Determinants and information content of intraday bid-ask spreads: Evidence from Chinese commodity futures markets

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ABSTRACT

This paper investigates the way in which intraday bid-ask spreads are related to trading volume, volatility, skewness, as well as kurtosis for commodity futures on copper, aluminum, gold, and rubber in China. We show that bid-ask spreads are generally negatively related to trading volume and skewness, but positively related to volatility and kurtosis. In addition, the effects of trading volume, volatility, and skewness are stronger than those of kurtosis. Moreover, using a threshold regression model, we document that these relations exhibit asymmetries with regard to good versus bad news, large versus small volatility, positive versus negative skewness, as well as high versus low kurtosis. While these asymmetric effects vary across futures, we find some common patterns, and provide economic explanations for the observed asymmetric relations.

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1. Introduction

It is well documented in the market microstructure literature that bid-ask spreads in financial markets contain substantial market information. In conventional open outcry markets, bid-ask spreads repay market makers for the costs incurred in providing market liquidity, including the costs for carrying and managing inventories (Cohen et al., 1981; Ho and Stoll, 1981; O'Hara and Oldfield, 1986) to meet traders' demand immediacy requirements as well as the costs for processing orders (Benston and Hagerman, 1974; Stoll, 1989). Additionally, bid-ask spreads represent compensation for potential losses resulting from trading with informed traders, which is referred to as the asymmetric information (or adverse selection) cost component (Copeland and Galai, 1983; Easely and O'Hara, 1987; Glosten and Milgrom, 1985). Thus, bid-ask spreads measure the round-trip transaction costs for traders and can also be used as a proxy for market liquidity. It is particularly important for traders, market regulators, and researchers to understand the determinants, components, and patterns of bid-ask spreads in financial markets.

While there is an extensive literature on bid-ask spreads in equity and options markets, futures markets have received a great deal of attention in recent studies. For example, Ding (1999) analyzes the intraday and daily determinants of bid-ask spreads for Deutsche Mark (DM) and Japanese Yen (JY) foreign exchange futures traded on the Chicago Mercantile Exchange (CME), and finds that trading volume and price volatility are the major determinants. In particular, he finds that trading volume is negatively

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related to bid-ask spreads, while price volatility is positively related to bid-ask spreads. Locke and Sarkar (2001) investigate changes in the provision of liquidity in futures markets across volatility levels, and their results are consistent with the notion that for high-cost, inactive contracts, market makers will raise their bid-ask spreads in response to temporary increases in volatility. Using bid-ask spreads as a measure of liquidity, Goss and Avsar (2002) examine how bid-ask spreads for US dollar and JY futures are related to their trading volume and volatility. They show that the relationship is non-linear, with bidirectional Granger causality between bid-ask spreads and trading volume as well as volatility. Huang (2004) compares the intraday components of bid-ask spreads in Taiwan's stock index futures traded on the Taiwan Futures Exchange and Singapore Exchange Derivatives Trading Limited, and finds that volatility and information are the major determinants of the information asymmetry and order-processing cost components of bid-ask spreads in both markets.

The purpose of this paper is to investigate the determinants and information content of bid-ask spreads for Chinese commodity futures contracts. More specifically, our work is motivated by two research issues. First, we are interested in exploring the roles of trading volume, volatility, skewness, and kurtosis in determining intraday bid-ask spreads. This complements the previous work on this subject that focuses primarily on the effects of trading volume and volatility. Including skewness and kurtosis in explaining bid-ask spreads is crucial, as it is widely documented in the literature that higher moments in asset returns are related to asset valuation and subsequent returns. For example, Boyle et al. (2010) find that investors pay a premium for stocks with higher expected skewness. Harvey and Siddique (2000) also show that conditional skewness helps explain the cross-sectional variation of expected returns across assets. Bali and Murray's (2013) findings provide further support for the pricing of risk-neutral skewness in stock returns. Conrad et al. (2013) use option prices to estimate ex ante higher moments of the underlying individual securities' risk-neutral return distributions, and find that individual securities' risk-neutral volatility, skewness, and kurtosis are strongly related to future returns. Similarly, Dittmar (2002) and Poti and Wang (2010) demonstrate that kurtosis, along with skewness, helps explain the cross-section return of industry-sorted portfolios. In addition, previous work in this area documents that higher moments greatly influence portfolio selection decisions (Gibbons et al., 1989; Scott and Horvath, 1980). Thus, we conjecture that in addition to trading volume and volatility, skewness and kurtosis also play an important role in determining bid-ask spreads.

Second, we seek to understand the asymmetric effects of good versus bad news, large versus small volatility, positive versus negative skewness, as well as high versus low kurtosis on the determination of bid-ask spreads; previous work does not distinguish these asymmetric effects. Markets respond to good and bad news in different ways (Perrakis and Khoury, 1998; Thomakos et al., 2008). Market characteristics and performance, as well as investors' trading behaviours in the cases of large volatility, positive skewness, and high kurtosis, are distinct from those in the cases of small volatility, negative skewness, and low kurtosis (Albuquerque, 2012; Bajo, 2010; Conrad et al., 2013; Diavatopoulos et al., 2012; Dungey and Hvozdyk, 2012; Yoon and Byun, 2009). By explicitly incorporating the asymmetric effects under these distinct market conditions into our model, we are able to identify the economic rationale behind the relations between bid-ask spreads and various factors under consideration. To detect the asymmetries in these relations, we adopt a threshold regression model, with a skewed student-t (ST) distribution to better capture observed distribution characteristics in futures data.

In this paper, we utilize data on Chinese commodity futures, including copper, aluminum, rubber, and gold futures traded on the Shanghai Futures Exchange (SHFE). In contrast with the low-frequency data used in previous studies, in this analysis we use high-frequency tick-by-tick futures trading data, in an effort to provide an in-depth analysis of the content of intraday bid-ask spreads and to reveal microstructure characteristics and information efficiency in Chinese commodity futures markets. Futures returns are calculated using five-second interval futures prices that are extracted from the tick-by-tick data set. Bid-ask spreads, trading volume, volatility, skewness, and kurtosis are then calculated using the data in 15-min intervals.

From an empirical perspective, Chinese commodity futures provide an interesting case for research. Chinese futures are traded by an electronic trading system rather than the conventional open outcry trading system. Due to the distinctions between open outcry and electronic trading, bid-ask spreads under electronic trading may exhibit different characteristics in terms of size and intraday patterns. Aitken et al. (2004) document that electronic trading can facilitate higher levels of liquidity and lower transaction costs than can the traditional system, leading to lower bid-ask spreads for futures markets in Hong Kong, London, and Sydney. Cheng et al. (2005) also demonstrate that bid-ask spreads tighten with electronic trading. Further, there are significant structural and institutional differences between Chinese futures markets and other markets, particularly developed markets. These differences include information release mechanisms, trading regulations, daily price limits, and contract specifications, among others (Liu and An, 2011). Although these factors are not directly observable from the screen, their impacts on markets will be reflected in bid-ask spreads, trading volume, and volatility in markets, leading to different relations among these variables than the relations documented in developed markets. Focusing on Chinese commodity futures may provide new insights into how various factors drive the size of bid-ask spreads, and help us better understand the market microstructure and information characteristics in emerging markets.

We find that bid-ask spreads are generally negatively related to trading volume and skewness, but positively related to volatility and kurtosis. In addition, the effects of trading volume, volatility, and skewness are stronger than the effects of kurtosis. Moreover, we document that these relations exhibit asymmetries with regard to good versus bad news, large versus small volatility, positive versus negative skewness, as well as high versus low kurtosis.

The remainder of this paper is organized as follows. Section 2 describes bid-ask spreads and defines the variables under consideration in the paper. Section 3 discusses the data sets. Section 4 presents empirical results and analyses, while Section 5 concludes this paper.