



## Market interactions in returns and volatilities between spot and forward shipping freight markets

Manolis G. Kavussanos<sup>a,\*</sup>, Ilias D. Visvikis<sup>b</sup>

<sup>a</sup> *Department of Accounting and Finance, Athens University of Economics and Business, 76 Patission St, 104 34 Athens, Greece*

<sup>b</sup> *Department of Maritime Studies, University of Piraeus, 80 Karaoli & Dimitriou St, 185 34 Piraeus, Greece*

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### Abstract

The lead–lag relationship in both returns and volatilities between spot and futures markets has been investigated extensively in the financial economics literature. Only a limited number of such studies have appeared on forward markets, primarily due to the lack of easy access to empirical data. This paper uses a unique database in over-the-counter Forward Freight Agreements (FFA) to investigate the issue. The underlying commodity is non-storable, being that of a shipping service, with the additional feature of transactions costs being higher in the spot market in comparison to the forward market. These features have interesting implications for the markets. At the practical level, the better understanding of the mean and variance dynamics can improve risk management and budget planning decisions.

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\* Corresponding author. Tel.: +30-210-8203-167; fax: +30-210-8228-816.

*E-mail addresses:* [mkavus@aub.gr](mailto:mkavus@aub.gr) (M.G. Kavussanos), [elias10@otenet.gr](mailto:elias10@otenet.gr) (I.D. Visvikis).

## 1. Introduction

Following Working (1970), price discovery refers to the use of one price series (e.g. derivatives returns) for determining (predicting) another price series (e.g. spot returns). The lead–lag relationship between the price movements of derivatives returns and the underlying spot market returns illustrates how fast one market reflects new information relative to the other, and how well the two markets are linked. In a perfectly frictionless world, price movements of the two markets would be contemporaneously perfectly correlated and non-cross-autocorrelated. Thus, in perfectly efficient derivatives and spot markets, informed investors are indifferent between trading in either market, and new information is reflected in both simultaneously. However, if one market reacts faster to information, and the other market is slow to react due to market frictions, such as transactions costs or market microstructure effects, a lead–lag relation in returns is observed. In particular, volatility spillovers from one market to the next arise primarily due to the realisation that speculative price changes are being interwoven with higher moment dependencies, such as shown by Bollerslev et al. (1992).<sup>1</sup>

Thus, the lead–lag relationship in returns and volatilities between spot and derivatives markets is of interest to academics, practitioners, and regulators for a variety of reasons. Firstly, the issue is linked to market efficiency (as explained earlier) and arbitrage.<sup>2</sup> Secondly, it is believed that derivatives markets potentially provide an important function of price discovery.<sup>3</sup> If so, then derivatives prices should contain useful information about subsequent spot prices, beyond that already embedded in the current spot price. Thirdly, if volatility spillovers exist from one market to the other, then the volatility transmitting market may be used by market agents, which need to cover the risk exposure that they face, as a vehicle of price discovery. For

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<sup>1</sup> Ross (1989) uses a no-arbitrage model to show that the variance of price changes is related directly to the rate of flow of information. Engle et al. (1990) provide an alternative interpretation that relates information processing time to variance movements. This development suggests price volatility has significant implications concerning information linkages between markets. Hence, previous studies ignoring the volatility mechanism may not offer a thorough understanding of the information transmission process.

<sup>2</sup> If new information disseminating into the marketplace is immediately reflected in spot and derivatives prices by triggering trading activity in one or both markets simultaneously, there should be no systematic lagged responses long enough, or large enough to economically exploit, considering transactions costs. Significant causal relationships would, however, be incompatible with market efficiency because they would imply that forecast accuracy of the spot (derivatives) market's subsequent performance can be improved upon by using past information from the derivatives (spot) market. To avoid contradicting the unbiasedness hypothesis paradigm, the joint co-movement of price changes in the two markets should be predominantly contemporaneous (Chan et al., 1991).

<sup>3</sup> An explanation of why futures prices may lead spot prices is that derivatives markets are less costly (i.e. highly liquid markets, low transactions costs, easily available short positions, low margins, rapid execution) for traders to utilise compared to the spot markets (Min and Najand, 1999). Another explanation may be short-sale constraints in the spot market, such as legal or contractual restrictions of shorting by certain institutional investors and corporate insiders, and the inability to borrow stock to short (Diamond and Verrecchia, 1987).

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