Valuation of the Bet Performer:
Price Prediction Report
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1. EXECUTIVE SUMMARY

This report provides data about the cost, capacity, and other elements of a ship. The basic purpose is to determine the worth of a ship named "Bet Performer." We begin with a list of recent capesize ship sales that includes the values of ship features that can affect the ship's cost.

To establish the final price of the vessel, we used a variety of statistical tools and approaches such as Euclidean distance, Z-Score, and regression. According to our analysis, the Bet Performer's recommended price should be 132.79$ M. To determine the value of the ship, we used the market approach.

According to the single variable regression model, the greatest feature to estimate ship price is age at sale, which provides a good R squared value of around 62%. Additional factors that influence ship prices include oil prices, existing location, current conditions, and other market factors such as demand and supply. All these aspects are discussed further in this paper.

Using multiple regression, we can conclude that all the ship's parameters (Age at sale, DWT, Capesize) can explain 91.5% of the variation in sale price.

2. MARKET APPROACH

The market approach valued the ship's price based on most previous similar ship transactions.

Based on current market patterns, we may create a projection about how much the market elements will affect the final price of the ship.

We obtained the closest reference ship by applying the Euclidean distance to all 48 comparable ships and obtained the closest reference ship as Sumi Hou with a sale price of 106$M.

3. METHODS & STATISTICAL REASONING

3.1 Euclidean Distance

Initially, we narrowed the search for best fit from 48 to 17 ships by using empirical rule. We looked at the mean and standard deviations of all the variables and decided to filter ships that lie in the range of +1 to -1 standard deviation (our results filtered the ship with the following criterion: DWT: 142-175, Sale Price: 39 to 106 million, Age: 8 to 20 Years, Capesize: 5144 to 10143),then out of 17 ships we shortlisted 6 ships which were closest to Bet Performer in reference to age , year built , sale price and DWT .We then used Euclidean distance to locate the closest ship to the Bet Performer.

Furthermore, we used regression analysis to determine the estimated price of the Bet Performer in relation to all other criteria such as DWT, Capesize, and Age at sale.

We discovered significant insights by combining the results of Euclidean distance, Regression analysis, bell curve analysis, and then looking at current market patterns, which led us to a final pricing for the Bet Performer.

We first established the data by calculating Z values by subtracting the mean and dividing the results by the standard deviation of both parameters (Age at sale and DWT). We did not include the capsize figures in the Euclidean because they change month to month and would not represent the closest ship to the Bet Performer. While there are 48 distinct Euclidean distances, the shortest distance represents the closest proximity to Bet Performer. According to the results, the Sumihou is the closest ship, with a Euclidean distance of 0.9. (See Exhibit 1)

EXHIBIT 1

Column1	Sale Date	Vessel Name	Sale Price ($US millions)	Age of sale (y	Dead-Weight Tons (000	Euclidian dist
9	Mar-07	Johnny K	65.00	13	165.3	6.992138443
10	Mar-07	Zorbas	70.00	11	165.1	6.9
33	Nov-07	Sumihou	106.00	11	171.1	0.9
20	May-07	Zorbas II	86.00	11	174.5	2.5
21	May-07	Fertilia	50.50	10	172.6	1.166190379
22	May-07	Ingenious	64.20	11	170	2
29	Oct-07	Tiger Lily	90.00	12	149.2	22.82191929
30	Oct-07	Dong-A-Helios	47.00	21	146.9	27.01869723
31	Oct-07	Marine Hunter	45.00	23	164.5	14.1509717
32	Oct-07	Peace Glory	57.00	23	166.1	13.37198564
35	Nov-07	Netadola	97.00	14	149.5	22.69911893
37	Nov-07	Captain Vangelis L	87.50	15	148.2	24.13379373
12	Mar-07	Martha Verity	63.00	12	158	14.03566885
16	Apr-07	Nautical Dream	63.50	13	151.4	20.69685967
17	Apr-07	Formosabulk Allstart	67.00	12	150.4	21.62313576
18	Apr-07	Arimathian	62.00	13	149.8	22.28990803
23	Jun-07	Anangel Dawn	67.00	13	149.3	22.7879354

3.2 Regression Analysis

3.2.1 Singe Variable Regression Analysis

We then derived the linear regression equation and analyzed the data using a scattered plot and many other values such as R square and P value. Regression analysis describes how independent variables affect the dependent variable in the form of a simple linear equation, allowing us to predict the approximate value of the dependent variable in relation to the independent variable. We evaluated the price of Bet Performer by applying regression with reference to the sale price and age at sale, the sale price and DWT, and the sale price and capsize.

In our approach, three significant factors influence the ship's sale price.

1. Purchase age

2. DWT

3. Index of Capesize

Age of purchase: Using regression analysis between selling price and age of sale, for bet performer whose age at time of sale is 11 years (X1),

$$Y = α + (β_1 * X_1) + (ε_1)$$

$$β_1 = -4.2165, α = 133.13, ε_1 = 21.11$$

We calculate the sale price as 86.74 + 21.11 = $107.85M.

Age explains 62% of the variance in sale price, according to the adjusted R2 value (Exhibit 5).

Kilo tons (DWT): Given that the DWT for bet performance is 172 kilo tons (X2),

$$Y = α + (β_2 * X_2) + (ε_2)$$

$$β_2 = 0.98, α = -84.16, ε_2 = 29.37$$

We calculate the sale price as 84.4 + 29.37 = $113.7M.

The adjusted R2 value is 26.5%, indicating that DWT can explain 26.5% of the variation in sale price (Exhibit 5).

Index of Capesize: Given that the capesize index for the Bet performance in May 2008 is 12479 (X3),

$$Y = α + (β_3 * X_3) + (ε_3)$$

$$β_3 = 0.0048, α = 36.43, ε_3 = 32.06$$

after performing regression analysis between Sale price and DWT

We calculate the sale price as 96.32 + 32.06 = $128.3M.

The adjusted R2 value is 12.41%, indicating that the Capesize Index can explain 12.41% of the variation in sale price (Exhibit 5).

The single variable regression analysis shows how the independent variable affects the variance of the dependent variable. However, while performing a single variable regression analysis, we assume that the other components have no relevance or are constant, which is not always the case. For example, while computing the sale price from the age of sale regression model, we ignore the effect of the DWT and Capesize index on the age of sale. There is a possibility that all independent variables are also correlated. So, if there are more than two factors influencing our dependent variable, single variable regression is not always a viable model. (EXHIBIT 2, 3, 4, and 5).
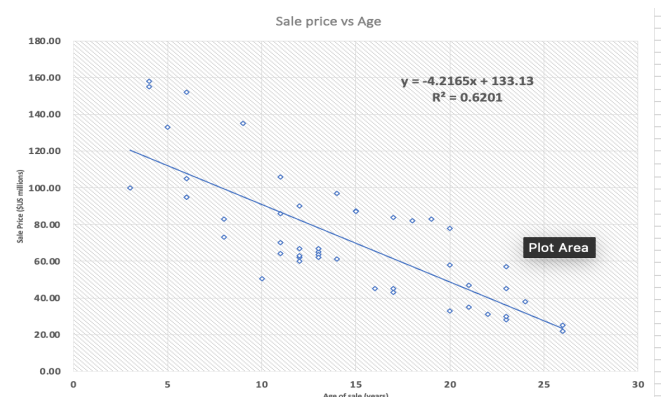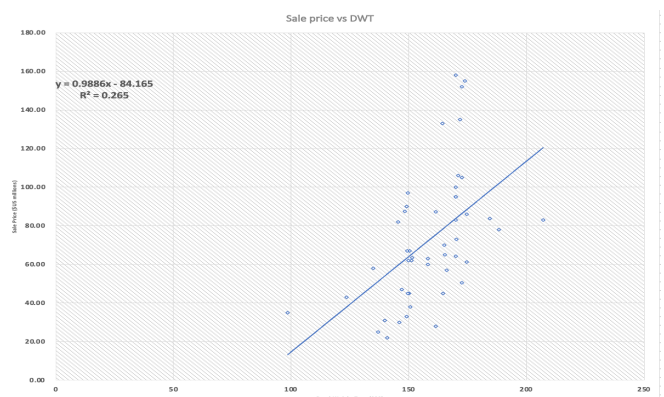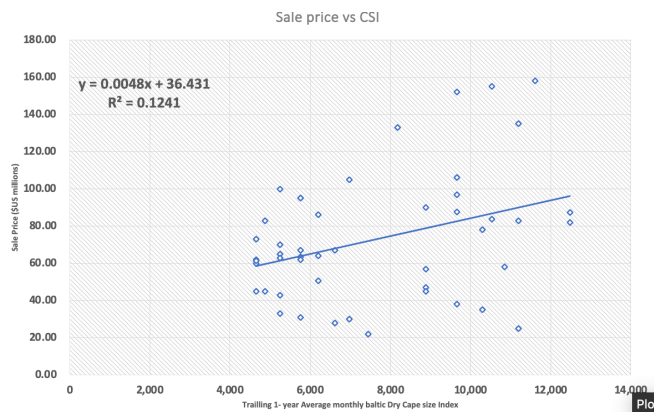
Exhibit 2

Exhibit 3

Exhibit 4

Sale price vs CSI

y = 0.0048x + 36.431
R² = 0.1241

Exhibit 5

Single Variable Analysis Against Sale Price (y)	Age of sale (x1)	DWT (x2)	Capesize (x3)
Intercept	133.12	-84.16	36.43
Correlation	-0.78	0.51	0.35
Standard Error	21.11	29.37	32.06
Coefficient	-4.21	0.98	0.0047
R-Square	0.62	0.26	0.12
Adjusted R-Square	0.61	0.24	0.10
Sale Price (without error)	86.74	84.4	96.32

3.2.2 Multivariable Regression Analysis

As all three parameters have a considerable impact on sale price, a single variable regression model cannot provide a satisfactory prediction value. As a result, we performed multiple regression models to obtain a more accurate prediction value for ship sale price when all three independent variables are taken into account. We were able to develop a more accurate model by using numerous independent factors to influence our dependent variable, the sale price. This prediction model surpasses single variable analysis due to the inclusion of all relevant elements.

With an R2 value of 0.915, multiple regression analysis minimizes the variation of sale price by 91.5%. This is significantly better than single variable regression because the highest R2 value in single variable analysis was 62%, which is far lower than the R2 value in multivariable analysis.

Exhibit 6 shows the coefficients (β) of each independent variable as well as the intercept (α) derived from multi regression analysis. We may use these values to estimate the ship's sale price and add a buffer of standard error value (ε).

$$Y = \alpha + (\beta_1 * X_1) + (\beta_2 * X_2) + (\beta_3 * X_3) + (\varepsilon)$$

X1 = Age of bet performer at time of sale = 11 years

X2 = bet performer's DWT = 172 Kilo tons

X3 = May 2008 Capesize Index = 12,479

Exhibit 6, α = 44.22

β_1 = -4.54

β_2 = 0.24

β_3 = 0.0072

Sale price determined by multivariable regression analysis

Y = 122.91

Finally, taking our standard error into account () Y = 122.91 +/- 9.88 = \$132.79M/ \$113.03M

The adjusted R2 value is 91.5%, indicating that the Capesize Index can explain 91.5% of the difference in sale price (Exhibit 6).

Exhibit 6

Multivariable regression analysis	Regression model values
Intercept	44.22
Standard Error	9.88
Age of sale Coefficient	-4.54
DWT Coefficient	0.24
Capesize Coefficient	0.0072
Adjusted R-Square	0.915
Multiple R	0.95
Sale price	122.91

Using the data presented above, we can conclude that if the ship had been 5 years younger, it would have been sold for \$145.61 million, if the ship had been 20K lighter in DWT, it would have been sold for \$118.12 million, if the charter rate had been

30% lower, the ship would have been sold for $96.70 million.

4 EXTERNAL FACTORS

These are those factors which affected the price of ships. Factors includes:

- Oil prices have an impact on the current market rates of the BACI. We know that the capsize index rises when iron ore and coal prices rise, and that iron ore and coal prices are directly related to oil prices.
- We also know that oil prices were skyrocketing at the time, reaching an all-time high of 145 dollars in May 2008.
- Loan rates were quite cheap. Loans were readily available and on favorable terms. We have no idea what these rates will be in the future.
- Because the economic conditions were turbulent and sellers dominated the agreements, we knew that if we made an offer that was lower than the market rate, the sale would be compromised.
- The average price of sold ships with more than 160 DWT from March to May is $126.73M.
- The market was thriving due to great demand, and the ship's current location would also play a significant influence in determining the eventual price. The ship's current condition and maintenance status might also influence its pricing.

5 PRICE DETERMINATION FOR BET PERFORMER

By combining the results of the regression study and the external market determinants, we recommend that the Bet Performer be valued at $132.79 million.

Multiple linear regression has a price of $122.91 million and a standard error of 9.88.

The final price is obtained by including the standard error in the regression price.

6 LIMITATIONS

There are several aspects that can affect the price of the ship, but we don't have that knowledge, thus we made the final decision without considering the following parameters:

• We don't know where the ship is right now or when it will be sold.

• The ship's condition is unknown.

• Any other criteria connected to the ship's quality and physical characteristics.

• Port charges vary around the world and, as a result, can influence the ship's pricing.

7 CONCLUSION

Based on the calculations and research, we have the Bet Performer's projected price should be $132.79 million; however, we would advise the client to keep in mind the external market considerations discussed in the summary, as they may play a significant impact in determining the ship's pricing.

8 REFERENCES

Compass Maritime Services , LLC Valuing Ship HBR

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R-Squared - Definition, Interpretation, and How to Calculate (corporatefinanceinstitute.com)

9 APPENDIX

Link to the Excel file used to analyze and predict the price of the Bet Performer:

https://1drv.ms/x/s!AnA5QXrSYqz9hi0DWCdPLuWKGa-f?e=XRBYCv