

Title: Difference of the seasonality in charter rate and supply-demand ratio in dry bulk shipping market.

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Abstract text

Objective:

The purpose of this analysis is to investigate the differences in the seasonality of charter rates and supply-demand ratios in the dry bulk shipping market. This seasonal variation differs every year in the size and timing of peaks. For this reason, it is very important for the shipping industry to understand the nature of seasonal variations.

In both academia and industry, seasonal fluctuations in charter rates are considered being caused by fluctuations of cargo volumes (e.g. seasonality of demand for fossil fuels, harvest season for agricultural crops).

If this understanding is correct and assuming the model that each period's charter rates are determined by the supply-demand balance for that period, the seasonal fluctuations in charter rates and cargo volumes (or the supply-demand ratio in case changes in shipping capacity are considered) should look the same. If they differ, it is assumed that some factor other than the supply-demand ratio is influencing the seasonal fluctuation.

As for the understanding of the industry, Stopford (2009) provides a concrete description of seasonal fluctuations. As an example of academic study using modern time series analysis methods, Kavussanos and Alizadeh (2001) showed that stochastic seasonality exists in charter rate time series, but deterministic seasonality does not.

However, there have been no studies about the comparison of charter rate fluctuation and supply-demand ratio using statistical methods and modern shipping data set.

This presentation is about a preliminary study prior to a full-scale study. The purpose of this study is to extract seasonal fluctuations in dry bulk carrier charter rates and supply-demand ratios using the seasonal adjustment method, and to identify the characteristics of these fluctuations.

Data/Methodology:

This study employed the DECOMP method (Kitagawa and Gersh, 1984) as a seasonal adjustment method. DECOMP is based on a state space model and expresses the original time series as a sum of five components: a trend component, a seasonal component, a cyclical component, a regression component on exogenous variables, and an irregular component.

The dry bulk shipping market is separated into four submarkets. Among these submarkets, Capesize and Panamax are investigated in this study, as these two markets are considered having high market liquidity and reflect supply and demand situation.

The frequency of data is monthly. The Baltic 4T/C Average is used as the charter rate indicator for both Capesize and Panamax. As for the supply-demand ratio (supply divided by demand), total export volume of major cargoes and major exporting countries based on customs statistics are used as demand, and fleet capacity (in DWT) from the Clarkson database are used as supply.

The examined period is from January 2011 to December 2022 (12 years / 108 months).

Results/Findings:

The extracted seasonal fluctuations are figure 1. and figure 2.

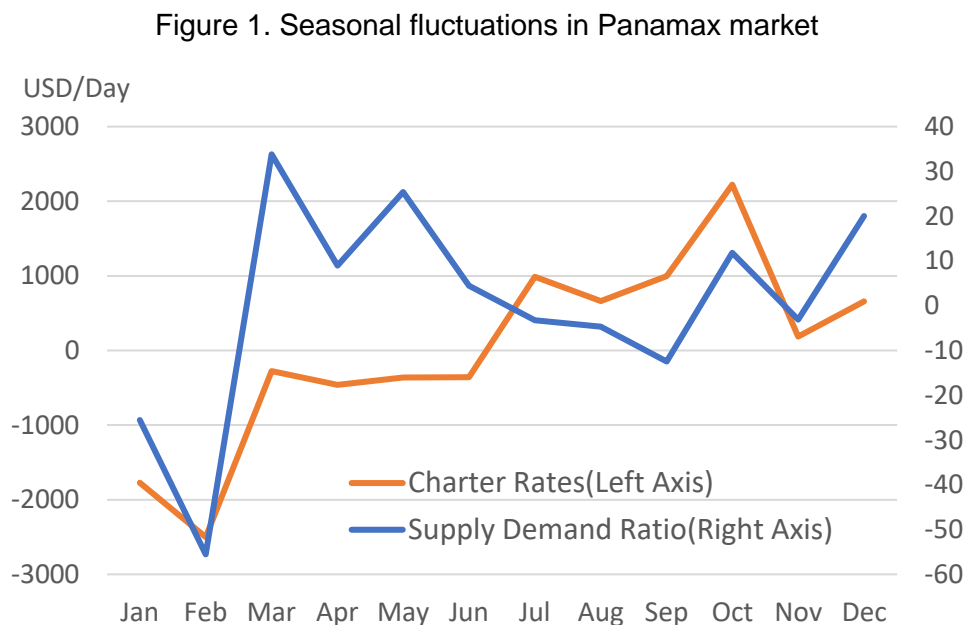
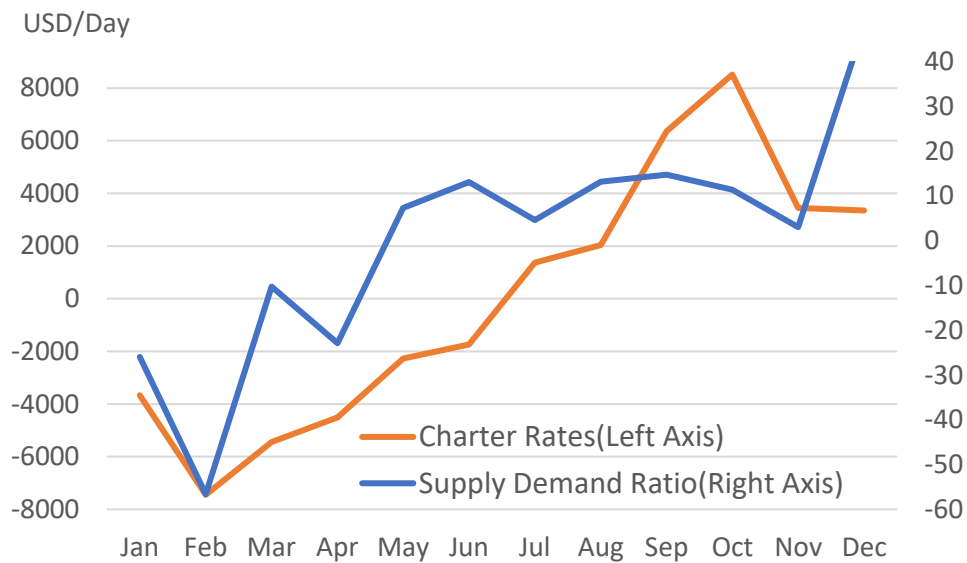


Figure 2. Seasonal fluctuations in Capesize market



Regarding the maximum fluctuation compared with the average of the original series, the charter rate is about 50% above and below for Capesize and about 20% for Panamax, while the supply-demand ratio is around 10% for both Capesize and Panamax. This confirms that the magnitude of seasonal fluctuation in both markets cannot be ignored.

The shape of fluctuations in chartered rates show some difference from that of supply-demand ratios both for Panamax and Capesize markets.

For Panamax, the supply-demand ratio and charter rates appear to be well synchronized from September to March. However, from May to September these two time series go opposite direction.

For Capesize, both charter rates and supply-demand ratio rise from February to September. However, the peaks are different; the supply-demand ratio peaks in December, while the peak of charter rates is in October.

In addition, as for the comparison of Panamax and Capesize, the shape of supply-demand rates fluctuation is different but that of charter rate resembles each other.

Implications for Research/Policy:

The results in the previous section suggest the below two points.

First, in some months, the supply-demand ratio causes fluctuations in charter rates. However, other factors besides the supply-demand ratio become a dominant influencer on charter rates in the rest of a year.

Second, there are common factors in Capesize and Panamax market other than the supply-demand ratio in the fluctuation of charter rates.

In future studies, we need to explore the above factors. It is necessary to include not only include the knowledge in the industry to define a hypothesis but also academic research design to examine the hypothesis with statistical method.

References:

Stopford, M., 2009, *Maritime Economics*, 3rd edition. (London, U.K.: Routledge)

Kavussanos, M. and Alizadeh, A., 2001, Seasonality patterns in dry bulk shipping spot and time charter freight rates, *Transportation Research Part E: Logistics and Transportation Review*, 37:6, 443-467.

Kitagawa, G. and Gersch, W., 1984, A Smoothness Priors-State Space Modeling of Time Series with Trend and Seasonality, *Journal of the American Statistical Association*, 79, 378-389.