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Shipping equity risk behavior and portfolio management

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ABSTRACT

This paper investigates the dynamics of stock price volatility for different vessel-type segments of the U.S, water transportation industry. We measure market exposure by a portfolio of tanker, dry bulk, container, and gas stocks to examine tail behavior and tail risk dependence. The role of mixture distributions in predicting future volatility is studied from both statistical and economic perspectives. We further test for predictability in co-movements in the tails of sectors returns. Findings indicate that large losses are strongly correlated, supporting asymmetric transmission processes for financial contagion. Finally, using a non-parametric approach, we extend the model to the multivariate case and assess the value of volatility and correlation timing in optimal portfolio selection. The results can help to improve the understanding of time-varying volatility, correlation and tail systemic risk of shipping stock markets, and consequently, have implications for risk management and asset allocation practices, as well as regulatory policies.

1. Introduction

Ocean freight transportation companies operate in one of the most internationalized industries by connecting sources of supply and demand around the globe. A key aspect of this is that shipping market information has received repeated attention either as a gauge of the state of real economic activity (Kilian, 2009) or as a predictor of financial markets (Papapostolou et al., 2016). Hence, uncertainty in the industry has broad economic policy and financial practice implications. The importance of the shipping industry is highlighted by the fact that more than 80% of the world's commodity trade by volume is transported by ocean going vessels (UNCTAD, 2017). With large volumes shipped around the world at relatively low costs, maritime transport is central to the growth and sustainability of the global economy. Ocean transport has transformed, over the last decade, from a pure service market (cost of transporting raw, semi-finished and finished materials), to a market where freight is bought and sold for investment and portfolio diversification purposes, attracting investment banks, equity traders, fund managers and hedge funds.

This paper empirically examines equity volatility dynamics in the water transportation industry from the perspective of risk analysis, quantification and forecasting, to provide institutional and retail investors – that consider shipping stocks as an alternative asset class – with information that can be used to calibrate risk attitudes and support the decision-making process. Shipping markets are notoriously volatile, mainly due to freight rate fluctuations, which are driven by a range of deterministic or stochastic influences such as political events and conflicts, natural disasters, seasonality, fuel price and currency volatilities, trading relationships, environmental regulations, supply and demand imbalances, among others. At the same time, a sound understanding of shipping equity risk is of particular significance; in light of the recent global financial crisis (that immensely affected international

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commodity trade, and, consequently, shipping) and the prominence of equity markets as a source of finance for shipping companies.[1] As a result, this paper is of practical value to equity funds, traders, institutional and retail investors in search of alternative style investments.

The literature exploring risk in shipping markets and its impacts focuses on physical market volatility and risk management; for a comprehensive survey see Kavussanos and Visvikis (2006a, 2008) and Alexandridis et al. (2018). For example, Cullinane (1995) considers the shipowner's financial commitments as investments and examines hedging strategies, utilizing a combination of time charter, voyage charter and derivative instruments to derive a set of optimal charter mix particular to the risk attitude of an individual decision-maker (see also Cullinane, 1991). The issue of freight derivatives hedging effectiveness has been investigated by Kavussanos and Visvikis (2010) and Alizadeh et al. (2015).[2] Another string of articles examines the suitability of various volatility models for freight rates in terms of estimating the Value-at-Risk (VaR) (see Kavussanos and Dimitrakopoulos, 2011).[3] Others, investigate linkages between freight volatility and other variables, such as the bid-offer spread (Batchelor et al., 2007), derivatives trading volume (Alizadeh, 2013) or commodity futures (Kavussanos et al., 2014).

Over the last two decades there has been an influx of papers in the transportation literature that examine: (i) the various ship capital sources (see for example, Grammenos et al., 2007; Grammenos et al., 2008; Drobetz et al, 2013; Kavussanos and Tsouknidis, 2014; Kavussanos and Tsouknidis, 2016; Satta et al., 2017, among others); (ii) the financial investments and corporate structure in shipping (see for example, Alizadeh and Nomikos, 2007; Tsionas et al., 2012; Alexandrou et al., 2014; Rau and Spinler, 2016; Drobetz et al., 2016a; and Papapostolou et al., 2017, among others) and (iii) the hedging and risk management in shipping (see for example, Cullinane, 1995; Kavussanos et al., 2004, 2014; Andreou et al., 2014; Alizadeh et al., 2015; Alexandridis et al., 2017a,b; and Kyriakou et al., 2017, among others). Thus, it seems that the euphoric 2003–2007 business environment, and the post-2008 challenging financial investment and money raising environment in seaborne transportation have generated an extensive academic research strand.

Nevertheless, research on exchange-listed shipping equity risks has received less attention, although adverse price movements affect negatively the cost of capital and stockholder wealth by imposing costs. The existing literature suggests that the risk (beta) of shipping stocks can be explained by non-systematic risk factors, such as the: asset-to-equity ratio which is found to be negative related to shipping stocks (Kavussanos and Marcoulis, 2000a); the illiquidity risk premium in shipping stocks which is priced higher than market-wide illiquidity (Panayides et al., 2013); oil prices which are positively associated; and changes in industrial production, which are negatively associated to shipping stock returns (Kavussanos and Marcoulis, 2000a, 2000b; Drobetz et al., 2010). The above literature suggests that market participants can realize more efficient risk-return trade-offs by diversifying their portfolios with shipping stocks, reaching higher expected returns for a given risk level.

More specifically, Syriopoulos and Roumpis (2009), by contrasting shipping portfolios to stock market indices, bond indices and diversified stock-bond portfolios, find that that shipping portfolios appear to be superior in terms of returns but are associated with higher volatility. Grelck et al. (2009) provide evidence in support of adding shipping stocks to a portfolio of stocks and bonds. In particular, performance of augmented portfolios is improved in terms of Sharpe ratios, although diversification gains are unstable throughout time. Moreover, Drobetz et al. (2010) argue that an investor whose goal is to maximize diversification gains could further enhance the risk-return spectrum by investing in shipping stocks as the risk-return profile of such stocks is distinct and should be regarded as a separate asset class.

With this in mind, risk measurement is fundamental for investment, asset allocation and risk management decisions. Homan (2009) investigates marine operator equity risk and documents that, the 9/11 terror attacks marked a structural rise in systematic and idiosyncratic risk. In that line of research, Drobetz et al. (2016b) explore macroeconomic and industry-level effects on corporate systematic risk and provide evidence of time-varying beta risk which exhibits a considerable industry cycle (see also Gong et al., 2006).[4] Drobetz et al. (2016a) argue that, as a result of the high volatility in the cash flows and asset values of shipping companies, their financing behaviour is more sensitive to rapidly changing economic conditions than companies operating in other industries. Furthermore, asset allocation and the risk-return characteristics of shipping stocks have been explored by Andriosopoulos et al. (2013) who employ evolutionary algorithms to devise equity investment strategies that replicate the performance of equity and freight indices cost-effectively. Syriopoulos and Roumpis (2009) examine equity VaR performance with a view to enhance asset allocation opportunities. Their findings confirm the "*high risk*" industry profile.

Therefore, knowledge of the response of stock price risk to market news, the likelihood of extreme stock price fluctuations and systemic risk or interconnectedness among different segments of the shipping stock markets are of eminent practical value. For example, stock price volatility forecasts and spillovers constitute a significant input in many financial models to calculate optimum

[1] Equity financing has contributed 43% on average to the total finance raised by the non-traditional sources (bonds, private equity and leasing) for the period 2004–2016 (source: Marine Money). This high contribution can be attributed to the wave of shipping companies entering the U.S. capital markets through Initial Public Offerings (IPOs), which also resulted in a higher profile for shipping in the global investment stage; and next, to the initial and secondary offerings filling a newbuilding funding gap created by the inability of the banking sector to provide the necessary capital or by the depletion of the equity base of shipping companies.

[2] For a comprehensive description of the freight derivatives markets, see Kavussanos and Visvikis (2006b, 2011, 2016) and Alizadeh and Nomikos (2009).

[3] VaR is defined as the expected maximum loss associated with a portfolio over a risk horizon within a fixed confidence interval. See Kavussanos et al. (2015) for a detailed application of VaR models in the shipping industry.

[4] Kavussanos et al. (2003) and Kavussanos and Marcoulis (2005) include some of the studies that explore systematic risk of shipping equities and find market betas close to one. This is consistent with Drobetz et al. (2016b) who noted relatively low betas in the early 1990s. However, systematic risk increased notably in recent years, especially from 2007 onwards, implying that business risk in the maritime industry is higher. Bearing in mind the importance of the relation between stock returns and liquidity in water transportation, Panayides et al. (2013) report that in addition to the other risk factors, the market-wide liquidity factor and the illiquidity risk premium are also significant in explaining shipping stock returns. For the return performance of the publicly-listed port industry see Satta et al. (2017).