

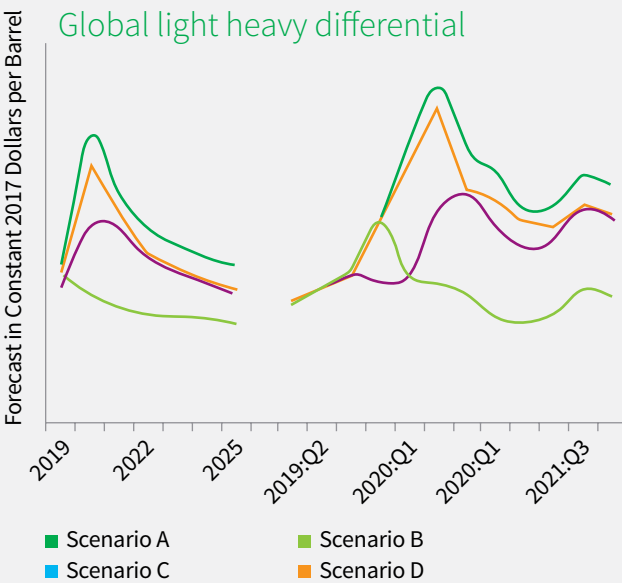
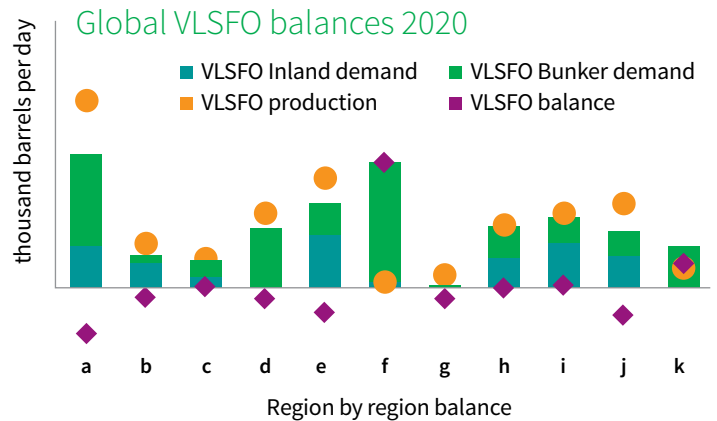
Navigating Choppy Waters

An IHS Markit multi-client study on marine bunker fuel in a low sulfur, low carbon world

Final Findings

1 Granular refinery analysis by IHS Markit indicates that in **2020 50%** of the new VLSFO (the new very low sulfur fuel oil – **0.5% sulfur**) bunker fuel will come from non-distillate refinery streams, with the other **50%** coming from distillates.

IHS Markit carried out refinery-by-refinery analysis using our global refinery modelling system to understand the likely producers of VLSFO based on crude processed, capability and economics. We also used our ship tracking to assess demand and create the VLSFO and HSFO balance for each region (which are anonymously shown in the figure).



2 Scenario and probabilistic (Monte Carlo) analysis confirms expectations of a potential wide range of oil market impacts starting from **mid-2019**, with most scenarios indicating considerable repercussions.

IHS Markit analyzed seven alternative scenarios as well as a base case. The scenarios included all the key uncertainty variables for the transition, such as high and low compliance, high and low scrubber installation, refinery project delays and phased implementation in 2020. The chart on the left shows the output from some of these scenarios on the global light-heavy differential. The pricing granularity was quarterly through 2019-21 to study the dynamics of the transition.

The analysis confirmed the sensitivity of the market impact to changes in some of the variables, and also which variables are the most significant and need to be most closely monitored through 2019.

IHS Markit then completed Monte Carlo probability analysis to gain an understanding of the range of impacts and distribution. The analysis confirmed there is a considerable range of potential outcome, albeit with a skewed distribution, and that considerable market disruption is the most likely outcome.

3 The impacts of **IMO 2020** scramble will be felt far beyond the core refinery products markets. IHS Markit has analyzed the impact on shipping freight rates, sulfur, coke, propylene, octane, lubricants markets, and even potentially global consumables prices and holiday cruise prices.

In the study IHS Markit also analyzed the impact on global freight rates and other markets. We found that a two-tier freight market might develop, with VLCC for ships without scrubbers being up to **\$10,000** per day lower. The potential impact of the IMO scramble on Group 1 baseoils (used to make lubricants) was also found to be particularly significant, because their by-products tend to be high in sulfur.

All-in-all, the **IMO 2020** scramble is unlikely to be calm for oil markets, and careful navigation will be required by anyone exposed to oil markets and freight rates.

