Who Has the Final Say? Market Power versus Price Discovery in China’s Sugar Spot and Futures Markets

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Abstract

Purpose—There is a clear departure between pricing power and price discovery in China’s sugar spot and futures markets. Our aim is to identify the reasons and provide our plausible explanations to this stylized phenomenon; therefore, our research may deepen the understandings of the operational mechanisms and internal efficiency of China’s sugar spot and futures markets.

Methodology—We analyzed the historical spot and futures price time series from China’s sugar spot market and Zhengzhou Commodity Exchange (CZCE) within a co-integration framework.

Findings—We found that China’s sugar spot market has the pricing power even though the futures market leads the spot market in price discovery. The phenomenon of observed departure of pricing power and price discovery of futures market may be caused by (i) irrational speculation in CZCE sugar futures market, (ii) oligopoly and local government politics, and (iii) the operational efficiency of the wholesale spot market, especially for its comparative advantages of information accessibility in the sugar producing areas. We also compared our results with other empirical findings in many other commodities markets.

Originality—We uncover and provide the earliest econometric evidence of the observed stylized phenomenon; We also provide our plausible explanations to this phenomenon.

Keywords: China’s sugar markets; co-integration; pricing power; price discovery

JEL Codes: C58, G13

1. Introduction

In recent decades, growing attentions have been drawn to China’s economy, the most important representative of transition and emerging economies, because of its rapid development and increasing influence. During China’s transition to a market economy, various futures markets have been launched to discover price and hedge risk. Among them, China’s Zhengzhou Commodity Exchange (CZCE), which was established in 1993, is one of the four futures exchanges in China, and specializes in the agricultural commodity futures contracts1, such as White Sugar2, Early Long-Grain Non-glutinous Rice3, Strong Gluten and Hard White Wheat contracts4, etc. It is intriguing to investigate whether or

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not China’s futures markets seized the pricing power through competition among buyers and sellers to find the prices for the spot markets, just like related counterparts perform in developed economies (Schwartz and Francioni, 2004).

On January 6th, 2006, CZCE inaugurated White Sugar contract (Sugar for short). Before the listing of the sugar futures contract, sugar was traded in the wholesale markets mainly in three southern provinces: Guangxi, Guangdong and Yunnan. Forward spot trading was somehow playing a role of futures markets before January 6th, 2006; that is, forward price became the benchmark of spot transaction. China’s sugar industry is essentially spatially clustered industry, for most sugar crops are produced mainly within the three provinces in Southern China. In 2008, over 70% of China’s sugar production is produced within this region. Except for the characteristics of spatial concentration, China’s sugar industry is actually unilaterally isolated from international sugar markets because China’s domestic sugar markets are basically self-sufficient; therefore, the pricing mechanisms are mainly influenced by domestic instead of international supply and demand. Based on the practical situation of China’s sugar industry, thereby an interesting question arises: is there separation of price discovery and pricing power? Since market power (in the form of spot market oligopoly) is prominently influential, the futures market might lose its pricing power and thereby fail to discover the right prices.

The function of price discovery is an important measure of the market efficiency of a futures market. In our paper, the price discovery is defined as price leadership and information transmission mechanism. Price discovery of futures market includes two aspects: pricing efficiency and information efficiency (Chen and Zheng, 2008). The former reflects rationality of futures contract pricing by examining whether there is non-arbitrage equilibrium, while the latter indicates how the price reflects market information immediately and correctly. In current literature, some researchers believe the speed of price adjustment can be viewed as a measure of information efficiency (Calamia, 1999); namely, how quickly price adjusts to new information and changes accordingly over time. It is important to note that, however, pricing efficiency and information efficiency may not necessarily be satisfied simultaneously in one specific market. Pricing efficiency usually depends on the inter-market arbitrage mechanism, while information efficiency relies on market maturity and transaction costs.

The study of price discovery (or market efficiency) and pricing power in agricultural commodity futures markets is important to government, related practitioners, and researchers in China. To be more specific, the government might make serious mistakes in setting policies without this critical knowledge; the practitioners need a reliable estimator of future prices to allow them effectively manage their risks; the findings on this issue is the economic premise and starting point to the researchers who want to make correct predictions or propose feasible policy suggestions. In one word, our research may deepen the understandings of the operational mechanisms and internal efficiency of China’s sugar spot and futures markets.

2. Literature Review

In current literature, many studies discuss price discovery between agricultural futures markets and spot markets. Fortenbery and Zapata examine the relationship between the New York coffee futures market and cash market, and found the futures market serves as the point of initial price discovery and cash market price variances may be influenced by the futures market (Fortenbery and

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Zapata, 2004). However, many others disagree and argue that futures market responds to price changes of spot market (Silvapulle and Moosa, 1999). Park et al. studied the interregional grain trade in China to characterize the market emergence during the process of economic transaction (Park et al., 2002).

Among current literatures on agricultural spot and futures markets, previous findings in existing literature support that an efficient futures market is characterized with dominant market power. Mattos and Garcia investigate the price discovery in Brazilian agricultural futures markets, and find that unlike more actively traded futures contracts such as coffee and live cattle, the thinly traded sugar futures market plays a more dominant role in the long-run price discovery (Mattos and Garcia, 2004). Empirical findings in the literature support that futures price plays a major role in price discovery, that is due to the greater transparency and, often, greater liquidity of commodity futures over physical commodities, futures markets react more quickly to new or unexpected information than the underlying spot market (Baldi et al., 2011). However, an exceptional case is reported by Baldi et al. (2011) in CBOT soybean market among the 2007-2008 world food price increases. In times of crisis and in particular in phases of strong price increases, the cash market becomes an important factor in the price discovery process because of the importance of fundamental patterns to price discovery in a special period, rather than financial trading on futures markets (Baldi et al., 2011).

Similar issues are widely concerned and discussed on electricity futures or forward contracts. Janssen and Wobben measure the exercise of the potential market power in German electricity market by comparing the time-dependent marginal cost (TMC) (Janssen and Wobben, 2009), but their research seldom discusses the interaction between futures and spot markets. Anderson and Hu investigate the wholesale electricity forward contract market in which generators can exert market power, and find that the existence of forward hedging contracts between consumers and generators mitigates this market power and may lead to social welfare maximization in some circumstances (Anderson and Hu, 2008).

Focusing on China’s futures markets, we investigate the separation of price discovery and pricing power of sugar futures market from a perspective of the interactions between the futures and spot markets, which is an important problem seldom discussed in current literature. First, a co-integration test and VECM model are established to test the efficiency of China’s sugar futures market. Second, the pricing power is measured by means of information share. Third, empirical analyses and discussion are performed to discuss obstacle factors to the development of this futures market.

3. Theoretical Framework

Co-integration

Co-integration has become a standard technique of Econometrics. In this article, the existence of co-integration does not address whether any individual market is pricing information correctly, but allows one to examine whether two different markets respond to the same information synchronously (Fortenbery and Zapata, 2004; Zapata and Fortenbery, 1996; Fortenbery and Zapata, 1997; Sanjuan and Dawson, 2003). Therefore, we apply co-integration theory to analyze the price discovery function of China’s sugar futures market.

Some researchers applied Granger and Engle two-step estimation procedure (Engle and Granger, 1987). But E-G model can hardly infer parameters and determine the co-integration rank of the equation, we used Johansen’s co-integration approach (Johansen and Juselius, 1990) based on VAR
model (Sims, 1980) to test the co-integration relationship and obtain equation parameters by maximum likelihood method.

Since time series is usually non-stationary and co-integrated, it is appropriate to perform the empirical analysis in a vector autoregression (VAR) framework (Engle and Granger, 1987), which is given by

\[
\Delta y_t = \alpha + \sum_{i=1}^{k} \gamma_i \Delta x_{t-i} + \sum_{i=1}^{k} \delta_i \Delta y_{t-i} + \epsilon_t
\]  

(1)

After differentiating, it satisfies

\[
\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta y_{t-i} + \epsilon_t
\]  

(2)

Co-integration is tested by the rank of \( \Pi \) coefficient matrix in Eq.(2). To estimate the rank of \( \Pi \), we use two tests: the trace test (Johansen, 1988) and the maximum eigenvalue (\( \lambda_{\text{max}} \)) test (Johansen and Juselius, 1990).

**VECM model**

Usually after identifying the long-run equilibrium relationship via co-integration approach, one should further investigate short-term relationship. Therefore, vector error correction model (VECM) is established to examine short-term efficiency in the markets.

According to Granger Representation Theorem (Granger and Weiss, 1983; Engle and Granger, 1987), if two variables are integrated of order 1, they can always be expressed in a VECM:

\[
\Delta y_t = \alpha + \lambda \text{ecm}_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta x_{t-i} + \sum_{i=1}^{k} \delta_i \Delta y_{t-i} + \epsilon_t
\]  

(3)

where \( \text{ecm}_{t-1} = y_{t-1} - \beta x_{t-1} \) is the error correction term, and parameter \( \lambda \) reflects the speed to restore equilibrium.

**Granger Causality**

Granger (Granger, 2001) pointed out that Granger Causality test could be conducted under an ECM framework. Silvapulle and Moosa (Silvapulle and Moosa, 1999) also indicated that error correction term should be included when Granger Causality test is conducted on two variables with co-integration relationship.

In Eq.(3), \( k \) is the optimal lag length chosen by sequentially testing lags in a VAR model. Then we use residual sum of squares (RSS) to perform F statistics, which tests if \( \gamma_1 = \gamma_2 = \cdots = \gamma_k = 0 \). If the null hypothesis is accepted, \( x \) cannot be Granger causing \( y \).

**Impulse Response Function**

Impulse Response Function (Lütkepohl, 1993) is estimated to measure the impacts of an innovation (one standard error) on endogenous variables (Lutkepohl and Reimers, 1992; Lütkepohl and Breitung, 1997).

**Variance Decomposition**

Variance decomposition is applied to measure the importance of a shock from each of the variables in the system to explain the forecast error variance of a specific variable. Granger causality test only captures the direct relationship between the variables, while variance decomposition can identify both direct and indirect impacts that propagate through other variables in the system.

According to Hashbrouck (1991, 1995), information shares (IS) in the Variance decomposition model are based on reactions to price shocks. This approach assumes that price volatility reflects new information and attributes superior price discovery to the market that contributes most to the variance of the innovations to the common efficient price.
If there is no correlation between the innovations the information share of the futures market is defined as:

$$H_F = \frac{\gamma_F^2 \delta_F^2}{\gamma_F^2 \delta_F^2 + \gamma_S^2 \delta_S^2}$$

where $\gamma_F$ and $\gamma_S$ are the coefficients of the error correction terms, and $\delta_F$, $\delta_S$ and $\gamma_{FS}$ are obtained from the residual covariance matrix from the VECM.

### 4. Data Description

The empirical results presented in this study are based on the data set comprises daily closing price for a rollover of nearby futures contracts\(^5\) from January 6\(^{th}\), 2006 to September 21\(^{st}\), 2009. CZCE futures prices are taken from Reuters Database, while spot market prices are the wholesale ones taken from Guangxi Sugar Net (http://www.gsmn.com.cn/). Guangxi is the major sugar-producing province in China. To investigate the co-integration relationship between the futures and spot prices, we exclude the unmatched prices and get 770 pairs of data. We also eliminate the possible heteroskedasticity in the data by means of the natural logarithm, i.e., $\ln f$ for futures and $\ln s$ for spot prices respectively.

### 5. Empirical Analyses

**Is China’s sugar futures market pricing efficient?**

As an initial step, the data were tested for the order of integration. The ADF test results (see Table 1) confirm that the series are non-stationary in levels and stationary in first differences.

As indicated by the unit root test, since $\ln f$ and $\ln s$ are both integrated of order 1, we apply the Johansen test to detect co-integration between the variables within a VAR model (Eqs. (1) and (2)).

Then we perform co-integration tests for futures prices and spot prices (see Table 2), which include the maximum eigenvalue ($\lambda_{\text{max}}$), the trace statistics and the probability, as well as the tested co-integrating equation normalized on $\ln f$. The Akaike Information Criterion (AIC) is selected with a lag of 4, while the Schwarz Criterion (SC) is selected with a lag of 2. Since both the two criterions disagree with each other, we then use LR test to judge the lag length as 4 instead. Besides, the linear trend is tested to be excluded from the co-integration space.

Trace test statistics indicates the existence of one co-integration ECM at 5% significant level while $\lambda_{\text{max}}$ test indicates one co-integration ECM at critical level of 10%. The coefficient of logarithmic spot price is positive to logarithmic futures price and significant in t-statistics, implying that the variation of sugar futures market price and spot price will converge in the long-run, and suggesting a closely correlation between them. Therefore, China’s sugar futures market is pricing informational in our sample period. From the coefficient for $\ln s$, one can witness a centesimal change against spot price will bring about 0.77 percent of variation in futures price. It is obvious that the relatively high spot price elasticity of futures price reveals a linkage effect between China’s sugar futures market and spot market.

Although by means of the co-integration test we find that there exists a long-term equilibrium

\(^5\) A daily price series can be obtained by changing from one contract to the nearest contract as the first contract approaches maturity.
relationship between sugar futures prices and spot prices, and that the lead-lag relationship remains
unknown yet between the futures and spot markets. Such relationship may be interpreted as futures
follow spot prices; or, available market information is fully reflected in futures market firstly, and then
transmits to spot market; or even they both response to new information at the same time. Our
results of Granger Causality Test are listed in Table 3 to investigate the relationship.

Only the second test of VECM Granger Causality test rejects the null hypothesis, which implies
that the futures market leads spot markets, but not vice versa. These findings are consistent with the
hypothesis that futures market plays a role of price discovery and the changes of futures prices lead
those of spot market.

Table 1
Unit root test of ln\(f\) and ln\(s\)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Levels</th>
<th>ADF statistics</th>
<th>5% critical values</th>
<th>First-difference</th>
<th>ADF statistics</th>
<th>5% critical value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Intercept or trend in the regression</td>
<td>ln(f)</td>
<td>-0.330914</td>
<td>-1.941245</td>
<td>-8.563608</td>
<td>-3.415803</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ln(s)</td>
<td>-0.154300</td>
<td>-1.941236</td>
<td>-17.76731</td>
<td>-1.981236</td>
<td></td>
</tr>
<tr>
<td>Intercept only in the regression</td>
<td>ln(f)</td>
<td>-2.179479</td>
<td>-2.865088</td>
<td>-8.270607</td>
<td>-2.865168</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ln(s)</td>
<td>-1.387684</td>
<td>-2.865093</td>
<td>-17.75632</td>
<td>-2.865093</td>
<td></td>
</tr>
<tr>
<td>Intercept and trend in the regression</td>
<td>ln(f)</td>
<td>-1.572248</td>
<td>-3.415803</td>
<td>-8.563608</td>
<td>-3.415803</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ln(s)</td>
<td>-0.606363</td>
<td>-3.415686</td>
<td>-17.84698</td>
<td>-3.415686</td>
<td></td>
</tr>
</tbody>
</table>

Note: constant term and time trend are chosen under characteristics of each series.

Table 2
Co-integration test results for futures prices and spot prices

<table>
<thead>
<tr>
<th>Trace</th>
<th>(H_0)</th>
<th>Eigenvalue</th>
<th>Statistics</th>
<th>Probability</th>
<th>(\hat{\lambda}_{\text{max}})</th>
<th>(H_0)</th>
<th>Eigenvalue</th>
<th>Statistics</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>(r = 0) **</td>
<td>0.017924</td>
<td>16.02521</td>
<td>0.0416</td>
<td>(r = 0) *</td>
<td>0.017924</td>
<td>13.83619</td>
<td>0.0583</td>
<td>(r \leq 1)</td>
<td>0.002857</td>
</tr>
<tr>
<td>(r \leq 1)</td>
<td>0.002857</td>
<td>2.189027</td>
<td>0.1390</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Normalized co-integrating function (standard error in parentheses; t-statistics in [ ])

\[ \ln f \quad \ln s \quad \varphi \quad 1.000000 \quad 0.771654 \quad 1.909723 \quad (0.10047) \quad [-7.68042] \]

Note: ** denotes rejection of the hypothesis at the 5% level; * denotes rejection of the hypothesis at the 10% level.

Table 3
Granger Causality Test

<table>
<thead>
<tr>
<th>Null hypothesis</th>
<th>VECM Granger Causality test</th>
<th>Chi-sq</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(s) does not Granger Cause ln(f)</td>
<td>5.970316</td>
<td>0.2014</td>
<td></td>
</tr>
</tbody>
</table>
ln\(f\) does not Granger Cause ln\(s\) 32.58702 0.0000

Note: Lag lengths of the two variables are estimated by means of AIC method, with maximum lags of 4.

Combining the results of co-integration analysis and Granger Causality test, we find there are long-term equilibrium and unidirectional Granger causality from China’s sugar futures market to spot market. The equilibrium relationship can reasonably verify the pricing efficiency of futures market (Chen and Zheng, 2008). According to Chen and Zheng (2008), if arbitrage mechanism is perfect, arbitragers can utilize the spread information by means of arbitrage; therefore the spot and futures prices will converge or co-integrate in terms of mathematics or econometrics respectively.

Is China’s sugar futures market information efficient?

Given that the presence of pricing efficiency of futures market confirmed by the co-integration test, we perform the next step to examine the other part of price discovery, the information efficiency. VECM is then applied to provide specific information on the speed of adjustment. By adding up the co-integration restriction to the VAR model, the results are obtained of VECM estimation (see Table 4).

### Table 4
VECM estimation of Sugar futures and spot markets

<table>
<thead>
<tr>
<th>variables</th>
<th>ln(f)</th>
<th>ln(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ecm_{-1})</td>
<td>-0.037131((2.93303)^*)</td>
<td>0.002425(0.33904)</td>
</tr>
</tbody>
</table>

Lagged futures returns:

<table>
<thead>
<tr>
<th>Lag</th>
<th>(0.108265(2.50108)^*)</th>
<th>0.133626(5.46371)^*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>-0.012968(2.50108)^*)</td>
<td>0.025277(1.01371)</td>
</tr>
<tr>
<td>3</td>
<td>-0.001759(-0.29384)</td>
<td>-0.014800(-0.59434)</td>
</tr>
<tr>
<td>4</td>
<td>-0.029061(-0.66268)</td>
<td>-0.024195(-0.97652)</td>
</tr>
</tbody>
</table>

Lagged spot returns:

<table>
<thead>
<tr>
<th>Lag</th>
<th>0.007569(0.09927)</th>
<th>-0.003294(-0.07646)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.056859(0.75288)</td>
<td>-0.010270(-0.24184)</td>
</tr>
<tr>
<td>3</td>
<td>0.166952(2.22411)^*)</td>
<td>0.201209(4.74423)^*)</td>
</tr>
<tr>
<td>4</td>
<td>-0.051938(-0.70130)</td>
<td>-0.023278(-0.55630)</td>
</tr>
</tbody>
</table>

Constant 8.25E-05\(0.11612\) -3.99E-05\(-0.09929\)

Note: the lag length of VECM is determined using the Akaike’s AIC method; * indicates 5% significance levels; t-statistics is listed in parentheses.

Table 4 displays the short-term variation characteristics of sugar futures and spot prices. VECM explains the change of dependent variables through two terms: one is the difference term which reflects the influence of the short-term fluctuation; the other is the error correction term to explain long-term equilibrium. Only the error correction term of futures market is statistically significant, which demonstrates only the futures market significantly reacts to short-term variation and long-term equilibrium at the same time. This finding suggests that the futures market can adjust to the equilibrium quickly. Furthermore, the futures market negatively responds to the long-term equilibrium while spot market responses positively. A negative response implies the futures prices will decrease the variation and approach the equilibrium at the next period. Therefore, only China’s sugar futures market functions as the negative correction mechanism. Yet the spot market cannot
automatically revert to equilibrium quickly.

The prompt adjustment of China's sugar futures market to the long-term equilibrium implies that futures market is of information efficiency. In practice, because of the low-cost, high leverage and high liquidity characters of futures trading, marketers will increasingly trade in it firstly when facing new market shocks, especially in comparative mature, large and influential futures market. That makes new information be fully reflected in futures market, allowing a signaling of “futures price guiding spot price”. This result is in accordance with our previous findings of Granger Causality test.

*Who has the pricing power? A perspective from Information Share (IS)*

Previous studies in current literature suggest that a market's information share is influenced by its relative trading volume, transaction costs, and volatility (Poskitt, 2010). Higher levels of trading should attract more informed traders to the market, strengthening the role the market plays in the price discovery process (Chakravarty et al., 2004). Lower trading costs make the acquisition of information more attractive, encouraging informed traders to participate, thereby increasing the contribution of the market to price discovery (Fleming et al., 1996; Chakravarty et al., 2004). High levels of uncertainty, proxied by price volatility, are expected to inhibit price discovery (Capelle-Blancard, 2001).

In order to estimate the information share of China’s sugar futures and spot markets, we conduct variance decomposition upon the VECM. Variance decomposition separates the variation in an endogenous variable into the component shocks to the model, and provides information about the relative importance of each random innovation in affecting the variables in the VECM model. The outcome of the variation share represents the contribution of the component shock to the endogenous variable, i.e., how much the variation in an endogenous variable depends on the component shock. If a specific market is responsible for the majority of variance in innovations, that is to say, permanent price shocks exert predominantly from one market, then that market has more say in pricing power.

The time length is chosen to be 1000 and 300 respectively (the length of horizontal axis for two markets in Fig.1), so that it can completely present the dynamic changes of information shares until the curve changes are stable. Their results are shown in Fig.1.

![Figure 1 variance decomposition between sugar futures and spot markets](image-url)

The variance decomposition of the futures market (see Fig.1 (a)) suggests that the sugar futures price is merely determined by itself. As the periods extended, the influence from the spots market increases
gradually, and spot market's contribution rises to nearly 58%. Though the information share of spot market itself declines from the initial 71% to 56% at the first several periods, it eventually rises back to 62%, which is still larger than the share of futures market (see Fig.1 (b)). The relatively high information share of spot market suggests that the spot market is much more informative than the futures market.

6. Discussion

It is unexpected that, unlike most of the developed countries investigated in the existing literature, China’s sugar futures market has no advantage over spot market in pricing power, even though it is of pricing efficiency and information efficiency. No-arbitrage equilibrium of futures price and spot price, information transmission mechanism from futures market to spot market all demonstrate an efficient price-discovery process, which means the sugar futures market is pricing efficient. And with information efficiency (tested by VECM), China’s sugar futures market satisfy the weak form efficiency. While this efficient market still has less say in pricing power. This kind of departure implies that spot market partly undertakes futures market's function until now. As mentioned above, China sugar market has constituted a tradition of price formation by producing area wholesale market. The inauguration of sugar futures contract implies China sugar market is experienced a series of reforms in sugar pricing mechanism during the past few years. And our empirical study shows that the sugar pricing mechanism did have been changed significantly. It has the function of discovering price: futures price is the unbiased estimate of expected spot price, implying no costless arbitrage profits. While for some reasons, futures market has not yet got the regnant power of pricing in the China sugar market.

Now an interesting question arises: why does the futures market which functions well a price discovery mechanism yet lack of sufficient pricing power? The reasons for this interesting separation between price discovery and pricing power can plausibly attribute to the following:

First, irrational speculation distorts the pricing mechanism in the futures market. The futures positions in recent two years reveal significant fluctuations compared with those in the previous years. The short-term fluctuations can reflect the issue to a certain extent: the sudden and sharp increase of positions can only be explained by speculation. When excessive speculation drives the futures prices deviating from the supply and demand fundamentals, the market may fail to discover right future prices.

Second, the oligopoly and local government politics hinder the participation of the sugar marketers in futures market. The spot market may have dominant market power. Sugar enterprises in China tend to take advantage of their monopoly position to affect the local government decision, lobbying for government to support and stabilize the prices. Like the sugar enterprises, local government heavily relies on the sugar enterprises, because the latter contributes 70% to local taxation. Therefore, government has the tendency to safeguard the sugar spot prices instead of true market demand and supply situation. With the generous supports from local government, the industry lacks economic stimuli to find the right prices and to hedge risks in the futures market.

Third, China’s sugar wholesale markets somehow are playing a role of a futures market, thereby become a substitute for the latter. Major sugar wholesale markets are electronic markets operating in the key producing provinces. In these markets, producers and buyers are provided with ready and convenient accesses to market information. Each wholesale market has its own integrated trading rules. They can be viewed as sort of forward spot markets. Such wholesale markets own full sets of regulations and systems, therefore effectively replace some functions of a futures market. This may reduce reliance on the futures market for derivation of prices information. That can possibly explain why the spot market possesses a
larger information share than the futures market does.

In all, the observed surprising phenomenon seem quite reasonable during the development of the market reform. The spot market plays the role of pricing for a long history, whose price has been widely accepted. Producers and buyers still accept its prices, are accustomed to its trading system, and depend on its functioning. Similar history happens to CZCE mungbean futures market, which may deepen our understanding of such a clear departure between price discovery and market power. Before mungbean futures contracts were formally launched, a mungbean wholesale market was fostered in Zhengzhou in the late 1980s to attract customers and to create confidence among its actual and potential participants (Williams et al., 1998). As for the sugar futures markets, there still a long way to go to be an efficient market.

7. Conclusions

This paper analyzes the price discovery and market efficiency of the sugar futures market. We found a phenomenon in China’s sugar futures markets and provided our plausible explanations. Our findings can be summarized as follows:

First, China’s sugar futures market is efficient in price discovery. Sugar futures prices and spot prices are co-integrated. The former Granger causes the latter, but not vice versa.

Second, China's sugar futures market might be informationally efficient from the perspective of the VECM, in that it can promptly adjust to long-term equilibrium.

Third, compared to the cash market, it is interesting to find the efficient futures market has less say than the spot market in pricing power. This abnormal phenomenon may be plausibly explained by

First, China’s sugar futures market lacks pricing power, partly due to irrational speculation.

Second, the existence of some trade-convenient and information-accessible wholesale markets reduces the reliance of spot trades to CZCE sugar futures market.

Third, the sugar industry is characterized by the oligopoly, whose market power safeguards the prices through an interest linkage mechanism.

This study may deepen the understandings of the operational mechanisms and internal efficiency of China’s sugar spot and futures markets, and shed light on the impact of various factors on the futures market’s functioning. To better understand the impacts of these factors on futures market, we will further investigate this problem theoretically and empirically in our future works.

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