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BET PERFORMER SHIP VALUATION

A linear Regression Model Analysis

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Overview

This report provides insight from data analysis that was conducted to estimate the optimal bidding price for capesize bulk carrier, the Bet Performer. Following examination of the available data and using a market valuation approach with the Cape Falcon vessel as reference, we have determined the optimal bidding price for the Bet Performer.

In keeping with our price estimation, the current economic imbalance in the maritime industry with regards to the demand for ships and average charter rates puts our client in the best position to bid for the Bet Performer. However, it is important to remember to conduct a close inspection of the vessel to ensure that there is no sign of damage or malfunction as these could have significant impact on the ship's price.

Industry Background

The shipping industry is very volatile, so the capesize market keeps fluctuating. Capesize vessels are mainly used to transport iron ore, coal, and other raw materials, which are vital for the steel and power industries. Both these industries are directly concerned with the economic development of a country. Therefore, he demand for materials transported via capesize ships is ever increasing, due to which the need for capesize vessels was very high, leading to a shortage in the market. From 2000 to mid-2008, the industry saw a historic rise by the law of demand and supply. It peaked in May 2008.

Methodology

We applied multiple linear regression model to evaluate the impact of the different ship features in predicting its price and Manhattan distance-based approach to quantify and normalize the similar features of the Bet Performer ship. Our objective was applying multiple linear regression models to analyze ship price and other independent variables:

Deadweight Ton (DWT): The higher capacity a ship has for carrying its cargo, fuel stores, and crew and passengers, the higher its selling price will be.

Age at Sale: A bulk carrier ship usually remains adequate for 25 years. With time, its value will continue to depreciate, bringing its selling price down and thus making it a riskier investment.

Capesize Index: The relationship between the Capsize index and price is slightly less obvious than the other two factors due to the index's volatility. Given its sensitivity to factors such as prices of cargo materials, it is subject to change very quickly and unexpectedly.

To decide whether the results derived through regression are reliable, i.e., statistically significant, let us validate with a significant level of the p-value and R-square. Higher the R-square, the better fit our model for regression analysis. Based on our calculation of the projected sale price, it can be determined whether the ship is worth in terms of value that the buyers or sellers are willing to pay.

Estimated Price

Bet Performer is an 11-years-old bulk-size vessel with 172k in deadweight tons. It was built in 1997, and the use limitation is 25 years. We apply the distance matrix and market valuation approach to normalize and find the closest best comparable transactions.

Sale Date	Ship	Price (mils)	Age at sale	DWT (000)	Cape size
May 08	Cape Falcon	$87.2	15	161.5	12479

Table - 1. The best transaction reference to evaluate Bet Performer's sale price.

Hypothesis:

"The Cape Falcon has been deemed the best reference vessel. The predicted bidding price for the Bet Performer is $125 million."

We have hypothesis that the Cape Falcon 's transaction is the best reference to evaluate Bet Performer's price. To test this hypothesis, we ran multiple regression model and apply Manhattan distance-based matrix as mentioned in the methodology section.

Regression Analysis

Age at sale stands out due to its strong negative correlation at -0.78. Moreover, the relationships between deadweight ton and price are positively correlated at 0.51. Age at Sale and deadweight ton are significant features in predicting the price. However, the relationship between Capesize and price is less significant than the other two factors.

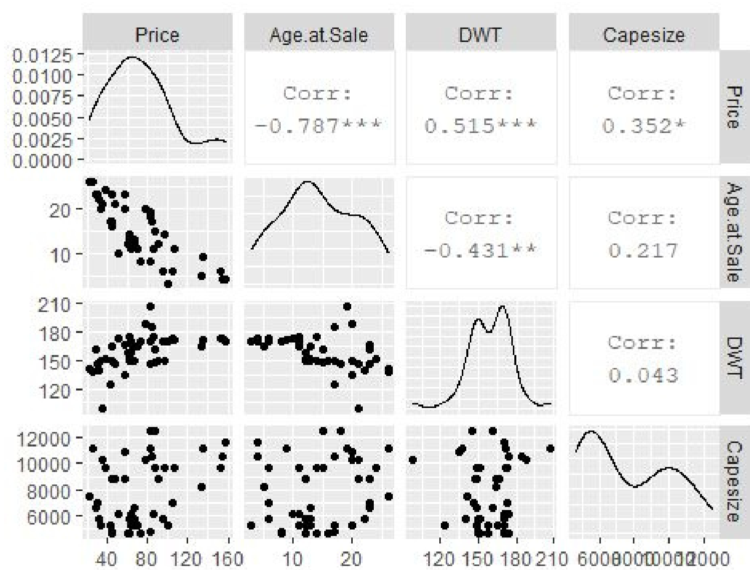

Exhibit 1. Visualization of the correlation between ship features and its price.

Coefficients	Estimate	Std. Error	t value	Pr(>|t|
Intercept	44.2	16.38	2.69	0.00**
Age at Sale	-4.54	0.26	-17.37	0.00***
DWT	0.24	0.09	2.64	0.01*
Capesize	0.00	0.00	12.05	1.57***

Table 2. Multiple linear regression model.

With each thousand-ton increase in the deadweight ton capacity of the ship, its price goes up by $0.988 million (Exhibit 3 - Appendix), and with each index increase, the sale price goes up by $0.0047 million (Exhibit 2,4 - Appendix). However, with a p-value of 1.57 (greater than the 0.05 threshold) Capesize Index shows no statistical significance in price prediction.

Ship Price Prediction 1

	Dependent variable	Independent variables		
Conditions	Predicted price (mils)	Age at Sale	DWT (000)	Capesize or Charter rate
5 years younger ship	$109	6	172	12,479
20k lighter DWT	$82	11	152	12,479
30% lower charter rate	$90	11	172	8,735

Table 3. Predicted ship price under different conditions without economic index.

Ship Price Prediction 2

	Dependent variable	Independent variables		
Conditions	Predicted price (mils)	Age at Sale	DWT (000)	Capesize or Charter rate
5 years younger ship	$148	6	172	12,479
20k lighter DWT	$120	11	152	12,479
30% lower charter rate	$98	11	172	8,735

Table 4. Predicted ship price under different conditions.

We used multiple linear regression with a 95% prediction interval and substituted the independent variables with their criteria. In Table 3, we apply three predictors in the regression model Age at sale, deadweight tons, and capsize. Table 4, has two predictors in the regression model, Age at sale, and deadweight tons, and this time we do not consider the economic index for Capesize. As we see the prediction 2 prices are more feasible than in prediction 1.

Comparison of price in two predictions

Model	Estimated Price (mils)	p-value	R2
Prediction 1 (Two factors)	$ 90.5	0.00	0.65
Prediction 2 (All factors)	$ 125	0.00	0.92

Table 5. Comparison of price in two predictions.

Each of the predictions has a convincing different price; however, when we look at the prediction 2 output, R-square is 26% more variation than the previous model. R-square and p-value to decide whether the results derived are reliable. Hypothetically, the higher R-square is the better fit for our prediction. Therefore, we recommend taking into consideration the economic index (Capesize) for our price prediction. Apart from the price, other external factors might consider whether ship value would be willing to buy for it.

Conclusion

As we mentioned in the experiment section, our customer should consider the economic index (Capesize) for bidding price of the Bet Performer. Therefore, we do not eliminate the hypothesis from the beginning after applying market approach to evaluate ship price based on the Cape Falcon's transaction.

WE CONCLUDE THAT 125 MILLION IS OPTIMAL BIDDING PRICE OF THE BET PERFORMER.

Limitation

Our analysis considered only three independent variables (Capesize Index, Age at Sale, DWT) to compare with the price. Our models are accurate. However, in Exhibit 3 from the case study, the Capesize index continuously increased from Jan 2000 onwards, but the model didn't consider the factors that are out of the dataset. Our regression analysis only depends on the available dataset, and the model could not consider other factors.

It requires additional data or information such as ship conditions, ship inspections, repaired costs, charter contracts, operation costs, risk costs, etc., to evaluate return on investment when our customer buys the Bet Performer at our optimal bidding price.

Recommendation

First, the recommended bidding price point for Bet Performer is $125 million. If considering the selling price of previous ships, this price is high. However, the average time charter rate was at its highest since 2000, while there has been a declining trend in ships available for sale since the first half of 2007 (Exhibit 7 - Appendix). This indicates an imbalance in the Demand and Supply scale, which leads to an increase in ship price.

In addition, giving a higher price puts the bidder in a better position to win the bid as it shows a sign of seriousness and goodwill towards the seller. According to Marine Structural Design, between 1980 and 1996, 43 heavy-duty carriers were lost at sea, which is one-fifth of the total US trading fleet at the time. The longevity and availability of a bulk carrier vary greatly based on the condition of the sea on their journeys.

Second, Compass Maritime Services Should look carefully for any signs of repair and altercations that have been done on the ship as this could affect the ship's capability and, therefore, affect the ship's price.

Appendix

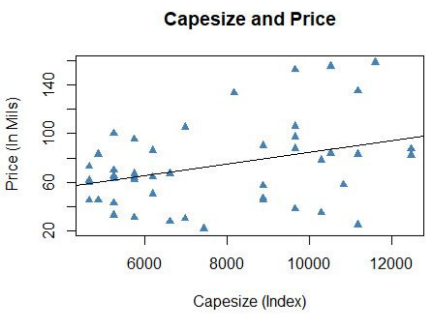

Exhibit 2. Capesize vs Ship Price linear regression.

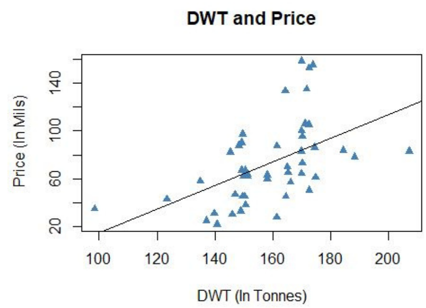

Exhibit 3. DWT vs Ship Price linear regression.

Exhibit - 4. Age at Sale vs Ship price linear regression.

Exhibit 5. The correlation between ship features and its price.

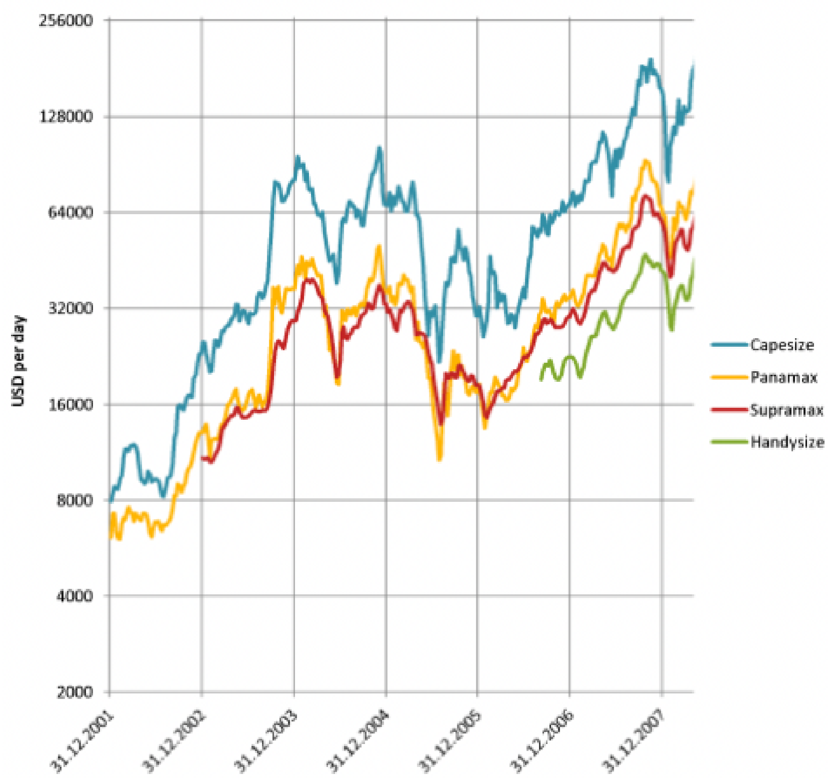

Exhibit 6. Average time charter rates for bulk carries. Source: Jashuah, Essence Securities, 2008

Appendix

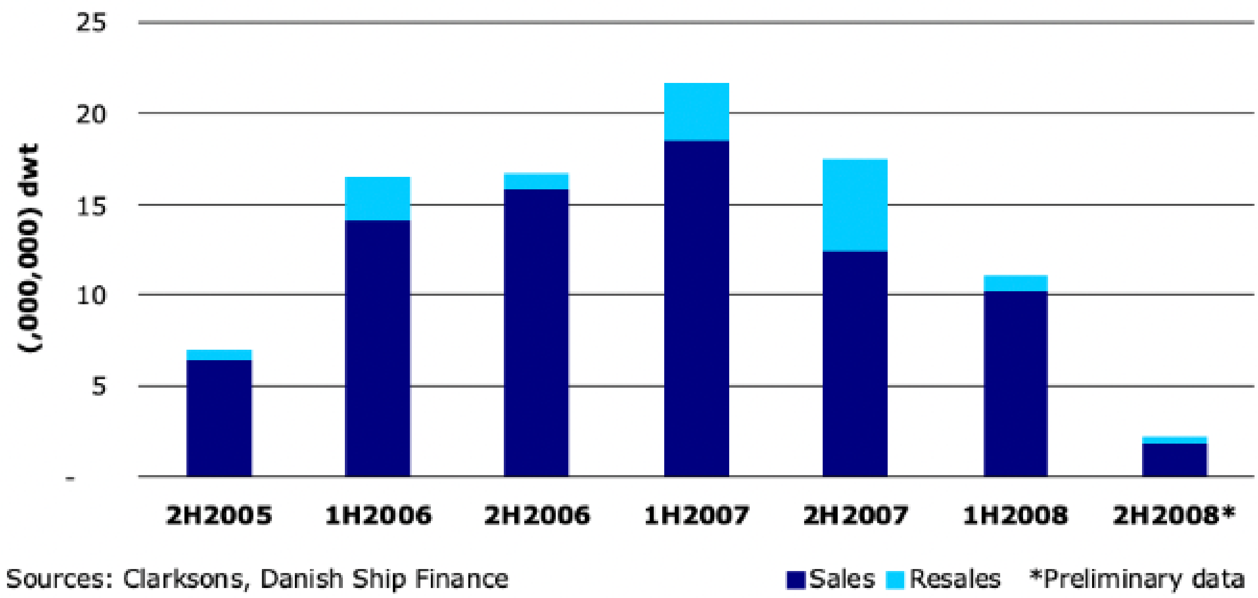

Exhibit 7. Total bulk carrier sales/releases 2005 - 2008

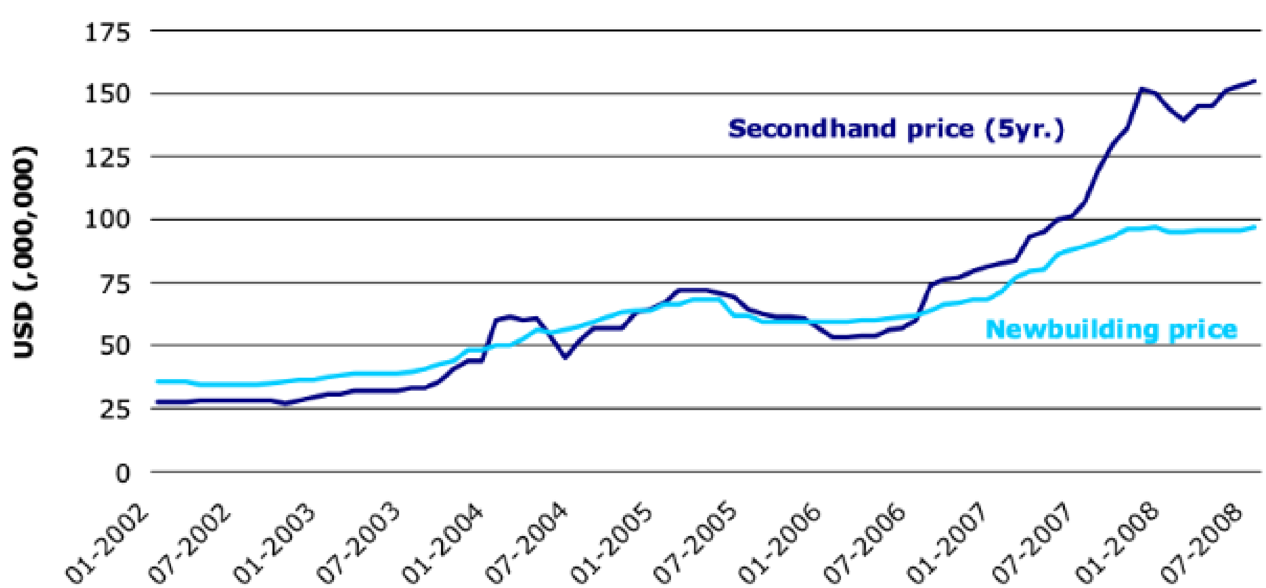

Exhibit 8. Average bulk carrier price 2022 - 2028,
Source: Clarkson, Danish Ship Finance