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Spillover effects in energy futures markets

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Abstract

Price discovery in crude oil and refined oil products has been extensively undertaken in organised futures markets for over a decade now. There are two dominant such markets today: the first one in the New York Mercantile Exchange; and the second in London's International Petroleum Exchange. With the demise of OPEC as the leading price setter for crude and products, NYMEX light sweet crude and Brent crude have usurped the role of benchmark grades for price setting. To date considerable work has been done to scrutinise the degree to which these two markets price efficiently, but little with regard to the way the two markets interact. Participants in these markets move with relative ease from one market to the other and usually take positions in both of them. It is of interest, therefore, to investigate the information transmission mechanism by looking at spillover effects and, perhaps, identify which market is the true price leader. This paper is a first attempt to look at such a problem in the energy market, although similar studies have been done on stock market indices. It is found that substantial spillover effects do exist when both markets are trading simultaneously, although IPE morning prices seem to be considerably affected by the close of the previous day on NYMEX.

JEL classification: C22, Q49

Keywords: Crude oil futures; Spillover effects; Exogeneity

1. Introduction

Organised commodity futures markets have been around since the end of the last century, but despite their longevity they have often been criticised as relatively less transparent, more inefficient and more difficult to interpret than more recently established financial futures markets. Agricultural commodity futures have been

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the prime focus of most research, but energy futures came to the limelight after the oil price collapse in 1986. Since then, there are primarily two markets which act as benchmarks for the pricing of crude oil and its refined products, on an international basis: New York and London.

In the crude oil market, more specifically, it is two 'marker' crudes that set the pace in prices: West Texas Intermediate and Brent Blend. The former is the base grade traded, as 'light sweet crude', on the New York Mercantile Exchange (NYMEX), while the latter is traded on London's International Petroleum Exchange (IPE) and is also one of the grades acceptable for delivery of the NYMEX contract.

Much of the research to date has focused on the interaction between the cash and the futures tiers of the crude oil market. In contrast, our research question focuses on the information linkages between the two markets. Variations of this question could be: Does the law of one price hold for the two markets?; Is one market more efficient than the other in assimilating information?; and Does one market 'lead' the other in its pricing function?

This paper investigates the information transmission mechanism between NYMEX and IPE crude oil contracts in both non-overlapping and simultaneous trading hours. It also addresses the concomitant questions of: how fast information is transmitted (e.g. within the same day or overnight); in which direction the information flows; and through which mechanism(s) information is transmitted (e.g. through price returns themselves or the variance of these returns).

We start by reviewing the literature on energy futures markets and — more importantly — on the issue of market linkages. We continue with a review of the data at our disposal, their characteristics and shortfalls (where inevitable), and the consequences in the choice of methodology. Following that is the section discussing the methodology employed and the interpretation of empirical results. The paper concludes with a summary of the most important findings and suggestions for further research.

2. Literature review

We concentrate on the subject of linkages between geographically separated markets where research has been restricted to the financial markets only, with work largely concentrated on stock markets. The dominance of the US market is well documented. King and Wadhwani (1990) investigate the volatility spillover issue among stock markets and find evidence supporting contagion effects, and Eun and Shim (1989) find that innovations in the US are rapidly transmitted to other markets, whereas no single foreign market can significantly explain US market movements. Koutmos and Booth (1995) find: (a) price interdependencies, with significant price spillovers from New York to Tokyo, as well as from Tokyo and New York to London; and (b) extensive price volatility interdependencies and sign effects.

Hamao et al. (1990) examine the transmission mechanism in common stock