Shipping Market Valuation and BDI Analysis under COVID-19

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Abstract. Contemporarily, COVID-19 as a major "Black swan" event strong affected the trade and shipping industry. Meanwhile, its continuous spread in the global scope has impacted the international shipping market, and the market value of some domestic shipping companies has also shown a downward trend. This paper adopts dual-line parallel research based on ROE DuPont analysis, CAPM and DDM model to analyze the market value of some shipping companies, and using Eviews regression model to analyze the Baltic Dry Index (BDI). According to analysis, COVID-19 has had a certain negative impact on the valuation of shipping companies. Due to the changes of the epidemic situation, the market valuation of shipping companies is still full of uncertain factors. Moreover, there is a certain degree of negative correlation between COVID-19 and BDI index, which will diminish with the improvement of the epidemic situation. The change of COVID-19 situation has become one of the important factors to judge the trend of BDI index. These results shed light on guiding further exploration of the future market valuation of shipping companies and the judgment of BDI index to some extent.

Keywords: COVID-19; Shipping market; BDI.

1. Introduction

On 11 March 2020, recognizes COVID-19 is recognized as a global pandemic by WHO. As a major "Black swan" incident, it has had a great impact on the global economy, trade and other aspects. Meanwhile, its continuing spread around the world has impacted the international shipping market. Under the impact of COVID-19, China has introduced a series of relevant policies to strengthen customs control and limit shipping volume, which has severely hindered the development of the shipping market and caused a declining trend of the market value of shipping companies.

Zhang et al. believed that the world economy and trade were greatly affected by the COVID-19 epidemic, especially the shipping industry [1]. It is concluded that Baltic Dry Index (BDI) can be regarded as a strong indicator for evaluating the extent of COVID-19. As for the relationship between oil price and BDI, Chen et al. concluded through research that oil price increase has a significant impact on BDI index growth [2]. Dai, Liang and Yang, Ge all selected Baltic Dry Index (BDI) as an indicator representing the operation of the dry bulk transportation market [3,4]. At the same time, the impact of COVID-19 on the dry bulk shipping market was explored by combining with the international crude oil price, where a strong effect of pandemic is observed. According to Li and Qin [5], under the influence of COVID-19, Chinese shipping enterprises have faced a series of problems, such as high risk of infection of shipping workers, tight supply of ship materialsand impact of traditional shipping model. In order to ensure the normal operation of the shipping market, he proposed the use of internal control mechanism combined with electronic equipments. Dai and Liang believed that the impact of COVID-19 on the international shipping market was reflected in both supply and demand sides [3]. According to Hu [6], the global container shipping market is under severe pressure due to the congestion of global ports under the background of COVID-19. Nowadays, port congestion in the United States and Europe has been alleviated in part by lower volumes.

Following previous literature, the purpose of our study is to improve the impact of COVID-19 on the shipping industry. With this in mind, this article investigates the impact of COVID-19 based on the Baltic Dry Index (BDI) and international shipping market valuation in the context of COVID-19. By using model constructed by Eviews to study BDI index and DDM (Dividend Discount Model) to carry out company valuation to analyze and discuss the impact of COVID-19 on shipping, including elaboration, regression analysis, focusing on supply-side impact, and forecast shipping market conditions under the COVID-19 epidemic in the future. The rest part of the paper is organized as follows. The Section 2 will introduce data and method used. The Section 3 will introduce how to analyze the BDI index. The Section 4 will introduce how to analyze shipping market valuation. Eventually, a brief summary will be given in Section 5.

2. Data

2.1 Data

The data used in this article are mainly from Clerkons, Clerkons Shipping, the website of the World Health Organization and NetEase Finance. In terms of data selection, BDI is chosen to reflect the fluctuation of the international dry bulk shipping market. The most intuitive data, i.e., the quantity of infections for COVID-19 worldwide was chosen as the feature evaluating the extent of the pandemic. In the meantime, other factors affecting BDI should also be considered, including EBSP and crude oil prices. For company valuation, the sales revenue, net profit and total assets of three shipping companies, namely Straits Shipping, Ningbo Shipping and Zhonghaihigh, are mainly selected for valuation analysis. Weekly data was selected, and the sample interval of regression analysis was from the fourth week of December 2019 to the second week of July 2022. The data for valuation analysis are mainly from 2018 to 2021.

2.2 Method

The Method includes BDI index analysis using Eviews software and company valuation analysis based on DDM model. In order to reduce the volatility of weekly frequency datasets, the logarithm of BDI, EBSP and COVID-19 data were respectively processed, i.e., lnBDI, lnCOVID and lnEBSP. Considering variable correlation factors, lnBDI and lnCOVID were treated with first-order difference, and variables GBDI and GCOVID were constructed to represent the growth rate of BDI and the growth rate of the global number of COVID-19 cases, respectively. The formulae of the model are given as follows:

$$GBDI = dlnBDI \tag{1}$$

$$GCOVID = dlnCOVID \tag{2}$$

Taking spot BDI index growth rate as the dependent variable, spot international crude oil price and COVID-19 global confirmed cases growth rate as independent variables, to explore the impact of spot COVID-19 epidemic, and analyze the impact of spot COVID-19 epidemic on BDI index. In this case, the basic equations for the analytical model can be described as:

$$GBDI = C1lnEBSP + C2GCOVID + C3 \tag{3}$$

Here, C1, C2 and C3 are the coefficients of each variable.

In this paper, DDM model is used to analyze the valuation of three shipping companies, Hainan Strait Shipping Co., Ltd (002320), Ningbo Marine Company Limited (600798) and COSCO SHIPPING Specialized Carriers Co., Ltd (600428). DDM model is one of the income method valuation models, namely dividend discount model. This paper adopts the fixed dividend growth discount model (Gordon model), which means that the dividend growth rate is assumed to be fixed. Based on the above assumptions, we can obtain the formula of the constant growth model:

$$V_0 = \frac{D_1}{k-g} \tag{4}$$

In this formula, g is dividend growth rate; k is the cost of equity investment; D_1 is the next dividend; V_0 is the intrinsic value of the current period.

3. BDI analysis

The same approach was utilized to construct a model to estimate the long-term effect of COVID-19 on the international dry bulk shipping market. Taking spot BDI index growth rate as the dependent variable, spot international crude oil price and COVID-19 global confirmed cases growth rate as independent variables, to explore the impact of spot COVID-19 epidemic, and analyze the impact of spot COVID-19 epidemic on BDI index. The basic regression model was established as shown in Eq. (3). The fitting reports are summarized in Table 1. The associated probability of each factor of the regression equation is significant, and the overall regression effect of the model is significant. The regression model can be described as:

$$GBDI = 0.1109 - 0.0246\, LNEBSP - 0.0389\, GCOVID \quad (5)$$

Table 1. The results of spot regression model.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.110949	0.110387	1.005089	0.3167
LNEBSP	-0.024599	0.026565	-0.926009	0.3562
GCOVID	-0.038941	0.019644	-1.982295	0.0496

By observing the results of regression model, there is a negative relationship between the growth rate of the global number of COVID-19 cases and the growth rate of BDI. It is specifically reflected in that the growth rate of BDI decreases by about 0.04 units when the growth rate of the global number of COVID-19 cases increases by 1 unit. In other words, the COVID-19 epidemic has a certain inhibitory effect. The relationship between the international crude oil price and the growth rate of BDI in the same period is negative. For every 1 unit of oil price increase of international crude oil price, the growth rate of BDI decreases by about 0.0246 units in the same period. In other words, in the long run, the impact of COVID-19 will be less severe than at the beginning as the epidemic progresses. There has also been some decline in correlation.

4. Shipping market valuation analysis

4.1 Dividend growth rate (g)

Dividend growth rate is the ratio of dividend growth in the current year over dividend growth in the previous year. The formula is in the following:

$$g = ROE \times b \quad (6)$$

Here, ROE is the return on equity (ROE), namely the return on net assets, which reflects the efficiency of the company's operation. b is retained earnings ratio (profit reinvestment rate). Return on equity which is also known as net interest rate on equity is an important data to evaluate a company's operating and financial performance. It is a relatively comprehensive index. Its decomposition formula is in the following:

$$ROE = net\ profit\ margin \times \text{capital turnover} \times \text{equity multiplier} \quad (7)$$

The decomposition of return on equity comprehensively links the operating efficiency, the use efficiency of assets and the financial leverage of an enterprise in a certain period, constituting a complete financial analysis system. The ROE decomposition data of the three companies selected in this paper are listed in Tables 2-4.

We use DuPont analysis to explain the profitable business model of the enterprise, which divided into high profit, high turnover, high leverage or a combination of the three. Firstly, the above shipping companies are not banks and other financial industries and do not rely on high leverage to make profits, so their equity multipliers are all low. Secondly, they have similar operating models and therefore reflect similar capital turnover values. On the premise that these two data are similar, the net profit rate on sales is an important influencing factor, which can evaluate the level of sales revenue of an enterprise over a period of time. Generally speaking, the higher the net profit rate on sales, the stronger the profitability of the enterprise.

Table. 2 DuPont Analysis Table for Hainan Strait Shipping Co., Ltd (002320)

year	Net profit margin	Capital	Equity	ROE
2018	31.79%	0.09	1.11	3.18%
2019	30.44%	0.09	1.09	2.98%
2020	26.47%	0.07	1.07	1.98%
2021	33.06%	0.08	1.07	2.84%

Table. 3 DuPont Analysis Table for Ningbo Marine Company Limited (600798)

year	Net profit margin	Capital	Equity	ROE
2018	5.53%	0.07	1.83	0.71%
2019	6.56%	0.07	1.62	0.75%
2020	- 7.99%	0.05	1.54	- 0.61%
2021	9.54%	0.07	1.45	0.97%

Table. 4 DuPont Analysis Table for COSCO SHIPPING Specialized Carriers Co., Ltd (600428)

year	Net profit margin	Capital	Equity	ROE
2018	1.21%	0.08	2.17	0.21%
2019	1.58%	0.09	2.22	0.32%
2020	0.23%	0.09	2.27	0.05%
2021	1.38%	0.07	2.28	0.22%

According to the data, the net profit rate on sales of Straits Holdings is far higher than that of the other two companies, which is largely due to the fact that the main business of Straits Holdings is different from other companies in terms of the tourist passenger route from Haikou to Xisha. The positive impact of tourism obviously cannot be ignored. The tourism passenger routes of Straits Stock will also bring corresponding negative effects when affected by the COVID-19 epidemic. Overall, in 2020, the net profit margin on sales of all shipping companies decreased compared with previous years due to the outbreak of the new champions league, ROE value in these shipping companies is also markedly reduced. As shown in Figure 1, the ROE value in Hainan Strait Shipping Co., Ltd and Ningbo Marine Company Limited drops obviously, the latter is even negative. It follows that the COVID-19 epidemic has a significant negative impact on the shipping industry.

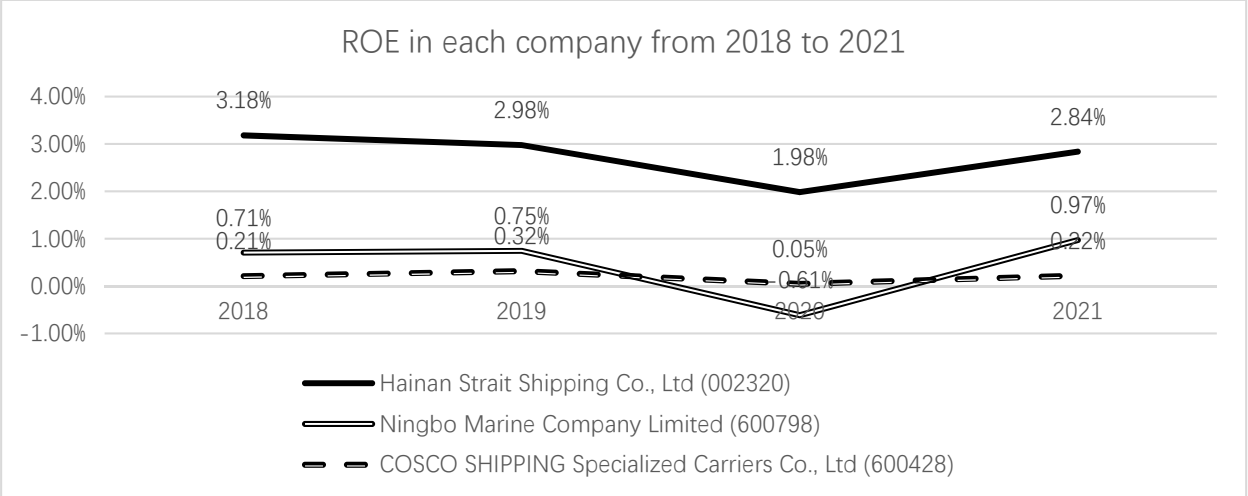

Fig. 1 ROE of each company from 2018 to 2021

The retained earnings ratio is the reinvestment rate and has the following formula:

$$b = 1 - \frac{dividend\ per\ share}{earnings\ per\ share} \tag{8}$$

Based on the above data and formula, the dividend growth rate can be finally obtained as shown in Table 5.

Table. 5 Dividend Growth Rate by Company from 2018 to 2021 (G)

year	Hainan Strait	Ningbo Marine	COSCO
2018	0.02	0.02	0.01
2019	0.04	0.01	0.01
2020	0.04	0.01	0.01
2021	0.04	0.02	0.01

4.2 Cost of equity investment (k)

Generally, CAPM model can be described as:

$$E_{ri} = r_f + \beta_{im}(E_{rm} - r_f) \quad (9)$$

In this formula, r_f is the risk-free rate of return, E_{rm} is the market interest rate, and β_{im} is the risk coefficient. In this paper, the risk-free rate of return is replaced by the yield of 10-year government bonds in China, which is valued as $r_f = 3.14\%$. β_{im} which is the risk coefficient is adjusted by 60 months relative to Shanghai stock exchange, and it is valued as $\beta_{im} = 1.35$. In addition, the average market return is the 10-year average return of Shanghai and Shenzhen index, which is valued as $E_{rm} = 4.62\%$. Therefore, $k = E_{ri} = 5.14\%$ is obtained by the CAPM model.

4.3 Final Valuation (V_0)

In this paper, the data were divided into 2018-2019 and 2020-2021 groups for comparative valuation analysis. According to the above data, different estimates before and after the epidemic were finally obtained for the two groups, namely V_a and V_b. The results are summarized in Table 6. According to the results, the valuation of the three shipping companies after the epidemic showed a downward trend compared with that before the epidemic, which indicates that they were all negatively affected by the epidemic.

Since 2021, the return on equity of the three shipping companies has recovered due to the effective control of the domestic epidemic caused by the unified deployment of vaccination according to the country. However, the overseas epidemic situation is still severe. The COVID-19 variants such as Delta and Omicron have rapid transmission, high pathogenic rate and strong occult, and the number of infected cases has shown exponential growth, which has further worsened the global epidemic. In particular, since the beginning of 2022, a new round of outbreaks has been sporadic in many parts of the country, and a large number of asymptomatic infections have emerged in this round of epidemic. There are still many uncertainties about how long the COVID-19 epidemic, which has lasted for nearly three years, will continue to last. Owing to the continuous impact of COVID-19, the shipping market at home and abroad will be affected accordingly, and the market value of shipping companies will also be subject to corresponding fluctuations. Therefore, the forecast of the future valuation of shipping companies is also uncertain.

Table. 6 Comparison of estimates before and after the epidemic

The company	V_a	V_b
Hainan Strait Shipping Co., Ltd (002320)	12.22	11.95
Ningbo Marine Company Limited (600798)	1.65	1.53
COSCO SHIPPING Specialized Carriers Co., Ltd (600428)	0.44	0.40

5. Limitations & Future prospects

On this basis, this study has some limitations. Primarily, ascribed to the impact of COVID-19, countries have restricted import and export and strictly controlled customs, which has had a negative impact on shipping. For instance, the business orders of shipping enterprises have further declined due to the COVID-19 [7]. Secondly, during this period, the global economic development was not clear, the shipping market was jolted, and the global inflation became more and more serious, which also affected the research and analysis. Currently the global economy recovers with higher performance of the international dry bulk shipping market than that of the previous year, which means

that shipping market expectation rises [8]. Not only does COVID-19 affect the shipping market but the shipping market also affects COVID-19 [9]. In addition, this study also ignores the influence of other variables on the analysis. For example, the shipping market valuation is also affected by the internal operation of shipping companies, and the BDI index is also affected by the import and export policies of shipping countries. Although shipping has been negatively affected by COVID-19, the shipping market will be less and less affected by COVID-19 in the future. In addition, in some countries, COVID-19 policies have been completely cancelled, and some countries have cancelled policies restricting import and export. On the other hand, technology is becoming more developed, route planning is becoming more mature, and the cost of shipping is gradually decreasing. Only by deeply understanding the changes of the economic environment and making progresses, shipping enterprises can achieve better development as described [10]. Meanwhile, countries that rely on import and export trade will promote the recovery of the shipping market. This is because in the post-pandemic era, it is more likely to become a booster for the recovery of the shipping market on account of the demand to restore the gross economic product. Finally, the current international situation is unstable. If there is a war in the future, it may lead to chaos in the international situation, which may have an impact on the trend prediction of international oil price in the future, and thus have an impact on the international shipping market.

6. Conclusion

In summary, this paper investigates the market value of some shipping companies and the Baltic Dry Index (BDI) based on DDM model and Eviews regression model respectively. COVID-19 has had a certain negative impact on the valuation of shipping companies. The market valuation of shipping companies is still full of uncertainties owing to changes in the pandemic situation, i.e., whether there will be another outbreak in the future and how long it is likely to last. With the development and maturity of medical technology, whether the epidemic can be completely controlled. With the adjustment of macro policies, whether the domestic and foreign shipping markets will be affected accordingly, and whether the market value of shipping companies will be subject to corresponding fluctuations. Therefore, the forecast of shipping company's future valuation still has a lot of uncertainty. Besides, there is a certain degree of negative correlation between COVID-19 and BDI index, which will weaken with the improvement of the epidemic situation. The change of COVID-19 situation becomes one of the important factors to judge the trend of BDI index. Furthermore, if the "Black swan" event similar to COVID-19 happens again, this study has a certain degree of continuity significance in judging the future market valuation of shipping companies and the trend of BDI index. Nevertheless, there is a lot of uncertainty about the impact of national policies and other variables. In the future, the development of global economy and shipping industry remains unclear. These results offer a guideline for the future market valuation of shipping companies and the judgment of BDI index.

References

[1] Zhang Y F, Gong J Y, Yin M. Influence of COVID-19 epidemic on China's port and shipping industry and Its Countermeasures. 2020, 20(03):159-167.

[2] Chen L F et al. Correlation analysis of dry bulk freight price and fuel price based on SVAR model. Journal of Dalian Maritime University. Journal of Dalian Maritime University, 2016, 42(4): 19-124.

[3] Dai T L, Liang J. Short term impact of novel coronavirus pneumonia on international dry bulk shipping market. 2021, 21 (13): 5556-5562. Retrieved from: https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2021&filename=KXJS202113051&uniplatform=NZKPT&v=93TFaYe4q62fs1B4Z6f4dbZh1gZvgQXgBiK4b1wSxpBgdDkNamMZXuR6BTV_6Qvr

[4] Yang J L, Ge Y E. Meeting of the water transport department of the world Transportation Conference in 2021. Analysis of the spillover effect of COVID-19 on the shipping market based on VAR model. Journal of Shanghai Maritime University 2021,42(03): 59-64.

[5] Li C, Qing C F. Analysis on the influence of COVID-19 on the internal control of shipping enterprises and Countermeasures. China water transport 2022,22(05): 11-12.

[6] Hu, H Q et al. The dry bulk shipping market is developed first and then restrained. China Aviation weekly 2022(27): 29-31.

[7] Wang J Y. Analysis on the impact of the worldwide outbreak of COVID-19 on the shipping industry' Pearl River water transport. 2020, (09): 82-83.

[8] Chen Y M, Wu Z H. Review of dry bulk shipping market in the first half of 2021 and prospect in the second half of 2021. World shipping 2021, 44(09):7-16.

[9] Wang W J, Han J L. China's contribution to the global shipping industry's response to COVID-19 and its future prospects. China Maritime 2022, (06):49-52.

[10] Liu Z P et al. The present situation, risks and Development Countermeasures of China's maritime industry in the post epidemic Era' Pearl River water transport. 2021(22): 62-63.