Default Probability Modeling for the Listed Shipping Companies in 2001-2016

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Abstract

Using the data sample of 192 the listed shipping companies from 36 countries, employing case study analyses it is determined that researchers underestimate the shipping industry's riskiness. According to previous studies, the industry's average rate of default is quite low, but authors do not consider quasi-defaults such as mergers and acquisitions of shipping companies that occur almost every year. This study implies under default not only cases when companies go out of business but also quasi-default's cases, because, as revealed, they increase the riskiness of shipping sector. The findings of this paper may be useful for shipping companies' directors to make the right management decision and timely to reveal crisis tendencies in operational activities.

Key words: probability of default, quasi-default, shipping industry, case study analysis.

JEL Codes: C01, C02, C13, C51, G24, G32, G33.

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1. Introduction

The profound crisis in the shipping industry has started in 2015, it has put not only the existence of small companies as well as world leaders of this sector in jeopardy. Although the shipping industry got through a multitude of various crises, there has not nevertheless been such a strong as one. Eleven from twenty largest shipping companies announced heavy losses over the first six months of 2016 (The Economist, 2016). The leading independent consulting company Drewry has determined that the industry of marine freight services may lose up to 10 billion dollars on revenue of 170 billion dollars in a year.

The company Maersk Line that is the shipping industry leader in its turn has become unprofitable on the basis of 2016 results. The largest default among shipping companies all over the world once again proved the importance of prediction for the company's financial stability.

In April 2016 the container carrier – Hanjin Shipping from South Korea, included in top ten shipping companies of the world and accounting for approximately 8% of cargo turnover of the Pacific coast of America, initiated asset restructuring to avoid the collapse. However, last August Hanjin Shipping made a judicial request on assets freeze and external administration. The default of Hanjin Shipping provoked real chaos in cargo services. In general, Hanjin Shipping' default is estimated as the biggest threat to the logistic chain in the shipping industry in recent years (The Economist, 2016). Subsequently, it may have a significant effect on global markets and oil price. If this company is liquidated, its largest costumers may choose alternative methods of delivering goods, for instance, airfreights. Excess demand for airfreights will increase the demand for oil price as airplanes consume more fuel (McDonald, 2016).

Three major Japanese shipping companies Mitsui OSK Lines, NYK Line, Kawasaki Kisen Kaisha decided to merge purposely to avoid the same fate as Hanjin Shipping. On 31 October 2016, the companies that were the largest operators of marine cargo in Japan and were included in the top twenty global companies in shipping industry had reported the association of the units. The

combined structure will take about 7% of the world shipping market and will manage 256 container ships, thus taking the 6th place in the world in this direction. Nippon Yusen, Mitsui OSK Lines, and Kawasaki Kisen Kaisha announced that the combined structure with the predicted turnover of 2 trillion yen (approximately $ 19 billion) will be established in July 2017 and will begin its work in April 2018. Nippon Yusen will control 38% of the combined structure, and other two companies – 31%. Experts point out that the market can expect a further wave of consolidation. A famous analyst Greg Knowler in a conversation with the BBC IHS said that the tendency to stabilization, taking into account the forecasts of weak demand and excess production capacity, which would continue for at least the next two years, will be the driver of consolidation in the market (Expert Online, 2016).

The French company CMA CGM, the world's third container carrier, announced heavy losses on 2 September 2016 (The Economist, 2016).

Timely identification of recessionary trends allows avoiding default of shipping companies. However, to date, there are not a single complex model which would take account specifics of this industry and would permit to predict default of a company more accurate.

Based on a sample of 192 listed shipping companies for the period 2001-2016 (including 42 defaulted), we measure the shipping industry's riskiness using the case study analysis. Calculating the default rate to measure the riskiness we also take into account cases of mergers and acquisitions and others that we determine as quasi-defaults. We argue that previous researchers underestimate the degree of risk of the shipping industry.

This paper is structured as follows. In the next section, we substantiate relevance of the study. Section 2 presents a summary of relevant studies regarding modeling the probability of default for companies from the shipping industry. In section 3 we describe the data sample and variables, which use in modeling the probability of default for shipping companies, and methodology of the current paper. Moreover, section 3 discusses in detail cases of quasi-default for companies

from the shipping industry. Section 4 introduces some empirical results of the current paper and a comparative analysis of research on shipping companies' default. In section 5 we summarize results of the current investigation and future plans for developing this study.

2. Literature Review

There are a number of approaches to assess the probability of company's default but studies regarding shipping companies' default are little. The paper (Grammenos et al., 2008) examined how shipping high-yield bond defaults can be predicted by exploiting a combination of companies' financial ratios and industry-specific variables. The authors reviewed defaults inability of the shipping company to make timely payments of interest or principal to bondholders. Moreover, they noted that default happened prior to bankruptcy when the company was declared insolvent and default might not lead to the bankruptcy. The dataset of the research consisted of 50 shipping high yield bonds issued during the period from 1992 to 2004. Thirteen bonds had defaulted by the end of 2004, and 37 bonds were still trading assets or had expired. A logistic regression analysis was used and had been concluded that the key financial variables that were associated with the probability of default were: the gearing ratio, the amount raised over total assets ratio, two liquidity ratios (the working capital over total assets ratio, the retained earnings over total assets ratio) and the industry specific variable.

Merikas et al. (2015) estimated the probability of internationally listed shipping corporations' default. They reviewed default according to (Basel Committee on Banking Supervision, 2006). The default of the shipping company occurred when the bank considered that the debtor was unlikely to pay its credit obligations to the banking group in full, or the debtor was past due more than 90 days on any credit obligation to the banking group. The sample included 175 non-defaulted shipping companies and 33 defaulted. The financial data for the operating companies were taken for the fiscal year 2013.The authors had located all shipping companies, which had defaulted from 2000 to 2014 and collected their

financial data for the year immediately before the default. They had also calculated the default rate as the number of defaulted companies divided by number of all companies in a given year. In Figure 1 below the distribution of default by year is presented.

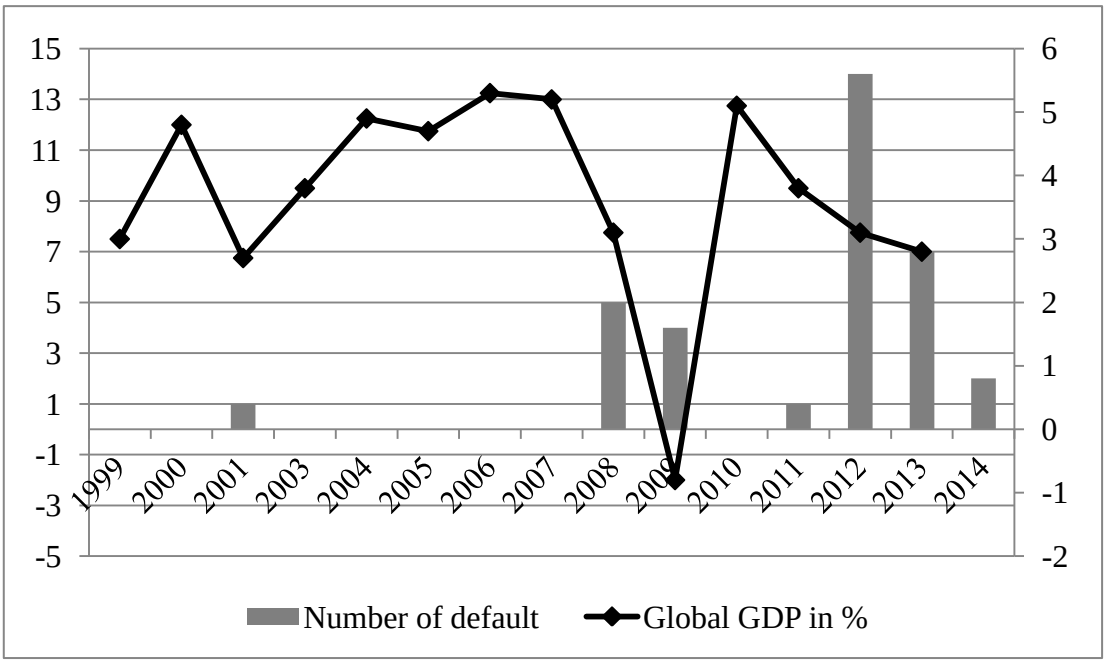

Figure 1. Default rate distribution by years
Source: (Mericas et al., 2015)

As can be seen, from the Figure 1 the largest number of defaults occurred in 2012 and the calculated default rate was 7.4%. Moreover, authors determined that the default rate was correlated with global GDP growth rate. They concluded that the average annual default rate was 0.53% during the period from 1861 to 2014.

The results of the research indicated that variables such as size, return on equity and the percentage held by the largest owner or owners of the company explained adequately the probability of default of listed shipping companies over the last fifteen years.

Thus, it can be concluded that the default risk in the shipping industry is quite low because the average default rate does not exceed 1% according to previous studies.

However, we find that many shipping companies go through procedures of mergers and acquisitions. Previous researchers do not take into account these cases

although the existence of mergers and acquisitions increases the riskiness of the shipping industry. Sometimes insolvent companies avoid default through these procedures and continue their performance. In this study, we introduce the concept of quasi-default for cases of mergers and acquisitions and some other procedures and measure the shipping industry's riskiness including not only cases of default but also quasi-default. Moreover, in the current paper, we analyze a wider range of potential risk factors and employ information on the activities of listed shipping companies over a longer time horizon.

3. Data and Methodology

The worldwide shipping industry includes a great number of different independent rational agent – port authorities, shipping services providers, shipping companies, etc. (Caschili and Medda, 2012). The data sample, retrieved from Thomson Reuters, consisted of information on 192 the listed shipping companies from 36 countries. Table 1 shows that the most of the shipping companies in the sample (82.82%) were registered in Europe and Asia (The World Bank Group, 2016).

Table 1

Continental affiliation of shipping companies

Part of the world	Number of companies	Portion (%)
Africa	1	0.52
Asia	80	41.67
Europe	79	41.15
North America	30	15.62
South America	2	1.04
Total	192	100

The distribution of companies among industry sectors is presented in Table A1. Shipping companies belong to 17 industry sectors that are quite diverse - from cruise lines to oil and gas transportation services. The main part of companies (68.23%) specializes in deep sea freight (deep sea transportation of cargo to or from foreign ports) and inland water freight and/or engages in maritime logistics.

Three major of them are A.P. Moeller - Mærsk A/S (Denmark), COSCO Shipping Company Limited (China) and Evergreen (Taiwan). Basic services of companies, operated in this industry sector, are transportation of intermodal containers (about 50% of sector revenue), palletized and boxed goods (20%), bulk liquids and gasses (10%) and dry bulk cargo (5%). Other services are the transportation of automobiles and trailers, as well as maintenance and repair services (Hoovers, 2016). In the data sample, 11.97% of companies perform refining and marketing oil and gas, servicing by oil transportation and work in the oil and related industries. Companies of this industry sector engage in the refining of crude oil and purifying of raw natural gas, as well as the marketing and distribution of its refined products (Dividend.com, 2016). The world's largest companies of this industry sector are Aegean Marine Petroleum Network Inc. (Greece), American Shipping Company ASA (Norway), Scorpio Tankers Inc. (Monaco) and Teekay Offshore Partners LP (Bermuda). The sector of 15.63% companies is unknown or makes a small proportion in the sample.

Based on the definition of default according to (Basel Committee on Banking Supervision, 2006) and depending on company default status from 2001 to 2016 the analyzed companies were classified into two categories: operating companies (150 companies, 77.6%) and defaulted companies (42 companies, 21.88%). Case study analysis presented below allows identifying among defaulted companies 26 quasi-defaulted ones (13.54%) and summarizes the main criteria for quasi-default in Table 2. Quasi-defaults were mergers; acquisitions; change of the name; re-registration of the company and others. The website Bloomberg was used to determine quasi-default status of companies and the data of default.

Table 2

Quasi-default cases

Criterion of quasi-default	Number of companies	Portion (%)
The company became the subsidiary of other company	10	38.46
Changing the name of the company/company group	5	19.23
The company absorbed other company	4	15.39
The company merged with other company from similar industry	5	19.23
The company became default, but it soon reactivated or was listed again	2	7.69
Total	26	100

Table 2 presents that more than a third quasi-defaulted companies (37.03%) are ones that became the subsidiary of other shipping companies. Some examples of quasi-defaults in the shipping industry are presented below.

1. The company became the subsidiary of other company:

- **Arlington Tankers Limited (2008)**. From 16 December 2008, Arlington Tankers Limited became a subsidiary of General Maritime Corporation. All shares of the company were exchanged for shares of General Maritime. Arlington shareholders were entitled to receive one share of General Maritime common stock for each share of Arlington common stock they had held immediately prior to the effective time of the combination (Marine Link, 2008).
- **Bird Acquisition Corporation (2008)**. Maritime Carriers Limited announced on 15 April 2008 that it completed its acquisition of Quintana Maritime Limited. As a consequence of the merger, Quintana Maritime Limited operated as a subsidiary of Excel under the name Bird Acquisition Corp. In accordance with the terms of the merger agreement, each issued and outstanding share of Quintana common stock was converted into the right to receive $13.00 in cash and 0.3979 Excel Class A common shares (Market Wired, 2008).
- **Blue Star Maritime S.A. (2008)**. From 23 December 2008, Attica Holdings SA acquired Blue Star Maritime S.A. Attica Group announced that following the merger by absorption of Blue Star Maritime S.A., the share capital of the company increased by the total amount of €55035163. At the same time, the nominal value per share increased from €0.60 to €0.83 and 37440020 new

common registered shares were issued, with a nominal value of €0.83 each (Quality Shipping Transportation Leisure Group Attica, 2008).

- **Broström AB (2009)**. On 27 August 2008, the Maersk Group announced a public offer for all shares in Broström. On 23 January 2009, the European Union sanctioned the merger and Broström AB became a subsidiary of Maersk Tankers A/S. This was the beginning of many changes with some partners leaving Broström, but in June the new organization was set. All tankers under 25000 dwt, whether Broström or Maersk Tankers, were trading under the Broström name from the headquarters in Copenhagen (Broström Official Website, 2009).
- **Crude Carriers Corporation (2011)**. From 30 September 2011, Crude Carriers Corp. has operated as a subsidiary of Capital Product Partners L.P. Capital Product announced that in May 2011 it resulted in an agreement to merge with Crude Carriers Corp. in a unit for share transaction. The exchange ratio was 1.56 CPLP common shares for each Crude Carriers Corp. share, which equated to a value of $17.58 per share based on CPLP's closing share price of $11.27 on May 4, 2011. The Partnership announced that it has completed the refinancing of Crude's debt of $134.6 million using its existing $350 million revolving credit facility founded in March 2008. The refinanced amount, as with all amounts drawn down under this facility, was non-amortizing until June 2013 (Capital Product Partners L.P. Official Website, 2011).
- **Dockwise Shipping B.V. (2013)**. Dockwise Shipping B.V. operates as a subsidiary of Dockwise Ltd. From 13 March 2013, Dockwise Ltd. operates as a subsidiary of Royal Boskalis Westminster NV (Bloomberg, 2016).
- **Global Ocean Carriers Limited (2001)**. From 13 February 2001, Global Ocean Carriers Limited became a subsidiary of Tsakos Energy Navigation Ltd (Bloomberg, 2016).
- **K-Sea Transportation Partners L.P. (2011)**. In March 2011 the company announced that it had entered into a merger agreement with Kirby Corporation.

In accordance with the terms of the agreement, K-Sea became a wholly owned subsidiary of Kirby. Under the terms of the agreement, K-Sea's common unitholders had the right to receive either $8.15 in cash or $4.075 in cash and 0.0734 of a share of Kirby's common stock for each common unit. K-Sea's preferred unit holders received $4.075 in cash and 0.0734 of a share of Kirby's common stock for each preferred unit. K-Sea's general partner received $8.15 in cash for each general partner unit and $18 million in cash for K-Sea's incentive distribution rights (Business Wire, 2011).

- **Sea Bright Holdings (2013)**. From 7 February 2013, Sea Bright Holdings operates as a wholly owned subsidiary of Enstar Group Limited.Sea Bright shareholders received $11.11 per share in cash, for an aggregate purchase price of approximately $252 million. The transaction was partly financed by a bank loan facility provided by National Australia Bank Limited and Barclays Bank PLC (DGAP.DE, 2013).
- **Yinson Production AS (2013)**. On 20 December 2013, Yinson Production AS became a wholly owned subsidiary of Yinson Holdings Berhad. Yinson Production AS was formerly known as Fred. Olsen Production ASA (Bloomberg, 2016).

2. Changing the name of the company/company group:

- **American Shipping Company ASA (2008)**. Aker American Shipping changed its name to American Shipping Company ASA after extraordinary general meeting on 25 June 2008. The new name was representative of that the US shipping company was no longer an Aker company, after Aker's shrinkage in ownership in the company from 53.2% to 19.9% (The World Company Database, 2016).
- **Danaos Corporation (2005)**. The company name was changed to Danaos Corporation in connection with its incorporation in the Republic of the Marshall Islands in 2005 (Danaos Official Website, 2005).
- **Nordic Shipholding A/S (2012)**. In 2012 Nordic Tankers divested its chemical activities to a company owned by the investment fund: Triton. The sale

included 9 chemical tankers, the entire organization, and the name: Nordic Tankers. Nordic Tankers has consequently changed its name to Nordic Shipholding A/S (Nordic Shipholding A/S Official Website, 2012).

- **The National Shipping Company of Saudi Arabia (2012)**. The National Shipping Company of Saudi Arabia was established in 1979 as a public company. In April 2012 the company unveiled its new brand identity as Bahri. Operations sectors include oil & gas, dry bulk, and general cargo shipping (Bloomberg, 2016).
- **Zhongchang Marine Company Limited (2010)**. In 2010 the company changed its name to Zhongchang Marine Company Limited and became a subsidiary of Guangdong Hualong Groups Limited Company (Bloomberg, 2016).

3. **The company absorbed other company:**

- **2GO Group Incorporation (2010)**. In December 2010, Negros Navigation announced that the China-Asean Investment Cooperation Fund acquired a control stake in the company through an equity infusion. The China-Asean Investment Cooperation Fund was a private equity firm wholly owned and controlled by the Government of the People's Republic of China was based in Netherlands. Briefly, the mainland Chinese government set up the China-Asean Investment Cooperation Fund, which then among other investments in the region took a controlling stake in Negros Navigation, which in turn purchased Super Ferry and related brands and rebranded itself 2GO Group (Bloomberg, 2016).
- **Birka Line ABP and Rederiaktiebolaget Eckero (2008)**. In early 2006 Birka Line ABP – Albanian shipping company was bought by Louis Cruise Lines due to financial problems and lack of passenger. In March 2007 Rederiaktiebolaget Eckero intended to purchase Birka Line ABP in its integrity, at the time, owning already 42% of company shares. On 24 May 2007 Rederiaktiebolaget Eckero owned 57.9% shares of Birka Line ABP. Since 28 May 2008 and to this

day Birka Line ABP ABP has been operating as a subsidiary of Rederiaktiebolaget Eckero (Bloomberg, 2016).

- **IM Skaugen SE (2003)**. In 2003 I.M. Skaugen merged with Teekay Shipping Corporation to jointly operate and expand its lightering business (the process of transferring cargo between vessels of different sizes), allowing Teekay to take a 50% stake in SPT (I.M. Skaugen Official Website, 2003).
- **Knightsbridge Shipping Limited (2015)**. On 31 March 2015 the company Knightsbridge Shipping Limited has completed the process of merging with the company Golden Ocean Group Limited. The companies entered into an agreement and a plan of merger, with Knightsbridge as the surviving legal entity, in October 2014. Knightsbridge Shipping Limited have issued 61.5 million shares to shareholders in Golden Ocean Group Limited, each share of Golden Ocean Group Limited has the right to receive 0.13749 shares in Knightsbridge Shipping Limited. The combined company has become one of the leading carriers of dry bulk shippers operating a fleet of 77 vessels, 36 of which were under construction from 31 December 2014. On 1 April 2015, the new combined company began trading shares on the NASDAQ and the Oslo Stock Exchange. Nowadays total capacity of the combined company's fleet is estimated at 10.6 million tons (Nasdaq Globe Newswire, 2014).

4. The company merged with other company from similar industry:

- **Evergreen Marine Corporation (2007)**. In 2007, Hatsu, Italia Maritima, and Evergreen merged into the single Evergreen Line (World Heritage Encyclopedia, 2016).
- **Hanjin Shipping Company Limited (2008)**. In July 2008 Hanjin Shipping agreed to the merger with Keoyang Shipping, bulk-oriented subsidiary (Hanjin Shipping Official Website, 2008).

5. The company became default, but it soon reactivated or was listed again:

- **Globus Maritime Limited (2010)**. The Company was incorporated on 26 July 2006 in Jersey to consolidate its founders' ship owning and ship management interests and had executive offices in Athens, Greece. On 24 November 2010,

Globus Maritime Limited re-registered into the Republic of the Marshall Islands (Globus Maritime Limited Official Website, 2010).

- **The Rodriguez Group Pty Ltd (2012).** The Company went out of business in 2012 and in 2013 was listed again (LinkedIn, 2016).

As part of the study, we considered four groups of potential drivers of default: financial and economic variables, macroeconomic variables, industry specific variable and other variables. Table 3 presents detailed information for selected variables.

Table 3

Description of variables

Dependent variable	
Default	1 – default/quasi-default company; 0 – operating company.
Financial variables	
ROE	Return on equity calculated as Net profit/ Equity, %
ROA	Return on assets calculated as Net profit/Total assets, %
Debt	Financial leverage calculated as Total liabilities/Equity, %
Tobin Q	Tobin Q calculated as Market value/Book value, %
Owners	The percentage of shares held by the largest shareholder, %
Current Ratio	Ratio of current liquidity calculated as Current assets/Current liabilities, %
Debt Ratio	Ratio of financial dependence calculated as Total liabilities/Total assets, %
EBITDA	Earnings before interest, income taxes, depreciation and amortization, USD
Macroeconomic variables	
GDP	Gross domestic product, USD
Oil Price	Brent oil price, USD
Other variables	
Total Asssets	Total assets, USD
Age	Age of the company calculated as difference between the current date and the date when the company was founded, year
Employees	Number of employees, mln people
Industry specific variable	
BSR	Bulk shipping rates, USD

The financial data, collected from the information-analytical system Thomson Reuters, in which information about companies is presented for the last 20 years of their existence maximum, for analyzed companies were collected from 1998 to 2016. Data about financial activity of companies were collected on 31 December. Some variables were recalculated on 31 December of each year, as

companies, included in the sample, publish their annual reports at various dates (30.01, 31.03, 30.06, 31.12). For example, Total Assets of the company whose financial year was ended in March had been recalculated in the following manner:

$$\text{Calculated Total Assets}_t = ¼ * \text{Total Assets}_{t-1} + ¾ * \text{Total Assets}_t,$$

where $\text{Total Assets}_{t-1}$ is the value of Total Assets from company's annual report in year t-1; Total Assets_t is the value of Total Assets from company's annual report in year t.

Many investment banks employed the simplification when they worked with companies whose financial years had ended in different months.

In addition, such macroeconomic indicators as gross domestic product (The World Bank Group, 2016) for 36 countries (country of company's registration) and Brent oil price, retrieved from websites Finam.ru, were collected. Gross domestic product was selected to take note a country affiliation of companies. Information on oil price was collected because most shipping companies in the sample use oil products as a fuel or operate in oil and related industries.

Moreover, we used the age of the company derived as the difference between the current date and the date when the company was founded (Age), total assets (Total Assets) to measure the company size and the number of employees each year (Employees), retrieved from Thomson Reuters. Bulk shipping rates, collected from the Clarksons dataset, were used as the industry specific variable.

4. Empirical Results

The distribution of defaults and quasi-defaults in shipping industry by years is shown in Figure 1. It shows that the greatest number of quasi-defaults occurs in 2008 (6 cases). Some experts associate it with the global economic crisis of 2008 that lead to falling demand for shipping services (Channel NewsAsia, 2015). Moreover, it can be seen that quasi-defaults happen more often than defaults.

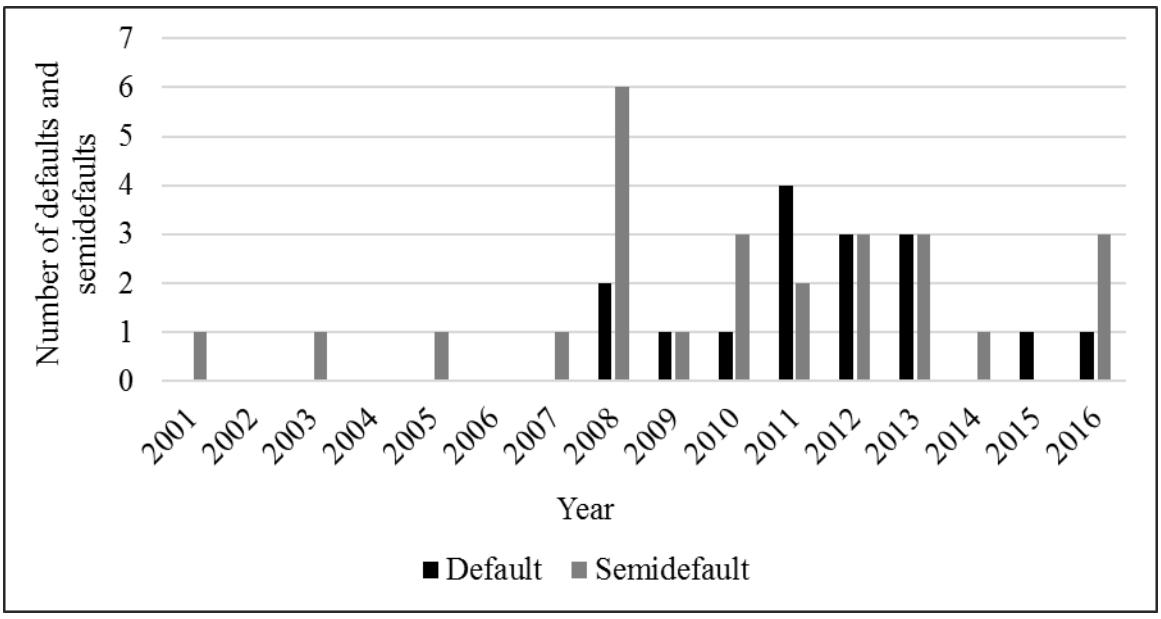

Figure 1. Default and quasi-default distribution by years

We have also calculated default rate by year as the number of defaulted companies (including quasi-defaults) divided by the number of all companies in each year (Figure 2). The highest default rate was 5.06% in 2008. As mentioned above the largest number of quasi-defaults occur in 2008 and the number of quasi-defaults affects the default rate.

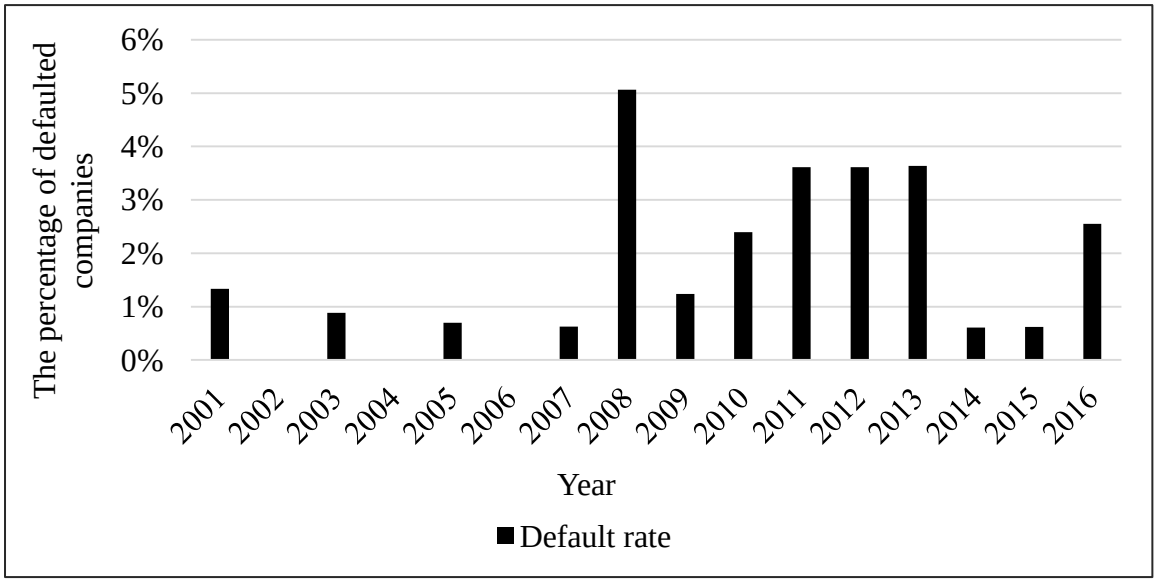

Figure 2. Default rate distribution by years

Table 4 reports a brief comparative analysis of relevant studies on similar topics and current paper.

Table 4

Comparative analysis of research on shipping companies' default

	Grammenos et al., 2007	Merikas et al., 2015	Current Paper
Time period	1992-2004	2000-2014	2001-2016
Number of shipping companies	50	208	192
Number of defaulted companies	13	33	42
Year with maximal number of defaulted companies	-	2012	2008
Average default rate	-	0.53%	1.79%
Methodology	Logistic regression analysis	Logistic regression analysis	Case study analysis, Logistic regression analysis
Data source	Clarksons' Shipping Intelligence Network, Bloomberg	Bloomberg, Compustat Global Database, S&P IQ Capital System, official websites of companies	Thomson Reuters, Bloomberg, Finam, The World Bank, Clarksons dataset, official websites of companies

Note: In contrast to previous studies (Grammenos et al., 2007; Merikas et al., 2015), current paper include not only default companies but also quasi-default companies in number of defaulted companies. In the future work, it is intended to use logistic regression analysis for modeling the probability of default for the listed shipping companies.

Comparing obtained default rates with the results from paper (Merikas et al., 2015) we find that a year with the largest number of defaults differs. It may be caused by the fact that Merikas et al. (2015) do not consider the group of quasi-defaulted companies. To estimate the riskiness of shipping industry we use the average default rate as the number of defaulted and quasi-defaulted shipping companies (42) divided by the number of all observations (2352) for the period from 2001 to 2016. Under the observation, we regard each company in one given year. The average default rate equals to 1.79% for the last 15 years that relevant to the results of the previous study (Merikas et al., 2015) about low shipping industry's average default rate that do not exceed 2%.

5. Conclusion and Discussion

In this paper we analyze 42 defaulted and 150 operating listed shipping companies for the time period 2001-2016 years. Apart from the cases of shipping companies' defaults, there are cases of quasi-defaults that can occur with companies that have introduced external control and with operating companies. Using the case study analysis we reveal among defaulted companies 26 quasi-defaulted ones. It should be noted that status of the quasi-default does not imply that the shipping company goes out of business. Some insolvent shipping companies avoid bankruptcy through procedures of mergers and acquisitions and continue their performance. It is important to consider these procedures at the measurement of the shipping industry's riskiness.

So even though in our sample it appears that the average default rate is quite low (1.79% for the period 2001-2016) it is higher than in previous studies. According to (Merikas et al., 2015), the shipping industry's average default rate do not exceed 1% during the last century, however, they do not take into account group of quasi-defaulted companies considering them as operating ones. Thus, we find that riskiness of the shipping industry is higher than in earlier projections and consideration of simidefauls affect it. Results of the current investigation will be useful for shipping companies' directors to make the right management decision and timely to reveal crisis tendencies in operational activities of a company in order to prevent default.

In a future paper, it is intended to construct logistic regression model to estimate the probability of default for shipping companies, considering such default companies as quasi-default companies. What is more, we plan to analyze logged effects of factors on the probability of default and to study predictive power of model by using ROC-analysis.

6. Appendix

Table A1. Industry sectors of shipping companies

Sector	Number of companies	Portion (%)
Cruise lines	1	0.52
Deep sea freight	70	36.46
Heavy machinery and vehicles	1	0.52
Inland water freight	6	3.12
Marine logistics	5	2.60
Marine freight and logistics	50	26.04
Life and health insurance	1	0.52
LNG transportation and storage	6	3.12
Marine cargo handling services	2	1.04
Marine port services	2	1.04
Metal containers and packing	1	0.52
Oil and gas refining and marketing	2	1.04
Oil and gas transportation services	13	6.77
Oil related services	3	1.56
Oil related services and equipment	5	2.60
Sailing yachts and motorboats	3	1.56
Sea-borne tankers	8	4.17
Shipbuilding	5	2.60
Unknown	8	4.20
Total	192	100

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