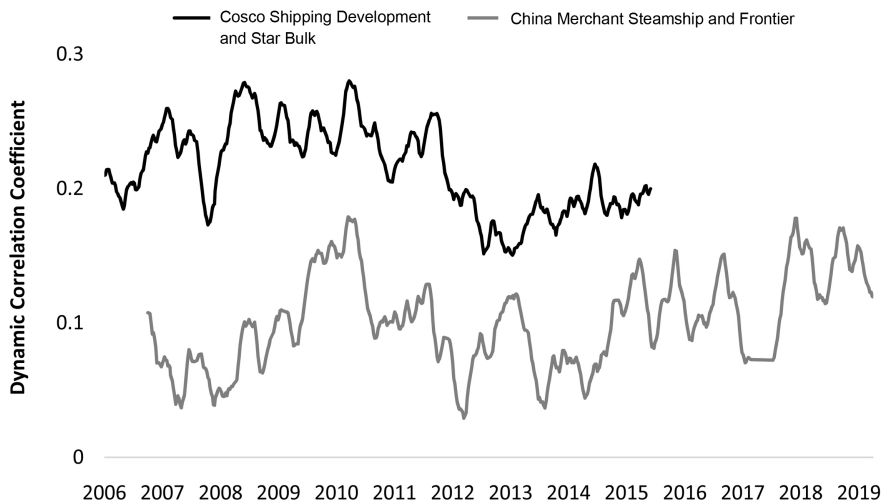


Figure 4. Dynamic correlation of stock returns between domestic and foreign bulk shipping companies and oil shipping companies.

of free flow of cross-border equity investment funds. The linkage between A shares and Hong Kong stocks is obviously stronger than the linkage between A shares and foreign companies.

The linkage between A-shares and Hong Kong stocks is stronger than the linkage between A-shares and foreign shipping stocks. The linkage of AH shares is the strongest, on the one hand because the companies of the two companies are identical, and on the other hand, because the investment in AH shares has been interconnected. The A-share and Hong Kong stocks are the second-best, because despite the interconnection, the underlying companies are different, and investors' risk preferences are different. A-shares have the lowest correlation with foreign stock markets because of differences in companies, limited financial flows, and different risk preferences.

China should continue to expand its capital market to the outside world and enhance the global pricing power of shipping stocks. China's cargo shipping volume and shipping capacity have ranked first in the world, but the pricing power of the shipping market has not matched it. From the perspective of the interconnection between the mainland and Hong Kong stock markets, the pricing power of shipping stocks is in A-shares and affects the pricing of H-shares. In the future, China should expand its open capital market and globalize the pricing power of shipping A-shares.

3.4. Analyses on Volatility Spillover Effects

The spillover effects between AH stocks index and three sample shipping companies in A/H stocks are shown in **Table 6**. The risk spillover effects of AH stocks are relatively weak, and A shares are mainly spilled into H shares. The risk spillover effect of the AH stock index is less than 0.1, indicating that the risk transmission in the two cities is small. The risk spillover effect of shipping AH shares was the highest in Cosco Shipping Holding, followed by Cosco Shipping Development and Cosco Shipping Energy. The A-share yield is the Granger causality of the H-shares, and the risk spillover of the A-shares to the H-shares is higher than the risk spillover of the reverse, indicating that the pricing power of the shipping stocks is mainly in the A-shares.

The correlation of AH stocks index and three sample shipping companies in A/H stocks are shown in **Table 7**. The correlation of AH stock price has increased significantly, indicating that the international pricing of A-shares has increased. A GC-MSV model was established for the AH stock returns in 2008 and 2018 to study the changes in risk correlation and volatility spillover effects. It is found that from 2008 to 2018, the correlation between AH stock index and

Table 6. Risk spillover effect of AH stock index and shipping AH stocks.

Risk Spillover Direction	AH Stock Index	Cosco Shipping Holding	Cosco Shipping Development	Cosco Shipping Energy
A→H	0.0969	0.3608	0.1884	0.0640
H→A	0.0748	0.2193	0.0912	0.0463

Table 7. Static correlation and risk spillover effects of AH index and shipping AH shares in 2008 and 2018.

Static Correlation	AH stock index		Cosco Shipping Holding		Cosco Shipping Energy		Cosco Shipping Development	
	2008	2018	2008	2018	2008	2018	2008	2018
	0.6216	0.8392	0.6521	0.7875	0.6178	0.7649	0.3004	0.7095
Risk Spillover Effects	A→H	H→A	A→H	H→A	A→H	H→A	A→H	H→A
2008	0.27	0.01	-0.02	0.26	0.02	0.21	-0.05	0.11
2018	0.04	0.07	0.12	-0.08	0.00	0.12	0.22	0.00

shipping AH stocks has been significantly enhanced, and A shares are Granger reasons, indicating that the influence of A-share pricing on H-shares is enhanced; the risk of A-share index to H-share index. The spillover effect is weakened and the reverse is enhanced, indicating that the overall risk pricing ability of H-shares is enhanced. Cosco Shipping Holding and Cosco Shipping Development shifted from H-share to A-share risk, and changed from A-share to H-share risk spillover, indicating that shipping A-shares became the dominant market for risk pricing.

Risk spillover effects of domestic and foreign representative shipping stocks are shown in **Table 8**. The risk spillover effects of domestic and foreign shipping stocks are still weak. The correlation between shipping stocks at home and abroad is low, and the risk spillover effect should also be weak. Among them, Cosco Shipping Holding's risk spillover effect is relatively strong, and it is related to Cosco Shipping Holding's restructuring at the end of 2015.

3.5. Results of Analysis

The four sections of this chapter have studied the relationship between the AH market and shipping stocks, the impact of the linkage between the A-share market and the H-share market itself, the relationship between A-share shipping stocks and the same company in the H-share market, Similar correspondence between foreign shipping stocks.

The first section is to study the volatility spillover effect between the AH market and shipping stocks, that is, the impact on the latter's risk. It turns out, the dynamic correlation between AH stock index and shipping AH stocks is on the rise, which is gradually opening to A-share investment.

The second section compares the sensitivity of A-share and H-share markets to stock price fluctuations. However, the correlation between A-shares and overseas shipping stocks has not increased, which is related to the restriction of domestic and foreign stock investment.

The third section compares the performance of the shares of the same company in A shares and H shares, and explores the effect of the A-share market and H share market on the same company's performance feedback to the stock price, as well as the degree of influence of between the performance and stock price of shipping companies of different business types. It turns out that the A-share yield is the Granger causality of H-shares, and the risk spillover effect is higher. The pricing power of shipping stocks is mainly in A share.

Table 8. Risk spillover effects of domestic and foreign representative shipping stocks.

Risk Spillover	Cosco Shipping Holding → Maersk	Cosco Shipping Development → Maersk	Cosco Shipping Development → OOCL	Cosco Shipping Holding → OOCL	China Merchant Steamship	Cosco Shipping Energy → Star Bulk
Forward	0.1439	0.1149	0.0706	0.0384	0.0235	0.0092
Reverse	0.2222	0.0730	0.0604	0.0408	0.0251	0.0365

The last section is to compare the stock price of A-share shipping stocks with similar overseas shipping companies, and study the impact of different performance of several different types of shipping companies in the same period on stock price. It was shown that A shares are quite strong and have a positive impact to shipping companies comparing to similar companies abroad. Thus, A shares should be further opened for investment, making China a global shipping asset pricing center after the global shipbuilding and shipping center.

4. Conclusions

In order to study the globalization of A-share pricing, the DC-MSV and GC-MSV models were established to analyze the dynamic correlation and risk spillover effects of the stock prices of domestic and overseas companies in the process of opening up China's capital market. The MCMC algorithm is used to empirically study the share price data of AH shares and domestic and foreign shipping stocks. According to the results of analysis in chapter 3, it is found that: First, the dynamic correlation between AH stock index and shipping AH stocks is on the rise, which is gradually opening to A-share investment. Secondly, the correlation between A-shares and overseas shipping stocks has not increased, which is related to the restriction of domestic and foreign stock investment. Third, the A-share yield is the Granger causality of H-shares, and the risk spillover effect is higher. The pricing power of shipping stocks is mainly in A-shares. Fourth, A-shares should be further opened for investment, making China a global shipping asset pricing center after the global shipbuilding and shipping center.

Considering the above four results, we can further conclude that the investment of A-share shipping stocks does not need to pay too much attention to the rise and fall of the corresponding H-shares and foreign shipping stocks. Instead, when investing in shipping H-shares, considering the greater pricing power of A-shares, it is necessary to track the corresponding A-share ups and downs in time to help infer the trend of H-shares.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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