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Trading activity and price behavior in Chinese agricultural futures markets

Xiaolin Wang[a,c,*], Qiang Ye[a], Feng Zhao[b]

[a] School of Management, Harbin Institute of Technology, China
[b] Naveen Jindal School of Management, University of Texas at Dallas, USA
[c] School of Economics, Heilongjiang University of Science and Technology, China

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ABSTRACT

Using a comprehensive sample of China's agricultural futures from 2010 to 2015, we investigate the relation between trading activities and futures markets liquidity, returns and volatilities. We find that contemporaneous order imbalances are positively related to returns. Order imbalance caused by price pressure lasts more than one day indicating difficulty in absorbing excess buy and sell orders. We also find that lagged order imbalance can predict current returns and that the effect of order imbalance on liquidity is limited. These results are consistent with the explanation that speculative trading not liquidity hinders the Chinese agricultural futures markets to accommodate excess order imbalance.

1. Introduction

Agricultural futures markets play a significant and important role in the production, circulation and consumption of agricultural commodities in the world. According to the latest investigation of FIA (Futures Industry Association), China has already been the largest market in the global agriculture futures markets. Foreign investors start to participate more in the Chinese markets due to loosening regulation. Therefore understanding of the Chinese agricultural futures markets is of great interest to regulators, practitioners and researchers alike.

We measure trading activity mainly by order imbalance in addition to trading volume. Trading volume is frequently split into small orders by investors, and volume alone could not represent the direction of trade. In contrast order imbalance could better reflect trading activity, it overcomes the inherent weaknesses of volume. Who is buying and who is selling are important elements in determining the information content of trades, the order imbalance and inventory accumulation of liquidity providers, the price impact of large trades, the effective spread, as well as many other related questions. The commonly available high frequency databases do not provide information on trade direction. Empirical researchers consequentially rely on trade direction algorithms in order to classify trades as either buyer- or seller-motivated. Most studies use one of three trade classification algorithms: the quote rule, the tick rule, and the Lee–Ready (1991) rule. A large body of literature studies the relationship between order imbalance and stock market returns. In the early phase most studies analyze order imbalances around specific events over short time horizon. Blume et al. (1989) demonstrate that there is a strong relation between order imbalance and stock price movements at both the time series and cross-section level when using data surrounding the October 1987 crash. Fung (2007) demonstrates that the arbitrage spread is positively related to

* Corresponding author. Tel.: +8613936255516.
E-mail address: wxl-jun@163.com (X. Wang).

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Table 1
Top 10 agriculture futures and options contracts.

Rank	Contract	Exchange	Contract size	Jan-Dec 2013 volume	Jan-Dec 2014 volume	Annual % change
1	Rapeseed meal futures	ZCE	10 tonnes	160,100,378	303,515,966	89.60%
2	Soy meal futures	DCE	10 tonnes	265,357,592	204,988,746	–22.70%
3	White sugar futures	ZCE	10 tonnes	69,794,046	97,726,662	40.00%
4	Rubber futures	SHFE	10 tonnes	72,438,058	88,631,586	22.40%
5	Palm oil futures	DCE	10 tonnes	82,495,230	79,996,388	–3.00%
6	Corn futures	CBOT	5000 bushels	64,322,600	69,437,304	8.00%
7	Soy oil futures	DCE	10 tonnes	96,334,673	64,082,631	–33.50%
8	Soybean futures	CBOT	5000 bushels	46,721,081	49,169,361	5.20%
9	Egg futures*	DCE	5 tonnes	1,951,323	35,188,187	1703.30%
10	Cotton no. 1 futures	ZCE	5 tonnes	7,452,748	31,782,665	326.50%

* Began trading in November 2013 (Data from FIA 2015: 2014 FIA Annual Global Futures and Options Volume).

the aggregate order imbalance in the underlying index stocks, as well as that a negative order imbalance has a stronger impact than a positive order imbalance. Fung and Yu (2007) examine the impact of stock market order imbalance on the lead-lag relationship between index futures and cash index prices. Chen et al. (2014) examine order imbalances as a proxy for the influence of informed volatility trading.

In this paper, we conduct a study of the Chinese futures markets in nine agriculture futures contracts in two Chinese future markets, the Dalian Commodity Exchange (DCE) and Zhengzhou Commodity Exchange (ZCE) covering the period from 2010 to 2015. The availability of high-frequency data allows us to examine a wide variety of issues in Chinese agriculture markets. Our study focuses on the daily time-series relation between order imbalances and agriculture futures returns. Our empirical results find that contemporaneous order imbalances are positively related to returns. However, order imbalance caused by price pressure on a given day persists without sufficient investors taking the opposite side. This hinders absorption of price induced buying/selling pressure. We also find lagged order imbalances have a positive predictive relation to current day returns and that the effect of order imbalance on contemporaneous liquidity is moderate and very little on the subsequent liquidity, measured as quoted spread. These results are consistent with the explanation that speculative trading not liquidity makes the Chinese agricultural futures markets less able to absorb order imbalance.

This paper is organized as follows. Section 2 introduces the background of Chinese futures institutions. Section 3 describes the data. Section 4 discusses the relation between order imbalance and returns. Section 5 concludes.

2. Institutional background

There are currently three futures exchanges in China: the Zhengzhou Commodity Exchange, the Dalian Commodity Exchange, and the Shanghai Futures Exchange. Both the ZCE and DCE trade in agricultural commodity futures, primarily wheat in the ZCE and soybean in the DCE; the SFE specializes in trading metals. According to the United States FIA the SHFE, DCE, and ZCE ranked ninth, tenth, and twelfth respectively in global leading derivative exchanges by number of contracts traded and cleared during 2015.

Table 1 shows the global top 10 agriculture futures and options contracts; eight contracts are from China among the top 10. Obviously China is already the biggest market in the global agriculture futures markets. Both the ZCE and DCE have fully functional electronic systems including trading, delivery, clearing, risk control, news release, member services, etc.

3. Data

Our data sample period is from January 1, 2010 to March 30, 2015, including 1269 trading days. Each transaction is designated as either buyer- or seller-initiated according to the Lee and Ready (1991) algorithm. First, a transaction is classified as a buy if the price is above the midpoint of the best bid and the best ask price. It is classified as a sell if the price is below the midpoint quote, and transactions executed at the midpoint are not classified. Secondly, the transactions executed at the midpoint are classified by price movements relative to previous trades. If the transaction is above (below) the previous price, then it is a buy (sell). If there is no price change but the previous tick change was up (down), then the trade is classified as a buy (sell). Transaction data are respectively included or excluded according to the following criteria:

A trade is excluded if it is out of sequence, recorded before the open or after the closing time, or has special settlement conditions (since it may be subject to distinct liquidity considerations);
Quotes established before the opening of the market or after the close are excluded;
Negative bid-ask spreads are discarded;
Following Lee and Ready (1991), any quote less than five seconds prior to the trade is ignored and the first quote at least five seconds prior to the trade is retained.
For each day interval we compute the following:
$NOIB_{it}$: the number of buyer-initiated trades less the number of seller-initiated trades during day t for agriculture future *i*;