Determinants of the Price Premium for Eco Vessels

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Abstract

The International Maritime Organization's Initial Greenhouse Gas Strategy aims at reducing CO_2 emissions from vessels by at least 40% by 2030, pursuing efforts towards 70% by 2050, vis-à-vis the 2008 levels (IMO, 2018). To achieve that, among other measures, the shipping industry has recently started utilising vessels that are more eco-friendly —in terms of reduced fuel consumption and, in turn, CO_2 emissions— compared to conventional ones. As regulations regarding shipping decarbonisation are expected to become increasingly strict, ship owners are faced with the dilemma of investing in a cheaper but (much) more polluting conventional vessel or in a more expensive but eco-friendly one. To this end, this paper examines the determinants of the price premium paid for eco-friendly cargo-carrying vessels. This field is rather underdeveloped as previous research has focused on the technological rather than the financial dimension of shipping decarbonisation. Our paper focuses on dry bulk shipping as it is responsible for the transportation of more than 50% of the world seaborne trade.

Weekly data from August 2019 to December 2022 indicates that eco Capesize vessels trade at an average premium of 23.2% compared to their conventional counterparts. From an asset pricing perspective, this suggests that either the —current and expected— cash flows or/and the expected prices for an eco-vessel should be much higher or/and its cost of capital significantly lower than for a conventional one. We contribute to the shipping, asset pricing, and sustainable finance literatures by identifying and quantifying the major source(s) of this price discrepancy.

Regarding the cash flow dimension, the average eco premium for each period contract type is, in general, significantly lower than the price one. Namely, for longer-term contracts, which are more relevant from an asset pricing perspective, the average premia range from 8.6% to 9.6%. Therefore, for a given discount rate, the eco price premium should have been close to 10% and not above 20%. This empirical finding suggests that eco price premia are driven by expectations of future market conditions and/or a lower opportunity cost of capital for the eco vessel.

Due to the transition towards net zero, green/sustainable finance is becoming increasingly important in shipping. Namely, 30 leading shipping banks, jointly representing approximately USD 200 billion in shipping finance, have committed to the Poseidon Principles. However, while recent data suggest that roughly one third of shipping loans are green, the spread of green loans has on average been ca. 50 basis points lower compared to standard ones (248.46 basis points versus 275.17, respectively). Thus, a lower cost of capital does not seem to explain the observed eco premium.

According to the shipping asset pricing literature, vessel prices are determined by concurrent and expected cash flows rather than expectations of returns. This implies that expectations of future vessel prices are also driven by expectations of future cash flows. Thus, the price premia and future cash flows explanations are essentially the same.

Accordingly, this paper suggests and analyses that the major driver of the price premium is expectations of cash flows. In particular, a high price premium is associated with high current cash flow premium but mainly with expectations that future cash flow premia will be (much) higher. From a decarbonisation point of view, increasingly strict regulations (i.e. the Carbon Intensity Indicator [CII], implemented from 2023; the inclusion of shipping in the EU emission trading system [ETS] from 2024; the potential adoption of market-based-measures as carbon pricing in the coming years; etc.) are expected to give a strong competitive advantage to eco vessels against their conventional counterparts, expressed in high spreads between eco and non-eco freight rates, i.e. cash flows. Thus, investing in the (much) more expensive eco vessel, can be perceived as a rather medium- to long-term strategy.

In line with this argument, the income yield –expressed as the ratio of the time-charter income to the vessel price at a given point in time– for the eco vessel has been lower than for the conventional one, 21.1% and 18.6%, respectively. This suggests that the owner of a conventional vessel realises more current income relative to their investment compared to the eco owner. In other words, an owner does not acquire an eco-vessel for the current contract premium but for the expected future ones.

Another important dimension is that the eco vessel provides more secured income compared to its counterpart. Namely, in bad shipping markets, where the demand for vessels is relatively low, a period charterer would prefer leasing first the eco-friendly vessel (as it is more fuel-efficient but also because of ESG principles that become increasingly important). Accordingly, the residual demand for vessels is not significant, which results in a bigger cash flow and, thus, price spread during that period. Prosperous markets, in contrast, are equivalent to high demand for seaborne trade and tight supply of vessels. While eco vessels are still first employed realising very high cash flows, the increased residual demand pushes the cash flows of conventional ones high too –a relatively larger increase compared to the increase in the cash flows of the eco ones. As a result, the cash flow and price spreads decrease during good periods.

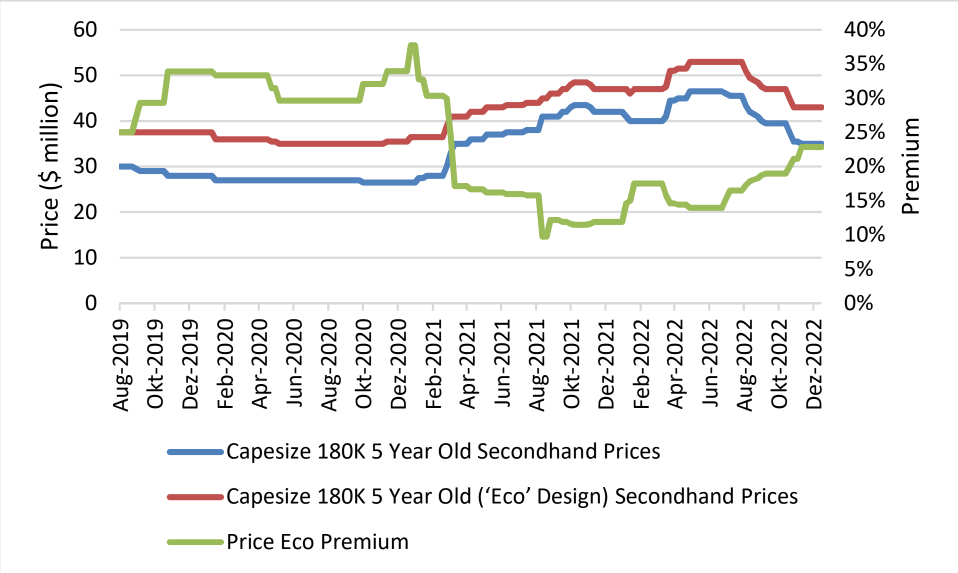
Apart from the above contributions to the academic literature, our findings have important implications for industry participants, policy makers, and regulators.

I. Introduction

Eco-design Capesize vessels trade at an average premium of 23.2% compared to their conventional counterparts (Figure 1). The standard present value argument implies that:

that premium could be explained by either higher current/expected cash inflows or/and higher expected prices for the eco vessel or/and lower opportunity cost of capital (i.e. required return) compared to the conventional one. Regarding the cash-flow dimension,

Figure 1. Vessel prices and eco-design premium (weekly frequency).



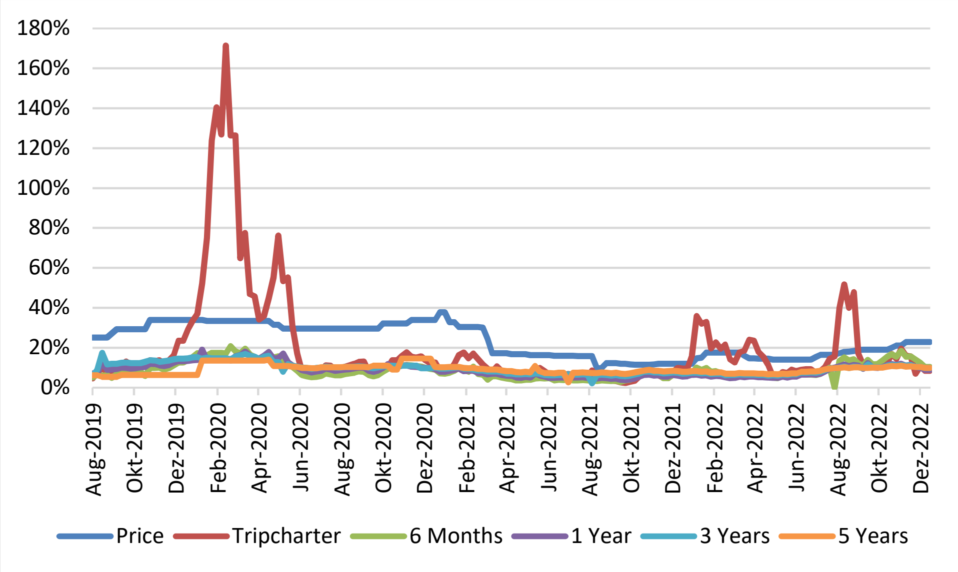
Let's begin by examining the cash-flow dimension. As illustrated in Figure 2 and Table 1 below, the average premium for each freight contract type is, in general, much lower than the price premium. Namely, for the longer-term contracts —i.e. the 6-month, 1-, 3-, and 5-year time-charter (TC) contracts— which are more relevant from an asset-pricing perspective, the average eco premia range from 8.6% to 9.6%. While the average trip-charter premium approaches the price one, this is due to the abnormally high premia in the first half of 2020. If we exclude that period though, the average premium is 12%, thus, significantly lower than the price one. Therefore, for a given discount rate and assuming that the figures of the contract premia are expected to persist in the future, the eco price premium should have been close to 10% and not above 20%.

Table 1. Descriptive Statistics for price and contract premia.

	Price Eco Premium	Trip Rate Eco Premium	6-month TC Eco Premium	1-year TC Eco Premium	3-year TC Eco Premium	5-year TC Eco Premium
Mean	23.2%	19.8%	8.6%	8.8%	9.6%	9.1%
St Deviation	8.3%	26.2%	4.3%	3.4%	3.0%	2.4%
Median	22.9%	11.4%	7.5%	8.5%	9.7%	8.6%
Kurtosis	-1.61	13.06	-0.23	-0.11	-0.40	-0.03
Skewness	0.03	3.43	0.79	0.70	0.53	0.61
Range	28.0%	169.2%	20.8%	15.4%	15.3%	12.0%
Min	9.8%	2.3%	0.0%	3.7%	2.1%	2.5%

Max	37.7%	171.4%	20.8%	19.0%	17.4%	14.5%
N	177	177	177	177	177	177

Figure 2. Price and contracts premia (weekly frequency).



To further examine whether and how contract premia affect the price premium, we run univariate explanatory regressions in the form of:

$$pp_t = \alpha + \beta \cdot fp_t + \varepsilon_t, \qquad (1)$$

where pp_t is the price premium and fp_t corresponds to each of the five freight premia, both at time t.

As Table 2 illustrates, contract premia strongly and positively affect the eco premium in all cases, with the slope coefficients being significant at the 1% level and the R^2 of the regressions ranging from 14.5% to 62.5%. Namely, the coefficient of determination increases with the maturity of the contract, with the exception being the 5-year one which has the lowest R^2 among the time-charter contracts (i.e. 24.5%). The highest, 62.5%, is for the 3-year contract and the lowest for the trip-charter case -the latter is expected due to the short nature of the contract.

In accordance with the present value argument, if the eco premium is solely determined by the freight premium and under the assumption that the latter will remain constant over time, one should expect the slope coefficient of the regression to be equal to 1, especially for the longer-term contracts. In other words, that a one-unit increase in the contract premium would result in a one-unit increase in the price premium. Interestingly, this is only the case for the 6-month contract where the beta is 1.06 (Table 2). For the trip-charter contract, the beta is just 0.12 (which seems reasonable due to its short-term nature) while, for the TC ones, the betas are close to or even above 2. Specifically, the beta for the 3-year contract —that has the strongest R^2— is 2.22. The latter implies that, if the premium for the eco contract increases by one unit, the eco price premium will increase by 2.22 units, that is disproportionately.

Those results suggest that either eco price premia are determined in practice by the 6-month TC premia (which is an interesting finding on its own) or that at least one of the assumptions we imposed above does not hold. Namely, that the current freight premium will persist for the remaining lives of the vessels and both vessel types have the same opportunity cost of capital.

We next turn to the explanation that high current contract premia can indicate that the future contract premia will be even higher. In other words that, even if the current contract premium cannot justify the price premium, expected increases of it can do so. To investigate that, we run forecasting OLS regressions where the price premium is the predictor and the 52-week-ahead (i.e. the 1-year-ahead) contract premium is the predicted variable. To account for the overlapping nature of the predicted variables (since we use weekly data for annual horizons), we report Newey-West (1987) heteroskedasticity and autocorrelation consistent (HAC) standard errors.

$$fp_{t+52} = \alpha + \beta \cdot pp_t + \varepsilon_{t+52}, \quad (2)$$

where pp_t is the price premium at time t and fp_t corresponds to each of the five freight premia, both at time t.

Table 2. Results from univariate regressions of the price premium on contract premia.

Contract	T	β	t^{NW}	R^2
Trip Charter	172	0.12***	5.37	14.5%
6-month TC	172	1.06***	8.26	28.6%
1-year TC	172	1.85***	14.90	56.6%
3-year TC	172	2.22***	16.83	62.5%
5-year TC	172	1.73***	7.49	24.8%