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Information transmission in informationally linked markets: Evidence from US and Chinese commodity futures markets

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This paper investigates information transmission and price discovery in informationally linked markets within the multivariate generalized autoregressive conditional heteroskedasticity and information share frameworks. Based on both synchronous and non-synchronous trading information from Chinese futures/spot markets, the New York Mercantile Exchange (NYMEX), Chicago Board of Trade (CBOT), and CME Globex futures markets for copper and soybeans, we show that there is a bidirectional relationship in terms of price and volatility spillovers between US and Chinese markets, with a stronger effect from US to Chinese markets than the other way around. Additionally, the NYMEX and CBOT play a more important role than the CME Globex in the flow of information from US to Chinese markets. Moreover, we find that Chinese copper market adjusts more quickly than the NYMEX copper market to correct the disparity between both markets. However, the converse is true in the case of soybeans. Finally, our results highlight the remarkable role of Chinese futures markets in the price formation process, though NYMEX and CBOT futures markets are the main driving force in price discovery.

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1. Introduction

The term “informationally linked markets” refers to markets in which traded assets are fundamentally related to each other. Although these markets are interrelated, they have different information processing abilities and make different contributions to price discovery due to distinct transaction costs, regulations, liquidities, and other institutional factors. It is important for us to understand the dynamic nature of the price discovery process, because it reflects information transmission across markets, thereby providing an indication of price efficiency.

Price discovery and information transmission in informationally linked markets have been extensively examined in the literature. In their seminal paper, [Garbade and Silber \(1979\)](#) first propose the concepts of dominant and satellite markets and analyze the short-run price behavior of an identical asset traded in two different markets: the New York Stock Exchange and regional stock exchanges. Subsequently, a number of studies have investigated the lead–lag relationship between two informationally linked markets, such as spot and futures markets, and domestic and overseas futures markets ([Ding et al., 1999](#); [Hasbrouck, 1995](#); [Lihara et al., 1996](#); [Roope and Zurbruegg, 2002](#); [Tse, 1999](#); [Xu and Fung, 2005](#)). [Grammig et al. \(2001\)](#) examine price discovery in international equity trading by analyzing quotes originating in New York and Frankfurt for internationally-traded firms. On the other hand, some research focuses on the case of three markets. For example, [Booth et al. \(1996\)](#) document the linkages and information transmission of similar Nikkei 225 stock index futures traded on the Osaka Securities Exchange, the Singapore Exchange, and the Chicago Mercantile Exchange, and find that none of the markets can be considered the main source of information flow. [Chu et al. \(1999\)](#) explore the price discovery function in three S&P 500 index markets: the spot index, the futures index, and S&P Depository Receipts (SPDRs) markets by using matched synchronous intraday trading data. Their results suggest that the futures market serves a dominant role in price discovery, and imply that price adjustments take place in the spot index and SPDRs markets, but not in the futures market. [So and Tse \(2004\)](#) investigate price discovery relations among the Hang Seng Index, Hang Seng Index futures, and the tracker fund using the [Hasbrouck \(1995\)](#) and [Gonzalo and Granger \(1995\)](#) common-factor models as well as the multivariate generalized autoregressive conditional heteroskedasticity (M-GARCH) model. They conclude that futures markets contain the most information, followed by the spot market, while the tracker fund does not contribute to price discovery. [Covrig et al. \(2004\)](#) assess intraday information revelation and price discovery for the Nikkei 225 spot index traded on the Tokyo Stock Exchange (TSE), Nikkei 225 futures traded simultaneously on the Osaka Securities Exchange (OSE) and the Singapore Exchange (SGX), and confirm the dominant role of futures markets in price discovery.

This paper investigates price discovery and information transmission across Chinese commodity spot/futures markets and US futures markets. In particular, for Chinese markets we consider copper and soybean spot contracts, copper futures on the Shanghai Futures Exchange (SHFE), and soybean futures on the Dalian Commodity Exchange (DCE). For US markets, we consider copper futures on the New York Mercantile Exchange (NYMEX), soybean futures on the Chicago Board of Trade (CBOT), and CME Globex copper/soybean futures. Our research represents a significant contribution to the literature in a number of ways.

First, previous studies on this subject focus mainly on spot and futures markets or the domestic and overseas futures markets that have the same or overlapped trading hours. However, our research is based on both synchronous and non-synchronous trading information in three markets. While the regular trading hours of the NYMEX and CBOT do not overlap at all with those in Chinese markets, CME Globex copper and soybean futures trade throughout the entire Chinese trading session and also trade when Chinese markets are closed. Information flows rapidly between US and Chinese markets, but may exhibit different characteristics during the overlapped and non-overlapped trading periods. It is documented that, as a result of different rates of information flow, asset price volatilities are higher during exchange trading hours than at other times ([French and Roll, 1986](#)). [Liu et al. \(2011\)](#) further show that the information accumulated during non-trading hours contributes substantially to integrated risks of Chinese commodity futures markets. Apparently, the trading activity in the US NYMEX/CBOT and CME Globex futures markets represents an important part of this non-trading period information in Chinese markets. Our research serves as an important step toward understanding characteristics of information flow across markets with both overlapped and non-overlapped trading

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