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What makes a freight market index? An empirical analysis of vessel fixtures in the offshore market

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ABSTRACT

We estimate a hedonic pricing regression to generate a market index from heterogeneous fixture data in the Offshore Support Vessel (OSV) market. We consider a fixed effect framework where we control for vessel characteristics and contract-specific variables. Applied to a dataset of more than 30,000 transactions from 1989 to 2015, estimates show that around 70–80% of variation in dayrates is explained by the time fixed effects used to estimate the market index. Spot freight rates increase with engine power and transport capacity. The volatile market index is seasonal and is positively correlated to both oil prices and production volumes.

1. Introduction

Standardized indices are crucial to the transparency and informational efficiency of any financial and commodity market. Such indices are relied upon as an indicator of price movements and often form the basis for a tradable derivatives market. In markets where the volume of transactions is large and the underlying asset is homogeneous, such as those for equities, the derivation of such indices is straightforward and almost continuous.

The markets for the chartering of vessels for transportation services belong to the other extreme, with heterogeneous transactions occurring at irregular intervals and with low frequency. Principally, every contractual agreement (fixture) is different from the last, as each vessel's technical specifications and route can be substantially different. Here the construction of market indices has then become the domain of experts known as shipbrokers, who act as intermediaries between buyers and sellers of shipping capacity and transport demand. The freight indices generated by Clarkson Research (2016) are well known and the go-to source for econometric analysis of the global shipping and offshore markets.[1] Similarly, the Baltic Exchange (2016) collects and processes price indications by route from panels of shipbrokers around the world and disseminates daily spot freight rate indices for a large number of routes across the oil tanker, gas tanker and drybulk freight markets.

The main challenge with this approach is that the human expertise or judgment which is built on knowledge accumulated over the years – be it by a single shipbroker at a major broking house or a global panel of such brokers – ultimately represents a "black box". We can observe the output, but do not know which information set forms the input, as emphasized in Veenstra and van Dalen (2008): "What remains unclear, however, to the outside observer, is how this information is trans-

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[1] Recent examples include for instance Poblacion (2015), Población (2017) and Adland et al. (2016).

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formed into economic indicators such as price indices. There is very little consensus on what type of information is required by practitioners, and what kind of decisions they base on that information. Furthermore, the methods of calculating the indices are known only superficially".

The objective of this paper is to develop a methodology to generate market indices when data is constituted from a large set of irregular and heterogeneous transactions. Drawing on hedonic price models, our methodology allows to estimate a market index net of vessels' characteristics and buyers' effects, thus representing the "true" changes in the market over time, once composition effects and unobserved heterogeneity have been accounted for. Further, the methodology gives the possibility to identify what are the main determinants of the market index using variance decomposition calculations, so that we contribute to the opening of the "black box".

We provide an empirical application to the North Sea Offshore Support Vessels (OSVs) chartering market, though the proposed methodology could be applied to any freight market (and not even necessarily for maritime transportation) as long as sufficient information on transactions exists. Our work represents the first ever empirical analysis of the chartering market for OSVs. This market is very different from the traditional deep-sea shipping typically considered in the literature, which serves as strong motivation for our research for several reasons.

Firstly, the market provides crucial logistics services to the offshore gas and oil markets worldwide – serving highly capital-intensive rigs in complex and time-critical marine operations. Secondly, the OSV spot markets are very short term, highly weather dependent and local in nature, giving rise to extreme dayrate volatility. Thirdly, the vessels are highly heterogeneous in terms of technical vessel specifications, with the ability to simultaneously carry different chemicals, drybulks, offshore containers, or remotely operated submarine vehicles, and are engaged in a wide range of activities such as rig anchor handling or subsea support. The heterogeneous nature of vessel characteristics and contractual terms motivates the importance of analyzing price formation for individual fixtures. At the same time, the potential for price differentiation creates the need for objective market indices that, ultimately, can assist in price discovery and efficient pricing of contingent claims (e.g. OSV valuation).

The remainder of our paper is structured as follows. In Section 2, we review the relevant literature on freight market modeling. Section 3 presents our methodology to generate a market index based on fixture data. Section 4 presents our dataset as well as relevant descriptive statistics. Estimates from regression models are discussed in Section 5. Finally, Section 6 presents some conclusions.

2. Literature review

Research on the formation and dynamics of freight rates can broadly be divided into two streams. The first stream takes the time-series of rate indices at face value and develops suitable empirical models to represent its dynamics. Such stochastic representations either take the form of continuous-time models (Bjerksund and Ekern, 1995; Tvedt, 1997; Adland and Cullinane, 2006; Adland et al., 2008; Poblacion, 2015; Población, 2017) or time-series models (Kavussanos, 1996; Berg-Andreassen, 1996; Franses and Veenstra, 1997; Kavussanos and Alizadeh, 2001). The potential impact of market illiquidity and changes in the specifications of the vessels or routes underlying the indices is generally not discussed here, or even stated to be a concern.[2]

The second stream of research uses microdata – detailed information of individual fixtures and vessels – to investigate the determinants of contracted rates. In the first study of this kind, Bates (1969) presents a multivariate linear regression model of spot rates for global sugar transportation incorporating hauling distance, cargo size, route, season, year and contractual terms. Shimojo (1979) undertakes a similar study. Tamvakis (1995) tests whether there is a freight rate premium paid to tanker vessels of lower age, vessels with double-hull construction, or vessels trading to the United States. Tamvakis and Thanopoulou (2000) investigate the existence of a two-tier spot freight market in the drybulk freight market on the basis of vessel age, and find no significant age premium in the freight rate.

Alizadeh and Talley (2011a,b) broaden the investigation of vessel and contract-specific determinants of tanker and drybulk spot freight rates to include the lead time between the contracting date and loading as well as macroeconomic proxies representing the market freight rate level and its volatility. Köhn and Thanopoulou (2011) investigate the presence of a quality premium in the drybulk timecharter (TC) market and find evidence for the existence of a two-tier dry bulk TC market during the freight market boom years of 2003–2007. Agnolucci et al. (2014) estimate a microeconomic model for TC rates in the Panamax drybulk market and focus on whether there exists a rate premium for fuel efficiency.

Adland et al. (2016) show that there exist substantial fixed effects related to the identity of owners, charterers and owner-charterer matches in the pricing of voyage charters in the tanker and drybulk segments. Adland et al. (2017) evaluate the presence of a fuel-efficiency premium in the drybulk TC market based on a hedonic model that includes macro, vessel- and contract-specific variables. They find that energy efficiency is rewarded only during poor freight market conditions, and that owners then only recoup a small fraction of the savings in fuel costs through higher timecharter rates.

Starting with Alizadeh and Talley (2011a,b), all the recent studies include a market index as one of the dependent variables. The logic is that, in a perfectly competitive market, the index captures a large share of price movements. However,

[2] The only exception is Nomikos and Kavussanos (2000) who investigate the impact of changes in the route specifications of the Baltic Freight Index on hedging performance.