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Shipping risk management practice revisited: A new portfolio approach

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ABSTRACT

The international shipping industry is susceptible to heightened market volatility manifested in significant freight rate fluctuations and thus diversifying and hedging the associated risks have become central to shipping business practice. Building on the extant literature on shipping freight derivatives, this study develops a portfolio-based methodological framework aiming to improve freight rate risk management. The study also offers, for the first time, evidence of the hedging performance of the recently developed container freight futures market. Our approach utilises portfolios of container, dry bulk and tanker freight futures along with corresponding portfolios of physical freight rates in order to improve the efficacy of risk diversification for shipping market practitioners. The empirical findings uncovered in this study have important implications for overall business, commercial, and hedging strategies in the shipping industry, while they can ultimately lead to a more liquid and efficient freight futures market.

1. Introduction

One of the fundamental characteristics of the international shipping industry is its distinctively volatile nature which is manifested in significant cash flow and return variability for key shipping market practitioners, such as shipowners, charterers (shippers), operators, and investors, amongst others. Although volatility in vessel prices, bunker fuel prices, foreign exchange and interest rates all contribute towards an environment of heightened uncertainty, freight rate variability is considered as the most important factor amongst all. Accordingly, minimizing freight rate fluctuations – either through utilizing traditional physical market-based diversification with charterparty contracts of different duration or by employing financial hedging strategies with derivatives contracts – has become imperative for shipping businesses.[1] In this study, we argue that utilizing derivatives contracts over and above holding a well-diversified portfolio of physical freight rates should offer shipping practitioners the opportunity to further minimize their freight rate risk exposures and ultimately lead to superior risk management performance.

Existing studies have examined the performance of hedging strategies involving freight futures in dry bulk markets (see Thuong and Visscher, 1990; Kavussanos and Nomikos, 2000a,b,c; Kavussanos and Visvikis, 2004; Goulas and Skiadopoulos,

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[1] Typically, traditional freight rate risk management involves diversifying holdings in different vessel types (larger vs. smaller) and market sectors (tramp vs. liner), and charterparties of different duration (voyage vs. timecharter) in order to minimize (spread) the risks (see Kavussanos and Visvikis, 2006).

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2012) as well as in tanker markets (see Alizadeh et al., 2015a), and point to lower hedging effectiveness (40–60% variance reduction) relative to what we typically observe in financial and commodity markets.[2,3] The methodologies employed by previous studies are based on an asset-by-asset framework, whereby each individual (physical) freight rate exposure is hedged against the corresponding (derivatives) futures contract (henceforth referred to as *direct hedge*). This study employs for the first time, to the best of our knowledge, a portfolio approach that follows a modern portfolio theory multi-asset framework in the spirit of Markowitz (1952)[4]; Along these lines, it utilises a mixed portfolio of different freight futures contracts to hedge the price fluctuations of a well-diversified portfolio comprising physical freight rates (henceforth referred to as *cross hedge*). The main methodological novelty of this portfolio approach is that it considers the correlations and covariances between the freight futures contracts allowing to further reduce the total risk associated with shipping freight markets, thereby improving freight rate risk management. In a recent study, Tsouknidis (2016) finds a strong correlation between freight rates among various shipping segments. In addition, freight rates and corresponding freight futures are typically found tied in long-run equilibrium (cointegrating) relationship, and therefore, spillovers in returns and volatilities within different freight markets have been observed in the dry bulk market (Alexandridis et al., 2017) as well as in the tanker market (Li et al., 2014). This suggests that there may also exist correlations between freight futures contracts corresponding to different physical freight rates. Accordingly, this study takes into account the correlations between a portfolio of physical freight rates and a corresponding portfolio of freight futures contracts to examine the risk management performance of: (i) well-diversified physical freight portfolios, (ii) *direct hedge* freight futures portfolios, and (iii) *cross hedge* freight futures portfolios (see Section 2.2 for definitions).

Freight derivative contracts were first introduced in the early 1990s for tramp (dry bulk and tanker) shipping as forward contracts (FFAs – Forward Freight Agreements) traded Over-the-Counter (OTC) and tailored to users' needs. More recently, standardized freight forward contracts (henceforth, freight futures contracts) are cleared at various clearing-houses (such as LCH.Clearnet in London, SGX AsiaClear in Singapore, and Nasdaq Clearing in Norway, among others) circumventing counterparty default risk.[5] The dry bulk Capesize (160,000–180,000 deadweight – dwt vessels), Panamax (74,000 dwt), Supramax (52,000 dwt) and Handysize (28,000 dwt) freight indices quoted in US$/day or US$/metric ton, as well as tanker dirty and clean freight indices quoted in Wordscale points or Time-charter Equivalent (TCE), are produced by the Baltic Exchange in London and serve as the underlying assets for the corresponding dry bulk and tanker futures, respectively.[6] Such freight indices accurately reflect current market conditions as they are estimated from the average freight rates quotations provided by a panel of international shipbrokers (the Panellists) appointed by the Baltic Exchange. Freight futures contracts are cash-settled contracts between an agreed futures price and a settlement price which is calculated as the average of the underlying physical freight rates during all business days of the maturity (settlement) month.[7]

Further, the typically oligopolistic liner (container) shipping market, started exhibiting perfect competition characteristics after the abolition of liner (price fixing) conferences in 2008, exposing the liner companies and shippers to significant freight rate volatilities. The Container Swap Forward Agreements (CFSA) contracts started trading OTC in 2010, through freight derivatives brokers, and are settled against the 15 freight routes of the Shanghai Containership Freight Index (SCFI) provided by the Shanghai Shipping Exchange (SSE). They are quoted as US$/TEU (Twenty-foot Equivalent Unit) or US$/FEU (Forty-foot Equivalent Unit). For the purpose of eliminating counterparty (credit) risk these contracts are cleared in the SGX AsiaClear clearing house. Our study employs for the first time a sample that includes container derivatives, therefore, providing new evidence of hedging performance within this emerging market of the shipping industry. Such markets have long posed a challenge for financial research. More specifically, Kavussanos et al. (2008) report that "*emerging market returns are characterised by low liquidity, thin trading, higher sample averages, low correlations with developed market returns, non-normality, better predictability, higher volatility and short samples. In addition, market imperfections, high transaction and insurance costs, less informed rational traders and investment constraints may also affect the risks and returns involved*" (see also Kavussanos and Visvikis, 2008). Thus, emerging market returns can exhibit different characteristics to those in developed markets, making the empirical investigation of the rather illiquid container FFA market important in terms of offering valuable insights (for a detailed discussion on the special features of emerging markets see Bakaert and Harvey, 1997; Antoniou and

[2] The relatively low hedging performance documented has been primarily attributed to the high basis risk associated with freight futures contracts due to the non-storable nature of the underlying freight service, which allows for no cost-of-carry arbitrage parity trades (see Kavussanos and Nomikos, 2000a; Kavussanos and Visvikis, 2004).

[3] Adland and Haiying (2017), for the first time, argue that if freight futures hedge is kept until the settlement (expiration) date, then there is no financial basis risk but rather only physical basis risk from the mismatch between the income stream of the actual vessel and the spot rate index. They argue that this mismatch may be due to technical specifications, deviation in operating speeds and bunker fuel consumption, trading patterns of the global fleet, timing of fixtures and duration of actual trips, and vessel unemployment. Their results indicate that physical basis risk decreases as the fleet size increases and the hedging durations are longer, but it doesn't disappear completely.

[4] The Modern Portfolio Theory (MPT) as developed by Markowitz (1952) quantifies the diversification of multiple risky assets in portfolios by utilizing the correlations and covariances between the assets to estimate mean (return)-variance (risk) efficient frontiers; that is, set of portfolios which satisfy the condition that no other portfolio exists with a higher expected return at the same level of risk. Past research in diversification of risky assets include Brennan et al. (1997), Cass and Stiglitz (1970) and Roques et al. (2008), among many others. Cullinane (1995) uses the portfolio theory to analyze mean and variances of physical freight rates in dry bulk shipping.

[5] NOS Clearing has merged with NASDAQ OMX in 2014, and the freight derivatives clearing portfolio is managed by NASDAQ Clearing.

[6] Worldscale rates are estimated assuming that a "*nominal*" tanker exists on round voyages between assigned ports. The Baltic exchange was established in 1883 in London to establish an organised market for market practitioners that wish to buy and sell freight services (for more details, see Kavussanos and Visvikis, 2006).

[7] An example of how they are used in practice is the following: if a shipowner (charterer) sells (buys) one contract of Capesize Time-Charter (T/C) futures at US $8000/day on 1st March 2016, with a settlement of US$7000/day on 31st May 2016, the shipowner (charterer) would gain (loss) US$1000 in the freight derivatives positon, which will then be used to cover the loss (profit) of the underlying freight rate position.