International Journal of Applied Economics, Finance and Accounting
ISSN 2577-767X
Vol. 13, No. 2, pp. 69-81.
2022
DOI: 10.33094/ijaefa.v13i2.623

Did COVID-19 Affect the Financial Performance and Risk of International Shipping Companies?

Andreas G. Koutoupis[1]
Nicholas D. Belesis[2]
Christos G. Kampouris[3*]

[1]*Department of Accounting and Finance, University of Thessaly, Larisa, Greece.*
Email: andreas_koutoupis@yahoo.gr
[2]*Department of Business Administration, University of Piraeus, Piraeus, Greece.*
Email: mpelesis@hotmail.com
[3]*Department of Tourism Studies, University of Piraeus, Piraeus, Greece.*
Email: chriskamp@unipi.gr

Keywords:
Systematic risk
Financial performance
Covid-19
Shipping sector
U.S. stock market.

JEL Classification
F30; G32; M41.

Received: *18 May 2022*
Revised: *7 July 2022*
Accepted: *22 July 2022*
Published: *4 August 2022*

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.

Abstract

This study focuses on the shipping sector and examines how it has been affected by the COVID-19 pandemic. More specifically, the paper examines the extent to which stock price returns, corporate systematic risk, and key financial performance variables were affected, as well as how all these variables correlated with the spread of COVID-19. Moreover, the paper examines the correlation of these variables with key shipping indexes, such as the Baltic Dry Index and Baltic International Tanker Route, and bunker prices, and how this correlation changed. Our sample consists of shipping companies listed on US stock exchanges, and the study period is 2015–2021. The findings reveal that the shipping companies' level of systematic risk increased after the pandemic. In addition, the beta coefficient of shipping companies is more affected by changes in bunker prices since the pandemic, and the average daily returns and bunker prices have a lower correlation after the pandemic.

1. Introduction

This paper focuses on the shipping industry and examines how this sector has been affected by the COVID-19 pandemic. More specifically, the study focuses on shipping companies listed on US stock exchanges (NYSE and NASDAQ) during the period 2015–2021. The sample is confined to ship-owning companies in the categories of Motor Tankers, Motor Vessels, Containers, LNG, and LPG, as these categories are dominant in the industry.

1.1. COVID-19

The outbreak of the new coronavirus (COVID-19) has undoubtedly been the most significant event of the 21st century to date and has affected the entire world. The first case of the virus was recorded in Wuhan, China, in December 2019, and it went on to spread worldwide. The World Health Organization (WHO) issued the first global alert for COVID-19 on January 30, 2020, and declared COVID-19 a pandemic on March 11, 2020. The global economy, financial markets, employment, and the economic sectors of every country have been greatly affected by this pandemic. Like the 2007–2009 global financial crisis, the key question for shareholders and stakeholders is what impact the COVID-19 pandemic has had on the profitability, financial position, and market value of companies.

More specifically, the current study, which focuses on the shipping sector, examines the extent to which share price returns and market value, corporate systematic risk (betas), and financial position as expressed by

key financial performance variables (financial ratios, leverage, earnings, etc.) were affected by the pandemic and how all these variables are correlated with the spread of COVID-19 (as measured by the daily cases and deaths). The paper also examines how the reliability of financial statements, as measured by the value relevance, has changed since the beginning of the pandemic. Moreover, the paper explores the correlations between the above variables and basic shipping indexes, such as the Baltic Dry Index (BDI) and the Baltic International Tanker Route (BITR), as well as bunker prices, and how these correlations changed after the pandemic.

1.2. Market Value

Regarding its effect on shipping share price returns and companies' market values, a pandemic such as COVID-19 can be considered a "Black Swan event" that can cause fear or even panic among investors, resulting in a sharp panic-selling response (He, Liu, Wang, & Yu, 2020).

Many studies have focused on the predicted impact of the pandemic on the stock market and the economy. For example, Ashraf (2020) found that stock markets in 64 countries reacted more proactively to the increase in the number of confirmed COVID-19 cases than to the increase in the number of deaths. Also, He et al. (2020) found that COVID-19 had a negative but short-term impact on the stock markets of affected countries, and the impact of COVID-19 on stock markets had bidirectional spill-over effects between Asian countries and European and American countries.

The study examines whether and how the stock returns of shipping companies have changed since the pandemic and whether there is any correlation between stock returns and the spread of COVID-19 (as measured by daily cases and deaths). Additionally, the study examines the correlation between stock returns and key shipping variables, hire rates as expressed by the relevant indexes (BDI and BITR), and bunker prices, and how these correlations were affected by the onset of the pandemic.

1.3. Betas

The corporate systematic risk is expressed by the beta of shipping companies. The beta is the key variable in the equation for modeling and controlling the systematic risk of an asset. This is the key variable of expected stock returns in the Capital Asset Pricing Model (Lintner, 1965; Mossin, 1966; Sharpe, 1964) and other similar models. Considering their importance to investors and corporate managers, it is crucial to examine empirically how betas have been affected by the pandemic. Bos and Newbold (1984) argued that changes in macroeconomic conditions, as well as in microeconomic factors, affect systemic risk levels; therefore, we expect to see a change in betas due to the pandemic. The study examines whether and how much betas in shipping companies have changed since the pandemic and whether there is any correlation between betas and the spread of COVID-19 (as measured by daily cases and deaths). Additionally, the study examines the correlation between betas and hire rates, as expressed by the relevant indexes (BDI and BITR), as well as the correlation between betas and bunker prices, as the cost of bunkers is a key cost in shipping. Finally, the study examines how these correlations were affected by the beginning of the pandemic.

1.4. Financial Performance Variables

Finally, the study focuses on the financial position and performance of companies as expressed by relevant accounting variables and ratios. We study the financial positions and performance of these companies over time, how the financial position of shipping companies has changed since the pandemic, and whether there is any correlation between financial ratios and the spread of COVID-19 (as measured by daily cases and deaths). Additionally, the study examines the correlation between financial ratios and hire rates, as expressed by the relevant indexes (BDI and BITR), as well as the correlation between financial ratios and bunker prices. Finally, the study examines how these correlations were affected by the beginning of the pandemic.

2. Literature Review

As the COVID-19 pandemic has dramatically affected economic markets around the world, many studies have been conducted on the pandemic's effects on stock markets and the global economy.

Ashraf (2020) found that the stock markets of 64 countries reacted more proactively to the increase in the number of confirmed COVID-19 cases than to the increase in the number of deaths. Also, He et al. (2020) found that COVID-19 had a negative but short-term impact on the stock markets of affected countries, and the impact of COVID-19 on stock markets had bidirectional spill-over effects between Asian countries and European and American countries.

Furthermore, Yilmazkuday (2022) investigated the effects of COVID-19 cases on the S&P 500 Index in the United States. He found that a cumulative 1% increase in daily COVID-19 cases in the country resulted in approximately a 0.01% cumulative decline in the S&P 500 Index after one day and a cumulative reduction of approximately 0.03% after one month. Similarly, Ahundjanov, Akhundjanov, and Okhunjanov (2020) investigated the relationship between Google search queries related to COVID-19 and the performance of major financial indices in developed and developing countries. According to their findings, an increase in

Google's global search interest for COVID-19 was associated with a cumulative decline in global financial indices of approximately 0.38% to 0.069% after one day and approximately 0.054% to 0.150% after one week.

Papadamou, Fassas, Kenourgios, and Dimitriou (2020) also examined the effects of the COVID-19 pandemic on implied stock market volatility across countries in Europe and Asia, as well as the United States and Australia, by employing a panel VAR model. Their empirical results suggest that there is a positive direct causal relationship between Google trend metrics for COVID-19 and implied stock market volatility.

Finally, Amstad, Cornelli, Gambacorta, and Xia (2020) analyzed the effects of investors' risk-taking attitudes, as indicated by internet searches, on the global stock market. They found that global stock markets are sensitive to changes in the risk-taking attitude index, especially in more financially developed economies.

Yet despite the growing literature on the impact of the COVID-19 pandemic on stock market performance, there is a lack of discussion and empirical evidence that focuses on the shipping industry. Regarding companies' systematic risk as expressed by betas, plenty of studies have dealt with this topic. Empirical evidence suggests that systematic risk and its determinants may differ substantially across industries (Fama & French, 1997).

Shipping has always been a volatile business (Drobetz, Richter, & Wambach, 2012; Greenwood & Hanson, 2015; Kalouptsidi, 2014; Osahon & Hassan, 2021), exhibiting high financial and operating leverage (Drobetz Gounopoulos, Merikas, & Schröder, 2013). Given these business risks, we expect, according to asset pricing theory, that the betas of shipping companies are intensely time-varying and relatively high compared to those of other industries.

Kavussanos and Marcoulis (1998), who compared betas across industries for the period 1984–1995, found that the water transportation industry exhibited significantly lower market risk than the average. Also, Kavussanos, Juell-Skielse, and Forrest (2003) compared the behavior of shipping and shipping-related company stock, using a sample of 108 publicly listed shipping and shipping-related companies, across world stock exchanges, for the period 1996–1999.

They found that there was no significant difference between the systematic risk of the bulk, tanker, container, and ferry sectors. They also concluded that for all the companies in the sample, the beta was lower than the market average. Gong, Firth, and Cullinane (2006), analyzing a relatively small shipping sample, found that shipping stocks indeed carry time-varying systematic risk. Even though they documented different market beta estimates for individual shipping stocks during different sub-periods, they did not provide support for a common market risk behavior across different firms or for common underlying risk determinants in the shipping industry. Also, Drobetz, Schilling, and Tegtmeier (2010), who tested multifactor models in a stochastic discount factor setup, found that shipping stocks exhibit remarkably low stock market betas.

Finally, Drobetz et al. (2010), studying a sample of 48 publicly-listed shipping companies over the period from January 1999 to December 2007, found that the shipping industry exhibited lower (covariance) risk in terms of betas than the overall stock market. Like previous studies that investigated the risk characteristics of the shipping industry, they documented that shipping stocks exhibit a beta lower than 1 and a high percentage of non-systematic risk. They concluded that shipping stocks had the potential to serve as a separate asset class.

Regarding the impact of bunker prices on the shipping industry, several studies have dealt with this. El-Masry, Olugbode, and Pointon (2010) examined the impact of exchange rates, interest rates, and oil prices on shipping companies' stock returns. They found strong evidence that the stock returns of shipping firms are more affected by exchange rate exposure than fixed interest rate or even oil price exposure but that most shipping firms have utilized reasonably successful hedging strategies to reduce the impact of these macroeconomic risks. Most surprisingly, they found a positive correlation between oil prices and stock returns.

They also found that firms that are more exposed to oil prices maintain a higher cash reserve. Also, Kavussanos and Visvikis (2016) showed that tanker freight rates have experienced an upswing due to low oil prices, as traders rent out tankers to store more oil offshore.

Finally, Maitra, Chandra, and Dash (2020) investigated volatility leaks and volatility co-movements between oil prices and the stock returns of major liner shipping companies for the period 2000–2019. They concluded, among other things, that oil price returns and liner shipping companies' stock returns show volatility asymmetry to news arrival and high volatility persistence. In addition, the volatility co-movement between Brent (oil) and liner shipping companies' stock returns increased between 2007 and 2009, the years of the global financial crisis, and during the recent Eurozone debt crisis (2010–2012).

3. Data Description

Our sample covered the period from January 1, 2015, to May 19, 2021, and included all shipping companies listed in the NYSE and NASDAQ indexes, except those without data.

Consequently, the research sample included 47 companies. Table 1 offers an overview of these companies.

Table 1. Shipping companies – research sample.

Company Name	Ticker	Market	Sub Sector
A.P. Møller - Mærsk A/S (trades on the OTC Market)	AMKBY	NYSE	Containers
Ardmore Shipping Corporation	ASC	NYSE	Tankers
Atlas Corp.	ATCO	NYSE	Containers
Capital Product Partners L.P.	CPLP	NASDAQ	Containers
Costamare Inc.	CMRE	NYSE	Containers
Danaos Corporation	DAC	NYSE	Containers
DHT Holdings Inc.	DHT	NYSE	Tankers
Diana Shipping inc.	DSX	NYSE	Bulkers
Dorian LPG Ltd.	LPG	NYSE	LPG
Dynagas LNG Partners LP	DLNG	NYSE	LNG
Eagle Bulk Shipping Inc.	EGLE	NASDAQ	Bulkers
Eneti Inc. (ex. Scorpio Bulkers Inc.)	SALT	NYSE	Bulkers
EuroDry Ltd.	EDRY	NASDAQ	Bulkers
Euronav NV	EURN	NYSE	Tankers
Euroseas Ltd. (Marshall Islands)	ESEA	NASDAQ	Containers
Frontline Ltd.	FRO	NYSE	Tankers
GasLog Ltd.	GLOG	NYSE	LNG
GasLog Partners LP	GLOP	NYSE	LNG
Genco Shipping & Trading Limited	GNK	NYSE	Bulkers
Global Ship Lease Inc	GSL	NYSE	Containers
Globus Maritime Limited	GLBS	NASDAQ	Bulkers
Golar Lng Ltd	GLNG	NASDAQ	LNG
Golar LNG Partners LP	GMLP	NASDAQ	LNG
Golden Ocean Group Limited	GOGL	NASDAQ	Bulkers
Grindrod Shipping Holdings Ltd.	GRIN	NASDAQ	Bulkers
International Seaways Inc.	INSW	NYSE	Tankers
KNOT Offshore Partners LP	KNOP	NYSE	Tankers
Matson Inc.	MATX	NYSE	Containers
Navigator Holdings Ltd.	NVGS	NYSE	LPG
Navios Maritime Acquisition Corporation	NNA	NYSE	Tankers
Navios Maritime Containers L.P.	NMCI	NASDAQ	Containers
Navios Maritime Holdings Inc.	NM	NYSE	Bulkers
Nordic American Tankers Limited	NAT	NYSE	Tankers
Overseas Shipholding Group Inc.	OSG	NYSE	Tankers
Pangaea Logistics Solutions Ltd.	PANL	NASDAQ	Bulkers
Performance Shipping Inc.	PSHG	NASDAQ	Tankers
Pyxis Tankers Inc.	PXS	NASDAQ	Tankers
Safe Bulkers Inc	SB	NYSE	Bulkers
Scorpio Tankers Inc.	STNG	NYSE	Tankers
Seanergy Maritime Holdings Corp	SHIP	NASDAQ	Bulkers
Star Bulk Carriers Corp.	SBLK	NASDAQ	Bulkers
StealthGas Inc.	GASS	NASDAQ	LPG
Teekay LNG Partners L.P.	TGP	NYSE	LNG
Teekay Tankers Ltd.	TNK	NYSE	Tankers
TOP Ships Inc.	TOPS	NASDAQ	Tankers
TORM plc	TRMD	NASDAQ	Tankers
Tsakos Energy Navigation Ltd	TNP	NYSE	Tankers

We extracted the stock prices from the Thomson Reuters DataStream. Also, from the same database, we extracted various accounting variables, specifically, Annual (January 1 to December 31) Sales, Gross Profit, and Net Income from profit–loss statements, and Year-end (December 31) Working Capital, Current Liabilities, Total Assets, Total Liabilities, and Equity from the balance sheets.

Daily betas for each company were extracted from Bloomberg. Daily hire rates and, more specifically, the daily values of the BITR Index for tankers and the BDI Index for bulkers were extracted from Clarksons' Shipping Intelligence Network. The daily average bunker values of HSFO 180 – HSFO 380 – VLSFO were extracted from Clarksons' Shipping Intelligence Network. Daily new COVID-19 cases and daily new deaths from COVID-19 (January 22, 2020, to May 19, 2021) were extracted from the World Health Organization's website (https://covid19.who.int/).

4. Research Approach

The sample of the present research consisted of all shipping companies listed on the New York stock exchange (NYSE) along with the companies listed on the NASDAQ stock exchange. The period of the empirical analysis was from January 2015 to May 2021. The data were collected from the Bloomberg database and all data points were listed on a daily basis. The main variables of the empirical analysis were the level of systematic risk of the sample companies, as measured by the beta coefficient, the performance of the sample companies, as measured by the percentage change of their current market price, and several different ratios showing the financial performance of the sample firms from a balance sheet perspective.

The first part of the analysis consisted of estimating the average beta coefficient for each company in the sample for each year from 2015 to 2021. After the average beta coefficient of each company had been estimated for each year of the research analysis, the full sample was broken down into four distinct groups. Specifically, the four groups were Tankers, Bulkers, Containers, and LNG & LPG ships. For each distinct group, the average beta coefficient of the group was estimated for each year of the analysis. Furthermore, the average beta coefficient for all the sample firms as well as the four distinct groups was compared for a period before the outbreak of COVID-19, and after its outbreak, to determine whether the pandemic played an important role in the change (whether an increase or decrease) in the systematic risk of shipping companies.

Next, the following correlation coefficients were calculated to examine the relationship between the levels of systematic risk of the sample firms and the outbreak of COVID-19:

- r (betas, New Covid Cases).
- r (betas, New Covid Deaths).

The main objective of the study was to examine the effect of COVID-19 on the risk level of shipping companies. Thus, the next part of the analysis examined whether the pandemic affected the relationship between the beta coefficient and the main variables that affect the profitability of shipping companies: bunker prices and hire rates. The analysis was performed both on a whole sample level and on a group level, apart from hire rates since this variable was only available for tankers and bulkers.

The second part of the analysis involved the estimation of daily stock returns for all companies in the sample. Thus, we next calculated the average returns per day based on the returns of all companies. We did not use a weighted average, as we did not intend to estimate the average return of the shipping industry but the average return of certain companies, focusing equally on each of them. Then, based on the average daily stock returns, we calculated the following correlation coefficients:

- r (stock returns, New Covid Cases).
- r (stock returns, New Covid Deaths).
- r (stock returns, Hire Rates Index (BITR or BDI)).
- r (stock returns, Bunker Prices).

All the above correlation coefficients were estimated separately for each company in the sample, for the Tanker subsample, the Bulker subsample, the Containers subsample, and the LNG & LPG subsample. Also, each of the above correlation coefficients was estimated for the following periods:

- 1/1/2015 to 31/12/2015
- 1/1/2016 to 31/12/2016
- 1/1/2017 to 31/12/2017
- 1/1/2018 to 31/12/2018
- 1/1/2019 to 31/12/2019
- 1/1/2020 to 31/12/2020
- 1/1/2021 to 19/5/2021
- 1/1/2015 to 21/1/2020 Period before COVID-19 (1320 observation days).
- 25/9/2018 to 21/1/2020 Period before COVID-19 (period of equal size to that since the outbreak of COVID-19).
- 22/1/2021 to 19/5/2021 Period since the outbreak of COVID-19.

As we wanted to check for any change in the correlations before and after the outbreak of the COVID-19 pandemic, we used equal periods so that any difference between the correlation coefficients would be statistically significant.

The final part of the analysis involved the estimation of the following financial ratios:

Liquidity Ratio

Current liquidity = Working Capital/Current Liabilities

Activity Ratio

Asset turnover = Sales/Total Assets

Profitability Ratios

Gross Margin = Gross Profit/Sales

ROE = Net Income/Shareholders Funds

ROA = Net Income/Total Assets

Capital Structure Ratios
Debt-Equity = Total Liabilities/Shareholders Funds
Debt ratio = Total Liabilities/Total Assets

All the above ratios were calculated for each company and each year-end (December 31). Next, we calculated the weighted average ratio of all companies for each year based on Total Assets. Finally, for each ratio, we calculated its correlation with the average bunker prices and the average hire rates.

5. Results

Table 2 presents the results of the empirical analysis concerning the first main parameter of the research model, namely the beta coefficient. As can be seen from the results, the average beta coefficient of the all-firm group showed an increase from 2015 to 2017 and then a decrease from 2017 to 2019. However, more importantly, the all-firm group experienced an increase in the average beta coefficient after the outbreak of COVID-19 as can be seen from the values for 2020 and 2021, as compared with 2019. This is particularly apparent when we compare the average beta coefficient for the whole period before Covid (0.9107) with the average beta coefficient after Covid (1.0285).

Table 2. Beta coefficients.

Beta	All	Bulkers	Tankers	Containers	LNG-LPG
Avg. Beta 2015	1.047	1.140	1.029	0.870	1.108
Avg. Beta 2016	1.091	1.119	1.094	0.870	1.266
Avg. Beta 2017	1.1900	1.187	1.193	1.021	1.356
Avg. Beta 2018	0.990	0.949	1.008	0.977	1.031
Avg. Beta 2019	0.913	0.889	0.972	0.833	0.922
Avg. Beta 2020	0.975	1.005	0.946	0.972	0.987
Avg. Beta 2021	0.999	1.063	0.919	1.036	1.010
Avg. Beta before Covid (total sample)	1.042	1.047	1.058	0.911	1.134
Avg. Beta before Covid (equal sample)	0.911	0.890	0.965	0.837	0.917
Avg. Beta after Covid	0.983	1.025	0.936	0.996	0.996
Avg. Beta total period	1.029	1.042	1.030	0.930	1.105

Notes: The table reports the average beta coefficients on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG, for each year of the research separately, along with the average betas before and after the outbreak of COVID-19.

To further investigate the increased beta coefficient on the all-firm sample before and after the outbreak of COVID-19, we estimated the beta coefficient for four distinct groups over the same periods. Our initial results from the all-firm sample are further validated by the analysis of the four distinct groups. All four groups (Bulkers, Tankers, Containers, LNG & LPG ships) displayed the same variation in average beta coefficients as the all-firm sample. Thus, the increase in the beta coefficient after the outbreak of COVID-19 cannot be attributed to the specific characteristics of any one of the four groups and was a widespread industry phenomenon. All results concerning the differences in means are statistically significant at the 5% level of significance.

Table 3 presents the results of the investigation into the correlation between beta coefficients and Covid new cases and Covid new deaths, on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG & LPG. This estimation was performed to fully understand the strength of the relationship between the levels of systematic risk of the sample firms and the outbreak of COVID-19. The first conclusion that can be drawn is that the relationship between the variables is quite strong, as indicated by the magnitude of the correlation coefficients. In the all-firm sample, there is a positive relationship between beta coefficient and Covid new cases and between beta coefficient and Covid new deaths. This strong positive relationship between the examined variables is further corroborated by the result of the four-group analysis. Specifically, we see the same strong positive relationship between beta coefficient and Covid cases and beta coefficient and Covid deaths for Bulkers, Containers, and LNG & LPG ships. The only exception to the result is the Tankers group. This should be further investigated by examining the specific characteristics of the Tankers group.

Table 3. Correlation of beta coefficients with COVID-19 statistics.

Correlations	ALL	Bulkers	Tankers	Containers	LNG-LPG
Correlation (Beta, Covid New Cases)	0.736	0.799	-0.543	0.721	0.599
Correlation (Beta, Covid New Deaths)	0.686	0.787	-0.619	0.762	0.511

Notes: The table reports the correlation coefficient between beta coefficients and Covid new cases and Covid new deaths, on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Table 4 presents the results of the investigation into the correlation between beta coefficients and bunker prices. This estimation was performed to fully understand whether the outbreak of COVID-19 affected the relationship between the systematic risk of shipping companies and the main variable (bunker prices) that affects their cost structure. As can be seen from the results, on an all-sample level, the correlation coefficient

between the two variables is not stable and changes value, from positive to negative, over the years of the research. Thus, it can be concluded that the beta coefficient and bunker prices do not have a stable relationship. This finding is validated by the results of the group-level analysis, where we can see that the correlations between the beta coefficients of Bulkers, Tankers, Containers, and LNG & LPG ships and bunker prices are not stable and vary from one year to the next.

Turning to the comparison between the correlation coefficients before and after the outbreak of COVID-19, it is evident that on a full-sample level, it increased in magnitude, revealing that the two variables became strongly related after the start of the pandemic. Thus, after the outbreak of COVID-19, the beta coefficient of shipping companies was more affected by changes in bunker prices. The same pattern can be seen for Bulkers and LNG & LPG ships, whereas for Tankers and Containers we witnessed a very small decrease in magnitude in the correlation coefficient after the outbreak of COVID-19.

Table 4. Correlation of beta coefficients with bunker prices.

Beta	All	Bulkers	Tankers	Containers	LNG-LPG
Avg. Beta 2015	-0.020	0.601	-0.072	0.520	0.311
Avg. Beta 2016	0.479	-0.241	0.435	0.780	0.688
Avg. Beta 2017	0.837	0.725	0.667	0.663	0.650
Avg. Beta 2018	-0.583	-0.407	-0.586	-0.615	-0.643
Avg. Beta 2019	-0.095	-0.080	-0.020	-0.351	-0.100
Avg. Beta 2020	-0.287	-0.406	0.686	-0.647	-0.253
Avg. Beta 2021	-0.625	-0.380	-0.667	0.548	-0.841
Avg. Beta before Covid (total sample)	-0.297	-0.417	-0.070	0.106	-0.567
Avg. Beta before Covid (equal sample)	-0.023	0.053	-0.118	0.096	-0.304
Avg. Beta after Covid	0.311	0.335	0.130	0.016	0.151
Avg. Beta total period	-0.247	-0.355	-0.052	0.069	-0.458

Notes: The table reports the correlation coefficient between beta coefficients and bunker prices, on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Table 5 presents the correlation coefficient between beta coefficients and hire rates. The purpose of this analysis was to examine whether the pandemic affected the relationship between the systematic risk of bulkers and tankers and the main variable (hire rates) that affects their income. As can be seen from the results, the correlation coefficient between the two variables is not stable and changes between positive and negative over the years of the study; thus, the pattern is analogous to that of bunker prices.

Table 5. Correlation of beta coefficients with hire rates.

Beta	Bulkers	Tankers
Avg. Beta 2015	0.454	-0.011
Avg. Beta 2016	-0.080	0.281
Avg. Beta 2017	0.587	0.790
Avg. Beta 2018	-0.544	-0.541
Avg. Beta 2019	0.651	0.449
Avg. Beta 2020	0.834	0.656
Avg. Beta 2021	-0.503	-0.626
Avg. Beta before Covid (total sample)	-0.260	-0.007
Avg. Beta before Covid (equal sample)	0.515	0.152
Avg. Beta after Covid	0.791	0.611
Avg. Beta total period	-0.169	0.049

Notes: The table reports the correlation coefficient between beta coefficients and hire rates, on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Turning to the comparison between the correlation coefficient before and after the outbreak of COVID-19, it is evident that it decreased in magnitude, revealing that the two variables were less strongly related after the start of the pandemic. Thus, the beta coefficients of Bulkers and Tankers were less affected by changes in hire rates after the outbreak of COVID-19.

Table 6 presents the results of the empirical analysis of the second main parameter of the research model, namely the average daily return. As can be seen from the results, the average daily return for the all-firm group experienced a slight increase after the outbreak of COVID-19, though it is not statistically significant. Moving on to the group-level (Bulkers, Tankers, Containers, LNG & LPG ships) analysis, we see the same pattern as for the all-firm group, except for Tankers. Once again, the results are not statistically significant.

Table 7 presents the correlations between the average daily returns of the shipping companies and new COVID-19 cases and deaths, on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG & LPG ships. This analysis was conducted to examine the strength of the relationship between the stock

returns of shipping companies and the COVID-19 pandemic. As indicated by the magnitude of the correlation coefficients, the relationship between the variables is quite weak.

Table 6. Daily returns.

Returns	All	Bulkers	Tankers	Containers	LNG-LPG
Avg. Return 2015	-0.002	-0.004	0.000	-0.001	-0.002
Avg. Return 2016	0.001	0.004	-0.001	0.000	0.001
Avg. Return 2017	0.000	0.002	-0.002	0.000	0.001
Avg. Return 2018	-0.001	-0.001	-0.001	0.000	-0.001
Avg. Return 2019	0.001	0.000	0.002	0.001	0.001
Avg. Return 2020	0.000	-0.001	-0.0012	0.0020	0.000
Avg. Return 2021	0.005	0.009	0.0032	0.0059	0.003
Avg. Return before Covid (total sample)	0.000	0.000	-0.0003	-0.0001	0.000
Avg. Return before Covid (equal sample)	0.000	-0.001	0.0010	0.0000	-0.001
Avg. Return after Covid	0.001	0.001	0.0003	0.0034	0.001
Avg. Return total period	0.000	0.000	-0.0002	0.0007	0.000

Notes: The table reports the average daily returns on an all-sample level and on a Bulkers, Tankers, Containers, and LNG-LPG level, for each year of the research separately, along with the average daily returns before and after the outbreak of COVID-19.

Table 7. Correlation of average daily returns with Covid statistics.

Correlations	All	Bulkers	Tankers	Containers	LNG-LPG
Correlation (Return, Covid New Cases)	0.108	0.141	0.042	0.137	0.081
Correlation (Return, Covid New Deaths)	0.139	0.166	0.073	0.141	0.125

Notes: The table reports the correlation coefficients between average daily returns and Covid new cases and Covid new deaths, on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

In the complete sample, there is a very weak positive relationship between average daily returns and new COVID-19 cases and between average daily returns and new COVID-19 deaths. Similar weak positive relationships between the examined variables can also be found in the analysis of the four separate groups.

Table 8 presents the correlation coefficients between average daily returns and bunker prices. Through this analysis, we wished to examine whether the COVID-19 pandemic affected the relationship between the stock returns of shipping companies and their main cost parameter (bunker prices). As the results show, on an all-sample level, the correlation coefficient between the two variables is very low (almost zero), unstable, and changes value from positive to negative over the study duration. Thus, it can be concluded that stock returns and bunker prices are not correlated over the specific years of the research. This finding is validated by the results of the group level analysis, where the correlation of the stock returns of Bunkers, Tankers, Containers, and LNG & LPG ships with bunker prices is unstable and varies from one year to the next, with values around zero.

Table 8. Correlation of beta coefficients with bunker prices.

Returns	All	Bulkers	Tankers	Containers	LNG-LPG
Avg. Return 2015	0.112	0.130	0.077	0.104	0.038
Avg. Return 2016	-0.008	-0.009	0.023	0.014	-0.073
Avg. Return 2017	0.061	0.018	0.093	-0.021	0.054
Avg. Return 2018	0.008	-0.064	0.061	0.006	0.014
Avg. Return 2019	-0.096	-0.104	-0.061	-0.093	-0.067
Avg. Return 2020	-0.156	-0.122	-0.122	-0.145	-0.169
Avg. Return 2021	-0.116	-0.109	-0.096	-0.072	-0.164
Avg. Return before Covid (total sample)	-0.003	-0.026	0.026	0.021	-0.027
Avg. Return before Covid (equal sample)	-0.086	-0.114	-0.041	-0.072	-0.062
Avg. Return after Covid	-0.055	0.002	-0.050	-0.059	-0.111
Avg. Return total period	-0.019	-0.021	0.003	-0.006	-0.051

Notes: The table reports the correlation coefficients between average daily returns and bunker prices, on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Comparing the correlation coefficients before and after the beginning of the COVID-19 pandemic on a full-sample level reveals that it decreased in magnitude, meaning that the two variables have a lower level of correlation after the outbreak of COVID-19. The same pattern can be seen for Bulkers, Containers, and LNG & LPG ships, whereas for Tankers there was a very small increase in the magnitude of the correlation coefficient after the outbreak of COVID-19. All in all, the relationship between the two variables in question was weak, both before and after the start of the pandemic.

Table 9 presents the correlation coefficients between average daily returns and hire rates. The purpose here was to examine whether the outbreak of the COVID-19 pandemic affected the relationship between the stock returns of bulkers and tankers and their main income variable (hire rates). The results show that the correlation coefficients between the two variables are not stable and change from positive to negative over the years of the research; thus, the pattern is analogous to that of the bunker prices.

Turning to the correlation coefficients before and after the outbreak of COVID-19, it is evident that the relationship remained stable for bulkers and increased slightly for tankers. Overall, the relationships between the variables, both before and after the start of the COVID-19 pandemic, are very weak.

Table 9. Correlation of average daily returns with hire rates.

Returns	Bulkers	Tankers
Avg. Return 2015	0.064	0.070
Avg. Return 2016	0.089	-0.005
Avg. Return 2017	-0.027	0.086
Avg. Return 2018	-0.018	0.021
Avg. Return 2019	0.051	0.029
Avg. Return 2020	0.120	0.019
Avg. Return 2021	-0.103	-0.036
Avg. Return before Covid (total sample)	0.029	0.041
Avg. Return before Covid (equal sample)	0.057	0.014
Avg. Return after Covid	0.109	0.016
Avg. Return total period	0.058	0.028

Notes: The table reports the correlation coefficient between average daily returns and hire rates, on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Table 10 reports the average current liquidity ratio of the sample firms for each year of the research. At an all-firm level, we can see a deterioration of the liquidity of the shipping companies between 2015 and 2020. This can be attributed to the specific characteristics of the industry on an international level. The picture is the same for bulkers, containers, and LNG & LPG ships, and only differs for tankers.

Table 10. Current liquidity ratio.

Year	All	Bulkers	Tankers	Containers	LNG-LPG
2015	0.479	1.421	1.214	0.182	-0.234
2016	0.550	3.508	0.517	-0.012	-0.190
2017	0.009	0.742	0.510	-0.170	-0.486
2018	-0.147	-0.055	0.493	-0.469	-0.281
2019	-0.339	-0.174	0.212	-0.573	-0.557
2020	-0.207	0.268	0.253	-0.317	-0.561

Notes: The table reports the current liquidity ratio on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Table 11 reports the average gross profit margin of the sample firms for each year of the research. At an all-firm level, we witness an increase in the gross profit margin (GPM) of the shipping companies between 2015 and 2020. Specifically, the GPM had negative values for 2015 and 2016, whereas from 2017 to 2020, it had increasingly positive values, ranging from 0.075% in 2017 to 32.11% in 2020. The same trend can be seen for the LNG & PLG group of companies, where the GPM increased from -62.29% in 2015 to 38.86% in 2020. In the tankers and containers companies, the GPM was positive for all years of the research, with a very low degree of variation; the containers group had the largest GPM among all the shipping companies, ranging from 33.62% in 2017 to 55.86% in 2020. The bulkers group of shipping companies had very low and in most cases negative GPM, in strong contrast to the other groups of shipping companies.

Table 11. Gross profit margin.

Year	All	Bulkers	Tankers	Containers	LNG-LPG
2015	-0.090	-0.741	0.336	0.383	-0.623
2016	-0.232	-0.760	0.195	0.368	-0.864
2017	0.008	-0.022	0.070	0.336	-0.330
2018	0.230	0.177	0.008	0.402	0.218
2019	0.334	0.086	0.169	0.559	0.306
2020	0.321	-0.058	0.270	0.390	0.389

Notes: The table reports the Gross Profit Margin on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Table 12. Asset turnover.

Year	All	Bulkers	Tankers	Containers	LNG-LPG
2015	0.143	0.089	0.246	0.170	0.056
2016	0.153	0.092	0.277	0.187	0.056
2017	0.149	0.147	0.242	0.178	0.058
2018	0.170	0.183	0.256	0.178	0.095
2019	0.182	0.193	0.287	0.174	0.107
2020	0.204	0.230	0.339	0.184	0.120

Notes: The table reports the Asset Turnover on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Table 12 reports the average Asset Turnover (AT) of the sample firms for each year of the research. At an all-firm level, we can see an increase in the AT of the shipping companies between 2015 and 2020, indicating that shipping companies were in a position to manage their assets more effectively over the years. The bulkers, tankers, containers, and LNG & LPG groups each showed the same picture as the all-firm group. Table 13 shows the Return on Assets (ROA) of the sample firms for each year of the research. Both at the all-firm level and at the bulkers, tankers, containers, and LNG & LPG levels, the picture is the same, with shipping companies exhibiting a very low ROA, and in most cases a negative ROA, with no particular trend over the years.

Table 13. Return on assets.

Year	All	Bulkers	Tankers	Containers	LNG-LPG
2015	0.010	0.005	0.058	-0.071	0.010
2016	0.008	-0.012	0.006	-0.053	-0.007
2017	0.000	0.009	-0.022	-0.041	-0.008
2018	-0.001	0.005	-0.022	-0.006	-0.004
2019	-0.004	0.009	0.011	-0.009	0.003
2020	-0.001	0.008	0.042	-0.081	0.004

Notes: The table reports the Return on Assets on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Table 14 shows the Return on Equity (ROE) of the sample firms for each year of the research. Both at the all-firm level and at the bulkers, tankers, containers, and LNG & LPG levels, the picture is the same, with shipping companies exhibiting a very low ROE, and in most cases a negative ROE, with no particular trend over the years.

Table 14. Return on equity.

Year	All	Bulkers	Tankers	Containers	LNG-LPG
2015	0.027	-0.020	0.044	0.030	0.030
2016	-0.001	-0.032	0.016	-0.022	0.020
2017	-0.003	-0.060	-0.028	0.036	0.003
2018	0.006	0.003	-0.020	0.030	0.000
2019	-0.028	-0.281	0.015	0.034	-0.019
2020	0.016	-0.073	0.085	0.021	-0.015

Notes: The table reports the Return on Equity on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Table 15 reports the average Debt to Equity (DE) of the sample firms for each year of the research. At an all-firm level, we can see an increase in the DE of the shipping firms between 2015 and 2019 and a decrease in 2020. Specifically, the DE ranged from 1.4889 in 2015 to 2.088 in 2019, indicating that shipping firms had, on average, twice the debt level compared to their equity value. The same trend can be witnessed for bulkers, tankers, and LNG & LPG shipping companies. On the other hand, the containers group witnessed an opposite trend, with DE decreasing from 2015 to 2020, indicating a significant deleveraging in container shipping companies.

Table 15. Debt to equity.

Year	All	Bulkers	Tankers	Containers	LNG-LPG
2015	1.489	0.139	0.308	3.057	1.485
2016	1.739	0.240	0.335	3.877	1.525
2017	1.906	0.387	0.508	3.739	1.819
2018	2.010	0.473	0.777	3.536	1.879
2019	2.089	3.750	1.090	2.025	2.178
2020	1.685	0.435	1.096	1.563	2.732

Notes: The table reports the Debt to Equity on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Table 16 reports the average Debt Ratio (DR) of the sample firms for each year of the research. At an all-firm level, we witness an increase in the DR of the shipping firms between 2015 and 2018. Specifically, the DR increased from 0.5684 in 2015 to 0.6002 in 2018. The same trend can be witnessed for bulkers, tankers, and LNG & LPG shipping companies. On the other hand, the containers group witnessed an opposite trend, with DR decreasing from 2015 to 2019. Thus, the results of the DR analysis validate the findings of the DE analysis in terms of the financial leverage of shipping companies.

Table 16. Debt ratio.

Year	All	Bulkers	Tankers	Containers	LNG-LPG
2015	0.568	0.420	0.517	0.677	0.568
2016	0.569	0.440	0.516	0.682	0.563
2017	0.590	0.482	0.536	0.660	0.609
2018	0.600	0.513	0.547	0.660	0.610
2019	0.582	0.517	0.542	0.601	0.620
2020	0.592	0.621	0.506	0.610	0.621

Notes: The table reports the Debt Ratio on an all-sample level and on the level of Bulkers, Tankers, Containers, and LNG-LPG.

Table 17 reports the correlation coefficients of all the above financial ratios with the average hire rates to examine the relationships between the main income variables and the financial performance of bulker and tanker shipping companies. Bulkers have a strong negative correlation with the current liquidity ratio and the return on equity, indicating that when the hire rates increase, allowing bulkers to earn more, their liquidity and their ROE will decrease, which is opposite to the result we expected. On the other hand, the positive relationships between bulkers' hire rates and their GPM, ROA, DE, and DR are normal and align with expectations. The correlation coefficients of tankers' hire rates are positive for Current Liquidity, DE, and DR and negative for GPM, ROE, and ROA, as indicated in the bottom row of Table 16.

Table 17. Correlation of financial ratios with average hire rates.

Sub Sector	Current Liquidity	Asset Turnover	Gross Margin	ROE	ROA	Debt-Equity	Debt-Ratio
Bulkers	-0.867	0.823	0.992	-0.440	0.686	0.524	0.614
Tankers	0.277	-0.539	-0.120	-0.375	-0.051	0.035	0.667

Notes: The table reports the correlation coefficient of Financial Ratios with Average Hires, on a Bulkers and Containers level.

Table 18 reports the correlation coefficients of all the above financial ratios with the average bunker prices to examine the relationship between the shipping companies' main cost variable and their financial performance. On an all-firm level, shipping companies display a negative relationship between bunker prices and current liquidity, which was expected, and ROE, which was also expected. On the other hand, shipping companies exhibit a positive relationship between bunker prices and AT, GPM, and ROA, which was not expected, and an expected positive relationship with DE and DR. Furthermore, we can see the same picture for the bulkers group. For the tankers group, the relationships between bunker prices and current liquidity, AT, GPM, ROE, and ROA are negative as expected, whereas the correlations between bunker prices and DE and BR are positive, which was also expected.

Table 18. Correlation of financial ratios with average bunker prices.

Sector & Sub Sector	Current Liquidity	Asset Turnover	Gross Margin	ROE	ROA	Debt-Equity	Debt-Ratio
All	-0.784	0.336	0.756	-0.427	0.055	0.752	0.667
Bulkers	-0.859	0.589	0.831	-0.408	0.802	0.573	0.311
Tankers	-0.330	-0.113	-0.572	-0.393	-0.407	0.602	0.829

Notes: The table reports the correlation coefficient of Financial Ratios with Average Bunker Prices on an all-sample level and on the level of Bulkers and Containers.

6. Conclusions

The main objective of the present study was to explore the impact of the pandemic on several characteristics of international shipping companies. More specifically, in the first part of the analysis, we examined whether the COVID-19 pandemic affected the levels of systematic risk under which shipping firms operate, with the use of the beta coefficient. Our results revealed that the beta coefficient and, thus, the shipping companies' level of systematic risk increased after the outbreak of COVID-19. To further investigate the increased beta coefficient of the all-firm sample both before and during the pandemic, we estimated the beta coefficient for four distinct groups (bulkers, tankers, containers, and LNG & LPG) during the same time periods. The results showed that the increase in the beta coefficient after the outbreak of COVID-19 could not

be attributed to the specific characteristics of any of the four groups but was a widespread industry phenomenon since all four groups exhibited essentially the same results.

To gain a better understanding of the effect of the pandemic on the systematic risk of shipping companies we examined the correlation between beta coefficients and new COVID-19 cases deaths, both on an all-sample level and on the levels of bulkers, tankers, containers, and LNG & LPG ships. In the all-firm sample, the results revealed a positive relationship between the beta coefficient and new COVID-19 cases as well as COVID-19 deaths, which was fully corroborated by the four-group analysis.

The next step involved the investigation of the correlation between beta coefficients and bunker prices. The results showed that the beta coefficient was not related to bunker prices, and this finding was validated by the results of the group level analysis, where the correlation of the beta coefficients of bulkers, tankers, containers, and LNG & LPG ships with bunker prices was not stable and varied from one year to the next. However, when comparing the correlation coefficient between betas and bunker prices before and after the outbreak of COVID-19, it was evident that the beta coefficient of shipping companies is more affected by changes in bunker prices since the start of the pandemic.

The final step involved the comparison of beta coefficients and hire rates. The results showed that the correlation coefficient between the two variables was not stable and changed its value from positive to negative over the years of the research; thus, its pattern was analogous to that of bunker prices. Comparing the correlation coefficients before and after the outbreak of COVID-19, it was evident that it had decreased in magnitude, revealing that the two variables were not strongly related after the start of the pandemic. Thus, the beta coefficients of bulkers and tankers are less affected by changes in hire rates since the start of the pandemic.

The second part of the analysis used as its main variable the daily returns of shipping companies. None of the results were statistically significant; thus, they were not taken into account. In the next step, the correlation between average daily returns of shipping companies and new COVID-19 cases and deaths was examined on an all-sample level and on the level of bulkers, tankers, containers, and LNG & LPG ships. The results showed that the relationships between the variables were quite weak, as indicated by the magnitude of the correlation coefficients.

When examining the correlation coefficient between average daily returns and bunker prices, we found that stock returns and bunker prices were not correlated over the specific years of the research. This finding was validated by the results of the group-level analysis, where we saw that the correlations between the stock returns of each group (bunkers, tankers, containers, LNG & LPG ships) and bunker prices were not stable and varied from one year to the next, with values of around zero. Comparing the correlation coefficients before and after the outbreak of COVID-19, it was evident that it had decreased in magnitude on a full-sample level, revealing that the correlation between the two variables has decreased since the start of the pandemic.

Finally, when we examined the correlation coefficient between average daily returns and hire rates, we found that the correlation between the two variables was not stable and changed its value from positive to negative over the years of the research; thus, its pattern was analogous to that of bunker prices. Comparing the correlation coefficients before and after the outbreak of COVID-19, it was evident that it had remained stable for bulkers and increased slightly for tankers. Overall, the relationship between the two variables was very weak, both before and since the start of the pandemic.

In the last part of the analysis, the financial performance of shipping companies was the main variable, measured through estimations of current liquidity, asset turnover, gross margin, ROE, ROA, debt equity, and debt ratio. We analyzed the correlation coefficients between each of these financial ratios and the average hire rates. We found that bulkers had a strong negative correlation with the current liquidity ratio and ROE, indicating that when hire prices increased, allowing bulkers to earn more, their liquidity and ROE also decreased, which was contrary to the expected result. On the other hand, the positive relationship discovered between bulkers' hire rates and their GPM, ROA, DE, and DR was normal and as expected from the theory.

Finally, the examination of the correlation coefficients of all the above financial ratios with the average bunker prices revealed that shipping companies displayed a negative relationship between bunker prices and current liquidity, which was expected, and ROE, which was also expected. On the other hand, shipping companies exhibit a positive relationship between bunker prices and AT, GPM, and ROA, which was not expected, and an as-expected positive relationship with DE and DR.

References

Ahundjanov, B. B., Akhundjanov, S. B., & Okhunjanov, B. B. (2020). Information search and financial markets under COVID-19. *Entropy*, *22*(7), 791.Available at: https://doi.org/10.3390/e22070791.

Amstad, M., Cornelli, G., Gambacorta, L., & Xia, F. D. (2020). Investors' risk attitudes in the pandemic and the stock market: New evidence based on internet searches. BIS Bulletin, No. 25.

Ashraf, B. N. (2020). Stock markets' reaction to COVID-19: Cases or fatalities? *Research in International Business and Finance*, *54*, 101249.Available at: https://doi.org/10.1016/j.ribaf.2020.101249.

Bos, T., & Newbold, P. (1984). An empirical investigation of the possibility of stochastic systematic risk in the market model. *Journal of Business*, *57*(1), 35-41.Available at: https://doi.org/10.1086/296222.

Drobetz, W., Schilling, D., & Tegtmeier, L. (2010). Common risk factors in the returns of shipping stocks. *Maritime Policy & Management, 37*(2), 93-120.Available at: https://doi.org/10.1080/03088830903533726.

Drobetz, W., Richter, T., & Wambach, M. (2012). Dynamics of time-varying volatility in the dry bulk and tanker freight markets. *Applied Financial Economics, 22*(16), 1367-1384.Available at: https://doi.org/10.1080/09603107.2012.657349.

Drobetz, W., Gounopoulos, D., Merikas, A., & Schröder, H. (2013). Capital structure decisions of globally-listed shipping companies. *Transportation Research Part E: Logistics and Transportation Review, 52*, 49-76.Available at: https://doi.org/10.1016/j.tre.2012.11.008.

El-Masry, A. A., Olugbode, M., & Pointon, J. (2010). The exposure of shipping firms' stock returns to financial risks and oil prices: A global perspective. *Maritime Policy & Management, 37*(5), 453-473.Available at: https://doi.org/10.1080/03088839.2010.503713.

Fama, E. F., & French, K. R. (1997). Industry costs of equity. *Journal of Financial Economics, 43*(2), 153-193.

Gong, S. X., Firth, M., & Cullinane, K. (2006). Beta estimation and stability in the US-listed international transportation industry. *Review of Pacific Basin Financial Markets and Policies, 9*(03), 463-490.Available at: https://doi.org/10.1142/s0219091506000811.

Greenwood, R., & Hanson, S. G. (2015). Waves in ship prices and investment. *The Quarterly Journal of Economics, 130*(1), 55-109.Available at: https://doi.org/10.1093/qje/qju035.

He, Q., Liu, J., Wang, S., & Yu, J. (2020). The impact of COVID-19 on stock markets. *Economic and Political Studies, 8*(3), 275-288.Available at: https://doi.org/10.1080/20954816.2020.1757570.

Kalouptsidi, M. (2014). Time to build and fluctuations in bulk shipping. *American Economic Review, 104*(2), 564-608.Available at: https://doi.org/10.1257/aer.104.2.564.

Kavussanos, M., Juell-Skielse, A., & Forrest, M. (2003). International comparison of market risk across shipping-related industries. *Maritime Policy & Management, 30*(2), 107-122.Available at: https://doi.org/10.1080/0308883032000069271.

Kavussanos, M., & Marcoulis, S. (1998). Beta comparisons across industries - A water transportation industry perspective. *Maritime Policy & Management, 25*(2), 175-184.Available at: https://doi.org/10.1080/03088839800000027.

Kavussanos, M., & Visvikis, I. (2016). *The international handbook of shipping finance: Theory and practice*. Publisher: Palgrave Macmillan.

Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *The Review of Economics and Statistics, 47*, 13–37.Available at: https://doi.org/10.2307/1924119.

Maitra, D., Chandra, S., & Dash, S. R. (2020). Liner shipping industry and oil price volatility: Dynamic connectedness and portfolio diversification. *Transportation Research Part E: Logistics and Transportation Review, 138*, 101962.Available at: https://doi.org/10.1016/j.tre.2020.101962.

Mossin, J. (1966). Equilibrium in a capital asset market. *Econometrica: Journal of the Econometric Society, 34*(4), 768-783.Available at: https://doi.org/10.2307/1910098.

Osahon, O. H., & Hassan, Y. G. (2021). Board cultural diversity and firm performance. *Humanities and Social Sciences Letters, 9*(2), 152–161.Available at: https://doi.org/10.18488/journal.73.2021.92.152.161.

Papadamou, S., Fassas, A., Kenourgios, D., & Dimitriou, D. (2020). *Direct and indirect effects of COVID-19 pandemic on implied stock market volatility: Evidence form panel data analysis*. Germany: University Library of Munich.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance, 19*(3), 425-442.Available at: https://doi.org/10.2307/2977928.

Yilmazkuday, H. (2022). Coronavirus disease 2019 and the global economy. *Transport Policy, 120*, 40-46.Available at: https://doi.org/10.1016/j.tranpol.2022.03.003.