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Assessing the implications of IMO 2020 on tanker vessels' chartering and employability prospects with a focus on the installation of SOx Scrubbers

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Abstract: As from January 1, 2020 the limits, which were coined as IMO 2020, of sulphur in fuel oil used on board vessels operating outside emission control areas was reduced from 3.50% m/m (mass by mass) to 0.50% m/m. Those limits are set out in Annex VI of the International convention for the Prevention of Pollution from Ships (MARPOL) is an attempt by International Maritime Organization (IMO) to reduce sulphur oxide produced by ships. To be noted that in the designated emission control areas (the Baltic Sea are, the North Sea are, the North American are, and the United States Caribbean Sea area) the maximum sulphur limit is 0.10%. One of the ways of complying with the IMO 2020 limits is by installing an exhaust gas cleaning system (scrubber) – others being switching from high-sulphur fuel oil (HSFO) to marine gas oil (MGO) or distillates; using very low sulphur fuel oil (VLSFO) or compliant fuel blends; use of sulphur free fuels. The installation of a scrubber ensures use of HSFO without breaching the IMO 2020 limits. Considering the importance and necessity of complying with IMO's regulations, this paper will assess the implications of IMO 2020 on tanker vessels' chartering, by way of the charter party provisions ensuring compliance, as well as the implication on their employability prospects. Particular emphasis will be put on the installation of scrubbers and the emergence of two-tier (or multitier) chartering market for tanker vessels. Aim of this paper is to provide a concise, yet comprehensive, view on the topic.

Keywords: IMO 2020, Tankers, Scrubbers, Multitier chartering market

1. Introduction

On 28 October 2016 the International Maritime Organization (IMO) during the Marine Environment Protection Committee (MEPC) 70 adopted resolution MEPC.280(70) that decided on the effective date of implementing the fuel oil standard in Regulation 14 of International Convention for the Prevention of Pollution from Ships convention, MARPOL Annex VI. The effective date being 1 January 2020 and the regulation has been known as 'IMO 2020'. The effect of IMO's decision, that is applicable to all ships, is that as of 1 January 2020 the sulphur content of any fuel used on board ships must not exceed 0.50% m/m (mass by mass) when the ship sails outside Emission Control Areas (ECAs) while the limit for ships sailing inside ECAs is 0.10 m/m (IMO 2016a). To be noted that the 2020 date for the implementation of the reduced sulphur limit was agreed in 2008; however, it was decided that the date should be reviewed by 2018 after having assessed the availability of compliant fuels to meet the new regulation requirements (IMO 2016b). It should be noted that prior implementation of the reduced low sulphur requirements, the limit was 3.50% m/m. In addition and in order to provide a further measure to ensure implementation of the 0.50% m/m limit, IMO during MEPC 73 that was held on 22-26 October 2018, adopted regulation MEPC.305(73) to ban the carriage of non-compliant fuel in fuel tanks, unless the ship is equipped with a scrubber (DNV GL, 2018). Obviously, IMO 2020 regulation, consist part of IMO target to reduce Green House Gas (GHG) emissions from ships by 2050 by 50% compared to the 2008 levels (IMO 2018).

Compliance is achieved by the use of very low sulphur compliant fuel oil (VLSFO); use of alternative fuel, such as LNG, after having retrofitted the ship; use of fuel oil with sulphur content of more than 0.50% m/m with the use of an equivalent – approved by IMO – method such as the installation of exhaust gas cleaning systems ('Scrubbers'); switching to marine gas oil (MGO) or distillates or compliant fuel blends (Boviatis 2021, Deloitte 2019). By systematically examining each available option and aiming to evaluate their respective advantages and disadvantages, the following conclusions can be drawn. Utilizing VLSFO and MGO leads to higher fuel expenses; however, these options can be easily implemented in most engines. Switching to compliant distillates or fuel blends may introduce operational challenges due to non-standard (off-spec) fuels, but they still offer the advantage of being readily and easily applicable to most engines. The use of LNG after retrofitting the ship is an expensive choice that demands both time and significant capital investment,

alongside higher fuel prices and uncertain availability. Further, issues arise concerning the requirement for sufficient tank space. However, in this option yield positive environmental performance. Lastly, the use of high sulphur fuel oil (HSFO) with the installation of a Scrubber, is a feasible solution for existing engines that achieve compliance with the IMO regulation. Nevertheless, is does result in a fuel consumption increase of approximately 2%, necessitates time and capital investment for Scrubber installation, entails potential operational costs and/or limitations depending on the type of scrubber and requires space of the scrubber and associated equipment.

2. Practical approach to Scrubber installation and implications to vessels' chartering

2.1. Practical approach to Scrubber installation

The available Scrubber systems include three alternatives: open-loop, closed-loop and hybrid. The open loop uses the alkalinity of the seawater to neutralize the sulphur in the exhaust. The disadvantage is that there are jurisdictions where the operation of open-loop Scrubbers is not permitted, such as Singapore (BIMCO 2018).Closed-loop Scrubbers the process water is circulated in a tank. Finally, the hybrid can operate both as open and closed-loop and provide operational flexibility. It is worth mentioning that according to BIMCO's marker report of 15 March 2023 (BIMCO 2023), although the number of Scrubbers installed in 2022 saw a decrease by almost 25% y-o-y the number of ships with Scrubbers are to increase considering that 17% of the ships in the order book are Scrubber fitted. Further, it was highlighted that the average deadweight capacity of Scrubber fitted ships is about 140,000 tones while the average capacity of ships without Scrubber is about 52,000 deadweight tones. These figures correspond to the observation that the bigger the ship, the more financially viable it becomes to invest in the installation of a Scrubber (Zis et al, 2022).

2.2. Scrubber installation implications on vessels' chartering and employability

The implications of an owner's decision of whether to install or not a Scrubber to a ship can be approached in two ways. The first one dealing with the contractual issues while the second identifying the effects of Scrubber installation to ship's earnings and employment prospects.

On the first point, the effects depend on the type of employment of the ship and the decision of the owner. If a ship is employed under time charter contract, then it is the obligation of the time charterer to provide bunkers (Vlachos & Psyhou 2000, Giziakis et al 2006). Accordingly, the higher fuel cost is paid by the charterer and not the owner. Therefore, is such circumstances, some owners are inclined not to install a Scrubber unless the charterer agrees to contribute both as regard the Scrubber cost as well as the respective time element of the installation. Naturally, whether such an agreement can be achieved and the level of charterer's contribution depends on the total cost and each party's estimation regarding the differentiation between HSFO and VLSFO prices in the future. If an owner of a ship operating under a time charter chooses to install a Scrubber, it is crucial to incorporate specific provisions into the contract. These provisions should require the charterer to consistently supply fuel oil that is in compliance with the standards outlined inn MARPOL Annex VI. It is also important to ensure that the maximum allowable sulphur content specified in the Scrubber documentation is not exceeded. Additionally, there are several other considerations that should be taken into account. Although this list is not exhaustive, it includes aspects such as indemnification for losses, damages and delays resulting from the use of non-compliant or off-specification fuel oil; an off-hire clause; provisions regarding ship's performance while operating the Scrubber; and provisions detailing the cost and timeframe for waste disposal in case a closed-loop or hybrid Scrubber is used. Most of the aforementioned issued have been addressed and dealt with by Intertanko (2019) in the Scrubber Clause for Time Charterparties issued on 21 August 2019 which consist a good starting point for the parties' negotiation on the issue.

As regards the issue of ship's employment prospects and earnings potential and in order to obtain a better perspective of the issue, market information was collected pertaining to the following parameters: (a) average price differentiation between HSFO and VLSFO in the five major ports of Fujairah, Houston, Singapore, Rotterdam and Gibraltar for the period 01/01/2020 – 31/12/2022 using weekly data, which was collected and processed by the authors; and (b) average VLCC circa 2010-built earnings Scrubber-fitted premium for the period 01/01/2020 – 14/10/2022, which were obtained by Clarkson (2022). Figures 1 and 2, respectively, illustrate the relevant data.

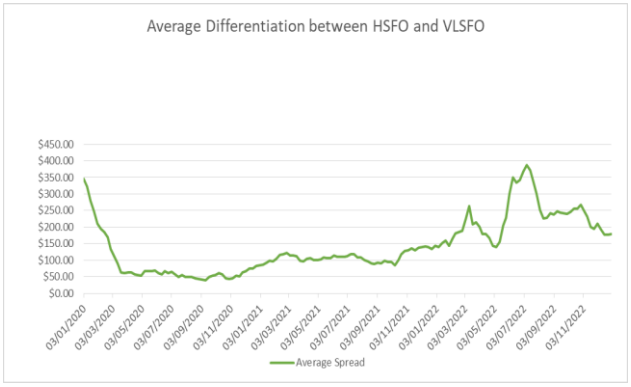

Figure 1. Average differentiation of between HSFO & VLSFO, data collected and processed by the authors

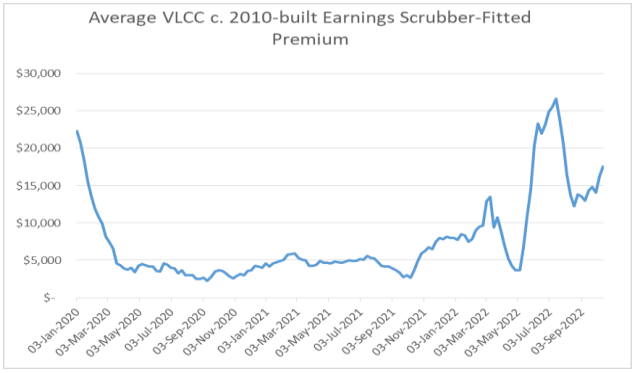

Figure 2. Average VLCC c. 2010-built Earnings Scrubber-fitted premium, Clarkson's data processed by the authors

In an effort to analyze the aforementioned data, the first step involves calculating the correlation between the two sets of data. It is worth noting that there is an intriguing finding, as the correlation between the average price differentiation and the premium earned by a Scrubber fitted VLCC is 0.9655. This correlation coefficient of 0.9655 indicates a very strong positive correlation, suggesting a nearly linear relationship between the variables. It signifies that when one variable increases the other tends to increase also. The strength of the correlation implies that the two variables have a strong tendency to vary together consistently. In general, a correlation of 0.9655 indicates a robust positive association between the variables. However, it is important to acknowledge that correlation does not imply causation. It does not determine whether one variable cause the other to change.

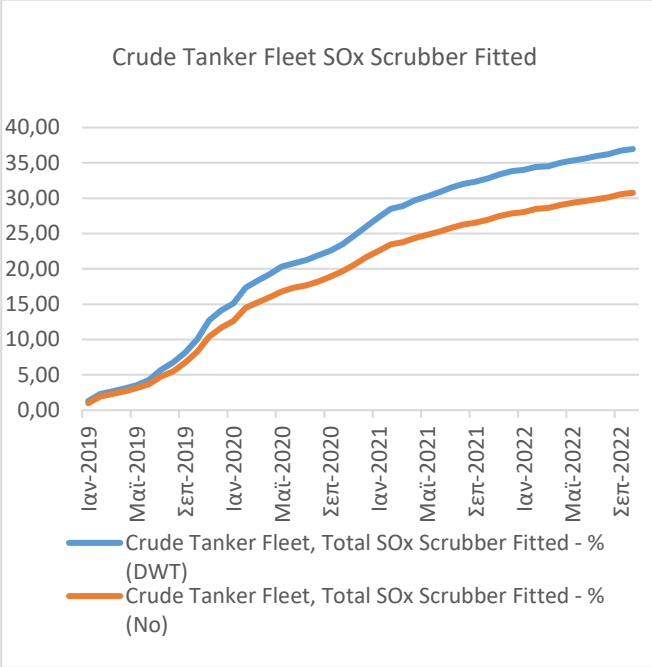

Figure 3. Crude Tanker Fleet, % of Total SOx Scrubber fitted in number of ships and dwt, Clarkson's data processed by the authors

Figure 3 visually illustrated the proportion of crude tanker ships equipped with Scrubbers, both in terms of the number of ships and their deadweight tonnage (dwt), during the period 1 January 2019 to 14 October 2022. In January 2019, the percentage of Scrubber-fitted tankers was approximately 1%. However, by January 2020, these figures had risen to around 15% (based on dwt) and 12.5% (based on the number of ships). Furthermore, by October 2022, these percentages had further increased to about 37% (dwt) and about 31% (number of ships) respectively. This data demonstrates that Scrubbers are becoming an increasingly popular choice amount owners of crude oil tankers.

Based on the above data set we aim to make a prediction for the Scrubber-fitted VLCC earnings premium using the simple exponential smoothing (SES) method. Forecasting involves the prediction of the future as accurately as possible given all available information including historical data and knowledge of any future events that might impact the forecasts (Hyndman & Athanasopoulos, 2021). Exponential smoothing methods generate forecasts by calculating weighted averages of past observations, where the weights exponentially decay as the observations become older. Essentially, the more recent observation carry higher weight in the calculation. This approach enables the generation of reliable forecasts for a wide range of time series, which is a particularly advantageous and significant for industrial applications. The formula is $F_t = aY_{(t-1)} + (1-a)F_{(t-1)}$. Where F_t is the forecast, a is the smoothing parameter, $Y_{(t-1)}$ is the actual value at the previous timeframe, and $F_{(t-1)}$ is the forecast at the previous timeframe (Hyndman & Athanasopoulos, 2021). The outcomes of the forecasting attempt for a forecasting horizon of 12 weeks, as displayed in Figure 4, yielded a mean absolute error of $3,019 per day. Considering the summary statistics of the dataset provided in Table 1 and taking into account the occurrence of two significant events during the recent past and more specifically since January 2020, namely the COVID19 pandemic and the Russian invention in Ukraine, both characterised as Black Swans event according to Taleb (2008), the observed level of error can be deemed acceptable. It is crucial to acknowledge that these events had a profound impact on the shipping and the tanker market, making their influence on the dataset unavoidable. Consequently, any forecasting attempt that relies on data from the period in which these events occurred may be affected by their presence.

Average VLCC c. 2010-built Scrubber-fitted earnings premium	
Mean	$7,623
Median	$4,944
Mode	#N/A
Standard Deviation	$5,738
Range	$24,423
Minimum	$2,274
1st Quartile	$3,974
3rd Quartile	$9,011
Maximum	$26,697
Count	146

Table 1. Summary statistics VLCC Scrubber-fitted earnings premium

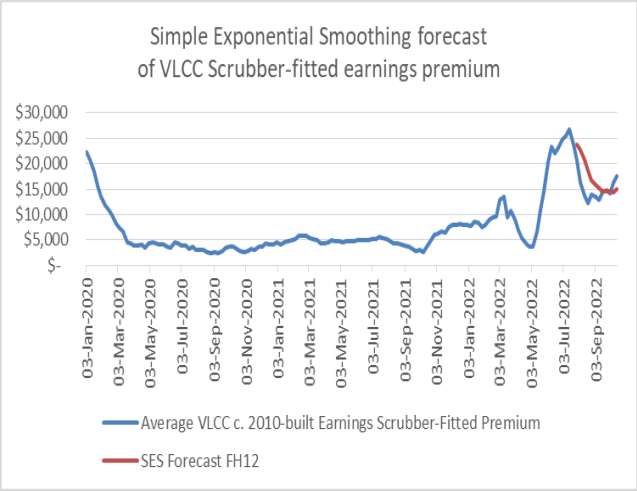

Figure 4. VLCC Scrubber-fitted earnings premium forecast by SES

3. Conclusions

The preceding concise analysis of the issue in question, lead us to some useful conclusions and the identification of room for further analysis. We initiated an analysis of the impacts of the IMO 2020 regulation on the Scrubber-fitted tanker ships chartering, considering two distinct perspectives. Firstly, we examined the contractual provisions within the charter party where a non-exhaustive list of issues to be considered and dealt with has be provided. The Scrubber Clause for Time Charterparties proposed by Intertanko serve as a suitable starting point for negotiations between owners and charterers. Regarding the employability prospects and earnings potential of a Scrubber-fitted ships, our analysis focused on data from VLCC 2010-built Scrubber-fitted ship. We observed the existence of a two tier market where the premium of a VLCC Scrubber-fitted ship range from as low as approximately US$2,000 to as high as approximately US$27,000 per day. Additionally, a strong correlation of 0.9655 between the average price differentiation of HSFO and VLSFO in major ports (Fujairah, Houston, Singapore, Rotterdam and Gibraltar) and the average earnings premium of circa 2010-built Scrubber-fitted VLCCs during the examined period. Furthermore, the percentage of Scrubber-fitted crude oil tankers experienced a remarkable increase, reaching approximately 37% (based on dwt) and 31% (based on the number of ships) within a span of less than three years. Lastly, our attempt to forecast the earnings premium of a Scrubber-fitted VLCC by the SES method yielded satisfactory results.

This section is concluded with the acknowledgement that there is room field for further analysis regarding this issue either on other types of tanker ships or other sections of the shipping industry, such as bulk carriers and/or container vessels. Moreover, it is advisable to explore alternative forecasting methods or models in order to enhance the accuracy and depth of predictions.

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