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“Exploring the Relationship Between Management, Corporate Governance, and Agency Theory: An Empirical Examination of Their Impact on Net Asset Value Premiums or Discounts in Publicly Listed Shipping Companies”

Master Thesis

by

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Abstract

This paper investigates the relationship between corporate governance and the premiums or discounts between the market capitalization and the net asset value (NAV) of publicly listed maritime shipping companies. We employ a quantitative study with a unique panel data, to explore and empirically investigate the reasons why a company’s corporate governance may affect NAV discounts or premiums. By understanding how management and corporate governance practices can influence the valuation of a company, stakeholders can make more informed decisions about their investments and the companies they choose to do business with. Factors such as Related Party Transactions, Return on Equity, Board Independence, and Board Size have a negative effect on the P/NAV ratio, indicating that these governance practices tend to result in NAV discounts. Conversely, CEO duality and market capitalization exhibit a positive effect on the P/NAV ratio, suggesting that these factors contribute to NAV premiums.

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Table of Contents

1 INTRODUCTION AND MOTIVATION	1
2 LITERATURE REVIEW	3
2.1 NET ASSET VALUE DEVIATION LITERATURE	3
2.2 ASSET VALUE LITERATURE.....	4
2.3 CORPORATE GOVERNANCE AND MANAGEMENT LITERATURE	6
3 DATA & METHODOLOGY	8
3.1 DATASET	8
3.2 METHODOLOGY.....	8
3.2.1 Hypothesis.....	8
3.2.2 Dependent variable.....	9
3.2.3 Independent variables.....	9
3.3 MODEL SPECIFICATION	13
3.3.1 Fixed effects, Random effects, or Pooled regression.....	14
3.3.2 Addressing multicollinearity.....	15
4 RESULTS AND ANALYSIS.....	17
5 ADDITIONAL ANALYSES.....	26
6 CONCLUSION.....	29
7 BIBLIOGRAPHY	31

List of Tables

TABLE 1: VARIABLE DESCRIPTION	12
TABLE 2: DESCRIPTIVE STATISTICS	13
TABLE 3: UNRESTRICTED REGRESSION	17
TABLE 4: HAUSMAN TEST	18
TABLE 5: PEARSON CORRELATION MATRIX.....	20
TABLE 6: RESTRICTED REGRESSIONS	21
TABLE 7: RESTRICTED SUBSET REGRESSIONS.....	22
TABLE 8: REGRESSIONS RESTRICTED ON MEDIAN AND P/NAV.....	26

1 Introduction and motivation

Maritime shipping is a vital industry that plays a crucial role in global trade and commerce. One of the central questions in the field of maritime shipping is the discrepancy between the stock market value and the value of a company's vessels net of its liabilities. In theory, if capital and second-hand ship markets were perfectly efficient and liquid, the price of a company's shares should accurately reflect the value of its assets net of its liabilities. However, in practice, there are a number of factors that can cause deviations from this expectation.

Within this context, the maritime shipping sector provides a particularly intriguing area of study from a corporate governance perspective. Publicly listed maritime shipping companies offer a unique vantage point as they embody both asset-based valuations and stock market values. Analyzing any discrepancies between these two valuation approaches can shed light on potential frictions and factors influencing the divergences. For instance, understanding why the value of a company's assets differs in one market from the other, despite its fundamental value being derived from tangible assets, such as ships, presents an intriguing research question.

In this research, we aim to explore the specific role that corporate governance and management plays in explaining the gap between a shipping company's stock market value and the value of its vessels. To achieve this, we will focus on the price-to-NAV ratio (P/NAV), a commonly used measure of premiums and discounts. (P) represents the company's market capitalization, while (NAV) denotes the value of its assets (ships) net of liabilities. Analyzing the P/NAV ratio will enable us to identify patterns or trends that may suggest a relationship between management and corporate governance and the deviation between stock market and vessel value.

While various factors can contribute to the deviation between stock market value and vessel value, including capital structure, stock liquidity, and market sentiment, our research centers on investigating corporate governance and management as specific factors. By focusing on corporate governance and management, we seek a deeper understanding of its contribution to the observed discrepancy.

The violation of the law of one price, wherein stock market value and vessel market value differ, makes this research topic particularly compelling. Our aim is to highlight the complex dynamics of the maritime shipping industry and contribute to ongoing discussions on enhancing sector efficiency and transparency.

Our hypothesis posits that companies with sound corporate governance practices will trade at a premium compared to their competitors, reflecting the market's perception of value-added by effective management and governance measures. Conversely, companies with poor corporate governance will trade at a discount, indicating market concerns over value destruction resulting from inadequate management and governance measures.

To test this hypothesis, we will examine the relationship between various corporate governance factors and the P/NAV ratio in publicly traded maritime shipping companies. Specifically, we will evaluate the impact of agency frictions, which denote the misalignment of incentives between CEOs and shareholders, along with other corporate governance metrics, on the P/NAV ratio. Through this investigation, we aim to shed light on the factors that shape the market's perception of a maritime shipping company's value. Our insights will be valuable for investors, analysts, and industry practitioners seeking a comprehensive understanding of the forces influencing the market value of maritime shipping companies.

2 Literature review

2.1 Net Asset Value Deviation Literature

While the availability of literature on "Net Asset Value (NAV) discounts and premiums" in the maritime shipping industry is limited, there exists a substantial body of research exploring NAV deviations in related sectors such as real estate and closed-end funds (CEFs). Therefore, in our analysis, we draw upon theories and insights derived from these three industries to gain a comprehensive understanding of the topic.

In the maritime shipping industry, Andrikopoulos, A., et al. (2022) conducted a study to examine the reasons behind NAV discounts and premiums. They found that these deviations are associated with company-specific factors such as capital structure, stock liquidity, fleet acquisition cost, operating performance, institutional ownership, cost of capital, corporate governance, dividend policy, and related party transactions. They used both a qualitative study with equity analysts and a quantitative study with panel data, providing a comprehensive analysis.

Similarly, Ke, Q. (2015) studied NAV discounts in UK-listed property companies and specifically focused on the impact of corporate governance mechanisms. She found that higher board independence can reduce the level of discount to NAV.

Chen, F., et al. (2018) studied the relationship between earnings opacity and closed-end country fund discounts. They found that the difference between the fund's NAV and its trading price is positively associated with the earnings opacity of the underlying companies. The positive relation varies predictably with U.S. investors' information acquisition and processing costs and with the extent to which host stock markets are segmented from the U.S. market, this means the more information U.S. investors have the less discount we see.

The study by Cheng, A., et al. (1994) suggests that this anomaly of the discount to NAV of investment trust shares may be caused by mean reversion in the discounts and hence market inefficiency. Furthermore, the study suggests that the NAV and the price of investment trust shares are cointegrated, which implies the existence of profitable trading rules based on the identification of Error Correction Mechanisms.

The study, "A liquidity-based theory of closed-end funds" by Cherkes, M., et al. (2008) examines the reasons behind NAV discounts in CEFs and presents a liquidity-based model of CEFs. The study argues that CEFs offer a way for investors to buy illiquid securities without facing the potential costs of direct trading or the externalities of open-end funds.

The study's theory predicts patterns of initial public offerings in certain sectors and the behavior of CEF discounts, which result from a trade-off between the liquidity benefits of investing in a CEF and the fees charged by fund managers. Specifically, the study explains why CEFs are initially offered at a premium to NAV and later trade at a discount. The study provides a new perspective on the underlying causes of NAV discounts in closed-end funds and supports the idea that it is a trade-off between liquidity benefits and management fees.

In conclusion, the literature on NAV discounts and premiums in various industries suggests that these deviations can be caused by a variety of factors such as capital structure, liquidity, operating performance, and corporate governance. Studies in different industries such as maritime shipping and real estate have shown that company-specific factors are associated with NAV discounts and premiums and the role of board independence, earnings opacity, information asymmetry, and liquidity trade-offs have been suggested as possible causes. These studies provide a useful starting point for further research on this topic and works as a framework for the further analysis of the effect of corporate governance on NAV deviations.

2.2 Asset Value Literature

In order to properly investigate the effect of corporate governance on P/NAV discounts and premiums, we have to consider the potential inefficiencies present in both the equity markets and the market for second-hand vessels.

The equity markets are where publicly listed maritime shipping companies are traded, and the prices of their stocks reflect the market's assessment of the value of the company and its assets. The efficient market hypothesis (EMH) posits that stock prices reflect all available public information, meaning that any information that could affect the value of a company is already reflected in its stock price, Fama, E. F. (1970).

This theory has been supported by classical financial literature, such as the Fama-French five-factor model, Fama, E. F., & French, K. R. (2015). This suggests that

the markets are efficient and that equity prices always reflect public information available to the investor. However, this theory also assumes that the markets are homogeneous and that all participants have equal access to information and resources, which may not be the case for the maritime shipping industry.

The pricing of maritime vessels, conversely, has distinct characteristics that set it apart from other sectors. However, this market is not as thoroughly researched as the efficiency of public equities. Research by Adland, R., & Koekebakker, S. (2007) has shown that ship prices are formed based on various factors such as the vessel's deadweight tonnage, age, and the state of the freight market.

Beenstock (1985) was an important contributor in maritime economics by examining both the freight and sale-and-purchase markets. He concluded that the prices of vessels are subject to the influence of seaborne trade volumes. Beenstock & Vergottis (1989a, 1989b) subsequently examined equilibrium models in tankers and dry cargo markets, revealing that second-hand vessel prices during the 1960s to 1980s were shaped by freight rate minus costs.

Furthering the research on the importance of freight rates Merika, A., et al. (2019) conducted a comprehensive study on second-hand dry bulk vessels, analyzing a sample of 5,591 transactions spanning the period from 1998 to 2016. Their research not only reaffirmed the significance of freight rates in influencing vessel prices but also identified additional fundamental factors such as vessel age, size, scrap prices, Baltic fleet size, and interest rates that exert an impact on vessel valuation.

But when it comes to the vessel market's ability to absorb the information, the evidence is inconclusive. While some studies such as "Market Efficiency in the Second-hand Market for Bulk Ships" from Adland, A. O., & Koekebakker, S. (2004), suggest that the EMH is supported, other studies from Alizadeh, A. H., & Nomikos, N. K. (2007) suggest that trading strategies based on earnings-price ratios can lead to excess profits, therefore the market may not be as efficient as the equity markets.

2.3 Corporate Governance and Management Literature

Extensive research in both the maritime shipping industry and broader business contexts has revealed a link between corporate governance, management effectiveness, and a company's financial performance. Recognizing the importance of this relationship, we have conducted a comprehensive literature review specifically examining corporate governance and management practices within the maritime sector and more generally.

Kohlbeck, M., & Mayhew, B. W. (2010) conducted a study to examine how the stock market values companies that engage in related party transactions (RPT) compared to those that don't. RPT are when a company has financial dealings with its own managers, directors, principal owners, or affiliates. The researchers analyzed the market values of these companies right before the implementation of the Sarbanes-Oxley Act, which prohibited certain RPT loans. By looking at the market's perception of these companies before the regulatory intervention, they could assess their valuation. They also examined the subsequent returns of the RPT firms to understand their overall risk-return profile. The findings of their market analysis revealed that RPT firms had significantly lower valuations compared to non-RPT firms. The subsequent returns of RPT firms were also marginally lower. The market's perception of these companies varied based on the type of RPT and the parties involved. These findings could also explain deviations in the firm P/NAV ratio

Bhandari, L. C. (1988) found that there is a positive connection between the projected returns on common stocks and the proportion of debt (liabilities excluding common equity) to equity. This association remains significant when considering factors such as beta and firm size. While the relationship is particularly strong in January, it is not influenced by changes in the market proxy, estimation technique, and other factors. These findings indicate that the added value associated with the debt-to-equity ratio is unlikely to be solely attributed to a "risk premium". This indicates that the managements choice of debt-to-equity ratio might have an impact on deviations in NAV.

Syriopoulos, T., & Tsatsaronis, M. (2012) explores the impact of CEO duality/separation on financial performance in the maritime shipping industry. As maritime shipping companies increasingly go public and move away from family-run models, conflicting arguments from agency and stewardship theories arise

regarding CEO duality/separation. CEO separation (having different individuals serve as CEO and Chairman) is considered good corporate governance, benefiting shareholders by enhancing monitoring and control of top management and improving financial performance (agency theory). On the other hand, CEO duality provides a unified command structure, minimizing conflicting decisions and supporting financial performance (stewardship theory). Previous empirical findings on CEO duality/separation and financial performance have been inconsistent. This study addresses this gap in the research, and it finds that CEO separation positively influences the financial performance of maritime shipping companies, supporting agency theory. Bhagat, S., & Bolton, B. (2008) also found that better governance, as measured by the indices, stock ownership of board members, and CEO-Chair separation, is significantly positively correlated with better contemporaneous and subsequent operating performance, but not with future stock market performance.

Andrikopoulos, A., et al. (2021) also found that profitability, financial leverage, firm size, board size and board independence are important determinants of RPT for maritime shipping companies. Even though the article does not relate to NAV deviations directly, it highlights the agency conflicts that may appear in the maritime shipping industry.

In conclusion, the research suggests that corporate governance practices play a crucial role in ensuring the interests of shareholders and other stakeholders are protected in the shipping industry, which is particularly important given the large investments in assets and long-term contracts that are typical in this sector.

Effective corporate governance practices can lead to better financial management decisions and firm performance. Additionally, interlocking corporate leadership and the presence of institutional investors can help to mitigate agency conflicts and improve corporate governance, ultimately leading to better financial performance.

3 Data & Methodology

3.1 Dataset

Our dataset consists of quarterly historical P/NAV ratios for more than 30 publicly listed maritime shipping companies. Gathering public data on vessel values has proven to be quite challenging, which has posed a constraint on data collection. To overcome this challenge, we have received valuable assistance from Clarksons, a renowned global shipping brokerage firm. Their comprehensive dataset covers the period from the third quarter of 2018 to year end 2022 and includes listed companies from multiple stock exchanges such as Oslo Stock Exchange (Oslo Børs), Euronext Brussels Stock Exchange, Copenhagen Stock Exchange, Nasdaq, and New York Stock Exchange (NYSE). This data provides a valuable overview of the financial performance and asset values over time.

Using the data provided by Clarksons, we have successfully compiled a distinctive panel dataset comprising the mentioned maritime shipping companies spanning the period from third quarter 2018 to year end 2022. However, due to the listing or delisting of certain companies during this timeframe, the panel dataset exhibits an unbalanced structure. The dataset consists of approximately 3.53 company years, which is slightly shorter than our 4.5-year timeframe, illustrating an unbalanced dataset.

3.2 Methodology

3.2.1 Hypothesis

General corporate governance and agency theory suggests that the transparency, accountability, quality of management and decision-making processes within a company may have a significant impact on the investor's perception of the company's value and risk profile (Eisenhardt, K. M., 1989). Our hypothesis is that this perception may have an impact on NAV premiums or discounts for maritime shipping companies.

To illustrate, companies with robust corporate governance practices and a strong management team may be seen as having lower risk for shareholder expropriation, which can lead to higher premiums for their NAV. Conversely, companies with weak corporate governance practices may be perceived as having higher risk of shareholder expropriation, resulting in discounts on their NAV. In other words,

corporate governance and management practices can have a direct impact on a company's NAV deviation, and therefore, its overall valuation.

3.2.2 Dependent variable

The dependent variable in our study is the Price-to-Net Asset Value ratio (P/NAV), which serves as an effective proxy to illustrate the extent of discount or premium for each company. A P/NAV ratio greater than one indicates a NAV premium, while a P/NAV ratio less than one signifies a discount. According to Clarksons, the calculation of the P/NAV ratio involves starting with the market price of each vessel and adding other maritime shipping-related and non-fixed assets. Once the asset side is determined, the liabilities are subtracted, and the company's market capitalization is divided by the resulting figure to obtain the P/NAV ratio.

3.2.3 Independent variables

There are limited articles regarding NAV deviations in the maritime shipping industry, thus creating a challenge from a research standpoint. That's why we have decided to focus on historical research on agency theory, management effectiveness and corporate governance. We have selected previous research qualitatively to find independent variables that suits the maritime shipping industry and our thesis.

CEO duality is included in our analysis, drawing upon the research findings of Syriopoulos, T., & Tsatsaronis (2012) and Bhagat, S., & Bolton, B. (2008). CEO-Chair separation increases top management monitoring and is considered good corporate governance in agency theory (Eisenhardt, 1989). Syriopoulos, T., & Tsatsaronis (2012) found a positive influence of CEO and chairman separation on the financial performance of maritime shipping companies, supporting this theory. Bhagat, S., & Bolton, B. (2008) also found a positive correlation between CEO-Chair separation and better operating performance. Therefore, it is relevant to include CEO duality as a corporate governance metric in our analysis.

Additionally, we include related party transactions (RPT) as an independent variable based on the research findings of Kohlbeck, M., & Mayhew, B.W. (2010). Their market analysis demonstrated that companies involved in RPT exhibited significantly lower valuations compared to those not engaged in such transactions.

Considering the prevalence of RPTs in the maritime shipping industry, we conclude that RPT is a relevant corporate governance metric to include in our analysis.

We also incorporate debt-to-equity ratio (D/E) as an independent variable, influenced by the research findings of Bhandari (1988). Bhandari's research suggests a positive association between projected returns on common stocks and the proportion of D/E. By including D/E in our regression analysis, we aim to assess the impact of leverage and risk management on the market valuation of publicly listed maritime shipping companies. The inclusion of the D/E ratio allows us to investigate whether maritime shipping companies with higher levels of debt experience a valuation premium or discount, considering that leverage is partly determined by the management.

Return on equity (ROE) is included as an independent variable to measure management effectiveness. ROE evaluates a company's profitability and efficiency in generating returns for shareholders. By incorporating ROE, we assess the impact of management effectiveness on NAV premiums or discounts in publicly listed maritime shipping companies. ROE provides insights into strategic decision-making, operational efficiency, and resource utilization (Arditti, 1967). Including ROE as an independent variable allows us to control for the effect of management effectiveness on NAV premiums or discounts.

Rozeff, M.S. (1982) observed that higher dividend payments in relation to earnings can reduce agency costs within a firm. However, this increase in dividends also results in higher transaction costs associated with external financing. Furthermore, research suggests that companies with greater investment, indicated by higher current and prospective revenue growth rates, tend to have lower dividend payouts. Given these relevant findings, we include the dividend payout ratio as an independent variable.

Board independence is included in our empirical research, as it is frequently considered as an independent variable in prior research on NAV premiums or discounts in the maritime sector and similar industries. Ke, Q. (2015) found a significant negative relationship between board independence and NAV, indicating that companies with more independent directors have a lower discount to NAV, suggesting enhanced firm performance.

Syriopoulos, T., et al., (2011) conducted a separate study that discovered an interesting relationship in highly competitive industries. Their findings suggested that companies operating in such industries may require fewer independent directors, as the competitive product market acts as a form of effective monitoring. Given the relevance of these findings, we consider it valuable to include the number of independent directors as an independent variable in our analysis.

To account for company size and reduce omitted variable bias, we include market capitalization as a control variable in our regression analysis. Including market capitalization enhances the accuracy and reliability of our findings, allowing us to isolate the effects of our independent variables on NAV premiums or discounts more effectively.

Additionally, we include board size as a control variable in our regression, influenced by the research findings of Yermack, D. (1996) and Eisenberg, T., et al. (1998). Yermack found evidence consistent with theories that smaller boards of directors are more effective and found an inverse association between board size and firm value using a large sample of US industrial corporations. He also found that small boards provided stronger CEO performance and better financial ratios.

Similarly, Eisenberg, T., et al. (1998) conducted a study focusing on small to medium-sized firms in Finland, revealing a negative correlation between board size and profitability within this specific context. Building upon these findings, we deemed it appropriate to examine the relationship between board size and NAV premiums or discounts in publicly listed maritime shipping companies within our own analysis.

Table 1: Variable description

This table reports both the dependent variable and the independent variables used in the empirical analysis. The first column is the name of the variable followed by the notation used in the regressions, variable description, continuous or categorical type and our prediction for the relationship between the variable and the dependent variable.

Variable	Notation	Description	Type	Predicted Relationship
Price/Net Asset Value	PNAV	A measure of a firm's net asset value per share, calculated as the difference between its total assets and liabilities divided by the number of outstanding shares.	Continuous	N/A
Dividend payout ratio	DPR	A measure of the proportion of a company's earnings that are paid out as dividends to shareholders. The dividend payout ratio is measured on a logarithmic scale to reduce the effect of extreme values and to make the data more normally distributed.	Continuous	+
CEO duality	CEODU	The roles of CEO (Chief Executive Officer) and Chairman of the Board are held by the same person. CEO Duality is measured as a dummy variable holding the value of one in the presence of CEO duality and 0 otherwise.	Categorical	-
Related party transactions	RPT	Related party transaction (RPT) is transactions between the company and individuals or entities closely related to the company, such as family members or directors. RPT is measured as a dummy variable holding the value of one in the presence of RPT and 0 otherwise.	Categorical	-
Board independence	BOARDIND	A measure of the amount of independent board members, independent board members divided by board size. Independent directors are directors that are independent of the company and its management.	Continuous	+
Board size	BSIZE	A measure of the number of board members in the board of directors.	Continuous	-
Return on equity	ROE	A measure of a firm's profitability and is calculated as a firm's net income divided by its total equity. Winsorized to reduce the effect of extreme values on the regression.	Continuous	+
Debt-to-equity ratio	D/E	A measure of a firm's financial leverage and is calculated as a firm's total debt divided by its total equity. Measured on a logarithmic scale to reduce the effect of extreme values and to make the data more normally distributed.	Continuous	-
Market capitalization	MCAP	A measure of the total value of a publicly traded company's outstanding shares of stock. It is calculated by multiplying the current market price of one share by the total number of outstanding shares. Measured on a logarithmic scale to reduce the effect of extreme values and to make the data more normally distributed.	Continuous	+

The data was extracted for each quarter spanning from third quarter 2018 to year end 2022, all variables except the RPT, were extracted from the Bloomberg and Refinitiv Eikon database. RPT, which are only available for US-listed companies, were extracted from companies' filings with the US Securities and Exchange Commission.

Table 2: Descriptive statistics

This table reports the descriptive statistics of the dependent and independent variables used in the regressions. The descriptive statistics reported are number of observations (N), mean, median, maximum value, minimum value, and standard deviation. The statistics reported for MCAP, DPR, and D/E is based on the data after logarithmic transformation.

Variables	N	Mean	Median	Maximum	Minimum	Standard Deviation
PNAV	537	0.794	0.767	1.82	0.197	0.283
DPR	537	0.2	0	3.258	-0.462	0.358
RPT	537	0.201	0	1	0	0.401
CEODU	537	0.233	0	1	0	0.423
BOARDIND	537	0.439	0.5	1	0	0.356
BSIZE	537	6.346	6	11	3	2.084
ROE	537	0.06	0.038	0.304	-0.229	0.143
D2E	537	0.696	0.663	1.314	0.001	0.242
MCAP	537	6.311	6.352	8.34	3.737	0.914

3.3 Model Specification

We conduct our empirical study by using unbalanced panel data to examine the effect of corporate governance and management on the P/NAV ratio in the maritime shipping industry. By employing panel data, we were able to explore factors that may vary across companies (idiosyncratic factors), factors that change over time but remain consistent across companies (time-varying factors), or both. One significant benefit of panel data is its ability to consider the heterogeneity of individual companies.

$$P/NAV_{it} = \beta_1 + \beta_2 DPR_{it} + \beta_3 RPT_{it} + \beta_4 CEODU_{it} + \beta_5 BOARDIND_{it} + \beta_6 BSIZE_{it} + \beta_7 ROE_{it} + \beta_8 D2E_{it} + \beta_9 MCAP_{it} + u_{it}$$

3.3.1 Fixed effects, Random effects, or Pooled regression

We have opted for a random effects model instead of a fixed effects model for several reasons. Firstly, we perform a Hausmann test to determine whether a fixed effects or a random effects model is more appropriate for our panel data analysis. In table 4 we see that we fail to reject the null hypothesis and should therefore use a random effects model. Secondly, the random effects model estimates indicate that the individual-specific effects account for a significant portion of the total variation in the dependent variable. By incorporating random effects, the model utilizes all available information and is more efficient in estimating the relationships between the independent variables and the dependent variable.

Additionally, the random effects model estimates the average relationships between the independent variables and the dependent variable for the entire population. This is particularly useful given that our research aims to make inferences beyond specific companies in our panel data. The random effects model captures both within-individual and between-individual variations, providing insights into the overall effects of the independent variables.

Lastly, we have some variables that are time invariant, such as RPT, and the random effects model allows for their estimation. Unlike fixed effects models that difference out time-invariant variables, random effects models retain them in the analysis, providing information about the impact of these variables on our P/NAV ratio.

In addition, we have included a fixed effects model for two main reasons. Firstly, utilizing fixed effects panel estimation enables us to mitigate the issue of omitted variable bias that arises from differences among companies. Fixed effects models offer a means of controlling for omitted variable bias when there are variables that are omitted from the model but correlated with the included variables. The fundamental distinction between random effects and fixed effects models lies not in whether the effects are randomly or fixedly determined, but rather in whether the effects are correlated or uncorrelated with the regressors.

Pooled regression has its own advantages and disadvantages compared to fixed effects and random effects models in panel data analysis. Pooled regression, being the simplest approach, treats the panel data as a single cross-sectional dataset without considering individual-specific or time-specific effects. This simplicity

facilitates easier estimation and interpretation of the model. Moreover, when the variables of interest are time-invariant and there is no need to account for individual-specific or time-specific effects, pooled regression can provide greater efficiency.

Based on these arguments, we have made the random effects model our primary approach. However, in order to bolster the robustness of our findings, we have also incorporated fixed effects and pooled regressions into our analysis.

3.3.2 Addressing multicollinearity

Since our regression includes two dummy variables, multicollinearity becomes a concern. To address this concern, we have taken an additional step in our analysis by conducting two separate regressions alongside our main model. One of these regressions excludes RPT, while the other excludes CEO duality. This separation allows us to gain insights into the individual effects of these variables on the P/NAV ratio. By isolating and examining the impact of each variable while controlling for other independent variables, we can provide a more comprehensive understanding of their influence.

To further enhance the precision of our analysis, we split our regressions again, into four separate models based on the presence or absence of RPT and CEO duality. By running separate regressions for companies including and excluding RPT, as well as for those including and excluding CEO duality, we can isolate the influence of individual variables while controlling for other factors. This allows us to explore potential heterogeneity within the sample and to investigate if the relationship between the independent variables and the dependent variable differ across the subgroups. The separate regressions will also enable us to examine the impact of collinearity within each subgroup by identifying any specific relationships that may be influenced or distorted by collinearity, allowing for more accurate and reliable results.

Comparing the results of the different regressions helps assess whether the relationships between the independent variables and P/NAV are dependent on the presence or absence of RPT and CEO duality. This helps us to identify any synergistic or opposing effects that may arise when certain variables coexist. This also serves as a robustness check, ensuring the consistency and reliability of our findings beyond the presence or absence of RPT or CEO duality.

Additionally, endogeneity concerns arise from the potential mutual relationship between the independent variables and the dependent variable, leading to biased estimates. Conducting separate regressions based on specific criteria enhances our ability to control for endogeneity. For instance, by examining the relationship between CEO duality and P/NAV in a separate regression, we can mitigate potential endogeneity arising from simultaneous causality between these variables (Wintoki, M. B. et al., 2012).

4 Results and analysis

Our selection of independent variables was informed by the relevant literature discussed in Section 3.2.3. The panel data test results, as presented in Table 3, demonstrate significant relationships between the discounts observed in the P/NAV ratio and several factors, namely related party transactions, return on equity, and board size. On the other hand, CEO duality and market capitalization reveal premiums in the P/NAV ratio.

$$P/NAV_{it} = \beta_1 + \beta_2 DPR_{it} + \beta_3 RPT_{it} + \beta_4 CEODU_{it} + \beta_5 BOARDIND_{it} + \beta_6 BSIZE_{it} + \beta_7 ROE_{it} + \beta_8 D2E_{it} + \beta_9 MCAP_{it} + u_{it}$$

Table 3: Unrestricted regression

This table reports the empirical results for three different estimation methods, Random effects regression, fixed effects regression and pooled regression. The dependent variable is P/NAV for publicly listed maritime shipping companies and all independent variables described in table 1 are included. The sample used in the regression consist of 38 publicly listed maritime shipping companies over the period q3 2018 - q4 2022 resulting in 537 observations. The numbers in parentheses are standard errors and the statistical significance is denoted by *, **, *** for respectively 10%, 5% and 1% significance levels.

Variables	Random effects regression		Fixed effects regression		Pooled regression	
Intercept	0.437 (0.0856)	***	NA NA		0.426 (0.0853)	***
DPR	-0.007 (0.0323)		-0.015 (0.0322)		0.080 (0.0334)	
RPT	-0.159 (0.0420)	***	-0.164 (0.0417)	***	-0.150 (0.0437)	***
CEODU	0.121 (0.0367)	***	0.122 (0.0365)	***	0.118 (0.0382)	***
BOARDIND	-0.051 (0.0340)		-0.059 (0.0343)	*	-0.040 (0.0343)	
BSIZE	-0.028 (0.0062)	***	-0.028 (0.0062)	***	-0.028 (0.0064)	***
ROE	-0.195 (0.0933)	**	-0.124 (0.0965)		-0.303 (0.0910)	***
D2E	0.004 (0.0159)		-0.003 (0.0159)		-0.006 (0.0163)	
MCAP	0.092 (0.0132)	***	0.092 (0.0135)	***	0.092 (0.0133)	***
R2	0.19		0.18		0.17	

Table 4: Hausman test

This table reports the results from a Hausman test using the random effects and fixed effects regression from table 3.

Specification test	χ^2	<i>df</i>	<i>p</i> Value
Fixed effects VS Random effects	1.98	8	0.98

Given the Hausman test above, we fail to reject the null hypothesis. Going forward, we will focus exclusively on the random effects regression for further analysis.

The negative effect of board size (BSIZE) is expected and consistent with the finding of Yermack, D. (1996), that larger boards tend to have a negative effect on firm value and in our case leads to discounts on NAVs. Another expected result is the positive effect of market capitalization (MCAP). This finding may suggest that higher MCAP reflects investor confidence in “bigger” companies, leading to a NAV premium. The positive relationship between MCAP and P/NAV underscores the importance of market perception and investor sentiment in determining the valuation of the company's assets.

Surprisingly, our analysis reveals a negative relationship between Return on Equity (ROE) and the P/NAV ratio, suggesting that companies with high ROE tend to have low P/NAV ratios. This finding contradicts previous empirical evidence and does not align with our initial intuition. However, upon conducting a qualitative analysis of our data, we have identified a potential explanation. Upon closer examination, we noticed that the companies exhibiting high ROE and low P/NAV ratios are those that have recently experienced a significant profitable cycle in freight rates. This prosperity has resulted in a surge in ship orders, thereby increasing the expected available tonnage in the market. Consequently, the anticipated future freight rates have decreased due to the amplified supply of ships (Tradewinds, 2022).

This observation provides some insights into why the stock market assigns lower expected revenues for these companies, thus leading to a decline in their market capitalization. Despite this, these companies continue to achieve exceptional returns in the present. It seems that the stock market and the vessel market perceive future revenues and associated risks differently for these companies.

To illustrate further, many of the companies exhibiting high ROE and low P/NAV ratios in our analysis are container companies that witnessed a substantial increase in freight rates during the COVID-19 pandemic. As a result, the orderbook to current fleet ratio for these companies reached a staggering 30% (Tradewinds, 2022). This influx of orders may force market shares for these companies to decline.

Our third variable with a significant negative impact on the NAV is related party transactions (RPT), this result is expected and consistent with our predicted relationship from table 1. This is also consistent with the findings of Kohlbeck, M. et al. (2010), who found that companies involved in RPT had significantly lower valuations when compared to companies not engaged in such transactions. CEO duality (CEODU) has according to this regression a significant positive impact on the NAV.

This is unexpected and the opposite of what we initially thought in Table 1, where we expected that CEODU would have a negative impact on the NAV. This also contradicts the empirical findings of Syropoulos, T. et al (2012) stating that the separation of the roles of CEO and chairman of the board positively influences the financial performance of maritime shipping companies. Given these factors, we create a correlation matrix including our dependent and independent variables.

Table 5: Pearson correlation matrix

This table reports the Pearson correlation matrix including all variables described in table 1, reported with three decimal precisions.

	PNAV	MCAP	DPR	D/E	RPT	CEODU	ROE	BOARDIND	BSIZE
PNAV	1								
MCAP	0.249	1							
DPR	0.047	0.041	1						
D/E	-0.015	0.068	-0.023	1					
RPT	-0.195	-0.057	-0.070	0.071	1				
CEODU	0.023	-0.089	-0.007	-0.089	0.658	1			
ROE	-0.064	0.228	0.298	-0.11	0.052	-0.034	1		
BOARDIND	0.012	0.01	-0.149	-0.076	-0.126	-0.15	-0.259	1	
BSIZE	-0.208	0.116	-0.142	0.103	0.399	0.093	-0.069	-0.169	1

This high correlation between CEODU and RPT may cause multicollinearity issues in our regression, which may lead to problems in interpreting the individual effects of these variables. Due to this we chose to split our regression into two new regressions.

Regression excluding RPT:

$$P/NAV_{it} = \beta_1 + \beta_2 DPR_{it} + \beta_3 CEODU_{it} + \beta_4 BOARDIND_{it} + \beta_5 BSIZE_{it} + \beta_6 ROE_{it} + \beta_7 D2E_{it} + \beta_8 MCAP_{it} + u_{it}$$

Regression excluding CEODU:

$$P/NAV_{it} = \beta_1 + \beta_2 DPR_{it} + \beta_3 RPT_{it} + \beta_4 BOARDIND_{it} + \beta_5 BSIZE_{it} + \beta_6 ROE_{it} + \beta_7 D2E_{it} + \beta_8 MCAP_{it} + u_{it}$$

By excluding one variable at a time, we can examine how the remaining variables in the model are associated with the dependent variable when controlling for other factors. This approach allows us to isolate the effects of each variable and gain a clearer understanding of their individual contributions to our model.

Table 6: Restricted regressions

This table reports the empirical results for three different Random effects regressions. The dependent variable is P/NAV for publicly listed maritime shipping companies in all three regressions and all independent variables described in table 1 are included in the unrestricted regression, while RPT is excluded from the second regression and CEODU is excluded from the third regression. The sample used in the regressions consist of 38 publicly listed maritime shipping companies over the period q3 2018 - q4 2022 resulting in 537 observations. The numbers in parentheses are standard errors and the statistical significance is denoted by *, **, *** for respectively 10%, 5% and 1% significance levels.

Variables	Unrestricted		Excluding RPT		Excluding CEODU	
Intercept	0.437 (0.0856)	***	0.445 (0.0866)	***	0.458 (0.0866)	***
DPR	-0.007 (0.0323)		0.001 (0.0328)		-0.004 (0.0325)	
RPT	-0.159 (0.0420)	***	NA NA		-0.062 (0.0300)	**
CEODU	0.121 (0.0367)	***	0.023 (0.0265)		NA NA	
BOARDIND	-0.051 (0.0340)		-0.065 (0.0342)	*	-0.075 (0.0336)	**
BSIZE	-0.028 (0.0062)	***	-0.04 (0.0056)	***	-0.034 (0.0060)	***
ROE	-0.195 (0.0933)	**	-0.286 (0.0920)	***	-0.245 (0.0925)	***
D2E	0.004 (0.0159)		-0.016 (0.0158)		-0.015 (0.0155)	
MCAP	0.092 (0.0132)	***	0.102 (0.0132)	***	0.098 (0.0133)	***
R2	0.19		0.16		0.17	

We see from our restricted regression of RPT that the significance of CEODU diminishes when we exclude RPT from the regression. The findings suggest that CEODU alone may not have a significant direct impact on P/NAV deviations. Instead, the influence of CEODU on these deviations is primarily mediated or confounded by the presence of RPT. In other words, the effect of CEODU on the P/NAV ratio may be driven by the associated conflicts of interest or governance issues arising from RPT.

Additionally, we see that board independence (BOARDIND) has a significant negative effect at 10% significance level when excluding RPT and 5% significance level when excluding CEODU. This negative effect is the opposite of what we initially thought in table 1, and is not consistent with the findings of Ke, Q. (2015). Ke, Q. found that companies with more independent directors had a lower discount to the NAV suggesting that BOARDIND enhances firm performance of UK real estate companies.

However, a possible explanation for this discrepancy could be attributed to the unique characteristics of the shipping industry. Past empirical evidence indicates that for companies operating in a highly competitive industry, fewer independent directors in the board of directors may be appropriate, as the companies are being “monitored” by a competitive product market (Syriopoulos, T., et al., 2011). They also found that higher BOARDIND had a significant negative effect on the financial performance of maritime shipping companies.

To further enhance precision and address potential heterogeneity within the sample we split the P/NAV dataset into four subsets based on the presence or absence of RPT and CEODU within each company. This allows us to isolate individual variables, control for other factors, and explore if the relationships between independent variables and the dependent variable differs across subgroups. (For more details, see section 3.3.1).

Table 7: Restricted subset regressions

This table reports the empirical results for four different Random effects regressions. The dependent variable is P/NAV for publicly listed maritime shipping companies in all four regressions and all independent variables described in table 1 are included except for RPT in the first two regressions and CEODU in the last two regressions. The sample used in the first regression consist of all the publicly listed maritime shipping companies including RPT in our dataset over the period q3 2018 - q4 2022 resulting in 108 observations. The second regression consist of all the publicly listed maritime shipping companies excluding RPT in our dataset over the period q3 2018 - q4 2022 resulting in 429 observations. The third regression consist of all the publicly listed maritime shipping companies including CEODU in our dataset over the period q3 2018 - q4 2022 resulting in 125 observations. The last regression consists of all the publicly listed maritime shipping companies excluding CEODU in our dataset over the period q3 2018 - q4 2022 resulting in 412 observations. The numbers in parentheses are standard errors and the statistical significance is denoted by *, **, *** for respectively 10%, 5% and 1% significance levels. The last row reports the R^2 for each regression.

Variables	Subset with RPT		Subset without RPT		Subset with CEODU		Subset without CEODU	
Intercept	1.028 (0.3280)	***	0.293 (0.0861)	***	0.857 (0.3917)	**	0.422 (0.0811)	***
DPR	0.154 (0.0998)		-0.054 (0.0327)	*	-0.018 (0.0871)		-0.019 (0.0323)	
CEODU	0.037 (0.1168)		0.194 (0.0423)	***	NA NA		NA NA	
RPT	NA NA		NA NA		-0.251 (0.0979)	**	-0.078 (0.0563)	
BOARDIND	0.011 (0.1199)		-0.01 (0.0354)		0.128 (0.1226)		-0.005 (0.0340)	
BSIZE	0.048 (0.0198)	**	-0.033 (0.0065)	***	-0.040 (0.0208)	*	-0.028 (0.0060)	***
ROE	-0.806 (0.2583)	***	-0.012 (0.0955)		-0.778 (0.2599)	***	0.011 (0.0954)	
D2E	0.160 (0.0899)	*	-0.011 (0.0151)		0.063 (0.1081)		-0.003 (0.0140)	
MCAP	0.007 (0.0428)		0.115 (0.0138)	***	0.063 (0.0539)		0.088 (0.0129)	***
R2	0.25		0.20		0.25		0.19	

These findings highlight the differential impact of CEODU depending on whether or not RPT is present. Within the subset of companies practicing RPT, CEODU does not exert a significant effect on the dependent variable, P/NAV. However, in the subset of companies excluding RPT, CEODU demonstrates a significantly positive influence on P/NAV. These results are consistent with the unrestricted regression but contradict the findings of Syropoulos, T., et al. (2012). On the other hand, Andreou, P.C., et al. (2014) discovered a positive relationship between CEODU and operating performance in the cross section of maritime companies.

The regression results for RPT are as anticipated. A majority of companies including CEODU positions also engage in RPT, which aligns with the high correlation observed in table 5. Consequently, it is also expected that RPT has no significant impact on the P/NAV when considering the subset of companies excluding CEODU.

The observed significant negative effect within the subsample including CEODU is also in line with the findings presented in table 3, as well as the empirical evidence from Kohlbeck, M., et al. (2010) mentioned in section 3.2.3.

The regression results reveal a significant positive relationship between the Debt-to-Equity ratio (D/E) and the P/NAV for companies that engage in RPT at a 10% significance level. This outcome contradicts our initial expectations, as indicated in Table 1, but aligns with the findings of Bhandari, L. C. (1988), which propose a positive association between projected returns on common stock and the proportion of D/E. The reason for this positive relationship observed in the subset of companies including RPT can be attributed to the amplified interest payments accompanying higher leverage. These interest obligations act as a deterrent to wasteful expenditure by management, effectively restricting such practices. Thus, higher D/E ratios are linked to improved financial discipline, leading to enhanced P/NAV for companies engaged in RPT (Bhandari, L.C.,1988).

The regression results reveal a significant negative relationship between the dividend payout ratio (DPR) and the P/NAV for companies excluding RPT at a 10% significance level. This finding contradicts our initial expectations but aligns with the research of Rozeff, M.S. (1982), suggesting that while higher DPR can reduce agency costs, it can also increase transaction costs associated with external financing. Notably, the companies with higher DPR in the subset excluding RPT also have relatively high D/E, indicating that the increased transaction costs associated with DPR may outweigh the reduction in agency costs.

The regression results reveal a negative relationship between ROE and P/NAV for maritime shipping companies including RPT or CEODU. Notably, there is limited empirical research that directly demonstrates how higher ROE might lead to lower P/NAV or similar valuation ratios. Consequently, we turn to an analysis of our dataset to gain insights. The observed negative effect of ROE on P/NAV in companies including RPT or CEODU can be interpreted within the framework of the inverse causality hypothesis. According to this hypothesis, companies with low P/NAV ratios may experience higher ROE due to the recent profitable cycle in freight rates as previously mentioned in this section.

The observed negative effect of ROE on P/NAV in companies including RPT or CEODU suggests the presence of an agency problem. In these companies, where

conflicts of interest between managers and shareholders may be more pronounced, the impact of ROE on P/NAV is likely to be different. It is possible that agency issues, such as value appropriation or suboptimal decision-making, hinder the translation of high ROE into higher P/NAV. These conclusions are similar to the conclusions of Kohlbeck, M. et al. (2010) for companies including RPT, while it is contradicting the conclusions of Syriopoulos, T., & Tsatsaronis, M. (2012) stating that CEODU may have a negative effect on financial performance.

5 Additional analyses

To address the absence of a definitive conclusion from our previous findings, we have opted to conduct a final panel data regression analysis. For this analysis, we have made a distinction between companies based on their P/NAV ratios.

Specifically, we categorized companies into two groups: those with a P/NAV ratio of one or above, and those with a P/NAV ratio below one. This categorization allowed us to examine the relationship between various factors and financial performance across the entire duration of our sample period.

Furthermore, to ensure a comprehensive analysis, we used the median P/NAV ratio as a threshold to further differentiate companies within each group. Allowing us to include a bigger sample for bigger P/NAV's rather than just using P/NAV above 1. This enabled us to compare the findings for companies above the median with those below the median, providing a more nuanced understanding of the impact of different variables on financial performance. We have conducted our analyses using these four regressions.

Table 8: Regressions restricted on median and P/NAV

This table reports the empirical results for four different Random effects regressions. The dependent variable is P/NAV for publicly listed maritime shipping companies and all independent variables described in table 1 are included. The sample used in the first regression consist of all the publicly listed maritime shipping companies with $P/NAV \geq 1$ in our dataset over the period q3 2018 - q4 2022 resulting in 109 observations. The second regression consist of all the publicly listed maritime shipping companies with a P/NAV above the median in our dataset over the period q3 2018 - q4 2022 resulting in 269 observations. The third regression consist of all the publicly listed maritime shipping companies with a $P/NAV < 1$ in our dataset over the period q3 2018 - q4 2022 resulting in 428 observations. The last regression consists of all the publicly listed maritime shipping companies with P/NAV below the median in our dataset over the period q3 2018 - q4 2022 resulting in 268 observations. The numbers in parentheses are standard errors and the statistical significance is denoted by *, **, *** for respectively 10%, 5% and 1% significance levels. The last row reports the R^2 for each regression.

Variables	PNAV \geq 1		Above median PNAV		PNAV $<$ 1		Below median PNAV	
Intercept	1.062 (0.1615)	***	0.796 (0.0924)	***	0.572 (0.0610)	***	0.560 (0.0608)	***
DPR	-0.081 (0.0521)		-0.057 (0.0313)	*	0.039 (0.0238)		0.043 (0.0264)	
CEODU	0.228 (0.0631)	***	0.199 (0.0414)	***	-0.003 (0.0278)		0.028 (0.0262)	
RPT	-0.052 (0.0753)		0.010 (0.0516)		-0.116 (0.0312)	***	-0.093 (0.0288)	***
BOARDIND	-0.017 (0.0608)		-0.031 (0.0378)		0.016 (0.0244)		0.017 (0.0236)	
BSIZE	-0.032 (0.0113)	***	-0.034 (0.0068)	***	-0.001 (0.0046)		0.006 (0.0045)	
ROE	-0.149 (0.1642)		0.095 (0.1034)		-0.276 (0.0662)	***	-0.029 (0.0612)	***
D2E	0.068 (0.0480)		0.023 (0.0181)		-0.015 (0.0107)		-0.021 (0.0107)	*
MCAP	0.047 (0.0245)	*	0.062 (0.0141)	***	0.024 (0.0098)	**	0.000 (0.0099)	
R2	0.38		0.24		0.20		0.29	

Our regression analysis yielded intriguing findings for companies with P/NAV ratios of 1 or above and those with P/NAV ratios above the median. Firstly, we found a statistically significant positive coefficient for the presence of CEODU, indicating that when the CEO also holds the position of the board chair, it is associated with higher P/NAV values. These findings align with the research conducted by Andreou, P.C., et al. (2014), reinforcing the notion of a beneficial impact of CEODU on financial performance.

In contrast, BSIZE exhibited a statistically significant negative coefficient for companies with P/NAV ratios above the median and 1 or above. This suggests that larger-sized boards tend to have lower P/NAV values. These results support the prior research conducted by Yermack, D. (1996), which highlights the negative relationship between BSIZE and financial performance. Furthermore, MCAP displayed a significant coefficient for companies with P/NAV ratios of 1 or above and P/NAV ratios above the median. This suggests a potential positive relationship between MCAP and P/NAV, indicating that higher MCAP is associated with higher P/NAV values. This coincides with our findings in section 4.

Turning to companies with P/NAV ratios below 1 and below the median, we found several significant results. Firstly, engaging in related RPT exhibited a statistically significant negative coefficient, indicating that companies involved in RPT tend to experience lower P/NAV values. This finding aligns with previous research conducted by Kohlbeck, M. et al. (2010), shedding light on the detrimental effect of RPT on financial performance within this group. This also aligns our findings in section 4.

Additionally, the variable representing ROE displayed a statistically significant negative coefficient, implying a negative relationship between ROE and P/NAV within this subset. Finally, MCAP exhibited a statistically significant positive coefficient for companies with P/NAV ratios below 1 and below the median. This suggests that higher MCAP is associated with higher P/NAV values within this group. These findings also coincide with our findings in section 4.

6 Conclusion

Our study has delved into the examination of asset-based equity valuations (NAV) and their deviations from stock market values (P) within the maritime shipping industry. Through comprehensive analysis and regression analyses, we have gained valuable insights that contribute to understanding equity valuation dynamics and the influence of corporate governance and management factors.

The maritime shipping sector, with its unique combination of asset-based valuations and stock market values, offers an intriguing perspective for our investigation. By examining the discrepancies between these two valuation approaches, we have revealed potential frictions and factors influencing these divergences. These findings hold implications for market efficiency and corporate governance practices, guiding the decision-making processes of investors, analysts, and policymakers within the maritime shipping industry.

We found empirical evidence that the deviations in P/NAV ratio are associated to several factors, including related party transactions, return on equity, board independence, board size, market capitalization, and CEO duality. These factors have a significant impact on the deviations observed in the P/NAV ratio within publicly listed maritime shipping companies.

In terms of the determinants of NAV discounts, our findings reveal a significant negative effect between the P/NAV and related party transactions, return on equity, board independence, and board size. Consequently, these factors contribute to discounts on the NAV of publicly listed maritime shipping companies.

Examining the determinants of NAV premiums, we have found a significant positive effect between the NAV and market capitalization, as well as CEO duality. As a result, these factors lead to premiums on the NAV within publicly listed maritime shipping companies. This suggests that higher market capitalization and the presence of CEO duality contribute to a higher valuation of the P/NAV ratio.

By addressing the gaps in existing literature and advancing our knowledge of equity valuation in the maritime shipping industry, our study establishes a coherent narrative that bridges theory and practice. The implications of our research extend beyond this specific sector, offering valuable lessons for other industries and market participants grappling with the challenges of equity valuation and corporate governance.

Given the constraints imposed by the availability of P/NAV data, our research has led us to uncover intriguing questions that warrant further investigation.

Unfortunately, due to the limited length of our data, we were unable to undertake a detailed analysis of various sub-sectors within our dataset, such as crude tankers, dry bulk carriers, and others. By conducting such analysis, we could have gained more comprehensive insights into how different factors impact P/NAV deviations over time within specific maritime shipping segments.

Furthermore, we propose that future research endeavors consider incorporating additional factors beyond those explicitly related to corporate governance and management. For instance, including more granular data on stock liquidity, institutional investors, and other relevant variables would enrich the analytical framework and provide a more comprehensive understanding of the factors influencing P/NAV deviations.

By expanding the scope of investigation to encompass a broader range of factors, researchers can uncover valuable insights into the complex dynamics of equity valuation in the maritime shipping industry. This would contribute to a more nuanced understanding of the relationship between corporate governance, market dynamics, and other influential factors, ultimately enhancing our ability to evaluate and predict P/NAV deviations.

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