

MSI Valuations – Overview & Methodology

Maritime Strategies International



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i) Introduction to MSI and MSI's Forecast Marine eValuator (FMV)

MSI Valuations – Overview & Methodology

FMV - an online modelling system for generating independent forecast vessel prices and cash flows for the shipping community and its allied industries

For over 30 years MSI has been providing independent values and forecasts of ship asset prices and cash flows on a vessel-by-vessel basis.

MSI is widely regarded as one of the leading providers of independent current and forecast ship values, earnings and operating costs with a global footprint and client base.

Forecasts are based on detailed proprietary sector specific econometric models with explicit views on supply and demand balances to derive earnings projections by asset type, size and age.

A rigorous fundamentals based modelling framework along with market insight and expert opinion make MSI's product both transparent and unique.

MSI's valuation methodology is widely accepted and often the preferred choice for many stakeholders within the industry.

MSI's assessments are extensively used by the financial community, investors and ship owners along with regulatory and governmental bodies for strategic insight, compliance requirements and risk evaluation.

ii) Vessel Price Drivers

MSI Valuation Approach

The drivers of second hand vessel prices can be categorised into four, largely independent, components newbuilding prices (replacement cost), earnings, life expectancy and scrap value.

i) Current Replacement Cost	ii) Earnings	iii) Life Expectancy	iv) Scrap Value
Cost to build a replacement vessel at the same yard and with the same specifications at the time of the valuation assessment	1 Year TC rate sets the rate of the depreciation at the time of the valuation assessment	Predominately market driven with life expectancy correlated to earnings	Scrap value dictated by the vessels light displacement and prevailing \$/LDT value
Used to define upper limit	Used to define the depreciation rate	Used to define when floor is reached	Used to define the price floor

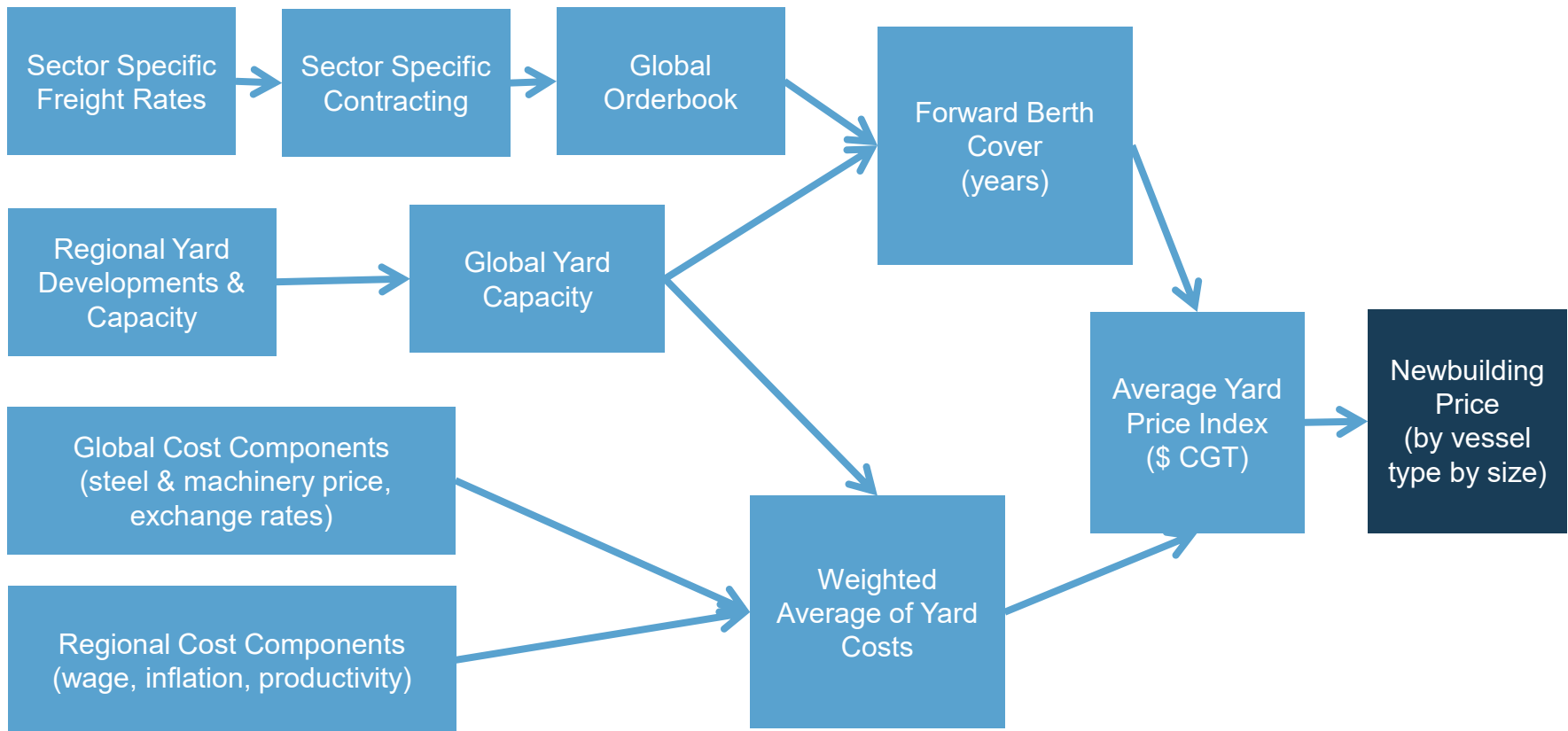
MSI FMV provides explicit forecasts for newbuilding prices and earnings complementing residual value projections, given their importance in determining future prices

In addition Operating Costs are also provided – a critical component in any cash flow analysis

iii) NB Price - Forecasting Methodology

Vessel Price Drivers

The newbuilding price forecast is formulated via MSI's proprietary Shipbuilding Service Model. This model utilises newbuilding demand (derived in MSI's sector specific models), cost and shipyard capacity assessing the overall balance between global demand and supply and the forward cover of shipyard orderbook. Forward cover is the critical input into the model's forecasts of yard profitability and mean price/cost mark-up.



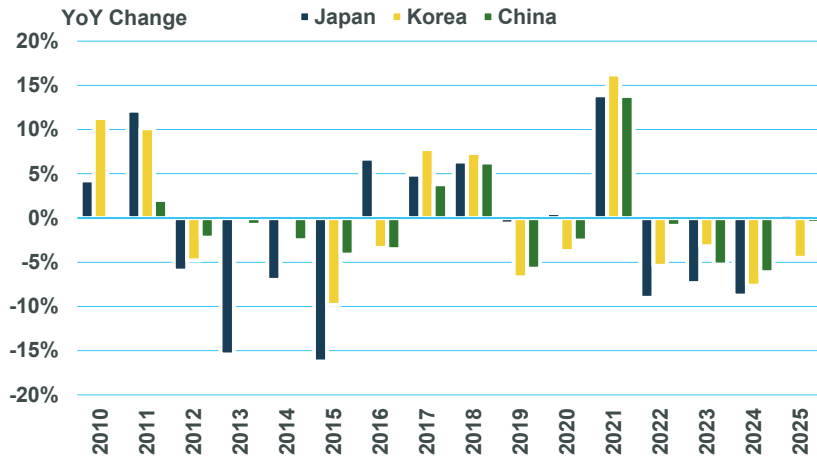
iii) Current Replacement Cost/Newbuilding Prices

Vessel Price Drivers

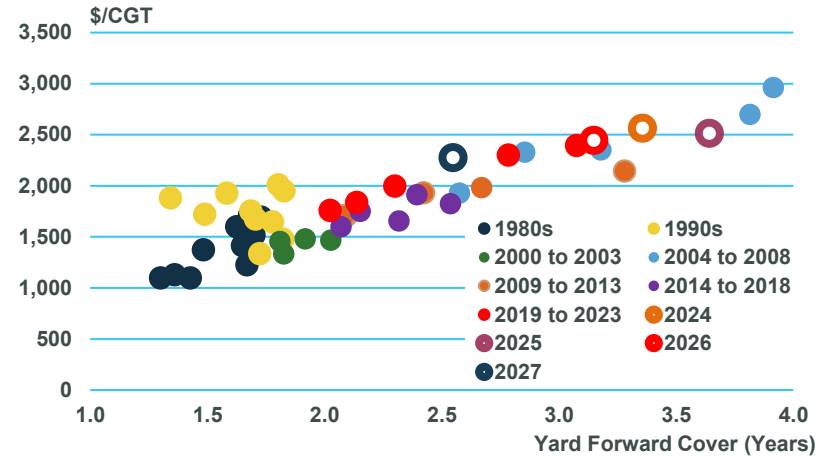
A major determinant in setting the level of secondhand values is the current newbuilding replacement cost i.e. what is the price to order a vessel of the same specifications at an equivalent yard. Understanding movements in newbuilding prices is imperative to understanding secondhand pricing. Values for modern vessels can move in tandem with newbuilding prices but in an opposite direction to earnings during parts of the market cycle.

Newbuilding prices move in tandem across shipping sectors driven by the dynamic relationship between:

- Shipyard costs (steel plate, labour, machinery exchange rates etc.)
- Global shipyard capacity and global orders (yard forward cover)



The chart above highlights the relative year-on-year movement in shipyard construction costs (in US\$) by the major shipbuilding regions. Not only do MSI explicitly assess and forecast ship plate steel and machinery costs but also wage inflation, productivity gains and exchange rate movements by shipbuilding region. This combination of inputs is critical in fully assimilating the outlook for shipbuilding contract prices.

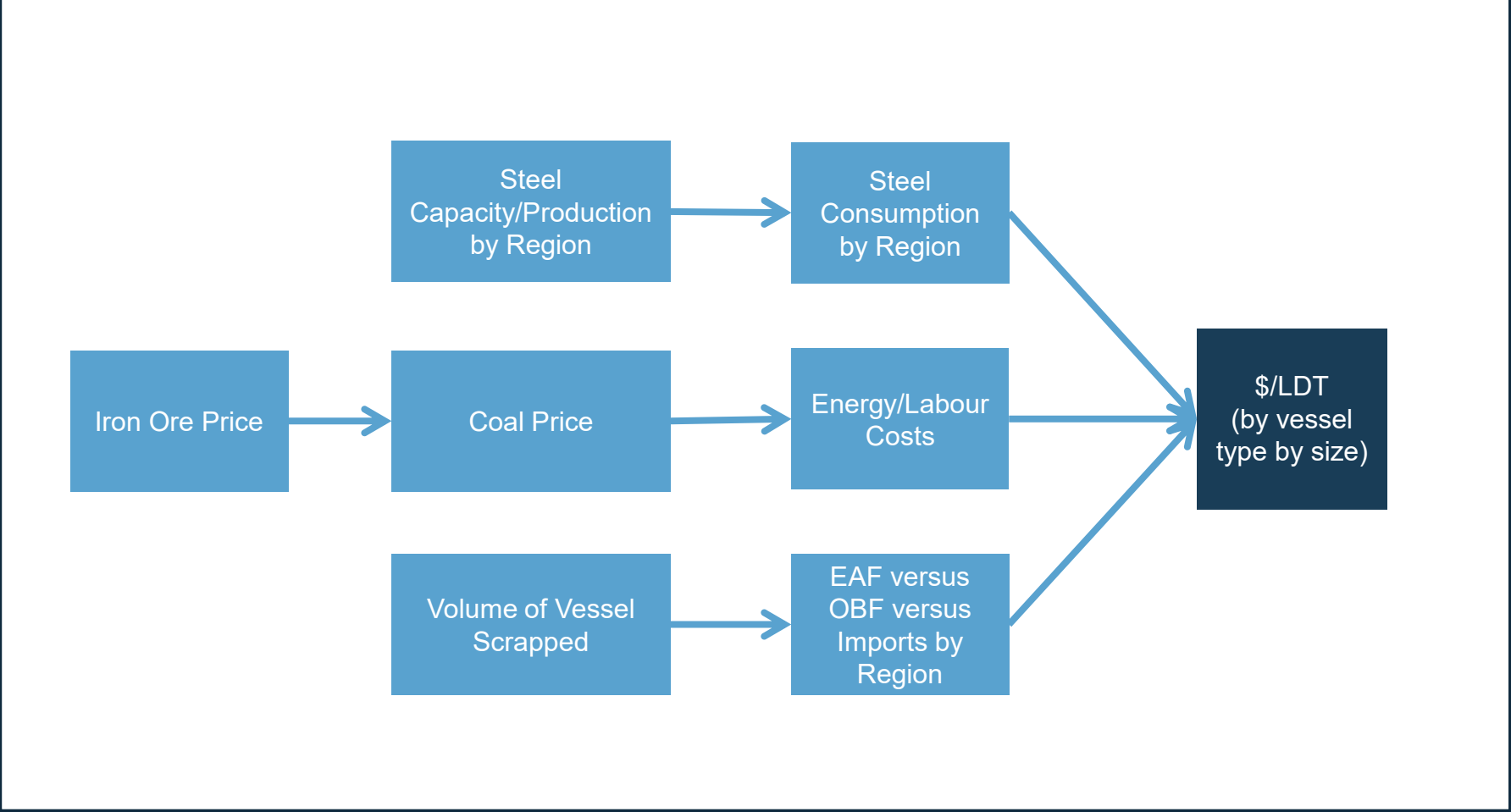


The chart above shows the annual average relationship between yard forward cover and newbuilding price (\$/CGT) since 1980. In general, the higher the forward cover the higher the newbuilding price. MSI's explicit sector specific contracting forecasts along with a detailed analysis of effective shipyard capacity and ongoing shipyard developments enables forecasts of this key determinant of newbuilding prices to be derived.

iv) Scrap Price - Forecasting Methodology

Vessel Price Drivers

Vessel scrap prices follow the fortunes of the steel industry, which in turn closely track the economic cycle. The interplay between steel capacity/production and regional consumption along with the associated cost inputs are explicitly captured and forecast in MSI's Dry Bulk Shipping Model (DSPS). In addition, given MSI's sector specific supply forecasts across all shipping sectors, including demolitions, global volumes of scrap steel can also be incorporated into the forecast algorithms.

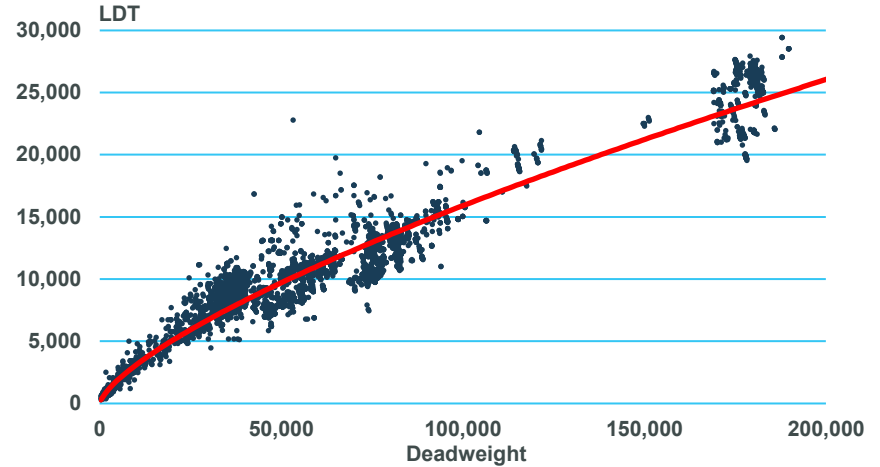
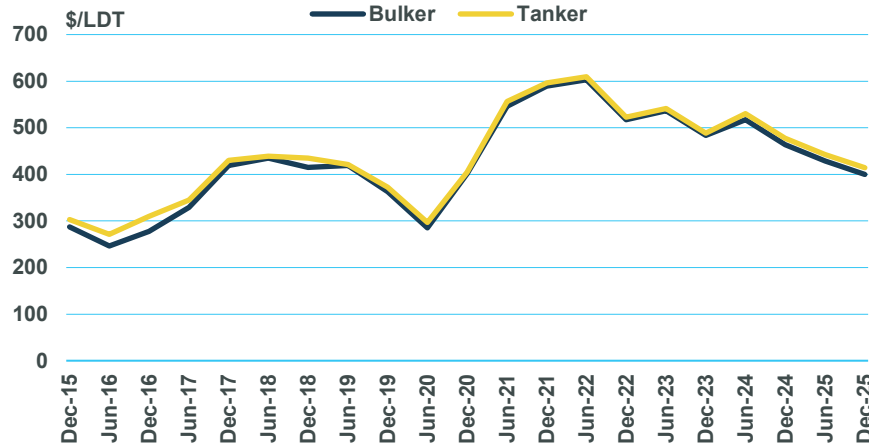


iv) Scrap Price

Vessel Price Drivers

Scrap price plays an important role in setting the floor for secondhand values, particularly for ageing vessels and during market troughs. Realised scrap prices are driven not only by the prevailing local \$/LDT value but also the size and type of vessel.

Market scrap prices and regional developments and how these relate to specific assets are core to forecasting scrap values



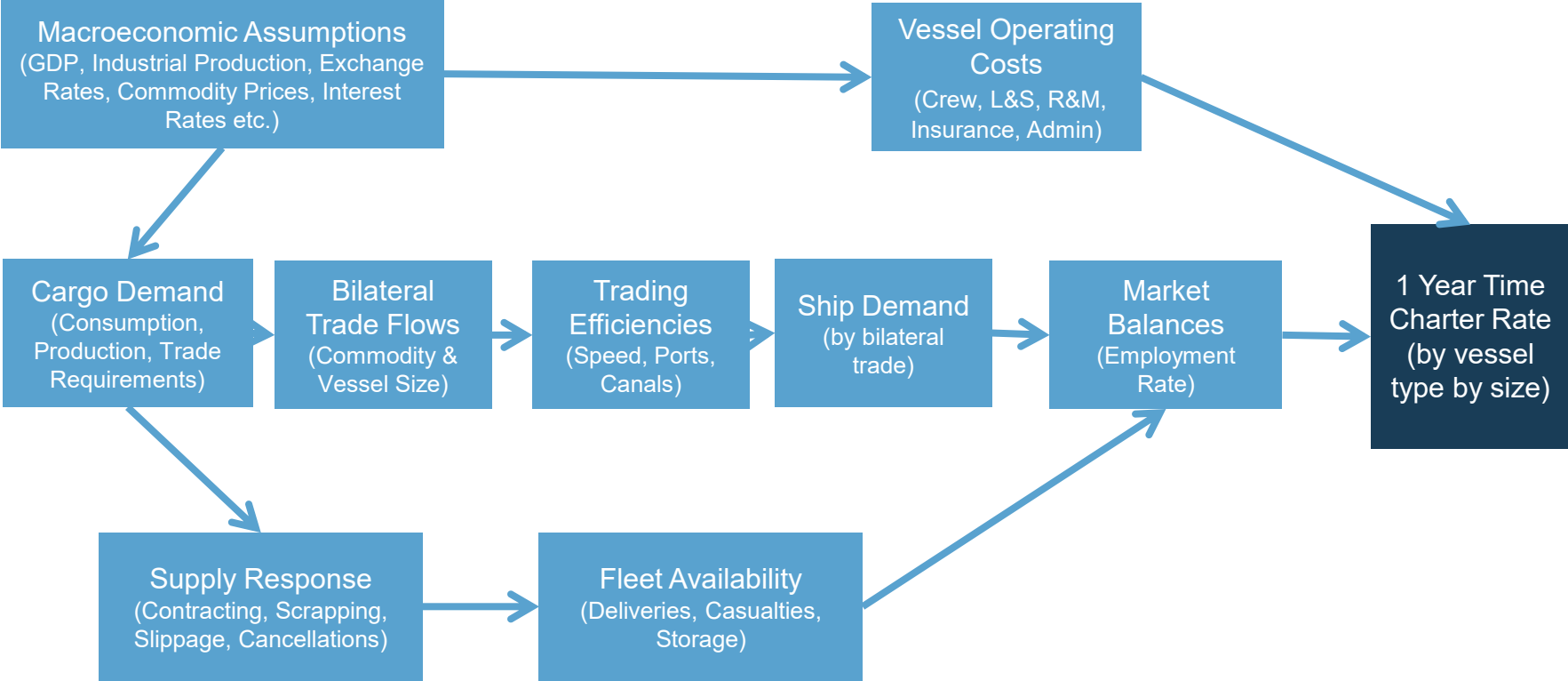
MSI tracks the prevailing vessel demolition price by country by vessel type. The chart above highlights the difference in \$/LDT price between two of the main shipping sectors for vessels scrapped in the Indian Subcontinent. Forecast assessments of \$/LDT prices are based on the global and regional steel price, steel imports into the traditional vessel demolition regions, along with the volume of vessels scrapped.

With access to a wide range of demolition and fleet databases MSI have built up detailed relationships between vessel volume/capacity metrics and the Light Displacement Tonnage by vessel type and size. The chart above shows, at a macro level, the relationship between Dwt and LDT for dry bulk carriers. Further adjustments are then be made, where required, based on the asset specifics and include country of build, non ferrous metal content etc.

v) Earnings - Forecasting Methodology

Vessel Price Drivers

MSI's forecasting methodology is based on sector specific supply demand fundamentals. By comparing the required tonnage to service specific cargo flows on bilateral trades (taking into consideration consumption and production dynamics along with trading efficiencies) against the physical fleet enables an employment rate to be derived. The sector specific employment rate, along with operating costs, define the 1 YR T/C rate forecast.



v) Earnings

Vessel Price Drivers

MSI's extensive bilateral trade forecasts by commodity and vessel type is imperative in the processes of forecasting sector specific employment rates. The translation of these cargo trades into the requirement for ships to service them is a central component in MSI's forecasting process. Tonne mile along with fleet efficiency are captured to provide a true representation of vessel demand. This provides a foundation with which employment rates and earning forecasts can be derived, once MSI's forecast of vessel supply is considered. On a vessel specific basis an age adjustment is also included.

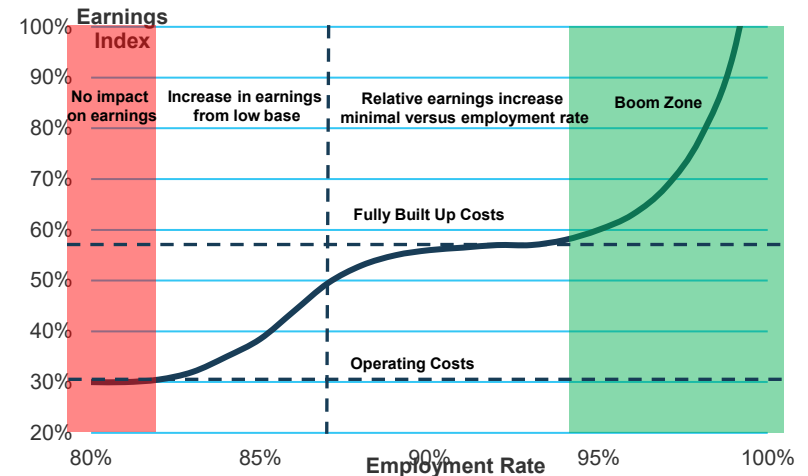
Two critical methodological approaches utilised to transform trade into earnings relate to calculating vessel requirement and the relationship between employment rates and earnings.

$$\frac{\text{Effective Capacity}}{\text{Total Capacity}} \times \frac{\text{Operating Days}}{\text{Voyage Days} + \text{Port Days}}$$

where:

$$\text{Voyage Days} = \left(\text{Bilateral Distance} \times \frac{1 + \text{Ballast Ratio}}{24 \times \text{Speed}} \right)$$

The equations above outline how MSI translates the cargo carried into the average vessel carrying capacity required to ship the cargo. This is aggregated for all routes and all commodities by ship size to provide total shipping requirement. This can then be directly compared with the average capacity of vessels on the water. This process is more sophisticated method of tracking demand than tonne-miles as it explicitly takes into consideration the inefficiencies within the fleet.



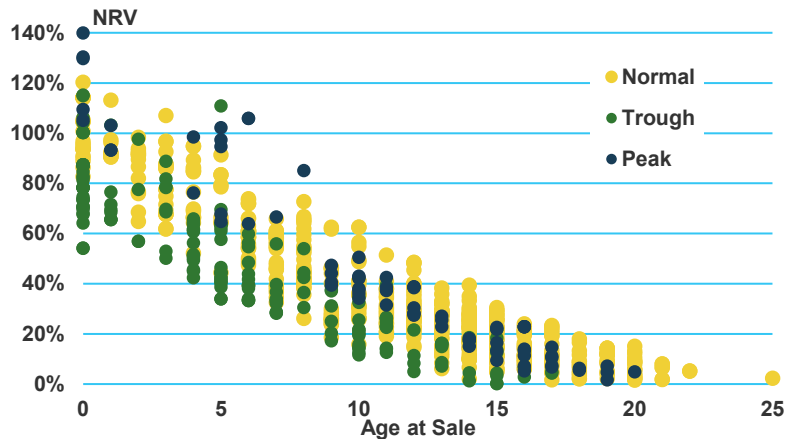
The relationships between the sector employment rate and earnings is not a linear one. The chart above shows a schematic of the interplay between the two variables captured by algorithms in each MSI's sector models. Where the employment rate sits relative to the curve therefore can have a significant impact on the vessel earnings, especially between the transition zones of operating costs and fully built up costs.

v) Earnings

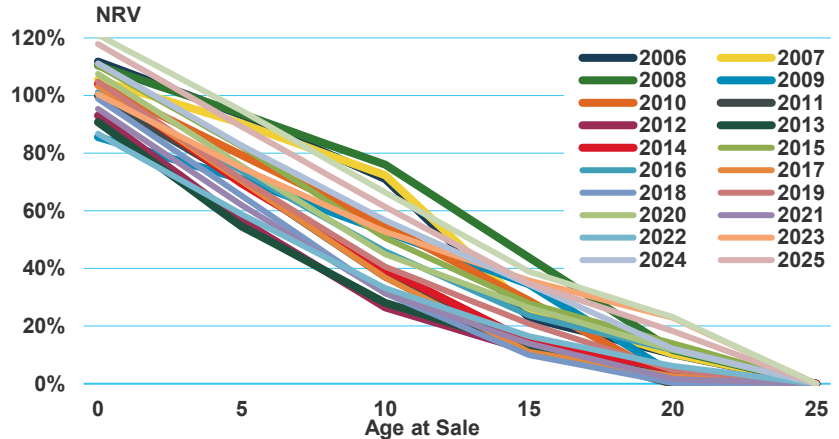
Vessel Price Drivers

A ship's earning ability is a primary component in dictating the ship's secondhand value, therefore changes to market fundamentals and earnings will impact value. A ship's resale price is typically highest at the top of the market cycle and lowest at the bottom. The relationship is best modelled and subsequently forecasted by utilising the Net Replacement Value Depreciation metric; this normalises secondhand prices against changes in the newbuilding price and removes the residual scrap price from the assessment, thus capturing the sole impact of earnings on relative secondhand value. This methodology means it is suitable for both liquid and illiquid markets, unlike many other approaches.

MSI's secondhand value forecasts are constructed on the interplay between earnings and the rate of depreciation.



The chart above shows the large distribution and spread of sales for Capesize bulk carriers since 1990 expressed in Net Replacement Value Depreciation terms (NRV). These sales can be compartmentalised into the strength of the market at the time of the transaction. As can be seen in the chart the weaker the earnings environment the greater the concavity in the depreciation curve and the further away this sits from straight line depreciation.



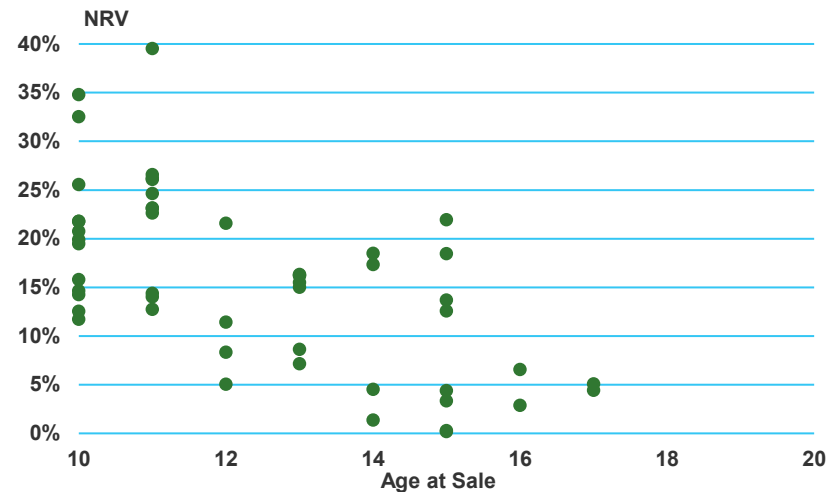
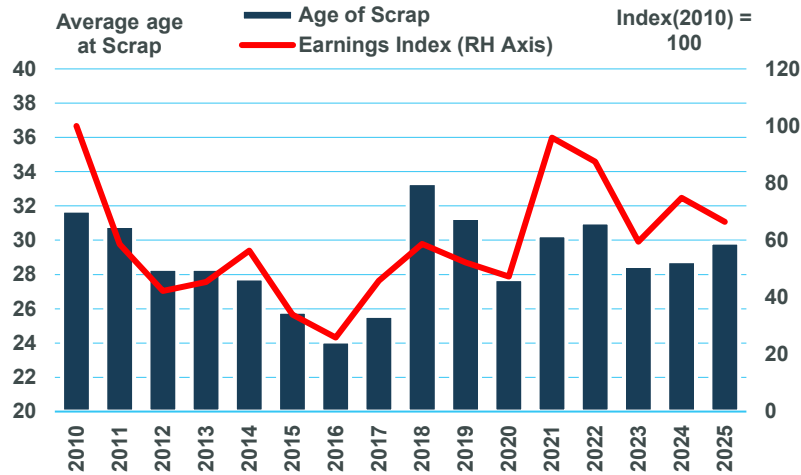
Utilising both sales and benchmark timeseries data historical depreciation curves can be constructed and analysed in the context of vessel earnings during all phases of the shipping market. The chart above shows the variation in the NRV for a VLCC since 1990. This historical relationship between earnings and the NRV can be used in conjunction with MSI's forecast earnings to depict the future NRV depreciation of a vessel type, size and age.

vi) Life Expectancy

Vessel Price Drivers

The expected economic life expectancy of a ship is critical when forecasting residual values. Life expectancy is inherently linked to market conditions and vessel earnings. However, it can also be an artefact of obsolescence and regulatory requirements, which typically accelerate the propensity to scrap.

Dynamics in the scrap market and vessel earnings are critical in determining life expectancy.



The chart above highlights the relationship between earnings and life expectancy for the dry bulk sector. As earnings decline then so too does the average age of scrap and visa versa. Life expectancy is also driven by the scrap price, a relatively high scrap price can be enough to encourage owners to scrap vessels, especially prior to expensive fourth or fifth special surveys which is further heightened during market weakness.

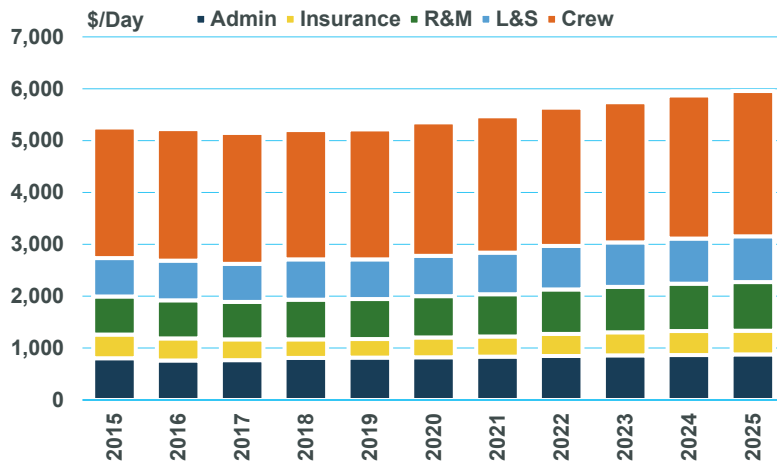
Actual transactions expressed in Net Replacement Value terms highlights the impact earnings have on life expectancy. Once a sale is recorded at 0% NRV that vessel has effectively been sold at a price equivalent to the scrap price. The chart above shows the NRV metric for capsized bulkers sold during trough earning conditions and it can clearly be seen that vessels life expectancy for some vessels have been as low as 15 years old.

vii) Operating Costs (OPEX)

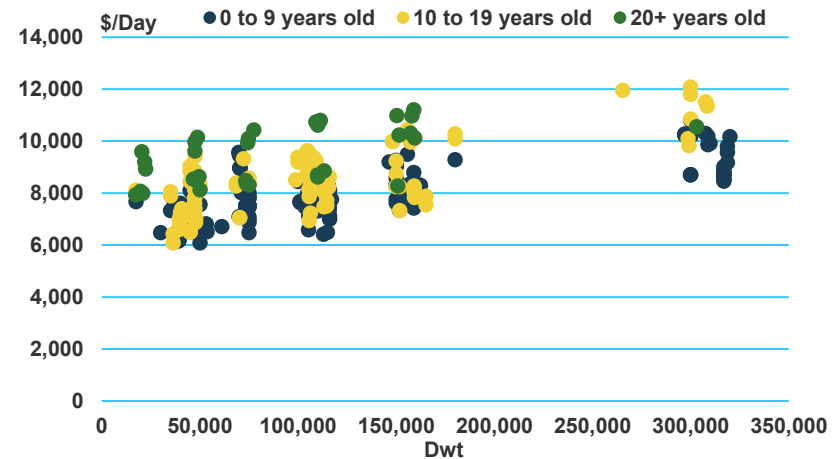
Vessel Price Drivers

To enable a true assessment of a vessels earning potential and therefore the associated cash flow the vessels operating costs need to be considered. Not only is this a crucial input into MSI's earnings forecast methodology but it is crucial metric when carrying out any benchmarking exercise on a vessel-by-vessel basis.

MSI's annual operating cost survey forms a foundation for the analysis and forecasting of OPEX for all vessel types.



On an annual basis MSI collates Operating Expenses information across all ship sizes and types. This information is drawn from an ongoing dialogue with owners, operators and ship managers at the individual vessels level, broken down into Crew, Lubes & Stores, Maintenance & Repair, Insurance and Admin/Overhead cost components. The data collected is strictly confidential. The chart above highlights the development in each cost component over the last decade for a Panamax bulk carrier.



In addition to costs by component MSI also analyse the impact age has on the underlying operating costs. The chart above captures the impact that age has on OPEX levels, as well as demonstrating the variability in actual data in a single survey year for oil tankers. The information collated by MSI enables forecasts to be derived based on the individual OPEX components each with their own forecast drivers. In addition cost escalators, by component by vessel age, are also modelled and integrated where applicable.

viii) Data Gathering

Timeseries Data Assimilation

MSI regularly publishes prices, rates and OPEX across all shipping sectors, sourcing information from across the industry. This data is invaluable during the process of formulating a vessel value as a specific vessel can be assessed with reference to a benchmark asset. These data and quarterly updates form the core of a number of bank and regulatory bodies compliance and risk appraisals

1. External Inputs

Information Gathering

- Databases
- Publications
- Shipbrokers
- Financial reports
- Industry contacts

Daily, weekly, monthly and quarterly flow of transactions and price series

2. Internal Processing

Data Processing

- Removal of outliers
- Archive searches
- Direct survey of clients

- Coding by ship type
- Size adjustments
- Price conversions
- Prices restated in % Net Replacement

3. Internal Analysis

Publishing

MSI Quarterly Rates and Prices Service



- Newbuilding contract prices
- 0, 5, 10, 15, 20 year old prices
 - 1 year TC rate
 - Operating costs

75 vessel types and sizes
updated quarterly with historical quarterly data and annual average forecasts

ix) Last Done Approach

Market benchmarking

MSI compile transaction databases and has access to market intelligence which enables assessments of a vessels current valuation in context with similar vessels sold recently or are about to be sold.



Known price on known date



Price adjustment factors

Benchmarked against market

Vessel valuation today's date



1. Historical similar sales are identified.

2. Price adjusted for:

- Age
- Size
- Specification
- Yard of build
- Survey proximity
- Sale circumstances
- Market movements
- Previous Owners
- Flag/Class

3. Market intelligence, including prospective sales candidates, are used to benchmark values derived from the process above.

x) MSI Online Valuations Platform - FMV

Online assessment

MSI Forecast Marine eValuator (FMV) is the first web-based tool to provide both historical, current and forecast price and cash flow data, covering virtually all of the deepsea shipping and offshore fleets.

- Data includes current quarterly value and earnings along with forecasts of newbuilding, second-hand prices, 1 year timecharter rates and operating costs for specific vessels.
- MSI FMV draws on MSI's proven, proprietary models and a consistent cross-sectional view across all principal shipping sectors. It puts asset values in the context of the near-term market to enable reliable benchmarking with outputs based on annual averages.
- Coverage:



Crude Oil Tanker



Chemical Tanker



Multi Purpose



Product Oil Tanker



LPG Carrier



Containership



Dry Bulk Carrier



LNG Carrier



PCC/PCTC



AHTS



PSV



MODUs

xi) Valuations Application and Commercial Implementation

MSI valuation and cash flow forecasts are widely used across the industry to fulfil a variety of needs where an independent rigorous, market modelled assessment of future value, earnings and opex are a necessity.

Restructuring	Investment Due Diligence	Strategy Planning	Project/Structured Finance
MSI assessments are regulatory used by both accountants and owners during restructuring processes, where an independent view of vessel specific cash flow is required to benchmark against the equivalent Management view.	MSI's assessment of future value/cash flow are used by both current and future market participants to assess the relative attractiveness of an investments. This can include vessel type and age specifications along with entry and exit timings and expected returns.	MSI forecasts are used by a wide range of owners, from small independents to large listed corporates, as an integral part of their strategic, financial and management planning.	MSI views form the basis of asset and market exposure assessments for banks globally providing structured finance solutions for shipping and offshore industries.
Litigation	Risk Assessment	Compliance	RVI Products
MSI capabilities can be used on their own or in tandem with MSI's expertise in litigation cases, including value, valuation and future cash flow in arbitration, bankruptcy or quantum cases.	MSI cash flow and forecast values are often an integral component of ship finance risk assessments providing a shipping and asset specific component to any probability of default, loss given default and expected loss calculation.	MSI values, earnings and OPEX data are used by both financiers, auditors as well as regulatory bodies as an independent provider of asset specific data.	MSI are the preferred provider of forecast values for many underwriters and brokers when structuring and pricing RVI products for the insurance industry. Soft and PML can also be incorporated to MSI's FMV.

MSI Background and Disclaimer

For over 35 years, MSI has developed integrated relationships with a diverse client base of financial institutions, ship owners, shipyards, brokers, investors, insurers and equipment and service providers.

MSI's expertise covers a broad range of shipping sectors, providing clients with a combination of sector reports, forecasting models, vessel valuations and bespoke consultancy services.

MSI's team is comprised of professionals with extensive academic credentials, deep industry knowledge and many years experience of delivering successful client projects.

MSI balances analytical power with service flexibility, offering a comprehensive support structure and a sound foundation on which to build investment strategies and monitor/assess exposure to market risks.

While this document has been prepared, and is presented, in good faith, MSI assumes no responsibility for errors of fact, opinion or market changes, and cannot be held responsible for any losses incurred or action arising as a result of information contained in this document. Although any forecasts contained in this document are based on MSI's assumptions, there can be no assurance that these forecasts will prove to be accurate, as future events could differ significantly. Any forward statements, forecasts or trends contained in this presentation are not guarantees of the future and therefore no reliance should be placed on them. The copyright and other intellectual property rights in data, information or advice contained in this document are and will at all times remain the property of MSI.



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