



MSI FMV (Forecast Marine eValuator)

Track Record



Introduction

Track Record

Through MSI's online *Forecast Marine eValuator* (FMV) tool, timeseries data is generated (see output example to the right) for marine assets covering:

- **Quarterly Data:**
 - Fair Market Values
 - 1 Yr T/C Rates
- **Annual Data:**
 - Newbuilding Contract Prices
 - Fair Market Values
 - 1 Yr T/C Rates
 - Operating Costs
 - Scrap Prices

Forecast Details		Quarterly Forecast												
MSI Base Case	v194.8	Downloaded for	Maritime Strategies International Ltd											
Downloaded By	William Fray	Download Date	17 Jan 2020											
Annual Forecast		Quarterly Average Timeseries												
		Q4 19	Q1 20	Q2 20	Q3 20									
Fair Market Value (\$ Mn)		15.2	13.9	14.2	14.2									
1 Yr T/C Rate (\$ k/Day)		11.2	10.4	10.8	10.9									
Annual Average Timeseries		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Newbuilding Contract Price (\$ Mn)	5	25.4	28.5	25.6	22.5	23.3	25.9	27.7	27.1	27.8	29.7	30.6	28.8	30.2
Age (Years)		2	3	4	5	6	7	8	9	10	11	12	13	14
Fair Market Value (\$ Mn)	9	24.8	27.4	18.0	12.4	15.6	16.6	15.2	14.2	13.9	15.1	15.5	14.8	14.4
1 Yr T/C Rate (\$ k/Day)	5	9.8	10.7	8.2	6.6	10.1	12.9	11.3	10.7	11.3	11.9	12.5	12.9	12.5
Operating Costs (\$ k/Day)		5.0	5.1	5.1	5.1	5.1	5.2	5.4	5.5	5.7	5.8	6.0	6.1	6.2
0 Yr Old Price (\$ Mn)	2	27.3	31.6	25.8	20.1	24.4	26.8	27.4	27.4	28.5	31.0	32.1	30.7	31.7
5 Yr Old Price (\$ Mn)	9	21.0	24.7	16.1	12.4	16.6	18.4	18.3	18.1	19.4	21.7	23.6	23.7	24.6
10 Yr Old Price (\$ Mn)	4	16.1	18.4	10.6	7.5	11.5	13.9	13.2	13.2	13.9	16.0	17.5	17.9	18.7
15 Yr Old Price (\$ Mn)	5	9.7	11.9	6.7	4.1	7.3	9.6	8.4	8.4	9.3	11.1	12.6	12.8	13.3
20 Yr Old Price (\$ Mn)		6.9	7.5	4.5	3.2	4.4	6.2	5.4	5.2	6.0	7.2	8.1	8.3	8.6
Scrap Price (\$ Mn)		4.8	5.4	4.0	2.8	3.7	4.5	3.7	3.2	3.1	3.0	3.0	3.1	3.2

- Timeseries include *historical* data, for vessel benchmarking and reporting purposes, and also *forecast* data underpinned by MSI's proprietary shipping market models, principally used for cash flow modelling and risk analysis.
- The purpose of this Track Record document is to place historical data into context against actual market observations, and also to provide detail on the observed accuracy of MSI's model-based published vessel timeseries forecasts.



Historical Data Assessments

MSI FMV Track Record




Historical Data Assessments


Introduction


- Historical data provided through the MSI FMV platform represents MSI's assessment of quarterly and annual market averages for vessels as defined by the user in the vessel input screen (see image on right for an example input screen, for oil tankers).
- Data is generated on a vessel-by-vessel basis according to a range of inputs provided by the user.
- FMV's calculation procedure is driven by MSI's proprietary sector-specific models, underpinned by a comprehensive range of benchmark vessel data collated according to MSI's rigorous market data collection and filtering processes.
- Nevertheless it should be recognised that realised timecharter, newbuild and S&P transactions and actual vessel operating costs will deviate from market averages as assessed by MSI through the FMV platform.
- The following section of this presentation first outlines MSI's benchmark data collection processes before providing context on how realised, observable transactions have deviated from historical market average data calculated through MSI FMV for timecharter rates, operating costs and prices.

Vessel Details - Oil Tanker




A vessel fitted with tanks for the bulk transport of oil (crude and/or refined oil products).

Oil Tanker Vessel Search 

9251585 - EUROFORCE 

The Vessel Search tool can be used to pre-populate the vessel characteristics below. Data is extracted from a 3rd party source and should be validated before relying on the information supplied.

Vessel ID	Size (Dwt)	Year of Build
EUROFORCE	106361	2002
Ice Class	Country of Build	Yard Tier
None	Japan	Tier 1
Tank	Efficiency	Scrubber-Fitted
Product		None

Save Vessel 

Historical Benchmark Data

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



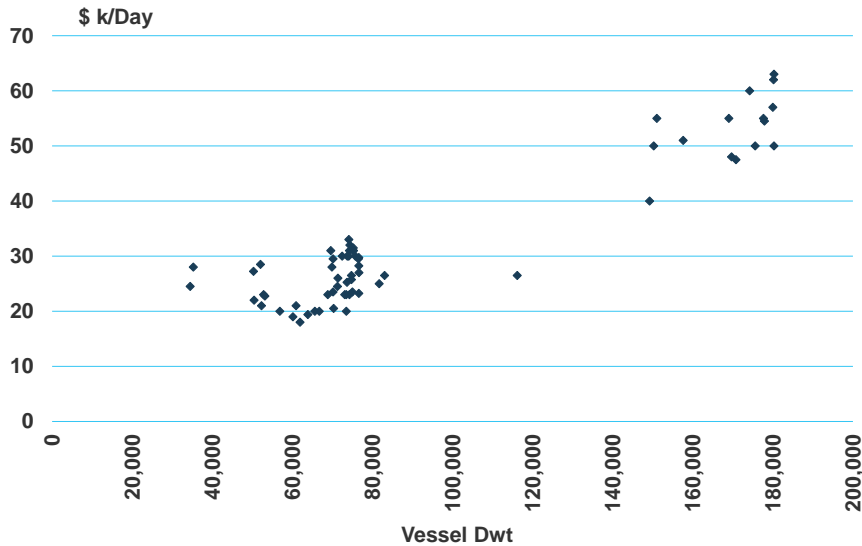
- Newbuilding contract prices
- 0, 5, 10, 15, 20 year old prices
 - 1 year TC rate
 - Operating costs

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

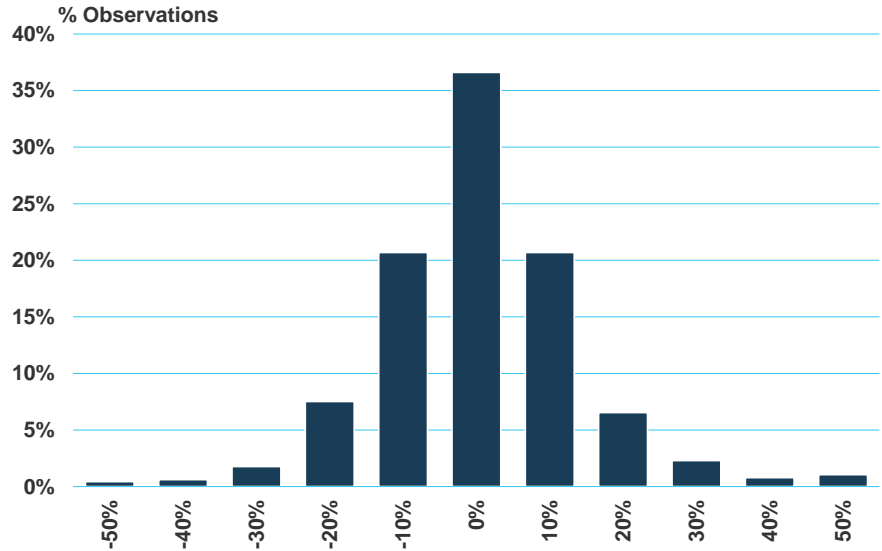
Historical Reported vs FMV Calculated

Dry Bulk 1 Yr T/C Rates

Actual 1 Yr T/C Observations for a sample quarter



Realised 1 Yr T/C vs FMV Calculation



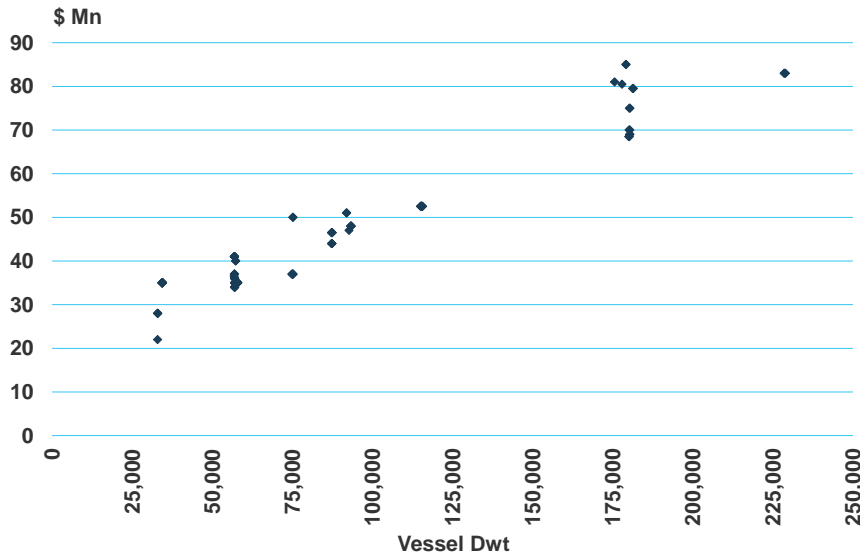
Key Messages

- The output from MSI FMV represents MSI's assessment of the fair market average 1 Yr T/C rate for the vessel type as specified by the user. This is underpinned by a range of inputs to the calculation methodology, such as reports by brokers and fixture data.
- The chart above left plots 71 dry bulk 1 Yr T/C fixtures in a sample quarter chosen due to high number of charters. This demonstrates the variability of 1 Yr T/C rates under the same market conditions.
- The chart above right illustrates the distribution of differences between 1300 actual observed 1 Yr T/C transactions in the dry bulk market since 2004 against MSI's corresponding quarterly average assessment of fair market average as calculated through MSI FMV.

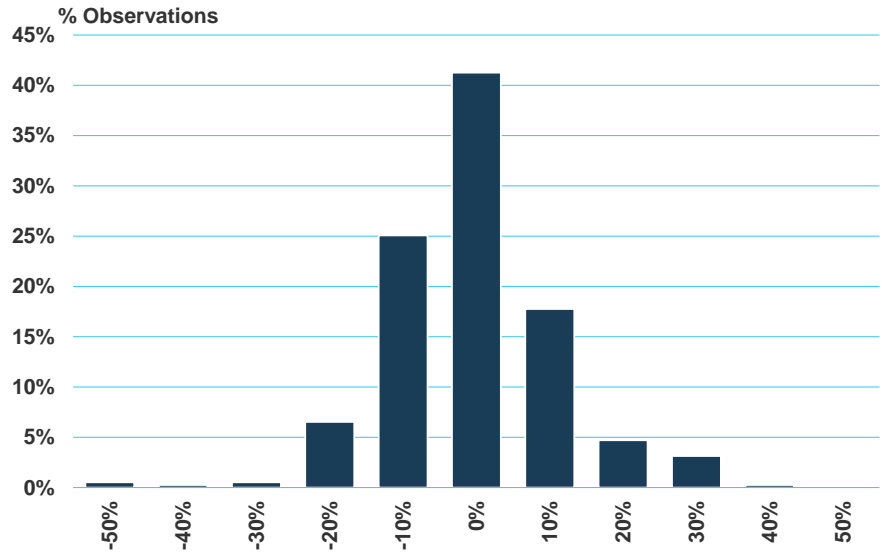
Historical Reported vs FMV Calculated

Dry Bulk Newbuild Contract Price

Actual NB Price Observations for a sample quarter



Realised NB Prices vs FMV Calculation



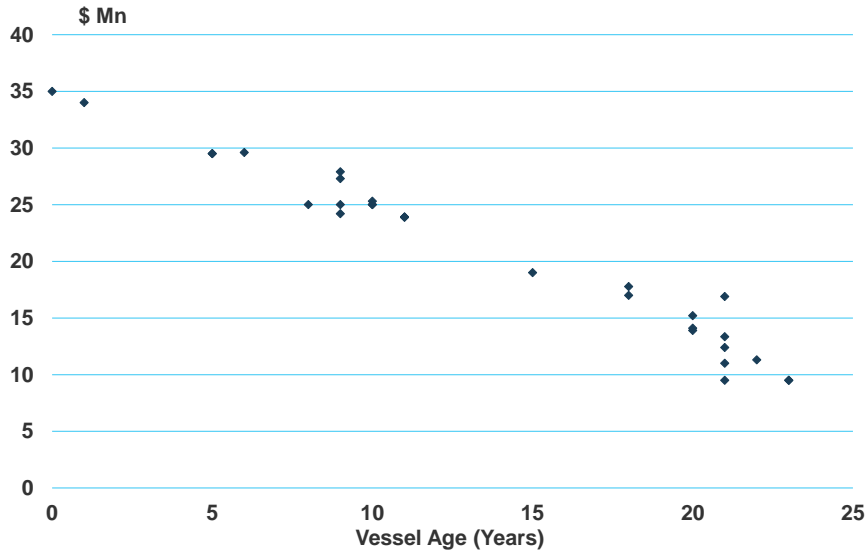
Key Messages

- Newbuild contract prices depend on a range of factors often unique to each yard, such as the size and content of orderbook at the time of contract, relationship with service providers, relationship with owner and historical build experience. MSI FMV captures some of these dynamics by aggregating yards by country and by tier: these inputs are integral to the newbuild price calculation in MSI FMV. MSI groups country of build by Japan, South Korea, China, Other Asia and Other, and defines yard tier as follows:
 - **Tier 1:** A shipyard with a proven track record of building both commodity (bulkers, oil tankers and/or containerships) and specialised vessels for predominately an export market.
 - **Tier 2:** A shipyard building predominately small (LOA less than 300m) commodity vessels (bulkers, oil tankers and/or containerships).
- MSI's benchmark vessel newbuild price timeseries are built from analysis of broker reports and actual transactions. Naturally there are variations in actual transactions from quarterly averages. The chart above-left illustrates the spread of reported dry bulk newbuild contract prices for transactions during a sample quarter. The chart above-right demonstrates the deviation of historical newbuild contract prices from the corresponding quarterly average assessment calculated through MSI FMV for over 1400 transactions recorded since 2000.

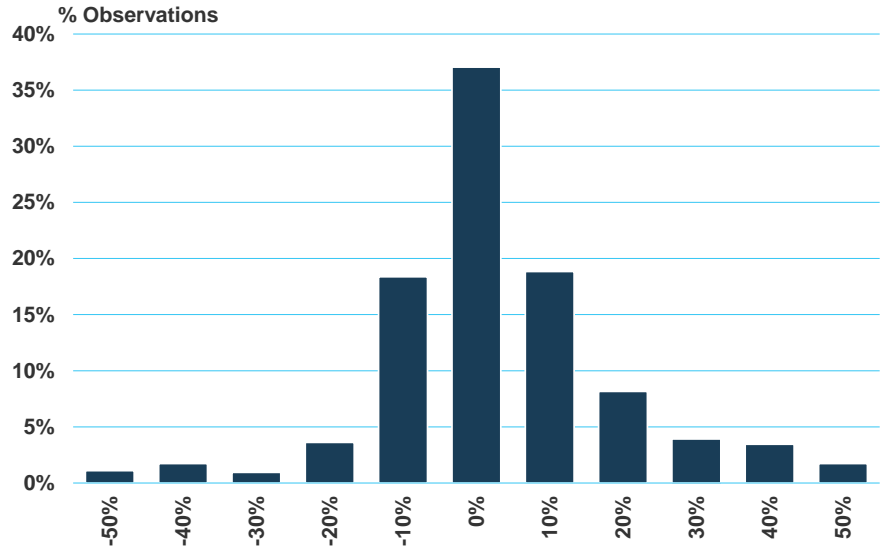
Historical Reported vs FMV Calculated

Fair Market Value

S&P Observations – Handymax Bulker for a sample quarter



Handymax Bulker Actual Sales – Deviation from MSI FMV



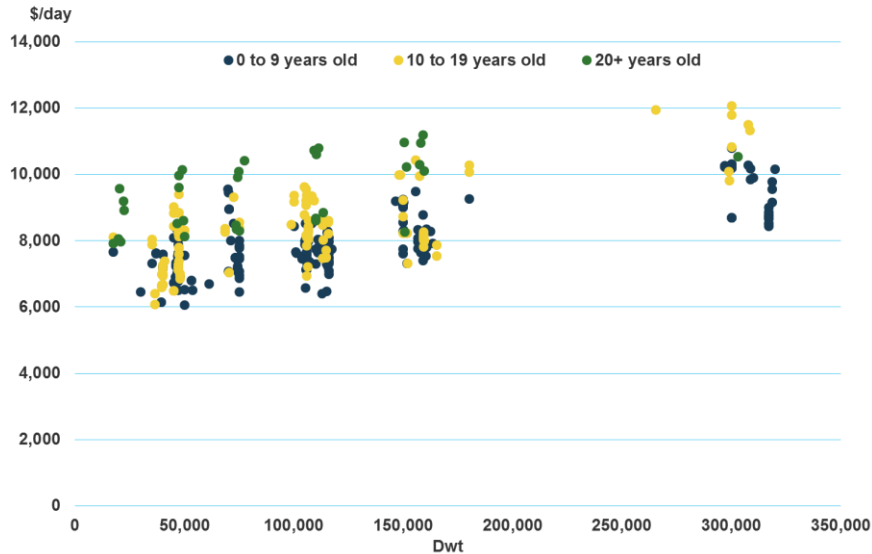
Key Messages

- Factors which determine the sale price of a ship can be broadly split into three groups:
 - Market Factors:** incorporating industry-wide factors such as newbuild contract prices, scrap steel prices and vessel operating costs (e.g. crew/insurance/maintenance costs), and also sector-specific factors such as the charter market.
 - Vessel Factors:** such as vessel specifications, age, vessel condition and proximity to survey.
 - Transaction Factors:** such as S&P market liquidity, existing charter commitments, buyer/seller relationship and vessel location.
- It has been observed that under comparable *market* conditions, ostensibly similar physical assets can command different sale prices primarily on the basis of a mixture of vessel-specific and transaction-specific factors. The chart above-left demonstrates this variation by plotting the distribution of actual realised prices during a sample quarter for 40-50 k Dwt bulker vessels.
- MSI's FMV model takes into account market-specific and key vessel-specific factors to calculate quarterly average 'fair market values' for a specified vessel type according to a range of user inputs. Whilst acknowledging that vessel-specific assessments require additional information that cannot be accurately captured in an automated system, the chart above-right presents the distribution of reported price observations realised for 64 transactions of standard 40-50 k Dwt dry bulk ships up to 25 years old recorded since 2000 against MSI's quarterly average fair market value assessment calculated through FMV.

Historical Reported vs FMV Calculated

Opex Distributions

Operating Cost Distributions by Age and Dwt (Oil Tankers)



Operating Cost Data

Vessel operating costs included in MSI's forecasting models incorporate all cost items typically borne by the vessel owner under a period time charter party:

- Crew Costs
- Lubes and Stores
- P&I Insurance
- H&M Insurance
- Repair and Maintenance
- Administration/Overhead

These costs are based on best practice management for modern vessels and includes provision for dry docking and special surveys.

Key Messages

- Since information on costs is confidential, MSI has developed its own database of based on MSI's ongoing dialogue with owners, operators and ship managers.
- The chart above left captures the impact that age has on OPEX levels, as well as demonstrating the variability in actual data in a single year, in this example 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.
- The quarterly average assessment for Opex generated by MSI FMV is built from analysis of this data and represents the average operating costs for a ship of that age and broad specification. Actual ship operating costs will vary from this assessment based on factors not assessed through the FMV platform such as vessel condition, flag of convenience, owner strategy & relationship with suppliers.



Forecast Data Assessments

MSI FMV Track Record



MSI's Forecasting Models

Background

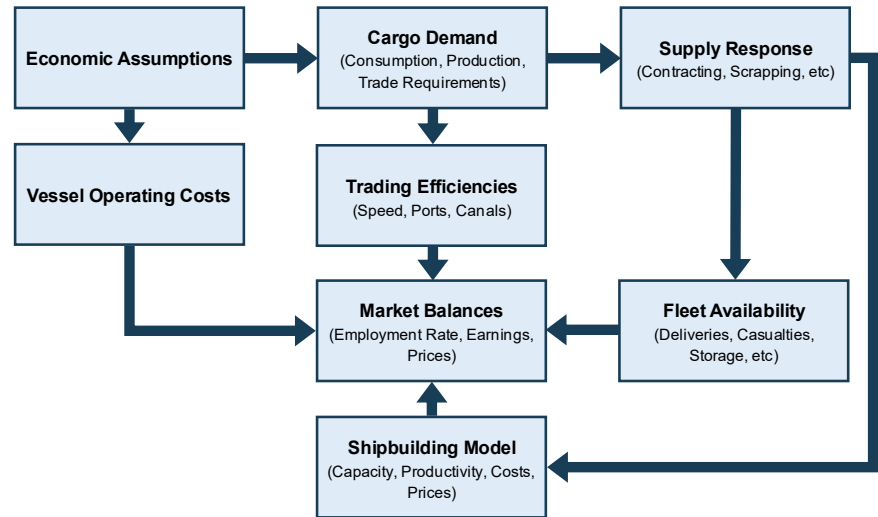
Model Methodology

- Our model methodology is underpinned by a bottom-up analysis of the key drivers of the global shipping market.
- At its core is a comprehensive analysis of the fundamentals of commodity/product trades within each individual shipping sector, complemented by an overarching view of the dynamics of the shipbuilding market.
- This approach enables us to generate a consistent outlook for future vessel cash flows and fair market values for assets covering all shipping sectors, underpinned by the same internally consistent forecast assumptions. Our approach enables us to calculate vessel fair market value even in illiquid markets.

Key Messages

- For almost 30 years MSI has forecasted the deep sea shipping markets through our proprietary econometric models. These models are continuously enhanced and refined with the aim of most efficiently determining likely (and identifying key risks to) future vessel earnings, operating costs and values.
- For each shipping sector, a fleet utilisation rate is generated by comparing the required tonnage to service trade (taking into consideration commodity consumption and production dynamics along with vessel trading efficiencies) against the physical fleet; this utilisation rate is a key input into forecasting timecharter rates for a range of benchmark vessels by sector. Timecharter rates are used as a proxy for vessel earnings which, in combination with output from our shipbuilding model (which forecasts newbuilding prices), and our forecasts for scrap steel prices, drives our secondhand asset value forecasts.
- Benchmark vessel T/C, opex and price forecasts provide the key market drivers behind our vessel-specific forecasts calculated through MSI FMV. Analysis of the historical performance of our long-running benchmark vessel forecasts therefore provides context for the reliability of the forecasts which underpin MSI FMV.

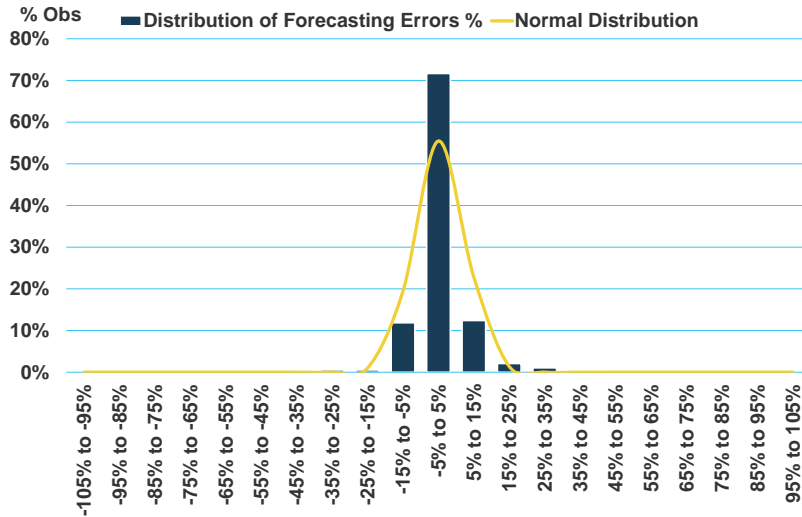
Model Schematic



MSI Model Forecast

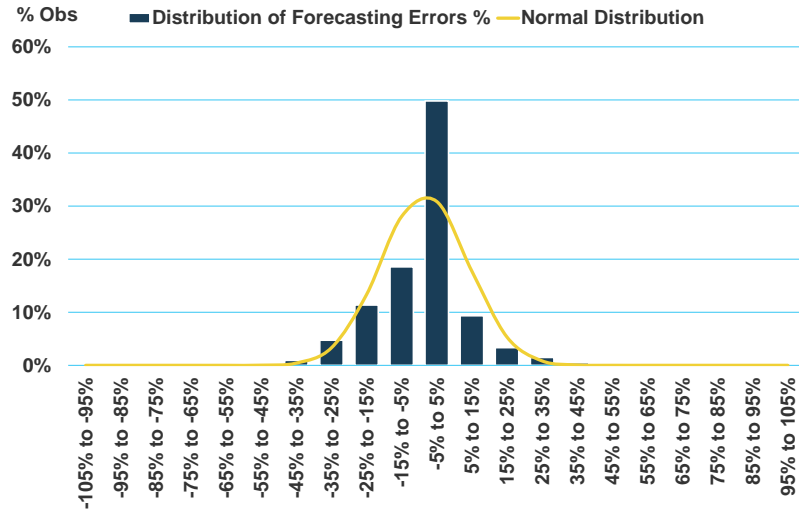
Error Analysis

Forecast Error Distribution – 1 Qtr-out, T/C Rates*



*Oil Tanker, Dry Bulk and Containerships, 388 observations since Q1 2011

Error Distribution 1Qtr – 2 Yrs-out, Prices*



*Newbuild contract and secondhand, Oil Tanker & Dry Bulk, 2,966 observations since Q1 2011

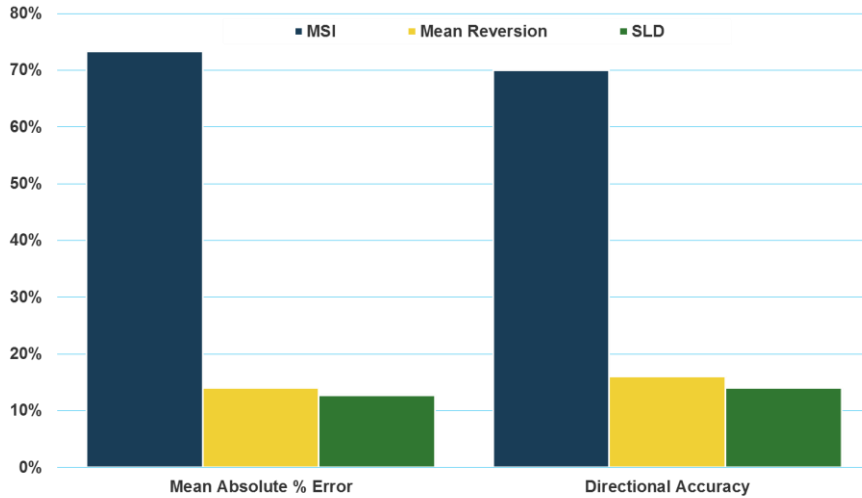
Key Messages

- Each quarter for over 30 years, MSI has generated timeseries forecast data for a range of benchmark vessels covering timecharter rates, operating costs and asset values from newbuilding through to scrap. Our coverage has expanded over the years; nevertheless these benchmark forecasts are integral to MSI FMV forecast timeseries data output and, as a proxy for specific vessel forecasts, can be analysed for forecast accuracy.
- The chart above left demonstrates the empirical distribution of forecast error for benchmark vessel 1 Yr T/C rates across tanker, bulker and container sectors combined, forecasted one-quarter-out, compared with a normal distribution.
- The chart above right shows the empirical distribution of MSI's forecast errors for tanker and bulker benchmark prices, forecasted 1 quarter-out to 2 years-out, compared with a normal distribution.
- Importantly, these forecast errors can be compared with other methods to determine the relative accuracy of MSI's forecasts.

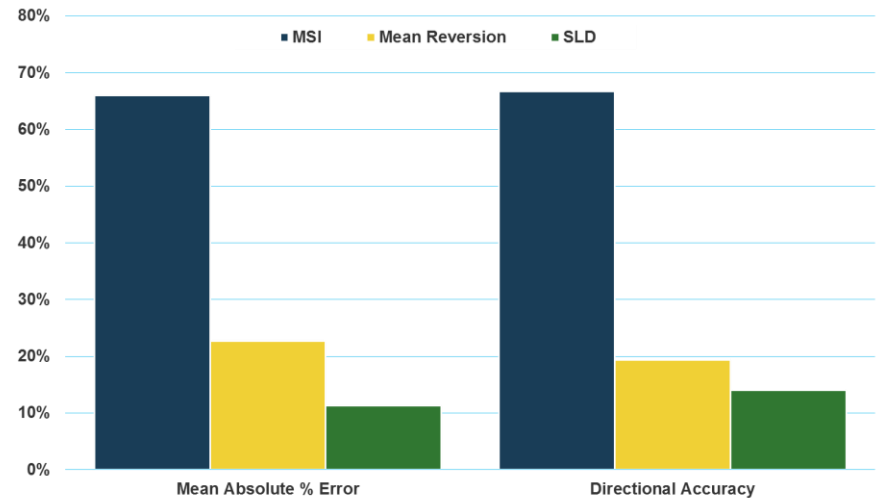
MSI Forecasting Track Record

Comparison with Other Methods

Tanker/Bulker/Container T/C & NB/SH Prices – 1 Yr Out



Tanker/Bulker/Container T/C & NB/SH Prices – 3 Yrs Out

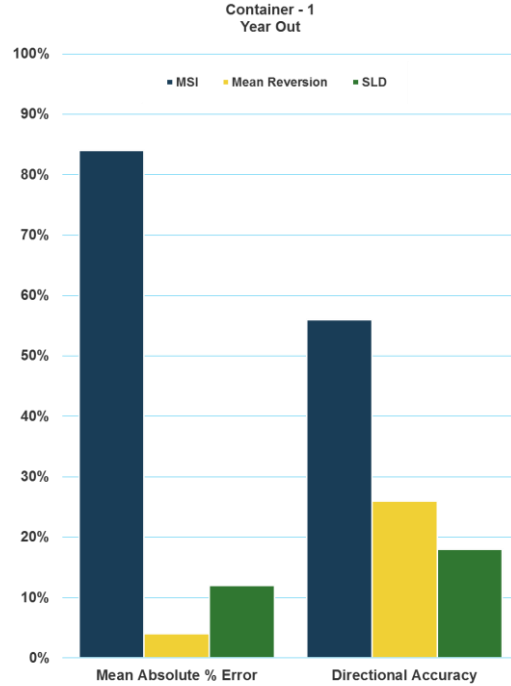
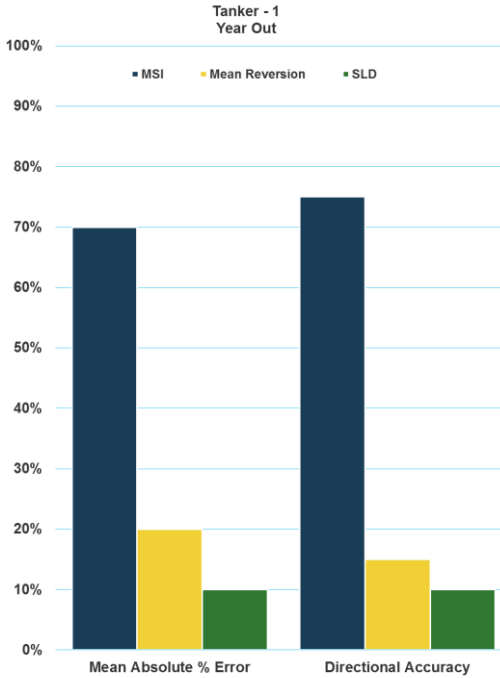
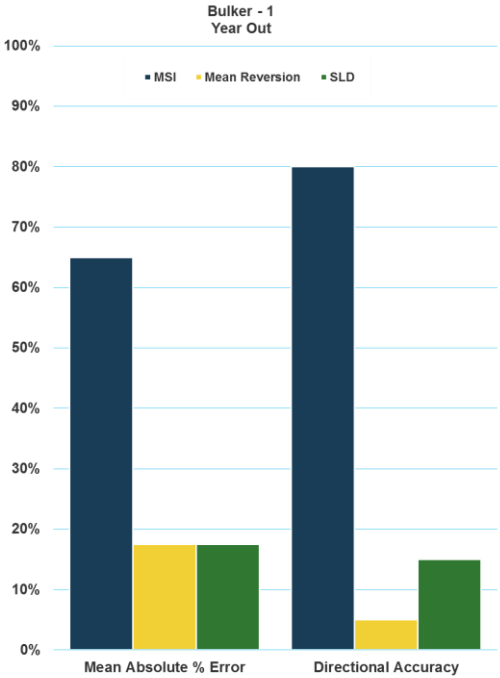


Key Messages

- MSI has compiled a database of forecasts published since 2000 covering 1750 timeseries and almost 7000 forecast observations for 1 Yr T/C rates, newbuild contract and secondhand prices across the tanker, bulker and container sectors.
- MSI has generated an equivalent forecast for each observation by mean reversion method according to historical data at the time of forecast. MSI has also generated forecasts for secondhand vessel prices using the Straight Line Depreciation (SLD) method.
- In a majority of instances, MSI has been most accurate measured by both mean absolute percentage error and directional accuracy. For example, MSI was most accurate 83% of the time in terms of MAPE and 79% in terms of directional accuracy for 1 year out forecasts.
- Note: The variation between 'mean absolute % error' and 'directional accuracy' 3-Yr-out performance is explained by occasions where other methods have more accurately forecasted relative changes, but in the wrong direction.

MSI Forecasting Track Record

Comparison with Other Methods by Sector

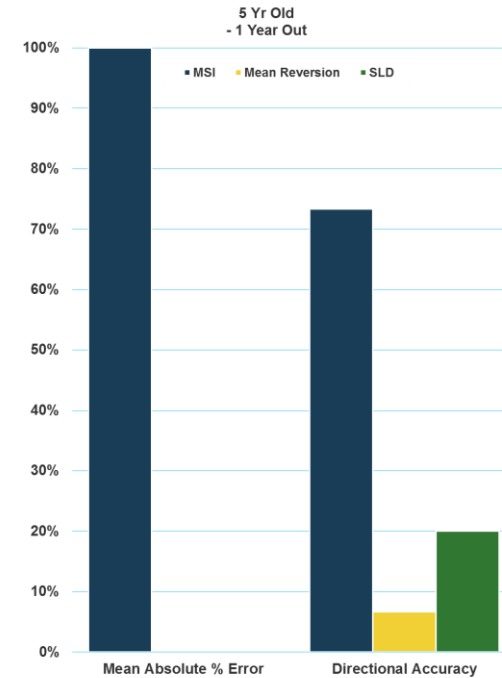
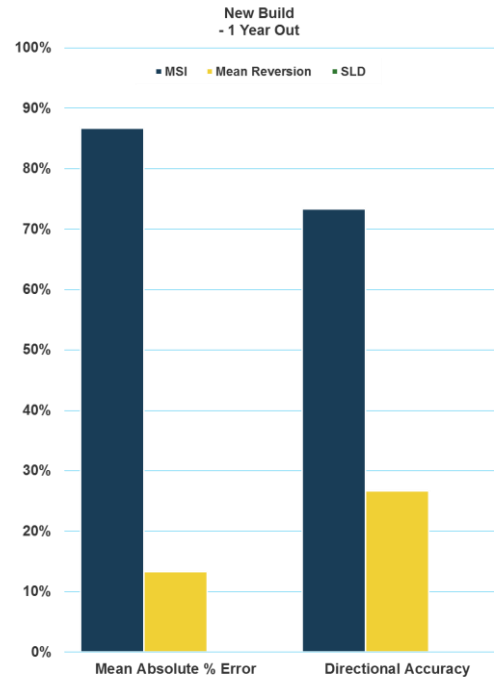
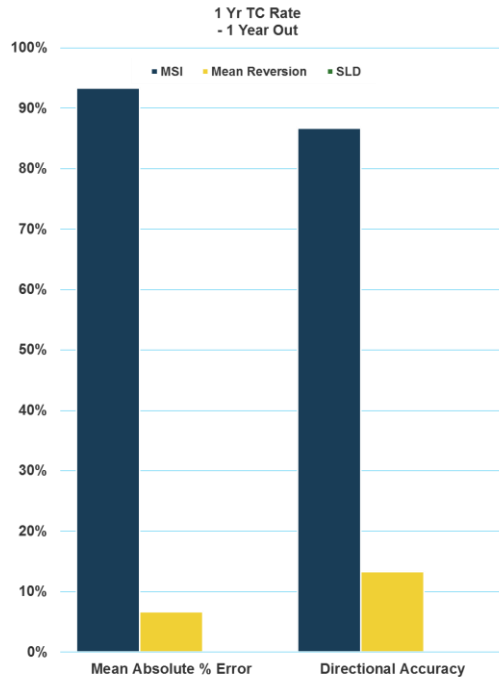


- MSI’s forecast performance is broadly matched across the main commodity shipping sectors.



MSI Forecasting Track Record

Comparison with Other Methods by Variable



- MSI's forecast performance is also broadly matched across key metrics shown here – 1 Yr T/C rates, Newbuild (NB) prices and 5 Yr Old prices with tanker/bulker & container sectors combined.

MSI Background and Disclaimer

For over 30 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.

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.



Maritime Strategies International Ltd



24 Southwark Bridge Road
London SE1 9HF
United Kingdom

Tel: +44 (0)207 940 0070



8, Shenton Way
#13-01, AXA Tower
Singapore 068811

Tel: +65 8754 3450

Email: info@msiltd.com