
THE EMERGENCE OF A FUTURES MARKET: MUNGBEANS ON THE CHINA ZHENGZHOU COMMODITY EXCHANGE

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INTRODUCTION

The China Zhengzhou Commodity Exchange is one of the few new exchanges for agricultural commodities to have opened in several decades. As many as 14 organizations in China have made substantial investments in trading rooms, clearing technology, contract design, and staff. Of these, perhaps six have sustained the membership, trading volume, and open interest necessary to be legitimately classified as futures exchanges. Of these six, the one as of September 1997 with the most stable growth and the most trading is the China Zhengzhou Commodity Exchange (CZCE).

The majority of the research was conducted when we all were associated with the Food Research Institute, Stanford University. We are indebted to Chairman Li Jingmou and members of the staff at the China Zhengzhou Commodity Exchange for their cooperation in providing data, responding to questions, arranging interviews, and commenting on earlier presentations of these results.

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It was founded in 1990, and its mungbean contract was inaugurated in 1993.

The story of the mungbean futures market is much more interesting than a story of a stock index contract or a government bond contract introduced among sophisticated traders experienced with derivative instruments. Because foreign-owned firms cannot yet trade on the CZCE or on other Chinese exchanges, Chinese traders have learned about futures trading not from others but through the ever-changing circumstances of an active market. Instead of attracting customers experienced with the leveraged speculation of futures contracts, the CZCE's brokerage members have attracted many newcomers with few other outlets for their savings in China's underdeveloped financial system. Instead of having experience with spatial and seasonal price signals, the CZCE's commercial members, including the suddenly independent components of giant governmental organizations such as provincial grain stabilization boards, find themselves struggling to adjust to profit-and-loss measures of performance. For commercial traders, physicals markets in China are also new, the progeny of the liberalizations during the late 1980s. In 1993 and 1994, substantial arbitrage possibilities persisted because traders had not yet learned to take advantage of them. They learned by 1995. Thus, the story of the mungbean futures market reveals how quickly a core group of traders can learn the techniques of arbitrage.

Considering how many futures markets have been attempted and how few have become viable (Telser and Higinbotham, 1977; Silber, 1981; Carlton, 1984), the story of the CZCE's mungbean market is especially revealing about the reasons for success. The CZCE is not run by its members but by its staff. In the late 1980s when Chinese officials consulted functioning exchanges elsewhere, including the Chicago Board of Trade (CBOT), they were advised to foster wholesale markets before attempting to begin futures trading. Accordingly, the CZCE opened a wholesale market for a variety of commodities in October 1990 and planned futures trading for later. The CZCE began futures trading not that much later, in May 1993. Among the several listed commodities, the futures market for mungbeans has flourished. The mungbean futures market has flourished even though physicals trading has advanced slowly after the initial liberalizations in favor of profit-oriented trading; physicals trading remains decentralized, plagued by quality disputes, and concentrated in spot rather than forward transactions. Futures trading is far more active than physicals trading in mungbeans anywhere in the country, including on the wholesale market in Zhengzhou, a major rail hub some

500 km southwest of Beijing. Such improvements as have occurred in physicals trading have come from the example set by the futures market.

The effects of the CZCE's presence and leadership can be seen in four broad areas: (i) the implementation of electronic trading; (ii) the encouragement of mungbean trading in particular; (iii) the response of arbitragers to the futures market's intertemporal price relations; and (iv) adjustments to the contract's terms and to trading rules. This article concentrates on these four broad areas in the story of the emergence of a new market. Necessarily, these four areas intertwine to some extent, and reveal where deeper knowledge of the composition of trading or of the practices of traders would add to the story of the emergence of the mungbean futures market.

BASIC ORGANIZATION AND TRADING PRACTICE ON THE CZCE

In 1992, after many years of study and in accord with their increasing emphasis on markets over central planning, China's reformers authorized futures exchanges on an experimental basis. More than 40 organizations in various localities began calling themselves futures exchanges (Wall and Wei, 1994). They did so for the cachet as much as anything. At the end of 1993, there was actual trading at 33 such exchanges, with a total turnover of more than 715 billion yuan, some \$90 billion (Fry, 1994). In 1994, total turnover had grown to 3200 billion yuan, even with a fall in the number of exchanges. In mid-1995, the government officially limited trading to those exchanges with sufficient membership—at least 50 members—and sufficient volume in at least one listed contract—at least 5000 contracts per day—classifying those that passed the standards as “experimental” markets. By the end of 1995, 14 experimental exchanges remained, with a total turnover of nearly 10,000 billion yuan (Li, 1996). Most of these exchanges saw their volume and open interest drop in 1996, with the exception of the CZCE. In the first nine months of 1997, the CZCE accounted for 31% of the trading on the 14 exchanges.

Futures exchanges in China are electronic, each having developed its own customized central computer system. The electronic trading system on the CZCE is similar to that developed by the Deutsche Terminbörse in Frankfurt and also used on the Hong Kong Futures Exchange and the Tokyo Commodity Exchange. The CZCE, nevertheless, retained part of the hand-trading system, namely a trading floor, believing that the commotion on a floor provides a useful sense of the market's tenor. Because of its growth, the CZCE added three trading floors within Zhengzhou, plus 19 smaller remote sites. Its new centralized facility opened in

May 1997. It has several large trading floors, each handling all listed commodities. A CZCE trading floor contains rows of terminals, variously 50–100 in total, where the equivalent of floor brokers take orders by telephone, access their computer screens for the desired commodity and delivery month, observe the prevailing bid and ask, and execute the order with several keystrokes. The computerized trading is continuous over each of two trading sessions, morning and afternoon, and some traders seem to be developing into the equivalent of scalpers.

Electronic trading makes it easy to incorporate more commodities and this, in fact, led many Chinese exchanges to list numerous commodities, often without regard to the comparative advantage of their region for marketing a specific commodity or without regard to the listings on other exchanges. In contrast, the CZCE initially listed only five commodities: wheat, corn, soybeans, sesame, and mungbeans. CZCE officials held out the most hope for wheat, given Zhengzhou's location in the wheat belt of north central China, but trading in mungbeans soon dominated. Since its opening, the CZCE has experimented with listing various additional commodities, including Treasury notes, aluminum, peanuts, red beans, rice, and cotton yarn. Following a regulatory review in mid-1995, CZCE officials suspended trading in most of these listings for lack of volume. More recently, they have been encouraging trading in one new commodity at a time, focusing since late 1996 on wheat with the help of an auxiliary trading session.

With respect to the proliferation of exchanges and contracts, the Chinese experience mirrors the development of futures markets elsewhere. Five exchanges vied for the gold market with the end of restrictions on U.S. citizens' trading in 1975; within a few years only two remained, and eventually only one. As late as the 1930s in the United States, there were still many wheat futures markets, in locations as disparate as Milwaukee, St. Louis, Portland, and Duluth, in addition to the three remaining today, namely Chicago, Minneapolis, and Kansas City. A number of cotton exchanges also vied with one another, until only the New York Cotton Exchange survived (Bouilly, 1975).

Futures trading in the United States emerged in the absence of federal regulation and oversight (Markham, 1987), while the United Kingdom exchanges have only recently been subject to any government regulation. In this respect, the Chinese experience has been similar, because a formal regulatory system was not in place at the beginning. Currently, light regulation is imposed through the China Securities Regulatory Commission. Even so, Chinese exchanges have had to contend with a central

government often concerned about individual commodities and retaining a healthy skepticism about the role of commodity exchanges more generally. For instance, in 1994, the government, concerned at the rise in the price of rice as recorded on the Shanghai Cereals and Oils Exchange and the absence of exchange monitoring of trading, imposed regional price ceilings, thereby reducing trading volume to minimal levels for many months.¹ Mungbeans have the advantage of not being a politically sensitive commodity.

The proprietary computer trading system developed by the CZCE represents a substantial investment. The initial investors in this computer system were the CZCE itself and the provincial grain bureau which backs the exchange. Traders purchase memberships from the exchange (in 1996 and 1997 at 200,000 yuan, i.e., some \$25,000), but membership does not convey governance, as it does on U.S. and U.K. exchanges. CZCE officials, who have been the real entrepreneurs in the situation, intend to convert the exchange into a member-run organization as it matures. In the meantime, the CZCE's growth has been financed through new memberships and per-contract trading fees.

At the end of 1995, the CZCE counted 256 member firms, up from 170 at the end of 1994 and 68 at the end of 1993. The number grew more slowly over 1996, reaching 316 by the end of the year, because only 273 could trade on one of the floors until the new facility was completed in May 1997. Since the constraint on trading facilities was relieved, competitive pressures on retail brokers have limited growth in the number of members; as of September 1997, the CZCE had 281 members.

According to *CZCE Yearbooks*, since 1995 the composition of its membership has been relatively stable. Some 50% are specialized futures firms, many involved with retail brokerage; some 35% are commercial firms (including both cereals-related and industrial firms); and the remainder include investment, finance, and miscellaneous other firms. Firms are not, however, specializing in mungbeans; instead, they commonly also handle soybeans, wheat, corn, and sometimes even industrial commodities. Most CZCE member firms are small to medium-sized, with only some 20% having registered capital of more than 50 million yuan (some \$6 million) and most are either joint-stock companies or state-owned. In short, the CZCE has been successful in developing a diverse membership, one in which commercially based firms, and not just retail brokers, are important.

¹Similarly, in 1994, the government, viewing the base metals sector as overheated, applied price ceilings and tighter import controls; consequently, the Shanghai Metal Exchange saw volume fall precipitously. Steel, sugar, raw silk, and soybean oil have had trading suspensions because of rising prices (Wu, 1996).

SPECIFIC CHARACTERISTICS OF MUNGBEAN TRADING ON THE CZCE

Mungbeans are a small green bean, used in China for soups, noodles, and beverages and exported to India for medicinal purposes. Much like soybeans, mungbeans are planted in spring or early summer. They are harvested in the early fall, but generally are marketed a month or so later. Most consumption occurs in the subsequent spring and summer. Because mungbeans deteriorate without careful storage, little of one crop is carried over into the next crop year.

The main producing areas are in the northwest and, increasingly, in the northeast of the country, more or less within the orbit of Zhengzhou; however, because the large total production is scattered across many farmers in many provinces, few dominant commercial flows have emerged. Mungbeans, as well as grains, still move in bags. Mungbeans move mostly by generic open-bed trucks, although sometimes by rail from hubs such as Zhengzhou.

Commercial firms have begun to specialize in aggregation among farmers' production, others in transportation to larger centers, still others in processing or larger-scale exports. At each stage of this marketing chain, ownership usually changes. Prices are quoted in metric tons, while the standard lot of ten tons (some 370 bu.) corresponds to the approximate size of an open-bed truck. The CZCE officials selected this relatively small lot size in part to encourage smaller speculators, who they wanted in the market for the liquidity they could provide. Larger processors, who tend to deal in lots of 60 metric tons, which is the size of a railcar, simply deal in multiples of six futures contracts.²

Grade standards for delivery on a mungbean futures contract are the recognized national standards regarding moisture, broken beans, and foreign matter. Many lots of mungbeans fail to meet the national standards, foreign matter being the most common problem. Since mungbeans are stored in bags, there is not the opportunity for mixing and cleaning while in bulk storage as in U.S. grain elevators. Any cleaning is done when the mungbeans arrive at the warehouse and when it is usually obvious whether they are best for the general wholesale market or for the futures market. Because the CZCE has strictly monitored delivery standards, it has enhanced the usefulness of the futures contracts to the larger mungbean processors, who prefer uniformly high quality. According to participants in mungbean wholesale markets, the CZCE's emphasis on meeting

²The CZCE has specified wheat trading to be in multiples of 50 metric tons, a lot size that larger dealers find less convenient.

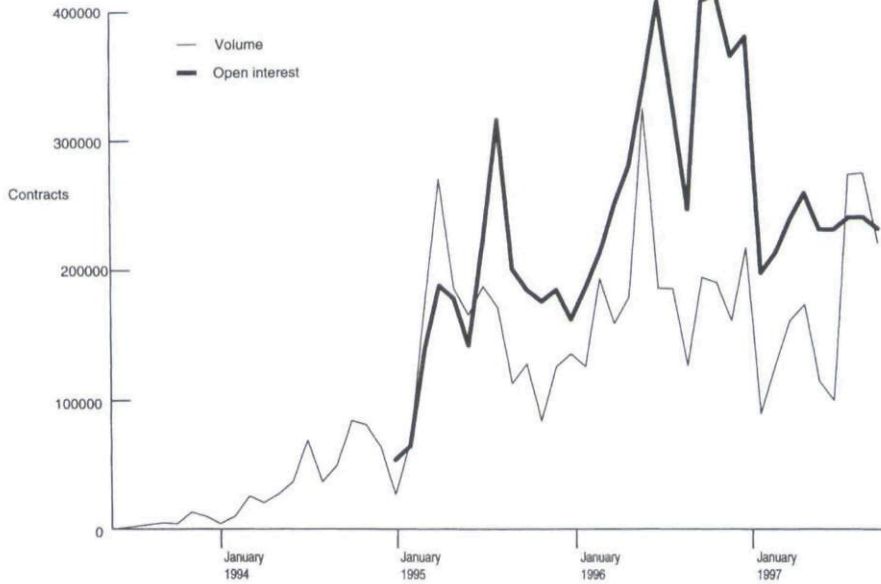


FIGURE 1

Month-by-month average daily total volume and open interest in CZCE mungbean futures.

the national standards for deliverable mungbeans has improved quality more generally.

Following the start of wholesale trading on the CZCE on 12 October 1990, trading in mungbean futures began on 28 May 1993. Figure 1 plots the history of trading volume from the contract's inception through September 1997. Complete open interest data are available beginning in January 1995, and those are displayed as well. The data plotted in Figure 1 are the monthly averages across all six delivery months, which are sequences of January, March, May, July, September, and November. The amounts of trading shown in Figure 1 exemplify the general growth of futures markets across China reported earlier, namely the rapid growth in early 1994, before the decline in the last half of 1994, coincident with a period of central government scrutiny of all the new futures markets. Not long after the China Securities Regulatory Commission officially designated the CZCE as an "experimental" exchange in October 1994, mungbean trading recovered, then grew substantially in the spring of 1995. Since spring 1995 through autumn 1997, monthly (not to mention daily) volume has shown considerable variation, but around a substantial mean. Thus, from these statistics, it would seem that the CZCE mungbean market—especially for the nearby months in which trading is concentrated—has relatively high liquidity.

Since spring 1995, average levels of open interest have grown significantly. The open interest of around 300,000 contracts in 1996 represents approximately three times national production of mungbeans. By way of comparison, the open interest on the CBOT's wheat, corn, or soybean futures markets represents less than half U.S. annual production. (Put differently, converting metric tons to bushels and adjusting for the contracts' sizes, the CZCE's mungbean open interest represents a quantity about 30% of the CBOT's wheat open interest.) Thus, it would seem that the CZCE has attracted considerable speculative interest, including short speculation, a necessary component of a successful futures market (Gray, 1967).

The open interest of individual delivery months follows the pattern seen in most other futures markets, namely, low when the delivery period is distant, followed by a peak a few months before the delivery period, and then a fall as the delivery period approaches. Even so, total open interest does not yet follow the seasonal patterns observed in U.S. grain markets (Irwin, 1935; Peck, 1979). Some of the swings in open interest since 1995 have resulted from speculative interest shifting among the various Chinese exchanges. Others, such as in late December 1997, have resulted from large speculators closing out their positions when the delivery period looms rather than rolling them into later delivery months.

Although the growth of open interest has partly resulted from longer-term speculation, the data accord with anecdotal accounts during interviews with commercial firms describing their increasing use of futures. That commercial firms were not all active from the first instant should not be surprising. Rothstein's (1983) evidence from the early history of the grain futures markets in the United States suggests many grain-handling firms there took a decade or more to devise strategies relying on those markets. More recently, with the introduction in the United States of futures markets in crude oil and natural gas, a number of years passed before futures trading became standard practice for commercial firms. By this standard, the adoption of the mungbean futures market within two or three years by commercial firms, most of whom had never even thought in terms of prices before, is nothing short of remarkable. It also augers well for the future, as commercial use is arguably the key determinant of the market's ultimate size (Working, 1954).

PRICE RELATIONS AMONG CASH AND FUTURES PRICES OF MUNGBEANS

Following the introduction of a futures market comes the measurement of its pricing effectiveness, especially compared to existing cash markets.

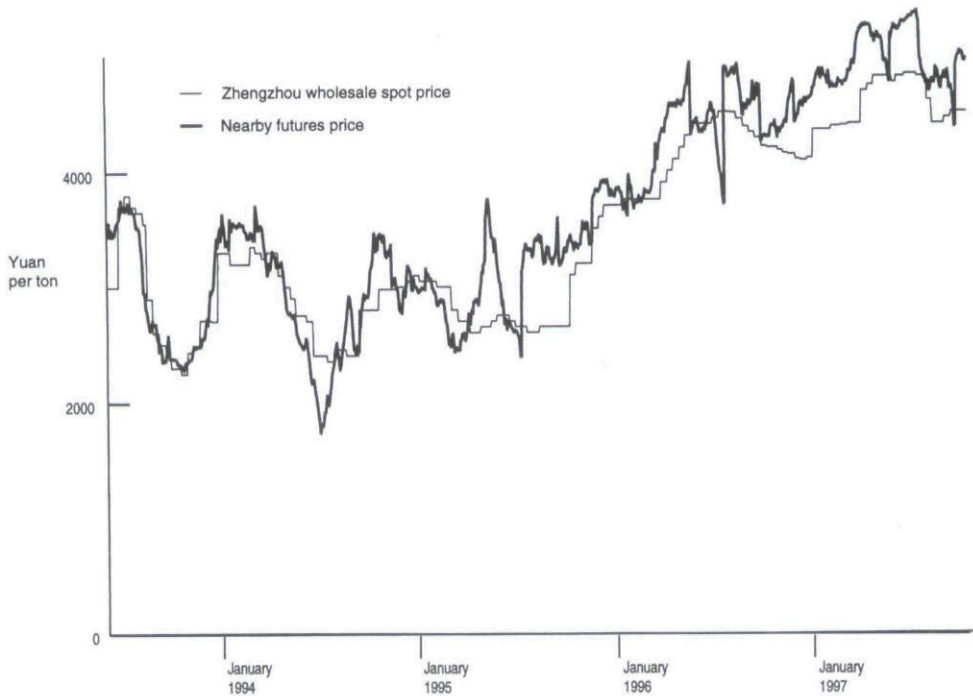


FIGURE 2

Daily CZCE mungbean futures and wholesale prices.

Soon after each contract was established, Modest and Sundaresan (1983) examined the S&P 500 index contract, Bailey (1989) and Brenner, Subrahmanyam, and Uno (1989) the Japanese stock index contracts, Stulz, Wasserfallen, and Stucki (1990) the Swiss Market Index contract, Esposito and Giraldi (1994) the Italian bond contracts, and Brailsford and Cusack (1997) the Australian individual share contracts. Although all found some "mispricing," the violations of arbitrage relationships rarely exceeded 1% of the futures price, which most likely was even less than the transactions costs in such relatively illiquid markets.

Figure 2 shows the price series for mungbeans, both the officially collected wholesale price and the nearby futures price. Wholesale prices are reported every ten days from the Zhengzhou local wholesale market and warehousing system; the nearby futures prices are always those of the contract closest to (but not including those during) delivery. In broad terms, the Zhengzhou wholesale price and the nearby futures price track each other. However, the two series often diverge by 15–20%, far beyond the costs involved in any arbitrage operation. Moreover, to government officials accustomed to stable wholesale prices, the futures price series in Figure 2 must seem extraordinarily volatile.

The sort of price relationships shown in Figure 2 are similar to those in markets that were effectively controlled before the introduction of futures trading. Examples in the United States include frozen concentrated orange juice, copper, and high fructose corn syrup, where price control was exercised by industry groups. Here, the issue is not control per se. Rather, the apparent stability in the wholesale price results from the reporting system itself, which reports prices only three times per month, in part because there is relatively little volume in the wholesale market. Thus, it is difficult to judge the degree of connection between cash and futures prices, because the cash price series limits the comparison.

A second difficulty in judging the connection between wholesale and futures prices is that the reported wholesale price, a Zhengzhou price, is only one of the twenty-one locations in five provinces now permitted under the delivery provisions on futures. The futures price in Figure 2 would not necessarily be expected to converge to the Zhengzhou wholesale price. Without the wholesale prices from the other locations, it is difficult to know whether locational differences are significant.³ Certainly, the information about cash prices is not available to test futures prices against a model of the embedded location option such as proposed by Pirrong Kormendi, and Meguire (1994). In short, arbitrage possibilities beyond 1% may have existed between cash and futures prices, but it is difficult to know for sure.

Because of the rudimentary state of physicals markets, the relationships among the futures prices themselves are more relevant for evaluating the presence and effectiveness of arbitrage. Figure 3 depicts six spreads among pairs of adjacent futures contracts. In the top panel of Figure 3, e.g., the difference in price between the January and November futures (both in the same crop year) is plotted. The differences are converted to percent by dividing the spread by the November contract's price. Because the November contract is the first fully post-harvest delivery month, the January–November spread is the first spread within the crop year. In the plots of these six spreads, two unusual features stand out: the large positive spreads, more than 10% for two months, during the first year or two of trading, and the sharp changes during the expiration of the July and September contracts.

In mature futures markets, it is axiomatic that spreads between two futures (or between the spot cash commodity and the nearby futures) do not exceed full carrying charges. A sufficient number of traders would take advantage of the arbitrage opportunity to preclude a spread above

³Wholesale prices from other locations are only recently being recorded, with the CZCE's encouragement.

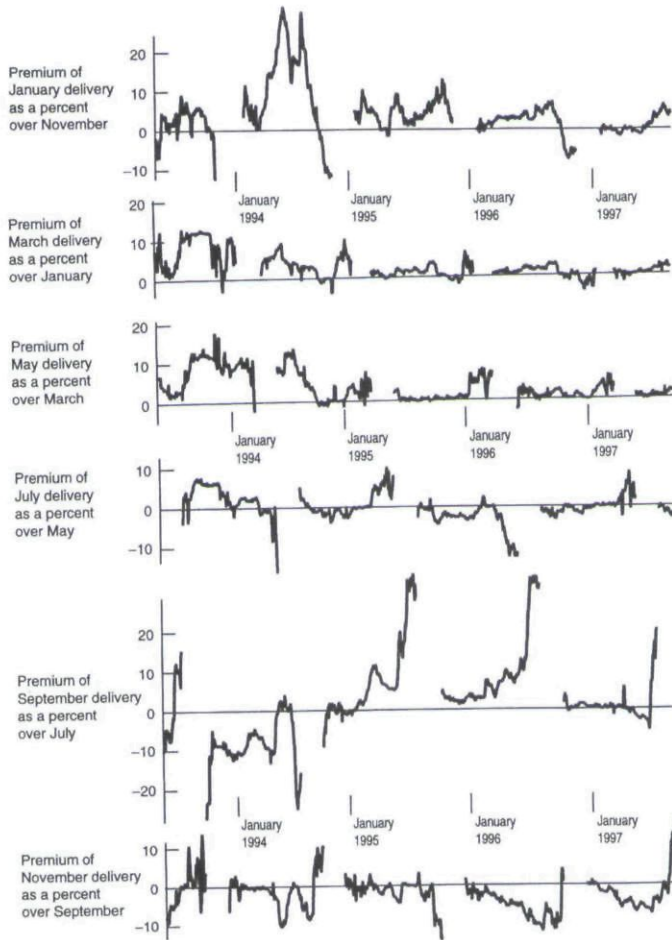


FIGURE 3

Spreads among CZCE mungbean futures prices through the crop year.

full carrying charges for all but the most fleeting moments. For mungbeans, from 1993 through 1996, full carrying charges over two months did not exceed 4% or 5% at the outside; warehousing fees were stable at 3 yuan per ten tons, equivalent to less than 1% for two months, while interest rates for commercial loans for the best borrowers remained always less than 1% per month (although credit rationing during some periods may have nearly doubled the effective rate for other borrowers). By this standard of 5% for two months of carrying charges, the data in Figure 3 are striking, both for the extent to which spreads at 10% were above the theoretical maximum when mungbean futures trading first began and for the clear evidence they provide of the emergence of intertemporal arbitrage over the last two years. In short, it is possible to know for sure

that considerable intertemporal arbitrage opportunities existed in 1993–1994. Spreads were markedly tighter and more stable after 1995 than earlier, even if precise calculations of full storage costs are complicated by the existence of more or less stringent credit rationing at various times during those years.

The anomaly in the evidence for increasingly effective intertemporal arbitrage appears to be that for the September–July spread (the panel one from the bottom in Figure 3) and, to a lesser extent, the November–September spread (the bottom panel). Not only does the difference in price between the September and July futures appear to be more variable in recent years, but it appears to have expired at levels well in excess of full carrying charges. The pricing of this September–July spread may well be evidence not of the absence of arbitrage but of its effectiveness. The July and September delivery months are the last two in the crop year, although September may be a “transitional” month if the harvest is able to enter commercial channels quickly. As early as July each year, traders begin to know the timing of the next crop and the quality of the remaining old-crop mungbeans, which deteriorate especially in summer’s humid conditions except in the controlled conditions of exchange-approved warehouses.⁴ Once new-crop mungbeans become available, old-crop mungbeans carry a substantial discount (the particular discount determined by prevailing market forces). In designing their contracts, CZCE officials incorporated this aspect of mungbean pricing by setting a substantial 20% discount on the delivery of old-crop mungbeans on the September and November contracts. According to exchange officials and market participants, the discount has been very effective in assuring that old-crop mungbeans are used first. The official discount also manifests itself in the observed spread between the September and July contracts. Obviously arbitragers must take into account the fact that mungbeans delivered in July, although redeliverable in September, will carry the discount if redelivered. Prior to July each year, traders must assess the possibility that all old-crop mungbeans will have been used by September and that new-crop mungbeans will be available that early in marketing channels. In July 1995, 1996, and 1997, it became evident that old-crop mungbeans would be carried into September, and thus the spread expanded to reflect the 20% discount.

The variable behavior of spreads between delivery months late in the crop year has been primarily during the delivery periods themselves. Ex-

⁴There are obvious parallels with onions, which are storable within a crop year but not across crop years and which had particularly volatile prices for futures expiring late in the crop year (Working, 1960).

change officials conclude that the behavior has most to do with a few speculators playing the game of chicken with the shorts. Although those longs are not prepared to take delivery, for whatever reason, they remain in the market until late in the delivery period. If their bluff is called and they must offset their position they incur something close to the full discount for old-crop mungbeans. This explanation of the spreads' behavior implies that other traders, whether commercial firms or speculators, do not step into the market to take advantage of the arbitrage opportunity. That may well be a rational calculation for many traders in the last days of the delivery month.

The increasing effectiveness of intertemporal arbitrage, with the possible exception of the delivery months late in the crop year, is also suggested from interviews. Traders interviewed in December 1993, who grasped spatial price relationships, did not follow calculations about carrying charges. Traders interviewed in October 1996 discussed carrying charges comfortably, while admitting their earlier lack of understanding. According to these traders and to CZCE officials, many individuals have come to watch and trade price differences. Traders, including speculators, now take spread positions with the long leg in the expiring contract, taking delivery and redelivering in turn whenever the opportunity presents itself.⁵ Commercial firms' traders now watch intertemporal spreads closely, deciding whether to resell or to store a recent physicals purchase, depending on whether carrying charges are attractive.

Overall, the price relationships provide evidence that significant intertemporal arbitrage has developed on the CZCE. Yet perhaps more interesting is the fact that significant arbitrage did not exist from the start. Evidently, arbitrage is a skill to be learned, both by individual traders and by their superiors, and such a skill is learned more easily for spatial relationships than for intertemporal relationships.

EXCHANGE MANAGEMENT ISSUES

Within the four years through September 1997, the CZCE and its mungbean contract developed both breadth and depth, in both speculators' interest and commercial firms' participation. The CZCE's success owes much to the aggressive management of aspects of trading by exchange officials. In just the few years the contract has traded, CZCE officials have had to respond to incidents of delivery problems, several attempts at manipulation, and violations of position limits.

⁵By regulation, Chinese banks cannot lend on the security of warehouse receipts. This restriction regarding pledge instruments is typical in transition economies (Lacroix and Varangis, 1996).

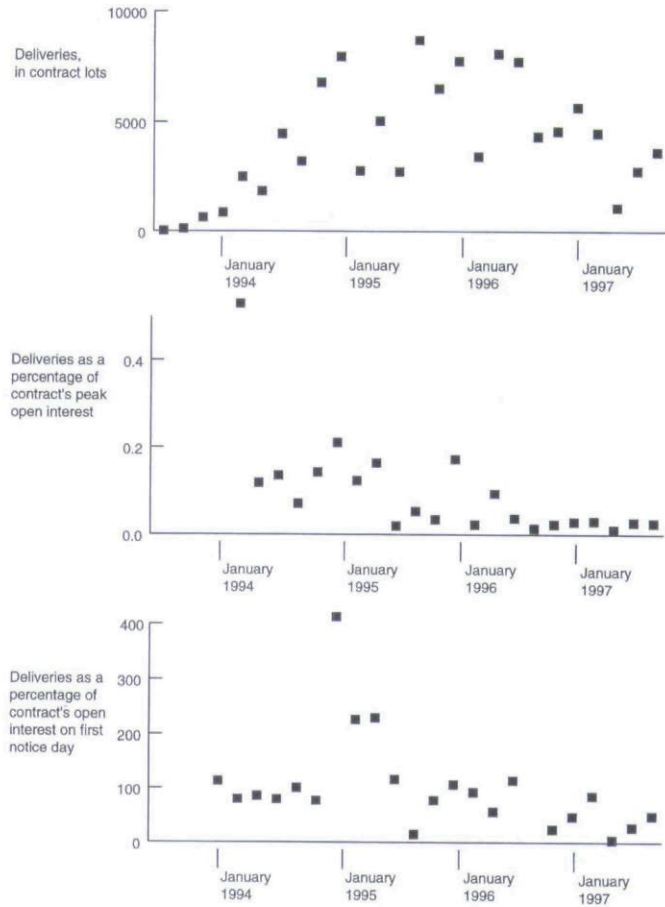


FIGURE 4
Deliveries on CZCE mungbean futures.

Originally, the rules regarding deliveries were few and the dedicated staff was small. For the initiation of trading in June 1993, the CZCE specified six delivery months: January, March, May, July, September, and November. The CZCE copied many contractual terms from the CBOT's grain contracts, which CZCE officials had studied carefully. Trading in the expiring contract ceases seven business days before the end of the calendar month, during which time the short can still deliver. Delivery is by warehouse receipts issued by one of the designated warehouses. Originally, four warehouses were registered. Now the number is 21, some as far as several hundred kilometers from Zhengzhou, all of which have had their receipts used for deliveries.

CZCE officials report that deliveries and trading within the delivery month are among the most important issues the exchange monitors reg-

ularly. Indeed, deliveries have become substantial in amount, as Figure 4 shows. In a typical month, some 50 CZCE members make or take delivery. Although some members take delivery in small quantities on behalf of their brokerage customers, some large processors use the futures delivery system as a major source of supply. Those taking delivery often trade the receipts by delivery location, in twice-weekly sessions provided by the exchange. The CZCE will soon have a new system in which a generic warehouse receipt is issued to someone standing for delivery; the recipient will then express preferences among the 21 registered warehouses, a preference that the CZCE will try to match as closely as possible among the specific receipts tendered by the shorts.

Although deliveries are substantial in amount, the evidence in Figure 4 also shows that deliveries are not disproportionate percentages of the open interest, either at its peak or at the first of the delivery period. The CBOT's wheat, corn, and soybean markets, for instance, have recently had percentages not much below those seen on the CZCE (Williams, 1992); physical settlement would be even more in line with CBOT if the many Exchanges for Physicals (EFPs) on the Chicago markets were included. Nothing yet has developed at the CZCE like the routine EFPs on U.S. exchanges, made possible because two commercial firms so frequently have offsetting futures positions. Nor are the smaller commercial firms who deal with farmers or smaller processors employing basis quotations, with the nearby futures contract as the benchmark price. In other words, although total integration of the physicals and futures markets has not yet happened, the delivery mechanism on futures contracts has become a major force in that direction.

From the beginning of futures trading, CZCE officials have managed difficulties in the delivery month aggressively as they arose. For example, problems arose with deliveries in November 1993, because of the strict limits on water content in the grade standards. Traders short the November 1993 contract arrived at registered warehouses, often from some distance, with truckloads of newly harvested mungbeans to make delivery on their contracts, only to have the mungbeans rejected for water content of 14–15% instead of the stipulated 13.5%. Some 40% of proffered mungbeans were rejected. Because the registered warehouses had limited drying capacity, shorts with rejected mungbeans had to sell their mungbeans in the local cash market and to offset their futures contracts, transactions in which they realized significant losses. By the CZCE rules, registered warehouses cannot take positions in the futures markets, but they could and did offer to buy the rejected mungbeans at their unloading facilities

at a discount as part of their own wholesaling operations.⁶ At one point during November 1993, the expiring futures contract went to such a premium over the local cash price, which was reflecting the higher water content, that a few shorts found it advisable to accept the special provision for cash settlement on their futures contracts upon payment of a penalty.⁷ CZCE officials, although concerned about these early problems, resisted changing the deliverable grade to something less than the national standard; instead, they encouraged registered warehouses to expand their drying capacity.

CZCE officials had their first experience with attempted manipulation in the July 1994 contract. One long, a broker/speculator based in Zhengzhou, held more than 1000 contracts at the start of July, close to the entire open interest remaining. The short side of the market was also highly concentrated, primarily split among three commercial firms. A backwardation of 20% emerged by mid-July relative to the September contract. CZCE officials responded immediately in three ways. First, they met with the long, in the fashion of all futures exchanges, to alert him of their concern and their resolve. Second, they altered the price-move limits, to make them tighter with each successive day, so as to cap the amount of variation margin the shorts would have to pay each day through the clearinghouse. Third, they encouraged the shorts to acquire mungbeans and to ship them to registered warehouses. The outcome by the end of July was chastening losses to the shorts, some, but not large, profits (and a lot of mungbeans) to the long, and no default.⁸

With the immediate crisis of the July 1994 contract behind them, CZCE officials considered more substantive changes to the contract terms to deter manipulation. They imposed position limits that become tighter one month prior to the delivery period. They increased the additional original margin both longs and shorts must deposit at the start of the delivery month, which had been variously 30%, 20%, and 15%, to the current 50% of the settlement price.⁹ They instituted a regulation that one trader cannot take more than 20% of the deliveries in any one month.

⁶The wholesale trade of all registered warehouses is, however, well under 10% of the entire wholesale trade.

⁷The mungbean contract allows for either the short (or the long) not to make (or take) delivery upon payment of a penalty, which happens to equal the original margin. In effect, this provision acknowledges that the CZCE has little recourse to traders through the court system. This provision has been invoked only in November 1993.

⁸The Beijing Commodities Exchange experienced a sharp corner in March 1996 mungbeans. One trader, in violation of position limits, stood for delivery on 3800 contracts, which he redelivered in May, breaking the price then. Prices in Zhengzhou were affected to the extent that in March many stocks in registered warehouses left for Beijing.

⁹Except for the delivery period, the original margin for mungbeans was 7% until September 1994 and has been 5% thereafter.

They also rethought their premise that deliveries on the contract should be difficult to accomplish. [U.S. exchange officials commonly hold the view that deliveries are and should be rare, despite the evidence (e.g., Peck and Williams, 1991).] To the original four warehouses, they began adding many others outside the immediate Zhengzhou area as eligible delivery points and allowed for delivery age-blackened beans, although at a stipulated discount, yellowish and grayish mungbeans, at par, and also "bright" mungbeans, at a 5% premium. Their alterations in the contract expanded the "deliverable supply" considerably.

Rules on price-move limits set during July 1994 were later found to be more constraining than desirable. In mid-May 1995, after a gradual run-up in price from late April, the price moved sharply downward, a large enough move to invoke the price-move limits for ten straight days. The price break was due in part to the government's closure of the Treasury bond futures market in Shanghai at a price beneficial to the shorts there but also to the forced unwinding of the position of a large long who had violated position limits.¹⁰ CZCE officials had considerable concern that the large long would be unable to meet margin calls, which might bankrupt several brokerage firms. Compounding the problem was that no one could trade out of contracts when prices were "locked down the limit." On Friday, May 12, the CZCE officials, fearful of a general collapse, announced the suspension of trading, to permit them to assess the situation. The CZCE officials reopened trading on the following Monday with much wider price-move limits in effect, and were relieved to see the price stabilize not far below the previous close and most customers and brokers make their variation margin payments.

CZCE officials have been vigorous in monitoring members for sudden increases in trading volume, tracking margin funds through banking channels, and performing background checks on new members. The large long in trouble in May 1995 had accumulated an excessively large position by trading through multiple accounts. CZCE officials uncovered the multiple accounts in early May 1995, and forced him to trade out of his positions in excess of the limits. The CZCE officials also uncovered a trader with multiple accounts in the fall of 1996, a trader who had previously been very active in the Beijing futures market. In February 1997, the CZCE revoked this trader's privileges, the first such disciplinary action taken by a Chinese exchange. The CZCE was sued in spring 1997 by a trader who objected to the exchange's intervention in the market; in the summer of 1997 a court upheld the CZCE's right to supervise its market.

¹⁰Government intervention in markets, not just futures markets, has generally been to keep prices down. Hence, traders, in anticipation of possible interventions, bid the prevailing price down.

IMPLICATIONS OF THE CZCE'S EXPERIENCE

The story of the CZCE's mungbean futures market contradicts the accepted account "that futures trading, unorganized and organized, develop[s] gradually, evidently to meet specific marketing needs" (Irwin, 1954, p. 5). The accepted account (e.g., Baer and Saxon, 1949; Burns, 1979; Markham, 1987) imagines a slow progression from a standardization of spot transactions, to an active forward market, to a culmination in a futures market, an evolution—to use the word in Irwin's (1954) title—rather than a revolution. The accepted account seems to be drawn mostly from examples during the 19th century, but key developments in financial futures, such as the connection between the CBOT's GNMA contract and the forward market for mortgages (Gray, 1973) and the connection between the Chicago Mercantile Exchange's (CME's) currency futures and the interbank forex market, would seem to support it. As presented in the CBOT's *Commodity Trading Manual*, from whence its Chicago-centric version has been copied into many textbooks, the accepted account verges on legend.

Modern stories, especially that of mungbeans on the CZCE, imply a major revision of the legend¹¹: The presence and leadership of an organized futures exchange make possible the evolution of marketing practices, including intertemporal arbitrage. The establishment of an institution for intertemporal pricing itself is generally much more abrupt, following closely upon a major change in storage technology, magnitude and direction of the physical flows, or price liberalization, as in China.

The CZCE has been able to observe mature futures markets elsewhere, of course. It has borrowed, especially from the CBOT, the broad philosophy of delivery of warehouse receipts during a month-long window, general rules such as for daily price-move limits, and general pro-

¹¹Then again, the legend bears little resemblance to the historical record. On closer inspection, many of the stories about the origin of futures trading reveal futures trading to have emerged simultaneously with major developments in the physicals trade. With the increased exports to Europe in the 1840s, the grain trade of New York City employed standardized forward contracts and options, arranged at the Corn Exchange and settled by the payment of monetary differences (Williams, 1988). [These practices, when transferred to upstart Chicago and combined with improvements in grain storage technology and the Midwest's pronounced seasonal flows (Cronon, 1991), established the CBOT in futures trading in the 1860s.] Standardized to-arrive contracts passing from one trader to another were a regular feature within the Cotton Brokers' Association once Liverpool handled large volumes in the 1850s, many years before the Liverpool Cotton Exchange's futures market was formally established in the 1870s (Dumbell, 1927). Complicated forward deals, settled through book entry, were features of the Osaka rice market almost as soon as rice was traded there in bulk in the 17th century (Schaefer, 1989). Irwin's (1954) own account of egg marketing in the late 19th century reveals that time contracts, speculation, and short selling appeared nearly simultaneously with the key advance in refrigeration technology at terminal markets; it took several decades and several aborted efforts to maintain such trading on an organized exchange. That is, in eggs as in these other commodities, the form of futures trading was present long before futures trading was widespread in commercial circles.

cedures such as for collection of variation margin. These transplantations have, undoubtedly, sped the emergence of its mungbean market.

Like the CZCE, all modern exchanges can actively design new contracts. They need not rely on informal forward trading to "ripen into organized trading in futures" and then for the organized trading to "show considerable evolution before reaching its full stature" (Irwin, 1954, p. 5). Their success is ever more dependent upon aligning the contract with trade practices for the physical commodity and on active management of the subsequent trading. For instance, the frozen pork belly contract succeeded in the mid 1960s only after the CME aligned provisions regarding shrinkage allowances, grading, and storage techniques with trade practices, revisions that took careful exchange management (Powers, 1967). When introducing a plywood futures contract, the CBOT deliberately copied the prevailing physicals trade (Sandor, 1973). The Minneapolis Grain Exchange's recent failure with the high fructose corn syrup contract (Thompson, Garcia, and Wildman, 1996) only reiterates the lesson that if a futures contract is not well aligned with what commercial practices are or ought to be or if it does not attract commercial use as part of regular merchandising operations, it will fail. The CZCE's mungbean story, however, adds another dimension to this relationship between physicals and futures trading. Some commercial firms experimented early on with the mungbean futures market; with this experience, they rethought their marketing needs rather than fit futures into prevailing marketing practices.

No doubt, exchange officials everywhere perceive the incongruity between the legend and facts. Even so, the legend is sometimes harmful—witness their advice that the CZCE should first promote a forward market. A major lesson from the story of mungbeans is that futures exchanges can deliberately improve the practices in physicals trading to the ultimate benefit of futures trading. The CZCE has supported a wholesale market in Zhengzhou itself, it has offered an electronic bulletin board for news about mungbeans as reported by market participants, it has developed an information system for the dissemination of prices at other wholesale centers, it has recruited members from the commercial trade regionwide, it has registered futures delivery warehouses in a variety of locations, it has advertised the grade standards eligible for delivery, it has encouraged investments in cleaning and drying facilities, it has specified rules for the wholesale trading of registered warehouses, and it has helped draft laws related to forward contracting and futures trading.

The CZCE has not been member-run; rather it was initiated by the grain bureau under the Henan provincial government and by the former

Ministry of Commerce, and then managed by the exchange officials themselves. On several occasions, the CZCE officials have taken a longer-term view of rules and interventions than perhaps members interested in current trading volume would have wanted. Although one false step by the CZCE might depress either speculative or commercial interest, the CZCE has actively adjusted its rules to keep the mungbean market in balance. Certainly, the CZCE officials have taken a stronger hand than would have occurred had the mungbean physicals and futures markets been left to develop on their own.

With the mungbean market to build upon, the CZCE some years from now may well have several actively traded commodities. China is a natural world center for trading of mungbeans, rice, pork, and until enormous investments in transport systems have been made, in commodities produced in substantial quantities far from ports, most notably wheat. For these commodities as for mungbeans, the revolutionary presence of an organized futures exchange should encourage the evolution of marketing practices for the physical commodity.

BIBLIOGRAPHY

- Baer, J. B., and Saxon, O. G. (1949): *Commodity Exchanges and Futures Trading*. New York: Harper.
- Bailey, W. (1989): "The Market for Japanese Index Futures: Some Preliminary Evidence," *The Journal of Futures Markets*, 9:283-295.
- Bouilly, R. H. (1975): "The Development of American Cotton Exchanges, 1870-1916." Ph.D. dissertation, University of Missouri-Columbia.
- Brailsford, T. J., and Cusack, A. J. (1997): "A Comparison of Futures Pricing Models in a New Market: The Case of Individual Share Futures," *The Journal of Futures Markets*, 17:515-541.
- Brenner, M., Subrahmanyam, M. G., and Uno, J. (1989): "The Behavior of Prices in the Nikkei Spot and Futures Market," *Journal of Financial Economics*, 23:363-383.
- Burns, J. M. (1979): *A Treatise on Markets: Spot, Futures, and Options*. Washington, DC: American Enterprise Institute.
- Carlton, D. W. (1984): "Futures Markets: Their Purpose, Their History, Their Growth, Their Successes and Failures," *The Journal of Futures Markets*, 4:237-271.
- Cronon, W. (1991): *Nature's Metropolis: Chicago and the Great West*. New York: Norton.
- Dumbell, S. (1927): "The Origin of Cotton Futures," *Economic History*, 1:193-201.
- Esposito, M., and Giralidi, C. (1994): "Preliminary Evidence on a New Market: The Futures on the Italian Treasury Bonds," *The Journal of Futures Markets*, 14:121-146.

- Fry, J. (1994): "The Regulation of Commodity Exchanges: An International Comparison." Landell Mills Commodities Studies, R 878.
- Gray, R. W. (1967): "Price Effects of a Lack of Speculation," *Food Research Institute Studies*, 7:S177-S194.
- Gray, R. W. (1973): "The Feasibility of Organized Futures Trading in Residential Mortgages." Unpublished report prepared for the Federal Home Loan Mortgage Corp., 67 pp.
- Irwin, H. S. (1935): "Seasonal Cycles in Aggregates of Wheat Futures Contracts," *Journal of Political Economy*, 43:34-49.
- Irwin, H. S. (1954): *Evolution of Futures Trading*. Madison, WI: Mimir Publishers.
- Lacroix, R., and Varangis, P. (1996): "Using Warehouse Receipts in Developing and Transition Economies," *Finance and Development*, September:36-39.
- Li, J. (1996): "Development, Problems and Strategies of China's Futures Markets." The Sixth Annual Asia-Pacific Futures Research Symposium. *Research Symposium Proceedings*. Chicago: Chicago Board of Trade, pp. 313-324.
- Markham, J. W. (1987): *The History of Commodity Futures Trading and Its Regulation*. New York: Praeger.
- Modest, D. M., and Sundaresan, M. (1983): "The Relationship between Spot and Futures Prices in Stock Index Futures Markets: Some Preliminary Evidence," *The Journal of Futures Markets*, 3:15-41.
- Peck, A. E. (1979): "Reflections of Hedging on Futures Market Activity," *Food Research Institute Studies*, 17:327-349.
- Peck, A. E., and Williams, J. C. (1991): "Deliveries on Chicago Board of Trade Wheat, Corn, and Soybean Futures Contracts, 1964/65-1988/89," *Food Research Institute Studies*, 22:129-225.
- Pirrong, S. C., Kormendi, R., and Meguire, P. (1994): "Multiple Delivery Points, Pricing Dynamics, and Hedging Effectiveness in Futures Markets for Spatial Commodities," *The Journal of Futures Markets*, 14:545-573.
- Powers, M. J. (1967): "Effects of Contract Provisions on the Success of a Futures Contract," *Journal of Farm Economics*, 49:833-843.
- Rothstein, M. (1983): "The Rejection and Acceptance of a Marketing Innovation: Hedging in the Late Nineteenth Century," *Review of Research in Futures Markets*, 2:200-214.
- Sandor, R. (1973): "Innovation by an Exchange: A Case Study of the Development of the Plywood Futures Contract," *Journal of Law and Economics*, 16:119-136.
- Schaede, U. (1989): "Forwards and Futures in Tokugawa-Period Japan," *Journal of Banking and Finance*, 13:487-513.
- Silber, W. L. (1981): "Innovation, Competition and New Contract Design in Futures Markets," *The Journal of Futures Markets*, 1:123-155.
- Stulz, R. M., Wasserfallen, W., and Stucki, T. (1990): "Stock Index Futures in Switzerland: Pricing and Hedging Performance," *Review of Futures Markets*, 9:576-592.
- Telser, L. G., and Higinbotham, H. N. (1977): "Organized Futures Markets: Costs and Benefits," *Journal of Political Economy*, 85:969-1000.

- Thompson, S., Garcia, P., and Wildman, L. D. (1996): "The Demise of the High Fructose Corn Syrup Futures Contract: A Case Study," *The Journal of Futures Markets*, 16:697-724.
- Wall, D., and Wei, J. (1994): "Futures Markets in China." University of Sussex, The Chinese Economy Programme.
- Williams, J. (1982): "The Origin of Futures Markets," *Agricultural History*, 56:306-316.
- Williams, J. (1992): "Patterns in Recent Deliveries on the CBOT Wheat, Corn, and Soybean Contracts," *Review of Futures Markets*, 11:204-215.
- Working, H. (1954): "Whose Markets? Evidence on Some Aspects of Futures Trading," *Journal of Marketing*, 19:1-11.
- Working, H. (1960): "Price Effects of Futures Trading," *Food Research Institute Studies*, 1:1-27.
- Wu, S. (1996): "Critical Issues Haunt China's Futures Market," *China Finance*, August: 8-9.

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