Compass Maritime Services, LLC: Valuing Ships

Q1. What is the main objective of Basil Karatzas?

The primary goal of Basil Karatzas is to assist the client in determining the appropriate valuation of Bet Performer and develop a negotiation strategy. This involves analyzing the ship's worth based on market data, technical specifications, and the broader maritime industry trends to ensure the client secures the vessel at its true market value.

Q2. What is the market approach to valuation of a ship?

Assessing the value of a ship based on the valuation of similar vessels that have recently traded in the market or they might be sitting in the market to find the potential buyer for it, involves methods that particularly give optimum results for commercial ships.

First and foremost approach an individual goes through is to find a similar ***ship that inlines to our ship****, this includes the characteristics of the ship, condition, wear and tear, purpose, engine health and many more.Followed by,* ***grabbing insights about selling price****, factors affecting the current ship market, and conditions related to the frequency of transaction to comparable ships. Furthermore, it is essential to make* ***necessary adjustments to reduce the GAP between the ship and comparable ships;*** *factors including equipment required, and maintenance.*

Moreover, delivering the ***value range of a ship*** *always goes parallel to the* ***market trends,*** *just like* ***analyzing the data*** *to get information about the* ***change in shipping demand and fuel prices****, respectively. Because this could impact the valuation of a ship.Lastly,* ***estimated value*** *must be considered both lower and upper ends of the range derived from the comparable ships.*

Lets calculate:

Average sale Price	$73.0 million ($73,000,000)
Average age at sale	14 year
Average Dread-weigh in tons	158.9 tons (158900)

- *Initial step is to calculate* ***sales price per weight(tons),*** *by dividing avg. sales price by avg. dead weight ton****:***
  - *Which is,* ***$73000000/ 158935 = $459.3***
- *After That, get* ***age adjusted value****:*
  - *Let's* ***assume a depreciation rate of 0.01****, as in 2008 it had a bearish market.*
  - ***Estimate Price*** *=* ***avg. price at sale * (1- (avg. age at sale * depreciation rate))***
  - ***Estimate price*** *=* ***$73000000 * (1 - (14 * 0.01)) = $62,582,291***
- *Now, the end step would be to* ***forecast the value of Bet Performer****.*
  - ***$73000000 * (1 - (11 * 0.01)) = $64970000***

So the range of valuation would be between: ***Approx.*** ***$64,970,000 to $68,000,000***

Q3. What is the income approach to valuation of a ship?

Income approach is used to determine the present value of the ship taking in consideration the future revenue it can generate. This approach is used to determine the value of all kinds of assets like airplanes, ships, tanks, etc.In our case, to estimate the Present value and Future Income of the Bet Performer we need to derive a few variables like various Revenue Streams, Costs, Net Operating Income (NOI), Discount Rate etc.

Revenue Streams: *For Bet Performer the revenue streams are Charter Rates, Lease Rates or any other recurring revenues. Cost Deduction: From the Revenue Streams identified we need to deduct the Operational Costs, Taxes etc. This is how we can determine the Net Operating Income of the Bet Performer.*
Net Performing Income = Revenue - Cost

Discount Rate: *Discount Rate is a Rate of Interest of how much are the future Cash flows worth today. This is crucial as money today may not be worth the same 10 years later due to various economic factors, hence this plays a key role in determining the Present Value of an asset.* ***-14%***

Present Value = (Net Operating Income) / (1 + Discount Rate)^(Time Period)

Net Operating Income = $14,000,000
Discount Rate = -0.14
Time Period = 10 Years (2008-2018)

From the above values

Present Value = (14,000,000) / (1-0.14)^10

Present Value = $63.6 Million

Q4. What is the cost approach to valuation of a ship?

(The cost approach determines a ship's value by evaluating its specifications and features. Pricing is based on the functions it performs and its unique characteristics compared to other vessels. This method helps establish worth by considering the ship's inherent attributes)

This is how I would approach the cost method: cost to replace it with a new one, minus any depreciation

1. The **cost of a new Capesize bulk carrier** in 2008 with the specifications you provided (172,000 DWT, B&W 6S70MC engine, 9 holds and hatches) is estimated to be around **$90 million to $100 million USD**.

2. Depreciation methods are restricted to the straight-line or linear method and the declining-balance method.
Straight-line method:
Salvage value = Scrap rate 2008 x lightweight tonnage = $400/ton value x 23,500 tons LWT= $9.4 million

$$\text{Straight-Line Depreciation} = \frac{\text{Asset Cost} - \text{Salvage Value}}{\text{Useful Life}}$$

Depreciation= (90-9.4)/26 = $3.3 million annually

3. Cost approach = Replacement cost in 2008 + Scrap value – Depreciation
= $95 million (avg) + $9.4 million – ($3.3 x 11 years)
= $104.4 mn – 36.3
= $68 million

Reference:
+ 1. Maritime industry publications: Reports from shipping industry sources such as Clarksons Research and Fearnleys shipbrokers, which regularly publish shipbuilding price indices. 2. Shipping industry databases: Historical data provided by ship valuation platforms and brokers like Compass Maritime, which track newbuild prices for various ship types, including Capesize bulk carriers. 3. Contemporary news reports: Articles from sources such as Lloyd's List, a well-known maritime news provider, which covered ship orders and pricing trends during the shipbuilding boom of the mid-2000s.
+2 VESSELS AND DEPRECIATION - The Islander Magazine

Q.5 In Exhibit 4, the Case Study shows five variables (other than sale price) in determining the value of a ship. What are these variables, and do you expect them to be positively or negatively associated with price?

Deadweight Tonnage (DWT): *Larger DWT indicates that the ship is large in size. Large ships have more capacity to accommodate and transport cargo in one trip. Thus, their demand increases which in turn increases the price at sale. This also depends on the world market. When the world market is in boom, there will be more trade and thus the demand of cargo ships increases significantly. The daily and yearly rental rates for ships also vary according to the market. But a strong market definitely increases prices of ships with larger DWT. It also means that larger ships will have a greater scrap value when discarded, which can be considered as a return at the end of life.*
However, we must also consider that ships with larger DWT have higher maintenance cost, cost of salary for more employees, depreciation, fuel cost, it required larger quantity of materials to manufacture them, having strong propelling engines, require more labor hours for their production, making them expensive compared to ships with smaller DWT, etc. which reduces the magnitude of the positive correlation.

Capesize Index: *This index shows the market patterns and trends for large ships. When index is high, the leasing price increases thus increasing the rent income for bigger vessels.*

Age at Sale: *The age of the ship during its sale is indicated by this variable. Typically this has a negative correlation with the price of the vessel, as older ships tend to be less valuable.The depreciation is high initially and later decreases steadily, so the negative correlation is also higher. Bigger vessels are often seen as more desirable, thus enhancing their market worth. When the index falls, the rent falls. Thus, index is positively correlated to price. Index is subject to global economic conditions, geopolitical conditions, and demand for certain types of goods. However, for second hand vessels, there is a lot of volatility in the market as the owners may be more likely to buy secondhand over new models wanting a higher profit from the booming market. Plus, second hand ships are more readily available compared to new ships. So they are likely to be sold faster.*

Year Built: *This indicates the year in which the ship is built and has a negative correlation with the price of the ship (newer ships are generally more valuable).*
Sale Date: *This can have varying effects on the Sale Price but it's likely to have weaker positive or neutral correlation with the price of the ship, as it represents market timing.*

Q.6 Compute the correlation between the five variables in Exhibit 4 and sale price.

- If the year of build increases, the price also increases.
- Hence as the age of the ship increases the price decreases.
- This indicates a notable positive correlation between price and DWT, if DWT increases, the price also increases.
- This indicates a notable positive correlation between price and capesize, if capesize increases, the price also increases.

Correlation between sales price and

sale Price with year build	0.810683322
sale Price with age at sale	-0.790143874
sale Price with Dread-weigh ton	0.513247284
sale Price with Trailing 1-Year Average Monthly Baltic Dry	0.349597696

Q7. Compute the means and standard deviations of all six variables.

Mean of all Six variable

Average sale Price	**$73.0 M**	**$73,000,000**
Average Year Build	**1993**	
Average age at sale	**14 years**	
Average Dread-weigh ton	**158.9 Tons**	**158935**
Average Trailing 1-Year Average Monthly Baltic Dry	**7,644**	

Standard Deviation	
S.D of sale Price	33.89537034
S.D of Year Build	6.330719879
S.D of age at sale	6.330404791
S.D of Dread-weigh ton	17.65098381
S.D of Trailing 1-Year Average Monthly Baltic Dry	2499.242355

Formula of mean:

Mean *= **sum**(**values** (x1,x2,x3,x4,x5...)) / N (number of values)*

Formula of Standard Deviation:

***Standard Deviation = sum**(**values** (x1,x2,x3,x4,x5)) * (**Xi**(each values in dataset - **μ**(mean of dataset)) / N (number of values)*

Q8. How much do you think the Bet Performer is worth based on comparable transactions? Which ship is the best reference transaction? Use only mean, standard deviation, and correlation to answer this question.

*Let's **consider the Baltic Dry Index** which is an indicator of the demand of bulk carriers and shipping rates . When we considered the Trailing 1- year Average monthly Baltic Dry Cape size Index.*

	Trailing 1- year Average monthly baltic Dry Cape size Index
mean	*7643.71*
std dev	*2499.31*
min	*4647.00*
max	*12479.00*
range	*7832.00*

*We can see that the std dev is bigger with respect to the average. This means that the index fluctuates significantly, indicating the volatility of the market. But the trend of Index is increasing with time. So our comparable transaction should have a higher than average index. Moreover, index is positively correlated to price. We can take the Baltic index in May 2008 as the highest at **12,479 or more**., based on max data and market conditions.*

Now, let's consider Dead Weight in tons which is an indicator of carrying capacity of the cargo

	Dead-Weight Tons (000)
mean	**158.94**
std dev	**17.65**
min	**98.40**
max	**207.10**
range	**108.70**

Smaller std dev indicates that there is moderate variation in the DWT of ships given in the data. So our comparable transaction ship should be closer to DWT value as the Bet Performer 172. We should also consider that DWT has positive correlation with price, so as Bet Performers DWT is more than average, the bid value should also be higher. Higher dwt compared to avg will give us a higher price.

But is price negatively correlated with age of ship? So, if they are the same age, under the same Index, same built year and same sale date, will they sell at a higher price if the DWT is lower?? This may be because of variation across averages, or the condition of the ship.

Column1	Sale Date	Vessel Name	Sale Price ($US millions)	Year Built	Age of sale (years)	Dead-Weigh t Tons (000)	Cape size Index
3	Jan-07	Spring Brave	62.00	1995	12	151.1	4,647
4	Jan-07	Martha Verity	60.00	1995	12	158	4,647

Now, when we consider Age of sale in years,

	Age of sale (years)	Greater std dev compared to mean tells us that there is greater variation in age in data. The age of our ship 11 years falls within the std dev limits. So the comparable transaction should have a range within SD. Also, age is negatively correlated to price. So, lower than average age of ship will have a higher comparable value. But the negative correlation is also higher.
mean	14.27	
std dev	6.33	
min	3.00	
max	26.00	
range	23.00	

We consider year built,

	Year Built	Greater std dev compared to mean tells us that there is greater variation in year built in data. The year built of our ship 1997 falls within the std dev limits. So the comparable transaction should have a range within SD. Also, age is positively correlated to price and our built year is higher than avg.
mean	1993	
std dev	6.33	
min	1981	
max	2004	
range	23	

If we consider comparable transactions, we should consider the characteristics of the ship:

Column1	Sale Date	Vessel Name	Sale Price ($US millions)	Year Built	Age of sale (years)	Dead-Weight Tons (000)	Trailing 1-year Average monthly baltic Dry Cape size Index
45	Mar-08	Cape Sun	135.00	1999	9	171.7	11,193

So, based on the above analysis, using only mean, std dev, correlation, and comparable transaction, we can compute the price of Bet Performer to be closer to $135,000.

Q.9 How could your analysis improve if you learn more statistical tool?

1. Polynomial and Multiple Regression Analysis: I*t provides the correlation between the price of the ship and several parameters (e.g., age, size, condition). While polynomial regression captures more intricate, non-linear relationships and offers a more precise and in-depth understanding of how each variable influences price, multiple regressions assess the impact of multiple variables at once. This provides deeper insights than mere correlation.*

2. The Logistic Regression Method: *With this approach, one may forecast binary results (like the reputation of a shipyard) and examine how categorical factors affect cost and More detailed predictions can be obtained using it than with standard correlation, which solely considers continuous variables. It works well for evaluating categorical or yes/no data.*

3. Decision Trees: *In order to facilitate understanding of the factors influencing ship pricing, this produces a visual model that divides data into branches according to the most significant variables. It also graphically illustrates which variables have the greatest influence and how they interact.*

4. Time Series Analysis: *this method observes trends and seasonal patterns in ship pricing over time, which can have an impact on valuation and comparing time series analysis to basic averages, which ignore temporal patterns, will increase the accuracy of your forecasts by taking into account changes in the market over time.*