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Forecasting spot and forward prices in the international freight market

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Abstract

This paper tests the performance of popular time series models in predicting spot and forward rates on major seaborne freight routes. Shipping is a nonstorable service, so the forward price is not tied to the spot by any arbitrage relationship. The developing forward market is dominated by hedgers, and it is an empirical question whether forward rates contain information about future spot rates. We find that vector equilibrium correction (VECM) models give the best in-sample fit, but implausibly suggest that forward rates converge strongly on spot rates. In out-of-sample forecasting all models easily outperform a random walk benchmark. Forward rates do help to forecast spot rates, suggesting some degree of speculative efficiency. However, in predicting forward rates, the VECM is unhelpful, and ARIMA or VAR models forecast better. The exercise illustrates the dangers of forecasting with equilibrium correction models when the underlying market structure is evolving, and coefficient estimates conflict with sensible priors.

JEL classification: G13; G14

Keywords: Forecasting; Freight market; Commodity market: Vector equilibrium correction model; ARIMA model

1. Introduction

In this paper we investigate the performance of alternative univariate and bivariate linear time-series models in generating short-term forecasts of spot freight rates in the international dry bulk shipping market, and corresponding rates fixed in the Forward Freight Agreement (FFA) market. The FFA market is interesting for several reasons. First, it is relatively new and under-researched, and our findings come from a unique and specially constructed database of forward freight rates. There is practical value to users of the market – ship owners and shipping agents – in knowing whether and how forward rates can best be used to predict spot rates. Second, the underlying asset traded in the FFA market is a service rather than a storable commodity. This means that arbitrage between spot

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and forward markets is not possible, so spot and forward prices are not linked by the rigid cost-of-carry relationships observed in most commodity markets. Third, unlike the large established markets in commodities and financial futures, the FFA market is small and dominated by the activities of hedgers rather than speculators. It cannot therefore be taken for granted that all information relevant to future freight rates is automatically incorporated into the forward price.

In these circumstances we should expect to observe certain characteristics in the time series of spot and forward freight rates. In speculatively efficient markets for nonstorable commodities, forward prices are unbiased forecasts of future spot prices, and changes in forward prices for fixed target dates are close to random, reflecting the arrival of news. The thinness of the FFA market and the absence of a strong speculative interest mean that forward freight rates may exhibit neither of these properties. Similarly, in arbitrage-dominated markets, forward rates are tied to spot rates, and both tend to move to ensure convergence at the expiry of contracts, as the cost of carry falls. The absence of arbitrage in the FFA market means that the spot rate may converge on the forward rate, provided that the forward rate embodies some expectations about future spot rates. However, there is no reason why the forward rate should converge on the spot rate.

The most general model we use is a vector error-correction (VECM) model linking spot and forward rates for four major shipping routes. This model is used to make inferences about the efficiency and usefulness of FFA rates. For example, if forward rates are expectations of spot rates we would expect (a) there to be a cointegrating vector linking spot and forward rates, and (b) the cointegrating vector to be the basis (that is, spot rate − forward rate = 0), and (c) this equilibrium to be established by spot rates converging on forward rates, but not vice versa.

The validity of the VECM model is tested by benchmarking forecasts from it against forecasts from a number of alternative linear time series models, and against the random walk. Even if two price series are cointegrated, incorporating the information contained in the cointegrating relationship in the model is not guaranteed to improve predictability. Moreover, as discussed by Clements and Hendry (1995, 1998, 2001), the VECM is not robust to structural change. The equilibrium correction term forces variables to their average historical relationship, so long-term forecasts in particular may be inaccurate if the underlying relationship has shifted. Stock and Watson (1996) show that most mainstream macroeconomic variables have been subject to significant structural change in recent decades. As a consequence, Allen and Fildes (2001) find that in practice, VECM models have a mixed track record in forecasting such time series. In commodity markets, the balance of evidence seems to favour the VECM approach. For example, Zeng and Swanson (1998) estimate VECM and other models for spot and futures prices of the S&P500 index, the US 30-year T-bond, gold and oil. They find that the VECM predicts better than all simpler models, and also the random walk. However, this is not surprising since in their chosen markets the possibility of arbitrage ensures that the basis (futures price−spot price) is equal to the cost of carry (borrowing cost less own rate of return on the spot asset), and their best-performing models use this as the cointegrating vector. Cash-and-carry arbitrage (borrow funds, buy spot, sell forward) is not feasible in the freight market since the underlying asset cannot be stored. Cullinane (1992) and Cullinane, Mason, and Cape (1999) report success in forecasting spot freight rates using simpler univariate ARIMA models. Kavussanos and Nomikos (2003) compare joint VECM forecasts of spot freight rates and the now defunct exchange traded BIFFEX futures freight rates with forecasts from ARIMA, VAR and Random Walk models. They find that the VECM generates the most accurate forecasts of spot prices but not of futures prices. Their tests use overlapping forecast intervals, which Tashman (2000) argues may bias forecast evaluation, and we have been careful to design our forecast evaluation procedures to avoid this problem. Alizadeh and Nomikos (2003) examine the directional forecast accuracy of FFAs and Freight Futures contracts (BIFFEX) in four routes and concluded that FFAs do not seem to be very accurate in revealing the direction of future freight rates. They report that the directional accuracy of FFAs in forecasting freight rates varies between 46% and 74%, and, in general, forecasting accuracy declines as maturity increases.

The paper is organised as follows. Section 2 describes the data and the models that are used to generate the forecasts. Sections 3 and 4 present the different models used to generate forecasts and discuss in-sample estimation results. Section 5 evaluates the forecasting