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COMMODITY PRODUCTS

Understanding Wheat Futures Convergence

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Background on Convergence

Futures market convergence is the process where cash market prices and futures market prices come together, or converge, at futures market expiration. Theoretically, convergence occurs at every futures contract expiration because of arbitrage; if cash prices remain below futures prices, a market participant could buy in the cash market and sell in the futures market, and make a risk-free profit. Similarly, if the cash price is above the futures price, a market participant could buy in the futures market, take delivery and sell in the cash market, again earning a risk free-profit.

This is fine in theory; in practice, however, cash and futures prices have occasionally failed to converge for a variety of reasons. One such situation is the CBOT Wheat futures market. Following the March 2008 contract expiration, the Wheat futures market exhibited poor cash-futures convergence for nine straight contract expirations. However, thanks to contract changes implemented by the Exchange in conjunction with market participants, the Wheat futures contract exhibited excellent convergence with its March 2010 expiration. While we cannot declare that convergence problems in wheat futures will not recur, the Exchange is optimistic that the significant contract changes implemented over the past 24 months may have alleviated the convergence issues.

Wheat Market Specifics

There are two major factors that came together to cause convergence problems in the Wheat futures market. This paper examines these issues and discusses how contract changes were instituted to address them.

The first issue that complicates the relationship between Wheat futures and cash prices is a market structure issue. Wheat is a complicated commodity with many varieties of wheat grown around the world. As such, wheat tends to be a local commodity and there are approximately 20 different wheat futures contracts listed around the world. However, the CBOT Wheat futures is by far the most liquid of all these contracts. Often, because of its liquidity, the CBOT Wheat futures contract is used as a benchmark for world wheat prices. This is typically not a major issue for the performance of the contract. However, when world wheat shortages are combined with abundant U.S. wheat stocks, disconnects between cash and futures prices can and do occur.

The solution to this problem is to ensure that the delivery system for the futures contract is large enough to allow effective arbitrage between the cash and futures markets. CME Group addressed this issue by adding additional delivery territories for the CBOT Wheat futures market effective with the July 2009 expiration. These new delivery territories were specified in areas that represent the primary production and marketing channels for soft red winter wheat: Northwest Ohio; the Ohio River from Cincinnati to the Mississippi River; and the Mississippi River from south of St. Louis to Memphis. These new territories more than doubled the contract's delivery capacity, which still contains the original territories in Chicago, Toledo, and St. Louis.

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The second major issue affecting convergence in the Wheat market is the classic supply and demand factor. From 2000 to 2007, world wheat consumption exceeded wheat production in five out of eight crop years. This drove the world wheat stocks-to-use ratio to its lowest level in over 40 years in the first half of 2008. Prices in 2008 before harvest increased significantly because the world was running out of wheat. However, the 2008/09 harvest was bountiful. It is often said that the cure for high prices is high prices. Here, declining world wheat stocks led to higher prices and farmers responded to those prices with record production. This record production resulted in falling wheat prices during the second half of 2008 following harvest.

The variety of wheat delivered on the CBOT Wheat futures contract is soft red winter (SRW), a low protein wheat used in cakes, crackers, and pastries. The 2008/09 U.S. SRW wheat harvest, at 614 million bushels, was the largest harvest since 1981. In just several months, the U.S. wheat situation went from a shortage, to having more SRW wheat than there was available storage. SRW wheat is grown in areas that also produce significant quantities of corn and soybeans, and the market was also anticipating near-record harvests for those crops. As a result, grain elevators were trying to maintain space for an expected large corn and soybean harvest, while at the same time they were inundated with more wheat than they were prepared to handle. The only way wheat was able to find storage space was if it became very cheap, and indeed, SRW cash prices fell relative to futures prices, resulting in a lack of convergence.

Famous futures market economist Tom Hieronymus wrote in *Economics of Futures Trading For Commercial and Personal Profit,*[*] that cash prices may be at a discount to futures prices during a delivery month when there is a lack of warehouse space and the cash price discount to futures is tied to the cost of putting the commodity into storage. For an elevator with a certain allotment of space for wheat storage, when that space is full, the cost to store an additional bushel of wheat can increase significantly due to the lost opportunity of using that space for corn and/or soybeans. According to Hieronymus' logic, convergence can be problematic whenever a commodity is in oversupply relative to available storage space. To address this issue, if the cost to store a commodity increases (decreases), one needs to examine how to also increase (decrease) the returns from storage to keep the costs and benefits in alignment. The benefits from storage are discovered in the price spreads between different expiration months in the futures market.

* Hieronymus, Thomas A. Economics of Futures Trading For Commercial and Personal Profit. New York, NY: Commodity Research Bureau, Inc., 1971.

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One of the functions of wheat futures contracts is to provide price signals to wheat merchandisers to help them efficiently market a crop that is grown once per year, but consumed throughout the entire year. The futures market price spreads and their relationship with cash prices provide these signals and ensure the crop is efficiently marketed throughout the year. These relative prices help grain merchandisers determine whether to store grain or sell it. A grain elevator will buy wheat when the cash price is cheap relative to the futures price and simultaneously sell futures contracts to hedge his position. If the cash price increases relative to the futures price by more than the elevator's cost of storage, the elevator profits. Reiterating Hieronymus' point, the 2008/09 SRW harvest was so large, that wheat had to continue to bid a higher and higher price for limited storage space to counteract the increasing cost of putting additional wheat into storage. The effects of this showed up as cash prices decreasing relative to futures prices (non-convergence).

Eventually, the value that cash wheat was bidding for storage was larger than the fixed storage charge specified in the CBOT Wheat futures contract. The price spreads for Wheat futures needed to reflect this higher value of storage being demanded of cash wheat, however, they were prevented from expanding due to the constraint of financial full carry. Futures spreads do not expand beyond financial full carry because of arbitrage: a market participant could take delivery of shipping certificates in the nearby futures contract, sell futures contracts in the next available futures contract, and redeliver the shipping certificates when the next available futures contract begins delivery, and receive a risk-free profit should futures spreads expand beyond financial full carry. Because of this arbitrage potential, futures market spreads rarely expand beyond financial full carry.

[1] Financial full carry is the situation where the price difference (spread) between the nearby futures contract and the futures contract that expires after the nearby futures contract covers exactly the cost to carry a futures market shipping certificate from the nearby contract period until the next contract period. Financial full carry is calculated from the storage charges specified in the wheat futures contract and the interest costs faced by someone carrying shipping certificates.

As a result of a large SRW wheat harvest, the cost to store additional wheat was increasing in 2008. Because the return from storage is fixed in the futures market spreads, the market expressed this increasing cost of storage through a weak non-converging basis. To facilitate convergence, the futures market spreads need to be able to respond to increasing storage costs in the same way the basis responds to increasing storage costs. CME Group, working closely with market participants and industry trade groups, is addressing this issue by implementing a variable storage rate (VSR) mechanism for wheat futures. Variable storage rates allow the storage rate specified in the wheat futures contract, and hence, futures price spreads, to better reflect the cash market cost of storage, which may result in improved convergence and improved contract performance. Visit **www.cmegroup.com/vsr** to learn more about the CME Group Variable Storage Rate mechanism.

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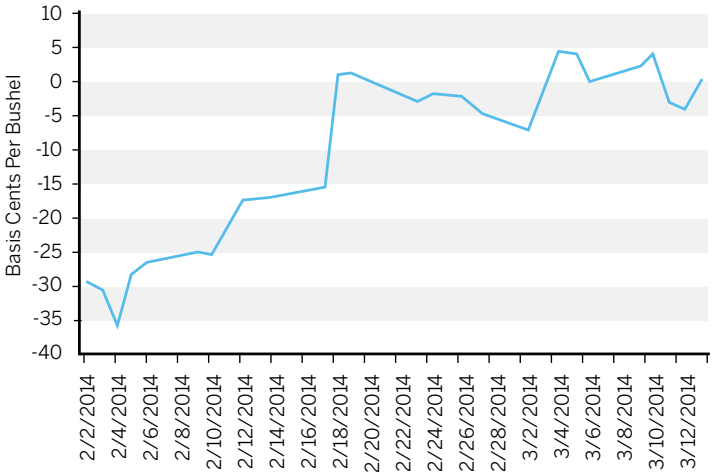
Variable storage rates were implemented beginning with the July 2010 futures contract. However, the results of this implementation appear to have positively impacted convergence in the March 2010 expiration. The fact that the benefits of the VSR mechanism occurred prior to its implementation may have been due to the following:

1. Storage rates can increase under VSR mechanism.
2. If the market expects storage rates to increase following the July 2010 contract expiration, the July – September spread may widen now.
3. The widening spread is likely to be achieved by an increase in the September contract price and a decrease in the July contract price, all other things the same.
4. When this happens, the May – July spread is affected, so the May contract reacts to maintain the same relationship with the July contract, which requires the March contract to respond to maintain the relationship with the May contract.

Basically, any expectations about deferred spreads that are discovered in the market reverberate back through to the current spreads. The ultimate result is that the Chicago SRW wheat market converged during the March 2010 futures expiration (figure 1).

FIGURE 1: CHICAGO FOB VALUE BASIS CALCULATED RELATIVE TO MARCH 2010 FUTURES UNTIL FUTURES EXPIRATION.



Source: CME Group

Summary

Two major points explain the convergence issues observed in the CBOT Wheat futures market over the past 18 months. Convergence issues arose following a bountiful harvest and a constrained wheat futures delivery system. CME Group acted, through collaboration with all categories of market participants, to address these delivery market constraints and the results so far are quite promising as convergence occurred in the Chicago delivery location with the expiration of the March 2010 futures contract. CME Group will continue to monitor convergence in the wheat contract and work closely with our customers to assure the CBOT Wheat futures market is a well functioning contract that provides the world with price discovery, price transparency, and effective price risk management tools.

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For more information on wheat futures convergence and Variable Storage Rates, visit **www.cmegroup.com/vsr.**

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