Market characterisation report

This is an ongoing piece of research carried out by UCL Energy Institute. The work presented below is an excerpt from Nishat Rehmatulla's PhD. Please cite as follows: Rehmatulla (2014) Market failures and barriers to energy efficient operations in shipping, unpublished PhD thesis, UCL Energy Institute. Different types of contracts in the shipping charter market (voyage and time charter) create incentives and barriers for shipowners investing in energy efficiency technologies. This report aims to provide a first pass or preliminary estimate of the ships on voyage and time charter in order to aid technology companies to have a better understanding of their target market (i.e. sectors and ship types) given their exposure to the two main charter contracts. Further work in the ShIFT project will aim to improve the accuracy of these results using satellite AIS data.

1. Summary

Analysis of the time charter market shows that it represents around 10% of the fleet in the wetbulk sector (across the different size segments/ship types) and around 50% of the fleet in the drybulk sector (across the different size segments/ship types) in 2011. The typical length of the time charter fixtures shows that duration varies according to ship size and sector but is generally too short to cover the payback period of technical energy efficiency measures, if a charterer was to invest. Moreover, the short duration of charters (and high frequency of time charters) increases the risk of an owner not being able to recoup investment over multiple time charters. Agnolucci, Smith & Rehmatulla (2014) show that on average in the drybulk Panamax sector, only 40% of the financial savings delivered by energy efficiency accrue to ship owner for the period 2008–2012. For the wetbulk sector the charter period is relatively longer compared drybulk and container, so although the wetbulk fleet has a large portion of its fleet on voyage charter, the remainder fleet on time charter is relatively on long term time charter. However when analysing fixtures it is clear that for all sectors the majority of them fall within two years. Table 1 and Figure 1 summarise the key findings of the fixtures analysis. In some cases the ownership period of the ship may also impact the incentives to invest in energy efficiency. Stott (2013) shows the pattern of ownership duration is found to vary significantly between the first and subsequent owners, with the first owner keeping the vessel for considerably longer (average of 10 years) than subsequent owners (average between 3 to 5 years) and with the influence of speculation increasing as the owner number increases.

General characteristics	Wetbulk	Drybulk	Container
% of total merchant shipping CO2 emissions[1]	≈23%	≈18%	≈27%
% of ships on voyage charter in charter market	≈90%	≈40%	N.A.
% of ships on time charter in charter market	≈10%	≈60%	?
Average length of time charter in months	17	8	11
Average ownership length in years[2]	8	8	8
Mode ownership length in years[2]	4	4	7

Table 1: General characteristics of the fleet and sectors

[1] IMO 2nd GHG Study
[2] Stott (2013)

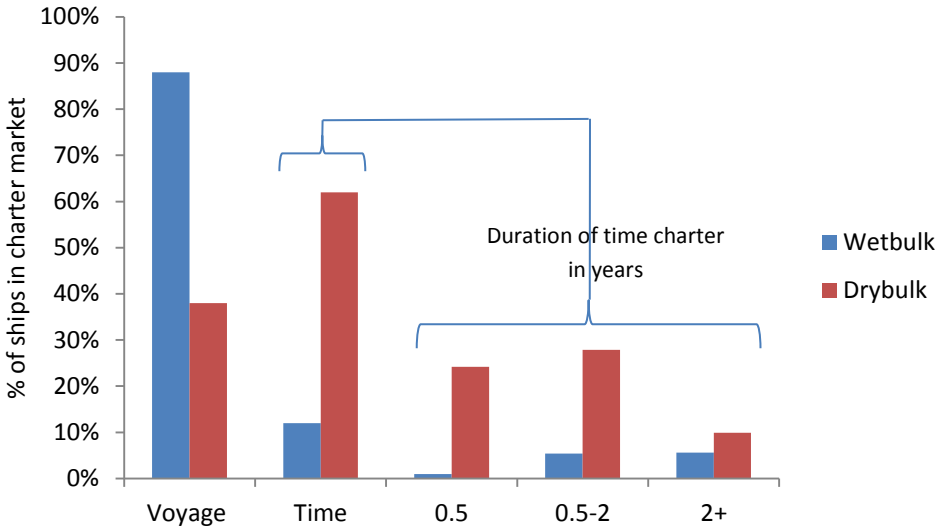
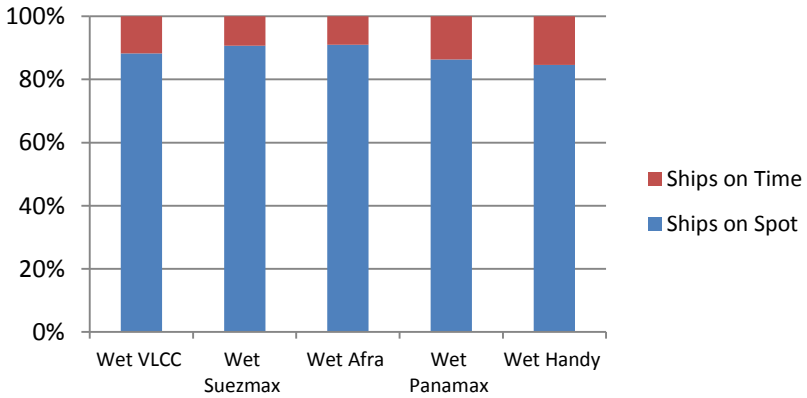


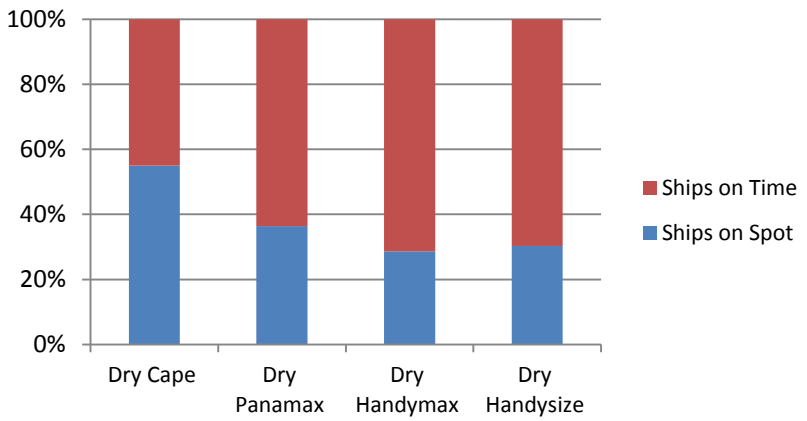
Figure 1: Summary of key findings on charter market and durations (2011)

2. Charter market proportions



Ship type	DWT >=	DWT <
Wet VLCC	200,000	
Wet Suezmax	120,000	200,000
Wet Afra	80,000	120,000
Wet Panamax	60,000	80,000
Wet Handy	10,000	60,000

Figure 2: Proportion of ships on voyage and time charters in the wetbulk sector in 2011



Ship type	DWT >=	DWT <
Dry Cape	100,000	
Dry Panamax	60,000	100,000
Dry Handymax	35,000	60,000
Dry Handysize	10,000	35,000

Figure 3: Proportion of ships on voyage and time charters in drybulk sector in 2011

3. Time charter durations

Non time normalised	Wetbulk	Drybulk	Container
% of fixtures less than 6 months	32%	59%	69%
% of fixtures less than 1 year	67%	81%	96%
% of fixtures less than 2 years	82%	97%	98%
% of fixtures less than 5 years	99%	100%	99%

Table 2: Distribution of time charter durations by sector

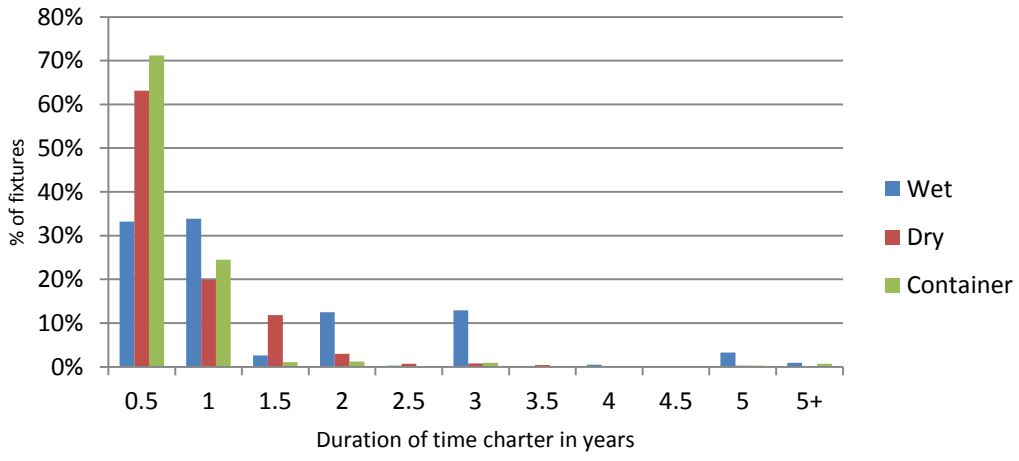


Figure 4: Frequency distribution of time charter durations by sector

Time normalizing

Ships which may be chartered only once on voyage charter will still show as single count for the whole of that year, whereas in reality the ship could have just been on voyage charter for only one month in that year. Similarly, a ship chartered-in on time charter for six months will show as a single count for the whole of the year. Furthermore ships time chartered in previous years for a longer period of time spanning over to or beyond 2011 would not have been captured. In order to represent the time a ship has spent in a particular charter market and to remove the bias of short term fixtures in voyage charter, further adjustments using several assumptions were required. The process and assumptions are detailed in appendix.

Time normalised	Wetbulk	Drybulk	Container
% of ships on fixtures less than 6 months	8%	39%	41%
% of ships on fixtures less than 1 year	32%	59%	76%
% of ships on fixtures less than 2 years	53%	84%	82%
% of ships on fixtures less than 3 years	81%	94%	87%
% of ships on fixtures less than 4 years	83%	96%	88%
% of ships on fixtures less than 5 years	94%	98%	91%
% of ships on fixtures more than 5 years	6%	2%	9%

Table 3: Distribution of time charter durations by sector (time normalised)

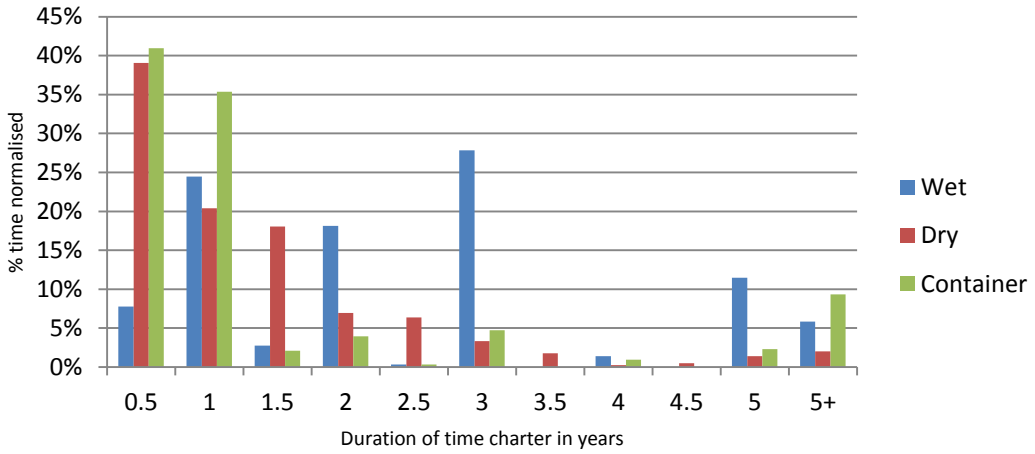


Figure 5: Frequency of time charters durations by sector (time normalized)

Subletting analysis

Figure below shows the average number of times a time chartered ship is voyage chartered. There is also a good correlation between the ship type sublet average and duration of the time charter, as shown in following figures.

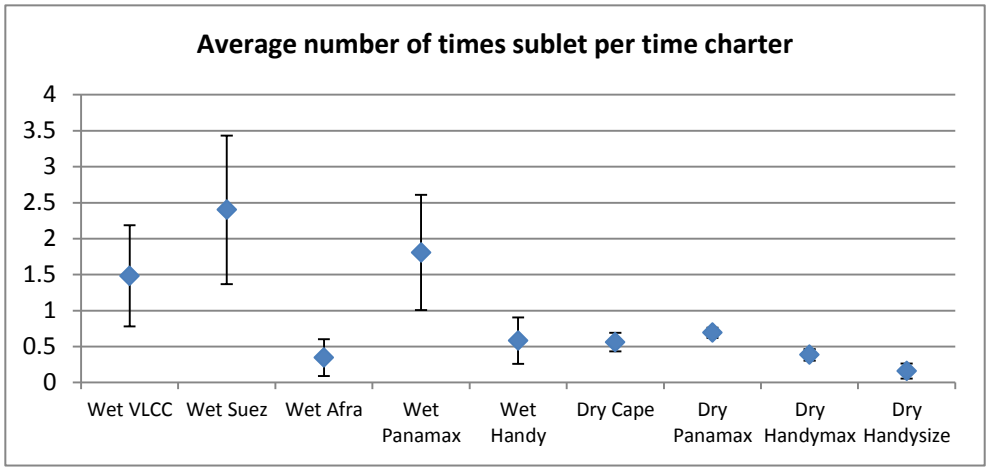


Figure 6: Average number of subletting per ship type

Relationship of ship size and durations

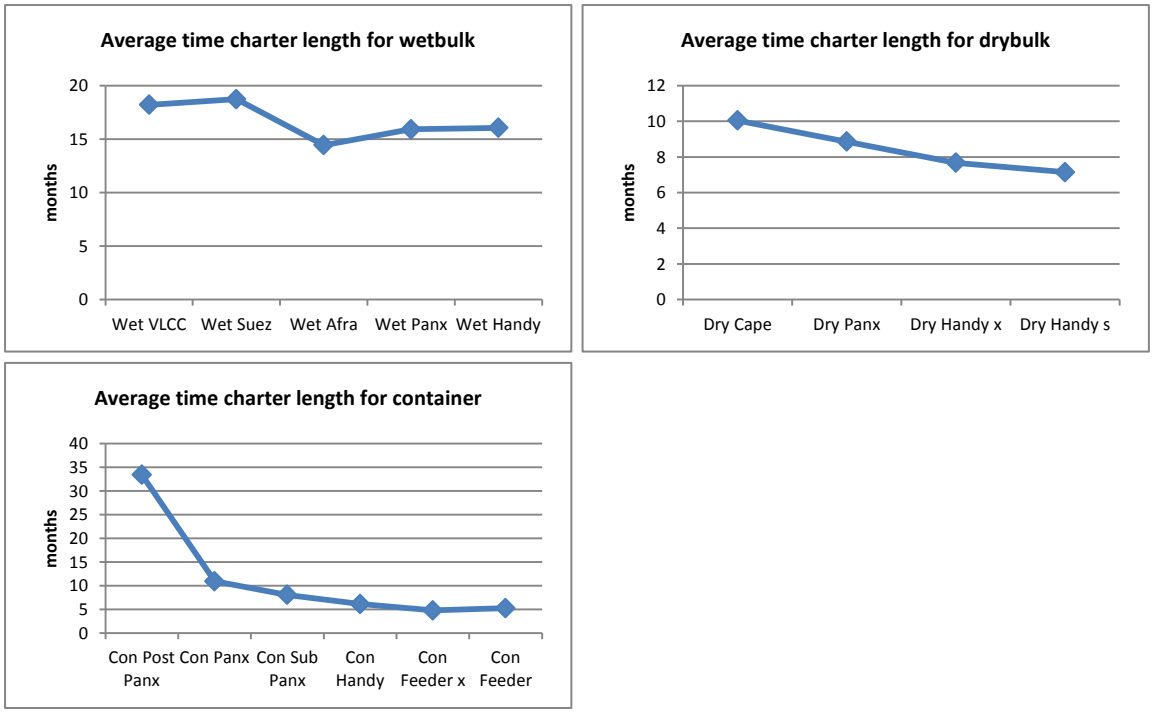


Figure 7: Relationship between ship type/size and average time charter duration

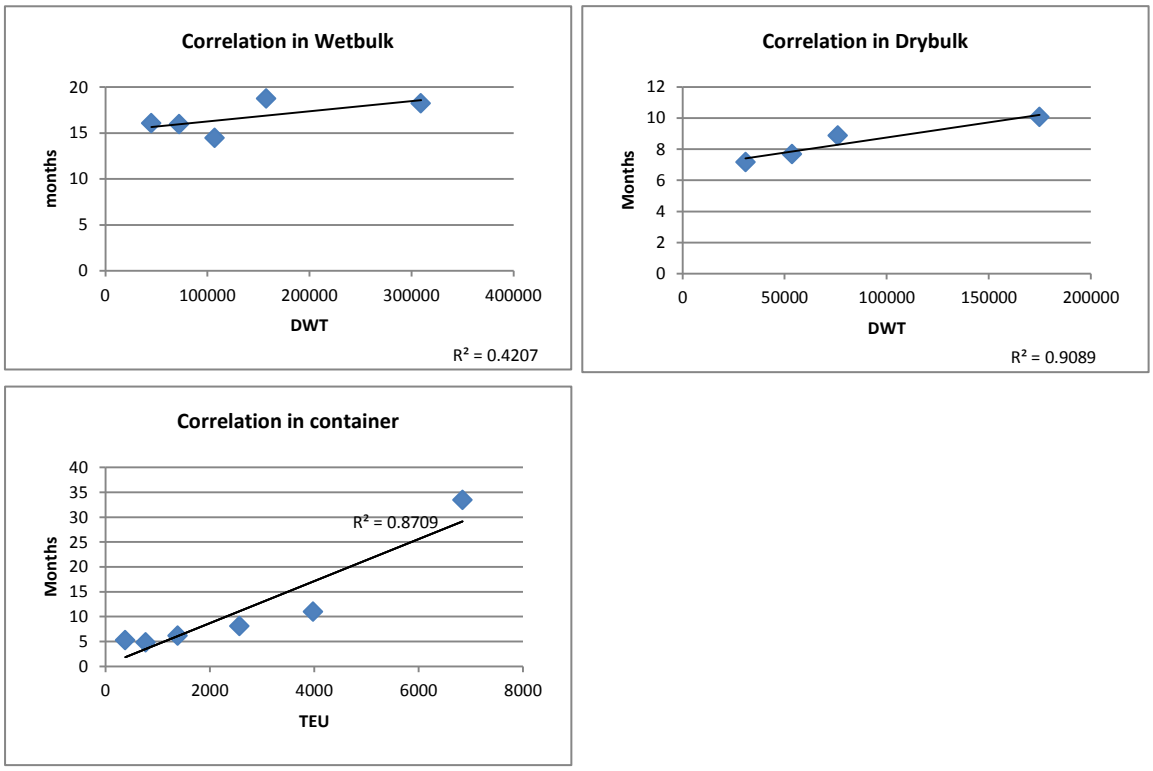


Figure 8: Relationship between ship type/size and average time charter duration

4. References

1. Agnolucci, P, Smith, T & Rehmatulla, N 2014, 'Energy efficiency and time charter rates: Energy efficiency savings recovered by ship owners in the Panamax market', *Transportation Research Part A: Policy and Practice*, vol 66, pp. 173-184

2. Buhaug, Ø, Eyring, V, Corbett, J, Endresen, Ø, Faber, J, Hanayama, S, Lee, S, Lee, D, Lindstad, H, Markowska, A, Mjelde, A, Nelissen, D, Nilsen, J, Pålsson, C, Wanquing, W, Winebrake, J & Yoshida, K 2009, *Second IMO GHG study - Update of the 2000 IMO GHG study*, IMO, London, viewed 06 November 2012, http://www.imo.org/blast/blastDataHelper.asp?data_id=27795&filename=GHGStudyFINAL.pdf

3. Stott, P 2013, 'A retrospective review of the average period of ownership with implications for the potential payback period of retrofitted equipment', *Journal of Engineering for the Maritime Environment*, vol 0, no. 0, pp. 1-13.

5. Appendix

	Fixtures on voyage	Fixtures on time
Wet VLCC	1698	18
Wet Suezmax	1616	15
Wet Afra	4069	20
Wet Panamax	1420	10
Wet Handy	5117	58
Total	**13920**	**121**
Dry Cape	1262	111
Dry Panamax	2653	394
Dry Handymax	1268	170
Dry Handysize	288	34
Total	**5471**	**709**
Cont Post Panamax		57
Cont Panamax		196
Cont Sub Panamax		380
Cont Handy		897
Cont Feedermax		509
Cont Feeder		12
Total		**2051**

Table A1: Number of fixtures on voyage and time charters for 2011

	Ships on Voyage	Ships on Time
Wet VLCC	450	18
Wet Suezmax	393	14
Wet Panamax	334	9
Wet Afra	729	17
Wet Handy	1171	47
Total	**3077**	**105**
Dry Cape	468	104
Dry Panamax	1150	329
Dry Handymax	800	159
Dry Handysize	234	31
Total	**2652**	**623**

Table A2: Number of ships on voyage and time charters for 2011

	Ships on Voyage	Ships on Time
Wet VLCC	150	20
Wet Suezmax	127	13
Wet Afra	131	13
Wet Panamax	101	16
Wet Handy	269	49
Total	**778**	**111**
Dry Cape	110	90
Dry Panamax	184	322
Dry Handymax	53	132
Dry Handysize	10	23
Total	**357**	**567**

Table A3: Number of ships on voyage and time charters for 2011 adjusted for time.

Methodology for adjusting proportion of time chartered ships

For estimating number of ships on time charter:

A) Time charters before 2011 but long enough to fall in 2011:
1. Number of days difference between Laycan to beginning of 2011 (Days360)
2. Time charter length in days (Period*30)
3. If time charter days are long enough to fall in 2011, fixture considered (1), not considered (0)
4. If considered then how many days in 2011
5. Proportion of days in that year on TC
6. Sum of all proportions

B) Time charters during 2011:
1. Number of days difference between Laycan to end of 2011 (Days360)
2. Time charter length in days (Period*30)
3. Proportion of days in that year on TC
4. Sum of all proportions

Sum of proportions from A+B

For estimating number of ships on voyage charter:

1. Pivot table to get number of ships and number of fixtures per ship
2. Apply assumptions for each ship type E.g.

Average haul 5000 miles for oil & products (Stopford, 2009)
Average journey length at 12kn/hr = 5000/288 = 17.4 days
Ballast to loaded days ratio = 0.9. = 15.6 days
Total days = 33 days = 1.1 months per fixture

3. Number of fixtures * Days per fixture
4. Sum of all proportions