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Economic information transmissions and liquidity between shipping markets: New evidence from freight derivatives

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ABSTRACT

Economic return and volatility spillovers of derivatives markets on a number of assets have been extensively examined in the general economics literature. However, there are only a limited number of studies that investigate such interactions between freight rates and the freight futures, and no studies that also consider potential linkages with freight options. This study fills this gap by investigating the economic spillovers between time-charter rates, freight futures and freight options prices in the dry-bulk sector of the international shipping industry. Empirical results indicate the existence of significant information transmission in both returns and volatilities between the three related markets, which we attribute to varying trading activity and market liquidity. The results also point out that, consistent with theory, the freight futures market informationally leads the freight rate market, though surprisingly, freight options lag behind both futures and physical freight rates. The documented three-way economic interactions between the related markets can be used to enhance budget planning and risk management strategies, potentially attract more investors, and thus, improve the liquidity of the freight derivatives market.

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1. Introduction

In a frictionless world, derivatives and underlying asset (physical) prices respond simultaneously to new market information and are thus perfectly correlated. In practice, however, there exist market frictions that can induce a lead-lag relationship between the two economic price series, allowing market participants to project the movements of the trailing market, based on new information transmitted by the leading market. Typically, derivatives contracts are more flexible and involve lower transaction costs than underlying physical contracts, facilitating a swifter adjustment of derivatives prices to new market information relative to underlying physical prices. Yet, the lack of a significant number of market participants in illiquid derivatives markets makes them less responsive to new information as it increases the cost of repositioning the contracts (see Capozza et al., 2004; and Löffler, 2005). This property is well documented in the general finance literature (see Fama and French, 1987; Sloan, 1996, among others) and has been extensively utilized by market practitioners.

The scope of investigating lead-lag relationships between different markets is a multifaceted one. First, it can provide insights on the inter-relationships between these markets, comparing their market efficiency levels, where the more efficient market absorbs new market information faster and transmits it to the least efficient market. Second, return spillovers from

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one market to another can be used as a price discovery vehicle, enabling practitioners to draw inferences for the price of the trailing market by observing price movements in the leading market. Gaining insight into future market prices is important since it can act as an effective anticipatory mechanism for market participants in the decision making process. Third, it can help draw inferences on volatility structures in order to hedge risk exposures. Market volatility projections can generally be based on: (i) the interaction of volatilities between the two markets; that is, if volatility transmissions exist between markets, a surge in market volatility of the informationally leading market indicates a possible increase in volatility of the trailing market (Ng, 2000; Baele, 2005); and (ii) a leverage effect; that is, a negative shock leads to greater volatility in the market relative to a positive shock of the same magnitude (Engle and Ng, 1993). This study focuses on investigating the economic spillover effects between physical and several derivatives freight markets in the shipping industry.

The international shipping industry is characterized by global trade, large-scale capital investments, but also sizable operational and commercial risks, due to the significant volatilities in rates and prices. Shipping is the channel of world trade, connecting nations together and is widely regarded as the most efficient and inexpensive mode of transportation for all types of merchandise. According to the International Chamber of Shipping (ICS), around 90% of world trade is transported by more than 50,000 seagoing vessels. Commercial fleet is registered in over 150 nations and operated by over a 1.5 million seafarers of every nationality. According to a recent study for the European Community Shipowners' Associations (ECSA) the "*overall contribution of the European shipping industry to the EU's Gross Domestic Products (GDP) in 2013 is estimated to have been €147 billion*" (Oxford Economics, 2015). The international freight rate market is characterized by some unique features that differentiate it from other "*soft*" commodity markets. These are the high volatility, the seasonality effects associated with commodities transported by the ocean-going vessels, the cyclical behavior of rates and prices following business cycles, and the non-storable nature of freight rates, amongst others (see Kavussanos and Visvikis, 2006b and Kavussanos and Visvikis, 2011). The non-storable commodity nature of the underlying service in question is a distinct feature of freight derivatives and means that in this case the traditional cost-of-carry no-arbitrage arguments of fair pricing do not apply (see Kavussanos and Visvikis, 2004; Alizadeh, 2013, and Kavussanos et al., 2014, for more details).

This study extends previous research on price discovery in sea-going transportation markets in a number of ways. First, in light of the importance of the shipping industry and the inherent relationships between the derivatives and the physical markets in shipping, to the best of our knowledge, this is the first study that empirically assesses the information spillover of returns and volatilities between time-charter rates and corresponding freight futures and options prices, and provides direct evidence of price discovery in the freight options market. Freight futures/forwards are agreements between a buyer (typically charterers, hedging against freight rate increases) and a seller (typically shipowners, hedging against freight rate decreases) of freight services for a specific time in future but at a pre-agreed freight rate. These contracts are cash-settled at the maturity date of the contract against a settlement price. For all dry-bulk time-charter futures contracts investigated in this study, the settlement price is the average of all time-charter rates during the maturity month, as published by the Baltic Exchange.

Freight call or put options contracts are also cash-settled against a settlement price, and follow the same settlement average process as above (that is, they are Asian options), which can only be exercised on the last trading (settlement) day of the contracts (that is, they have a European style exercise).[1] A distinct feature of freight options is that they can be seen as arithmetic price Asian options on the underlying freight rate market or, equivalently, as European options on futures/forward contracts. For Asian options XE "Asian options" the payoff is dependent on the average price of the underlying asset over some period of time before the settlement of the contract. Therefore, the first difference of Asian options with other options types is that they have lower volatility, and thus, are cheaper than European or American options. Typically, Asian options are written on underlying assets that have low trading volumes, and therefore, an average value of the underlying asset over a period of time is used as the settlement price, to avoid any possibility of price influence. Furthermore, for Asian options there are no analytical pricing formulas, as the assumption of lognormal price distribution does not hold. As a result, the following four options pricing models are typically used to price Asian options: (i) Kemma and Vorst (1990) propose a closed-form pricing model to geometric averaging price options; (ii) Turnbull and Wakeman (1991) suggest an analytical arithmetic form approximation with a lognormal distribution; (iii) Levy (1992) extends the Turnbull-Wakeman analytical approximation and argue that Asian options should be estimated on a discrete time basis; and (iv) Curran (1992) develops an approximation for arithmetic Asian options based on a geometric conditioning framework (for more see Kavussanos and Visvikis, 2006a).

Freight derivatives contracts are traded Over-the-Counter (OTC) through various freight brokers and cleared in various clearing-houses (LCH.Clearnet, NOS Clearing, SGX Asia Clear, and CME Clearing Europe), but also trade in organized derivatives markets (NASDAQ OMX, ICE Futures Europe, and CME Group) and electronic trading screens (Cleartrade Exchange in Singapore, and Baltex in London). More specifically our investigation focuses on three major categories of dry-bulk vessels; namely Capesize (around 160,000 deadweight – dwt), Panamax (around 75,000 dwt) and Supramax (around 54,000 dwt) vessels. Although freight forward/futures prices have been found to informationally lead the underlying freight rates (Kavussanos and Visvikis, 2004; Spreckelsen et al., 2014; Zhang et al., 2014) and lag the commodity futures prices (Kavussanos et al., 2014), there exists no evidence on the interaction with freight options.[2]

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[1] For a detailed analysis of the freight derivatives market see Kavussanos and Visvikis (2006a, 2011).

[2] In the literature, studies on freight options pricing have only been conducted (see Koekebakker et al., 2007; and Nomikos et al., 2013).

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