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## **Reexamination of the Impact of the Removal of CBOT Corn and Soybean Futures Contract Delivery from Toledo, Ohio**

by

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**Reexamination of the Impact of the Removal of CBOT Corn and Soybean  
Futures Contract Delivery from Toledo, Ohio.**

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## **Reexamination of the Impact of the Removal of CBOT Corn and Soybean Futures Contract Delivery from Toledo, Ohio.**

*Beginning with delivery on the July 2006 contract, non-convergence became an issue in the Chicago wheat futures contract. Despite several changes to the contract, convergence remains an issue. Recently, some have proposed eliminating Toledo, Ohio as a delivery point for the Chicago wheat contract. One concern is the potential impact this proposal could have on the cash-futures basis in the Toledo and surrounding delivery areas. To examine this issue, the impact of the removal of Toledo as a delivery point for corn and soybeans futures contracts beginning with contracts expiring in 2000 is examined. The changes in the Toledo and other Ohio corn and soybean basis conflict both in direction and significance, by crop and relative to changes in the corn and soybean basis in Illinois and Iowa. Thus, no consistent empirical evidence is found to support the claim that eliminating the Toledo switching district in 2000 as a delivery point for corn and soybeans had a serious detrimental effect on the corn and soybean basis in Ohio. These findings suggest that replacing Toledo as the primary delivery point for the Chicago wheat contract would not be expected to have a substantially negative impact upon the Ohio wheat basis.*

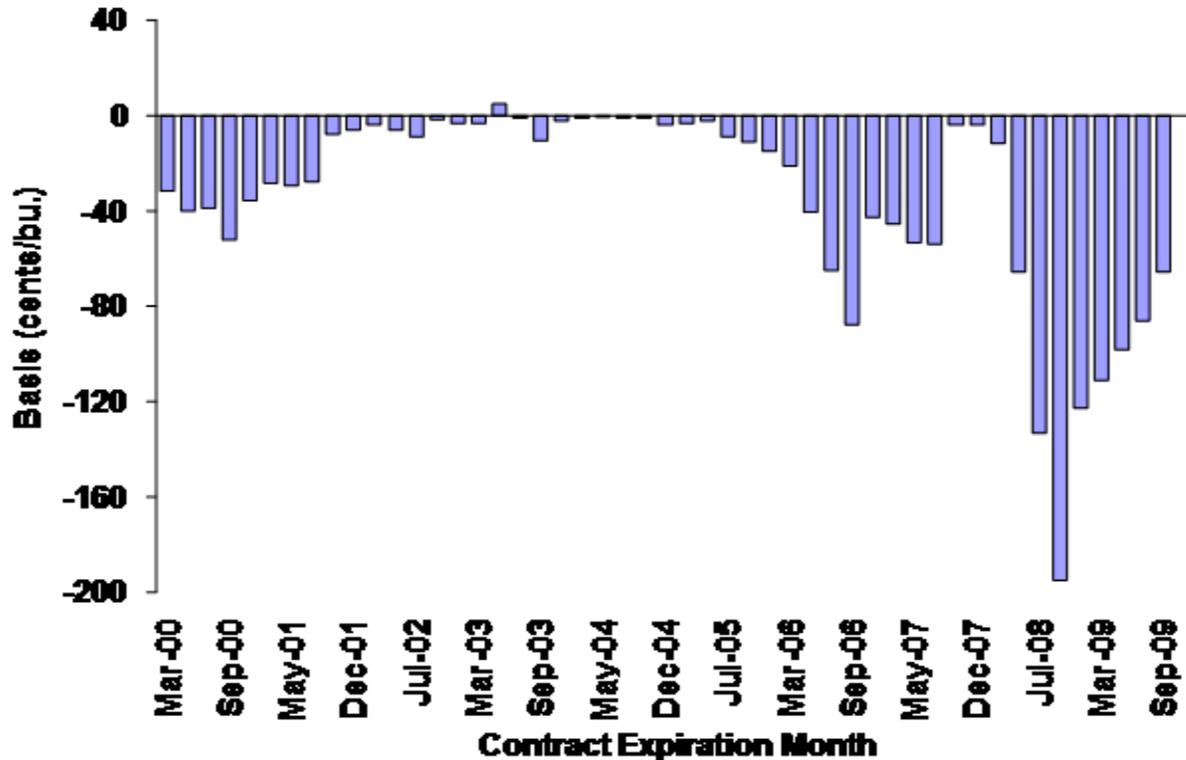
**Keywords:** delivery location, basis convergence, futures contract specification, Toledo, corn, soybeans

### **Introduction**

Convergence of cash prices and maturing futures contract prices is considered critical to the usefulness of the futures markets to cash market participants. Convergence is a demonstration of the linkage of futures market and cash market prices. Conceptually, any difference in the cash and futures price for a commodity at the time and place of delivery creates an arbitrage opportunity that is traded to zero. Transactions costs make absolute convergence to zero unlikely, but the difference in prices is expected to be within the range of transactions costs at the time and place of delivery. Convergence allows for effective hedging and more accurate price discovery in cash markets.

However, non-convergence emerged as an issue in the Chicago wheat market beginning with delivery of the July 2006 contract (Irwin, *et al.*, 2008). Concern has grown as the non-convergence problem has continued. The Commodity Futures Trading Commission organized forums, and Congressional hearings were held (for example, U.S. Senate Permanent Subcommittee on Investigations). In an attempt to address the problem, the CME group has made several changes to the Chicago wheat contract, including the addition of more delivery areas starting with the July 2009 contracts. While the basis has narrowed toward zero, convergence has not occurred (Figure 1). More recently, Irwin, *et al.* (March 2009) proposed eliminating Toledo, Ohio as a delivery point for the Chicago wheat contract. Historically, Toledo has been the primary delivery point for the Chicago wheat contract.

**Figure 1: Basis on the first day of delivery for December 2001 through May 2008 CBOT wheat futures contracts at the Toledo delivery area**



Source: Figure taken from Irwin, *et al.* (2008). Used with permission.

One concern with the proposal to eliminate Toledo as a delivery point is the potential impact it could have on the cash-futures basis in the current delivery area. A similar concern emerged when Toledo was eliminated as a delivery point for corn and soybeans beginning with futures contracts expiring in 2000. Given the similar nature of the 2000 change with the proposal by Irwin, *et al.* (March 2009), this paper examines whether the corn and soybean basis changed in Toledo and other areas of Ohio subsequent to the 2000 removal of Toledo as a delivery location for Chicago corn and soybeans. No consistent impact on the Ohio corn and soybean basis is found.

The rest of the paper is organized as follows. The 2000 changes in delivery on the Chicago corn and soybean contracts are discussed next, followed by a discussion of the procedures and data. Results of the analysis are presented, with the last section being conclusions and implications.

### **Background on the Changes in Delivery Attributes in 2000**

In December 1996, the Commodity Futures Trading Commission (CFTC) issued a notice to the Chicago Board of Trade (CBOT) that the delivery sections of the corn and soybean futures contracts no longer accomplished their objectives. The CFTC based its decision on:

“(1) the continuing diminution of the role of terminal markets in the cash market for grain; (2) the increasing shift of the locus of the main channels of commodity flows away from the delivery points on the contracts, particularly the par-delivery point of Chicago; (3) the continuing decline in cash market activity generally at the contracts' delivery points, particularly Chicago; and (4) the serious, precipitous drop in regular warehouse storage capacity at the Chicago delivery point” (CFTC, 1996, p. 67998)

The CBOT proposed a number of changes. The change most relevant to this paper was the removal of the Toledo, Ohio switching district as a delivery location. In addition, new delivery locations were added on the southern Illinois River. The changes were implemented with the contracts that expired in the year 2000 (CFTC, 1998).

Producers and policy-makers in Ohio expressed concern that such a move would have strong negative impacts on the basis in Ohio markets. However, Zulauf and Irwin found that such effects were unlikely. They examined the effect on the basis in Ohio markets due to the establishment of Toledo as a delivery point for CBOT corn in 1976. They argued that, if the presence of a delivery point affects the basis, the effect should be discoverable in the creation as well as the removal of a delivery area. The analysis did not find statistical evidence that the establishment of Toledo as a delivery point for CBOT corn had an effect on the Ohio corn basis.

## **Procedures and Data**

An event study approach is used. An event study examines one variable, comparing it before and after a significant event hypothesized to impact the variable in question (MacKinlay, 1997). It cannot be overstated that a single event study cannot demonstrate causality on the part of the event, given the multitude of other potential factors that could also have impacts. A number of event studies, each with a unique set of circumstances, would have to demonstrate a recurring pattern before even a correlative statement could be made. Our review of the literature has not located any other study of the removal of a delivery point. Thus, this study will not lead to general conclusions about the impact of removing delivery on local basis. Hence, the goal of this study is to examine whether the corn and soybean basis was different during the period immediately after delivery was removed than during the period just prior to the removal of delivery.

The observation period after removal of Toledo as a delivery point ends in December 2005. The reason for this ending point is that convergence problems began to occur in the Chicago corn and soybean contracts during 2006 (Irwin, et al. 2008). Given that six years are included in the period after the implementation of the change in corn and soybean delivery (i.e, 2000 through 2005), a six year period is examined prior to the change (i.e., 1994 through 1999). Thus, the observation period for this event study spans 12 calendar years, 1994 through 2005.

The nearby basis is calculated for each trading day in the observation period as follows:

$$(1) \quad \text{Basis}_{t,j} = \text{Nearby Futures Settlement Price}_t - \text{Cash Price}_{t,j}$$

where  $t$  is the trading day and  $j$  is the cash market location. This formulation generally results in positive-signed basis values.

Price of the closest-to-expiration futures contract is used to calculate the basis even if the contract is its delivery month. Contract delivery months are March, May, July, September, and December for corn and January, March, May, July, August, September, and November for soybeans.

Three Ohio areas are employed in this analysis: the port of Toledo, northwest Ohio, and the interior of Ohio. The northwest Ohio price is a simple average of cash prices sampled from the Northwest Ohio Crop Reporting District and the Northern Ohio Crop Reporting District. These two Ohio regions are the closest to Toledo.<sup>1</sup> The interior Ohio area consists of eight of the nine Crop Reporting Districts in Ohio. Southeastern Ohio (region 9) is excluded because little corn and soybeans are grown there. The northwest Ohio and interior Ohio regions were included as a sensitivity test to assess whether impacts observed at the delivery area occurred elsewhere in Ohio.

Cash prices also were obtained for Illinois and Iowa. Illinois was chosen because the Illinois River system is the current delivery location for the Chicago corn and soybean futures contracts. Iowa was chosen because it is a major corn and soybean production state but has no delivery point. The inclusion of Illinois and Iowa provide points of reference for assessing observed changes in the Ohio basis. If changes in the Ohio basis occurred concurrently in Illinois and Iowa, then it is less likely that the removal of Toledo was the cause of the observed changes. The Iowa average price is the simple average of the six reporting regions in Iowa. The Illinois average price is a simple average of the eight reporting regions in Illinois. A simple average price is also calculated for the central and north central regions of Illinois.<sup>2</sup> These two regions contain the current delivery points along the Illinois River for the Chicago corn and soybean futures contracts.

The difference in the basis between *regions A* and *B* is calculated as:

$$(2) \quad \text{difference in basis} = (\text{futures}_A - \text{cash}_A) - (\text{futures}_B - \text{cash}_B) = \text{cash}_B - \text{cash}_A$$

The sources for the cash prices and futures prices are discussed in Appendix A. Any observation date with a missing cash or nearby futures price was excluded from the analysis. Similar to the intra-region basis calculations, this formulation was arranged to provide basis differences that

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<sup>1</sup> The counties in these two Ohio regions are: Allen, Ashland, Crawford, Defiance, Erie, Fulton, Hancock, Henry, Huron, Lorain, Lucas, Ottawa, Paulding, Putnam, Sandusky, Seneca, Richland, Van Wert, Williams, Wood, and Wyandot.

<sup>2</sup> The counties in these two Illinois regions are: Bond, Brown, Bureau, Cass, Champaign, Christian, Clark, Clay, Coles, Crawford, Cumberland, De Witt, Douglas, Edgar, Effington, Fayette, Ford, Fulton, Greene, Grundy, Iroquois, Jasper, Kankakee, Kendall, La Salle, Livingston, Logan, Macon, Macoupin, Marion, Marshall, Mason, McLean, Menard, Montgomery, Morgan, Moultrie, Peoria, Piatt, Pike, Putnam, Richland, Sangamon, Schuyler, Scott, Shelby, Tazwell, Vermillion, Will, and Woodford. (Note: counties on the edge may not be completely contained in the region)

had positive signs. Given that basis has traditionally been stronger in Ohio than in Illinois or Iowa, the specific calculation was cash price in Ohio minus cash price in the other state.

Cochran's two-tailed t-test of means with unequal variances is used to test the null hypotheses that the mean price or price difference in the 1994-1999 period equals the mean price or price difference in the 2000-2005 period. The folded-form F-test was used to test the null hypotheses that the variance of price and of price differences from 1994-1999 was the same as the variance of price and of price differences from 2000-2005.

## Results

The average Ohio corn basis increased in the six years after Toledo was removed as a delivery point compared with the six years before the change (see Table I). The increase was greatest in the basis at Toledo, from 7.1 to 11.1 cents per bushel. The basis in northwest Ohio and interior Ohio increased by about three cents per bushel. These increases were statistically significant at the five percent test level. In contrast, the Ohio soybean basis decreased by a small, statistically insignificant amount after Toledo was removed as a delivery point.

An increase in the basis, or widening of the basis as is it described in the grain trade, means that the Ohio cash price declined relative to the futures price. In other words, the cash corn price in Toledo averaged 11 cents under the nearby futures price in the post-2000 period, an additional four cents under the futures price than during the pre-2000 period.

**Table I. Average Corn and Soybean Basis by Area and Period, Ohio, 1994 – 2005**

Region	Basis '94-'99	Basis '00-'05	Change	P-value
	-----¢/bu. -----			
Panel 1: Corn.....				
Toledo	7.1	11.1	4.0	0.0008
Northwest Ohio	14.6	17.8	3.1	0.0137
Ohio Interior	10.2	13.4	3.2	0.0067
Panel 2: Soybeans.....				
Toledo	8.2	7.9	-0.3	0.8159
Northwest Ohio	18.0	17.6	-0.3	0.8254
Ohio Interior	15.5	14.9	-0.6	0.6403

NOTES: The basis was calculated as the futures price minus the cash price. The P-value is for the test of the null hypothesis: average basis for 1994-1999 = average basis for 2000-2005.

Source: Original calculations using data sources described in Appendix A.

Standard deviation of the Toledo corn basis declined from 14.7 to 12.0 ¢/bushel after Toledo was removed as a delivery point (see Table II). This decline was significant at the one percent level. Standard deviation of the Northwest Ohio and Ohio Interior basis also declined, but the decline was not statistically significant. In contrast, standard deviation of the Ohio soybean basis was at least 40 percent higher during the post-2000 period than during the pre-2000 period. The increases were statistically significant at the one percent test level.

Comparison of the Toledo and Central Illinois basis is of particular interest because Central Illinois contains the current delivery point, the Illinois River system. These are the two delivery areas of interest in this analysis. The Toledo corn basis strengthened relative to the Central Illinois corn basis during the post-2000 period compared with the pre-2000 period (see Table III). The change was statistically significant at the one percent test level. As noted above, the Toledo corn basis widened during the post-2000 period compared with the pre-2000 period, with the change being statistically significant. Combining these two findings implies that, after Toledo was removed as a delivery point, the Toledo corn price declined relative to the futures price but the Central Illinois corn prices declined even more.

**Table II. Standard Deviation of Corn and Soybean Basis by Area and Period, Ohio, 1994 – 2005**

Region	Standard Deviation of Basis '94-'99	Standard Deviation of Basis '00-'05	Change	P-value
	-----¢/bu. -----			
Panel 1: Corn.....				
Toledo	14.7	12.0	-2.7	0.0009
Northwest Ohio	15.1	14.1	-1.0	0.2782
Ohio Interior	13.9	13.0	-0.9	0.2923
Panel 2: Soybeans.....				
Toledo	11.6	19.0	7.5	<.0001
Northwest Ohio	14.3	20.7	6.4	<.0001
Ohio Interior	12.8	17.9	5.1	<.0001

NOTES: P-value is for the test of the null hypothesis: standard deviation for 1994-1999 = standard deviation for 2000-2005. Source: Original calculations using data sources described in Appendix A.

**Table III. Difference in Corn and Soybean Basis between Ohio Areas and Illinois and Iowa Areas by Period, 1994 – 2005**

Region	Difference in Basis '94-'99	Difference in Basis '00-'05	Change	P-value
	-----¢/bu. -----			
Panel 1: Corn.....				
Toledo - Cen. Illinois	2.3	4.2	1.8	0.0069
Toledo – Illinois	2.6	4.9	2.3	0.0003
NW Ohio – Illinois	-4.9	-1.8	3.1	0.0001
Int. Ohio – Illinois	-0.5	2.5	3.0	0.0001
Toledo – Iowa	18.8	17.7	-1.1	0.0903
NW Ohio – Iowa	11.3	11.0	-0.3	0.7137
Int. Ohio – Iowa	15.7	15.4	-0.3	0.6003
Panel 2: Soybeans.....				
Toledo - Cen. Illinois	3.5	4.2	0.7	0.5284
Toledo – Illinois	5.0	6.6	1.6	0.1674
NW Ohio – Illinois	-4.8	-3.2	1.6	0.1384
Int. Ohio – Illinois	-2.3	-0.4	1.9	0.0411
Toledo – Iowa	19.1	6.4	-12.7	0.0001
NW Ohio – Iowa	15.9	9.4	-6.4	0.0001
Int. Ohio – Iowa	18.5	12.1	-6.3	0.0001

NOTES: Basis is calculated as futures price minus cash price. The P-value is for the test of the null hypothesis: difference in basis during 1994-1999 = difference in basis during 2000-2005. Source: Original calculations using data sources described in Appendix A.

Like corn, the Toledo soybean basis also increased relative to the Central Illinois soybean basis during the post-2000 period compared with the pre-2000 period. However, unlike corn, this increase was not statistically significant at commonly-used test levels.

When examined as a group, the overall conclusion is that the changes in the differences in the basis between Ohio areas and Illinois and Iowa areas vary by state and crop. Nominally, the corn and soybean basis in Ohio strengthened relative to the corn and soybean basis in Illinois (i.e, cash prices rose in Ohio relative to Illinois), but weakened relative to the corn and soybeans basis in Iowa (i.e, cash prices declined in Ohio relative to Iowa). The four changes in the corn basis between areas in Ohio and Illinois and the three changes in the soybean basis between areas in Iowa and Ohio were statistically significant at the one percent test level. Among the other seven comparisons, only the change in the soybean basis between interior Ohio and the state of Illinois was statistically significant at the five percent test level.

The numerical changes in the relative basis exhibited considerable volatility. The range was from a decline of 12.7 cent per bushel in the Toledo versus Iowa soybean basis to an increase of 3.1 cents per bushel in the Northwest Ohio versus Illinois corn basis.

### **Conclusions and Implications**

Following the removal of Toledo as a delivery point for the Chicago corn and soybean futures contracts in 2000, the corn basis throughout Ohio weakened statistically significantly (i.e. cash prices declined relative to futures prices) while the soybean basis in Ohio changed little. For corn, the basis in Ohio strengthened statistically significantly relative to the basis in Illinois (i.e. cash prices rose in Ohio relative to Illinois), but changed little relative to the basis in Iowa. In contrast, for soybeans, the basis in Ohio weakened statistically significantly relative to the basis in Iowa (i.e. cash prices declined in Ohio relative to Iowa), but changed little relative to the basis in Illinois. We can think of no reason why the removal of delivery should differently impact the corn and soybean basis in Ohio, both relative to nearby futures prices and the basis in other states. The conflicting directions and significance of the changes in basis by crop and relative to changes in the basis in Illinois and Iowa is not to say that changes in delivery location are unimportant, but rather that we can find no consistent empirical evidence to support the claim that the elimination of the Toledo switching district in 2000 as a delivery point for corn and soybeans had a serious detrimental effect on the corn and soybean basis in Ohio. This conclusion is unsurprising, as it seems unlikely that whether a location is also a delivery location will affect the basis. However, it is important to demonstrate that this logical judgment stand up to empirical scrutiny.

A suggestion for solving the current basis convergence problem in the Chicago wheat contract has been to remove Toledo as a delivery point for the contract. The findings of this study suggest that implementing such a change would not be expected to have a substantive negative impact upon the wheat basis within Ohio.

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## **Appendix A: Data Sources**

Ohio cash prices were obtained from the Ohio Cash Price Database. This database is maintained in the Department of Agricultural, Environmental, and Development Economics at The Ohio State University. Data are collected for the ports of Toledo and Cincinnati plus the nine Crop Reporting Districts for Ohio. On Thursday of each week, cash prices for corn, soybeans, and wheat are obtained from a grain elevator considered representative of the area. The cash price database, as well as a map delineating the reporting regions, can be found at: <http://aede.osu.edu/people/roberts.628/>

Illinois cash prices were obtained from the Illinois Regional Cash Price Database on the FarmDoc website. FarmDoc is administered by the Department of Agricultural and Consumer Economics at the University of Illinois. The cash price database is comprised of historical cash prices for seven geographic regions of the state. Prices are drawn from elevator bid prices reported on Thursday by the Illinois Ag Marketing Service. Regional prices are the midpoint of prices reported by the elevators located within the region. The database, as well as maps delineating the geographic reporting regions, can be found at <http://www.farmdoc.uiuc.edu/>

Iowa cash prices were obtained from a database maintained by Dr. Bob Wisner in the Department of Economics at Iowa State University. The database contains cash bids on Thursday for six reporting geographic regions in the state.

Futures prices were obtained from the Commodity Research Bureau Futures Price database.