



How Maritime Connectivity and Crude Oil Price Determine Capital Structure of Maritime Industry in Indonesia

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Abstract. Maritime industries dominate the world's trade transportation mode because more than 90% of international trade volume is transported by sea. Indonesia as the biggest maritime country in the world has a big contribution to international trade volume. Investment decisions are very important for the sustainability and competitiveness of the companies in this industry. This article showed that several variables such as oil crude price and maritime connectivity index have determined the capital structure of firms in the maritime industry in Indonesia. The research analyzed 23 listed companies in the maritime industry in Indonesia between 2016–2020 using the ordinary least square and fixed effect model. The results of this study are in accordance with the pecking order theory as well as the trade-off theory. It showed that financial leverage was negatively affected by return on asset, and positively affected by tangibility and operating cash flow. In addition, oil crude price and maritime connectivity index have strengthened and weakened the correlations between financial leverage and its independent variable such as the return of assets, tangibility, and operating cash flow. These findings could help managers of the company to make a decision about their optimal capital structure based on those variables. This study has focused on the macroeconomic factors that affect firms' capital structure such as crude oil prices and maritime connectivity. Companies in the maritime industry in Indonesia have to be more focused on the tangibility and profitability of the company to make an investment decision. Furthermore, the results showed that fluctuation of crude oil prices and maritime connectivity index also become factors to be considered to optimize the capital structure of the companies.

Keywords: Capital Structure · Maritime Connectivity · Oil Crude Price · Maritime Industry · Investment Decision

1 Introduction

Based on the International Maritime Organization (IMO), more than 90% of international trade volume is transported by sea, which means that the maritime industry dominates the world's trade transportation modes. In this case, investment decisions and the composition of the capital structure are very important for the sustainability and competitiveness of the company.

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Pecking order theory and trade-off theory are the two basic theories of capital structure proposed by Modigliani and Miller [1]. Tangibility, profitability, and operating cash flow are 3 determinant factors of the capital structure of the company. In addition, there are other macroeconomic factors that strengthen or weaken the correlation between capital structure and its determinant factors such as crude oil price and maritime connectivity index.

Macroeconomic factors such as gross domestic product (GDP) are determined by many factors. According to data published in 2017 by the Coordinating Ministry for Maritime and Investment Affairs of Indonesia, maritime GDP contributed 6–8 percent to the national GDP while maritime connectivity and energy resource are the biggest contributors to the maritime GDP of Indonesia. Fluctuations in crude oil prices and the maritime connectivity index have an impact on maritime GDP which in turn will affect company's decisions in identifying the capital structure's composition.

Some industries have a typical character that gives significance to many decisions in the company of specified industries. This study provides references to certain companies about the distinctive character of the maritime industry in making decisions regarding capital structure. A lot of research on the company's capital structure has been carried out, but there are still few that discuss the interrelationships of macroeconomic factors and distinctive characters of specific industries, especially in the maritime industry.

Paun [2] showed that capital structure in shipping industries had a negative relation with the profitability of the company, and a positive relationship with the tangibility of fixed assets. Another research conducted by Ahmed [3] in 2021 has given similar results with a sample of 22 listed gas and oil companies in GCC. Meanwhile, the relationship between capital structure and external factors of a company such as GDP has been expounded by Goel [4]. Macroeconomic indicators i.e., gross domestic product (GDP) were found negatively, statistically, and significantly related to capital structure measured by long-term debt to total assets. The distinctive character of maritime industries that give consequence to macroeconomic factors such as GDP has been revealed in Fugazza's research [5]. The results demonstrated how important marine connectivity was in determining bilateral exports. The empirical studies conclusively demonstrated that the absence of a direct marine connection with a trading partner was related to lower export values, which ultimately had an impact on GDP.

Appertaining to previous literature, this study provides the latest reference regarding the determinant factors of capital structure in the maritime industry. Furthermore, the relationship between capital structure and the distinctive character of mentioned industry such as maritime connectivity and crude oil price also expounded in the research.

The main objective of the research is to show how a distinctive character in maritime industries is represented by macroeconomic factors such as crude oil price and maritime connectivity index that have significance in capital structure decisions in the company of the mentioned industry.

2 Methods

Panel data regression analysis using the Ordinary Least Square (OLS) approach was the methodology used in this study. To ascertain the link between one dependent variable and a number of independent factors, this analysis was carried out. The nature and strength of the link between numerous independent factors and one dependent variable can be revealed via panel data regression. Regression describes the co-variation of two measured variables in an interval or ratio. A simple regression means that there is only one dependent variable”.

This research was conducted by collecting data from the financial statements of 23 companies in the maritime industry in Indonesia that have been registered as public companies until 2020. In addition, maritime connectivity index data released from the official UNCTAD website is published annually and quarterly. The time period used in this research data was the 2016–2020 period.

The study examined the relationships between the stated dependent and independent variables as well as the impact of moderating variables on the relationship between dependent and independent variables using descriptive statistics, correlation analysis, and a pooled (OLS) ordinary least square random effect model. The first model to understand the determinants of the dependent variables is:

$$FL_{it} = \rho_0 + \rho_1 TAN_{it} + \rho_2 ROA_{it} + \rho_3 OCF_{it} + e \quad (1)$$

The model to understand the implication of moderating variables towards the relationship between dependent and independent variables is:

$$\begin{aligned} FL_{i,t} = & \rho_0 + \rho_1 TAN_{i,t} + \rho_2 ROA_{i,t} + \rho_3 OCF_{i,t} + \rho_4 ICP_{i,t} + \rho_5 LSCI_{i,t} \\ & + \rho_6 TAN*ICP + \rho_7 ROA*ICP + \rho_8 OCF*ICP + \rho_9 TAN*LSCI \\ & + \rho_{10} ROA*LSCI + \rho_{11} OCF*LSCI + e \end{aligned} \quad (2)$$

Note:

$FL_{i,t}$ = Financial Leverage of firm I at time t

$TAN_{i,t}$ = Tangibility of firm I at time t

$ROA_{i,t}$ = Profitability of firm I at time t

$OCF_{i,t}$ = Operating Cash Flow of firm I at time t

ICP_t = Indonesian Crude Price at time t

$LSCI_t$ = Liner Shipping Connectivity Index at time t

The coefficients of regression are $\rho_0, \rho_1, \rho_2, \rho_3, \rho_4, \rho_5, \rho_6, \rho_7, \rho_8, \rho_9, \rho_{10}$, and ρ_{11} (unknown constant to be determined from the data). The data was coded before being entered into the analysis program EViews (Table 1).

Table 1. Variables Description

Variables	Type	Measurement	Source
Leverage	Dependent	<i>Total Liabilities</i>	Annual Report
		<i>Total Equity</i>	
Tangibility	Independent	<i>Total fixed assets + Total Inventory</i>	Annual Report
		<i>Total Assets</i>	
Profitability	Independent	<i>Net Income</i>	Annual Report
		<i>Total Assets</i>	
Operating Cash Flow	Independent	<i>Cash Flow from Operating</i>	Annual Report
		<i>Total Assets</i>	
Crude Oil Price (ICP)	Moderating	$ICP_t - ICP(t - 1)$	Ministry of Energy &
		$ICP(t - 1)$	Mineral Resources of Indonesia
Maritime Connectivity	Moderating	$LSCI_t - LSCI(t - 1)$	UNCTAD
Index (LSCI)		$LSCI(t - 1)$	

3 Results and Discussion

3.1 Descriptive Statistics

The total number of data observations in this research was 115 data. It was conducted by collecting data from the financial statements of 23 companies in the maritime industry in Indonesia for 5 years period of time (2016–2020). The descriptive statistic of the variables in this research is shown in Table 3. It shows that the mean of leverage as a dependent variable is 1.255 with a standard deviation of 1.123. In addition, the maximum and minimum leverage of the firms are 7.568 and 0.006. These results suggest that the majority of firms in the maritime industry in Indonesia use debt as a primary source to fund its capital.

3.2 Classical Assumption Test Results

A classical assumption test was conducted to ensure that the quality of the data observed in this research was valid and reliable. In addition, it proves that the regression model is the Best Linear Unbiased Estimator (BLUE). The test carried out included tests to reveal and resolve multicollinearity, autocorrelation, and heteroscedasticity problem. A normality test was not carried out because the data observed in this research was huge enough.

A multicollinearity test was carried out to prove that independent variables did not have any correlation with each other. Multicollinearity occurs when Variance-Inflating Factor (VIF) is greater than 10, and the tolerance of the test is less than 0.1. The results

of multicollinearity test are shown in Table 2. Value of VIF for all variables in this research are less than 10 and the tolerance are greater than 0.1. It is proven that no correlation exists between the independent variables. The result of White’s general heteroscedasticity test also proves that the regression models of the research are the Best Linear Unbiased Estimator (BLUE). Table 5 shows that the determinant coefficients of chi-square probability are greater than the significant value of alpha (5%). It means that there is no heteroscedasticity issue in the regression models.

The Breusch-Godfrey (BG) test was carried out to disclose the correlation between the current value and past value of the variables. Table 4 shows that autocorrelation occurred in both models. The test’s findings indicate that neither model’s probability chi-square exceeds alpha (5%). The autocorrelation problem could be removed with a differential method, Gujarati [6].

3.3 Regression Model 1

Building upon the results of the classical assumption test, It might be said that the regression models of the research are the Best Linear Unbiased Estimator (BLUE). Besides, it was able to fulfill the assumptions. The results of each model were estimated using OLS method. The first regression models describe the connection between leverage and its determinants factor such as tangibility, profitability, and operating cash flow. The results of this model are shown in Table 2.

Based on the first hypothesis test, the aim is to examine the tangibility’s impact on the company’s leverage in the maritime industry in Indonesia. Hypothesis H1 states

Table 2. Multicollinearity test result

Variables	Tolerance	VIF
TAN	0.962	1.039
ROA	0.622	1.609
OCF	0.622	1.608
LSCI	0.726	1.377

Table 3. Descriptive Statistics

	LEV	TAN	ROA	OCF	ICP	LSCI
Data Obs	115	115	115	115	115	115
Mean	1.255	0.768	-0.006	0.083	0.094	0.018
Median	1.048	0.794	0.017	0.076	0.192	-0.022
Maximum	7.568	0.963	0.389	0.560	0.440	0.327
Minimum	0.006	0.119	-1.022	-0.197	-0.289	-0.235
Std.Dev	1.123	0.162	0.151	0.087	0.258	0.183

Table 4. Breusch-Godfrey Serial Correlation LM Test Result

	Model 1		Model 2	
	Before	After	Before	After
Prob. F (2,100)	0.000	0.4804	0.000	0.851
Prob Chi-Square (2)	0.000	0.4636	0.000	0.832

Table 5. White's General Heteroskedasticity Test Result

	Model 1	Model 2
Prob. Chi-Square	0.2646	0.0681

Table 6. Regression Model 1

Variable	Coefficient	t-Statistic	Sig
C	-0.046	-0.846	0.399
TAN	2.372	2.929	0.004
ROA	-0.828	-2.277	0.0252
OCF	0.984	1.636	0.105
R-Squared	0.127	F-statistic	4.276
Adj. R-Squared	0.09	Prob (F-Statistic)	0.007
DW-Stat	1.135		

that tangibility does not have a significant impact on company leverage in the maritime industry in Indonesia, but the regression results in Table 6 show that tangibility has a significant effect on companies in the maritime industry in Indonesia. The effect of tangibility on the company's leverage in this study is positive. This result is in accordance with the hypothesis proposed by Paun [2] that the value of the company's tangible assets affected the company's credibility in obtaining debt and improvising its credit capacity because the company can have greater guarantees in the event of bankruptcy.

The regression results in Table 6 for the second hypothesis show that profitability has a significant and negative effect on company leverage in the maritime industry in Indonesia. The pecking order theory states that companies that have a high level of profitability target a low level of leverage where funding from internal sources is preferred over funding from external sources (debt financing). This study supports previous research which shows a negative relationship between profitability and leverage. The results of the previous study were revealed by Sutomo [7] that the level of company profitability calculated using the ROA ratio had a significant and dominant relationship with the company's leverage and had a negative effect.

The third hypothesis test was conducted to examine the effect of operating cash flow on company leverage in the maritime industry in Indonesia. Hypothesis H3 states that operating cash flow did not have a significant effect on company leverage in the maritime industry in Indonesia. The regression results in Table 6 show that operating cash flow has no significant effect on company leverage in the maritime industry in Indonesia. It can be concluded that the H3 hypothesis is accepted. The results of the regression model state that operating cash flow has a positive effect on company leverage. This supports the signaling theory that there is asymmetric information between company managers and external shareholders, where company management has more information than shareholders outside the company. The signaling model predicts that industries that have great potential for growth and development should use more debt than mature industries.

3.4 Macroeconomics Factor as a Moderating Variable

The second regression models describe the effect of macroeconomic factors such as oil crude price and maritime connectivity index on the relationship between leverage and its determinants factor such as tangibility, profitability, and operating cash flow. The results of this model are shown in Table 7. This macroeconomic factor acted as moderating variable which strengthen or weaken the connection between leverage and its factors. The link between tangibility and leverage is negatively impacted by the price of crude oil. This indicates that the relationship between tangibility and firm leverage tends to be weakened by fluctuations in crude oil prices. However, it has little impact; as a result, hypothesis H4.1 is rejected. Companies prefer to limit the usage of debt in the composition of their capital structure as the price of crude oil rises tends to diminish the tangibility value of the company. However, if the tangibility value of the business increases in response to a drop in gasoline prices, the business tends to raise the proportion of debt in its capital structure.

Hypothesis H4.2 states that fuel prices do not have a significant impact on the relationship between profitability and company leverage in the maritime industry in Indonesia. The regression results in Table 7 show that the price of fuel has no significant effect on the relationship between the company's leverage tangibility in the maritime industry in Indonesia, meaning that hypothesis H4.2 is accepted. The results of the regression model state that the increase in fuel prices has a positive effect on the relationship between profitability and company leverage. This means that changes in fuel prices tend to strengthen the relationship between tangibility and company leverage.

Hypothesis H4.3 states that fuel prices do not significantly impact the interaction between operating cash flow and company leverage in the maritime industry in Indonesia. The regression results in Table 7 show that fuel prices have a significant effect on the 5% alpha value on the relationship between operating cash flow and company leverage in the maritime industry in Indonesia, meaning that hypothesis H4.3 is rejected. The results of the regression model show that the connection between cash flow from operations and firm leverage is negatively affected by the rise in fuel prices. This means that changes in fuel prices tend to strengthen the relationship between operating cash flow and company leverage. Rising fuel prices will reduce the company's operating cash flow, so companies tend to reduce the use of debt in the composition of their capital structure. Meanwhile,

if the price of fuel decreases, the company's operating cash flow will increase, so the company tends to increase the level of debt in the composition of its capital structure.

Another moderating variable in the models is the maritime connectivity index. The results in Table 7 show how the maritime connectivity index strengthens or weakens the relationship between leverage and its determinants. Hypothesis H5.1 states that the maritime connectivity index does not have a significant effect on the relationship between tangibility and company leverage in the maritime industry in Indonesia. The regression results in Table 7 show that the maritime connectivity index has no significant impact on the relationship between tangibility and company leverage in the maritime industry in Indonesia, so hypothesis H5.1 is accepted. The results of the regression model reveal that the increase in the maritime connectivity index has a positive impact on the relationship between tangibility and company leverage. An increasing maritime connectivity index indicates an increase in maritime transportation activity. This will make the company's tangibility value increase so that the company tends to increase the use of debt in the composition of its capital structure, especially for investment purposes. Meanwhile, if the maritime connectivity index declines, the value of the company's tangibility will tend to decrease, so the company tends to reduce the level of debt in the composition of its capital structure.

Hypothesis H5.2 states that the maritime connectivity index does not have a significant effect on the relationship between profitability and company leverage in the maritime industry in Indonesia.

Table 7. Regression Model 2

Variables	Coefficient	t-Statistic	Sig
C	7.647	2.897	0.005
TAN	3.416	0.783	0.000
ROA	-1.140	0.378	0.003
OCF	0.833	0.728	0.256
ICP	1.921	0.939	0.044
LSCI	-1.383	0.973	0.159
TAN*ICP	-1.514	1.153	0.193
ROA*ICP	1.096	2.407	0.650
OCF*ICP	-7.354	3.141	0.022
TAN*LSCI	1.121	1.229	0.364
ROA*LSCI	-0.079	2.288	0.973
OCF*LSCI	4.962	3.087	0.112
R-Squared	0.276	F-statistic	2.777
Adj. R-Squared	0.177	Prob (F-Statistic)	0.004
DW-Stat	1.68		

The regression results in Table 7 show that the maritime connectivity index has no discernible impact on the relationship between profitability and company leverage in the maritime industry in Indonesia, so hypothesis H5.2 is accepted. The results of the regression model state that the increase in the maritime connectivity index has a negative effect on the relationship between profitability and company leverage.

Hypothesis H_{5,3} states that the maritime connectivity index does not have a significant effect on the relationship between operating cash flow and company leverage in the maritime industry in Indonesia. The regression results in Table 7 show that the maritime connectivity index has no significant effect on the relationship between operating cash flow and company leverage in the maritime industry in Indonesia, so hypothesis H_{5,3} is supported. The results of the regression model show that the increase in the maritime connectivity index has a positive effect on the relationship between operating cash flow and company leverage.

4 Conclusion

This research employed an OLS estimation method to examine the factors that determine the capital structure and the effect of macroeconomic factors such as crude oil price and maritime connectivity index to the linkage between corporate capital structures in the maritime industry in Indonesia and its determinant. The macroeconomic factor in this study acted as moderating variable which strengthen or weaken the relationship between the capital structure of companies in the maritime industry in Indonesia and its determinant.

This research proposes three determinants of capital structure as an independent variable (tangibility, profitability, and operating cash flow). The results support the trade-off theory which states that companies can increase their level of leverage to a certain point where the benefits of taxes on the use of debt are equal to the potential costs that must be incurred as a result of the increased possibility of financial distress. Financial distress in question is the company's financial difficulties which refer to the costs associated with bankruptcy or reorganization as well as the agency fees associated with a company's creditworthiness. Companies with large amounts of tangible assets will have lower costs associated with bankruptcy.

It also supports the pecking order theory which states that high profitability targets a low level of leverage where funding from internal sources is preferred over funding from external sources (debt financing). This statement is supported by empirical studies conducted previously by Drobetz⁴. Another study conducted by Ahmed¹ demonstrated that there was a negative connection between leverage and profitability, so companies with high profitability will use less debt.

This research also reveals that fluctuation of crude oil prices and the maritime connectivity index could strengthen and weaken the relationship between capital structure and its determinant. The implication of these results is that firms have to consider the fluctuations of crude oil price and maritime connectivity index to decide the optimal composition of capital structure.

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