

Research & Product Development

An Introduction to Grain Calendar and Basis Swaps

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Introduction

Futures markets are the linchpin for price discovery, price risk management, and price transparency in the world agricultural markets. Futures on corn, wheat and soybeans traded at CME Group's Chicago Board of Trade (CBOT) trade approximately eight, five, and 20 times world production respectively in any given year. Those in the grain and oilseed markets depend on these standardized futures contracts to manage their price risk throughout the crop year. Traditionally, these market participants have been forward-looking one to three crop years. However, recent demand growth spurred by developing nations, monetary policy, and the use of agricultural products to produce biofuels has resulted in higher prices and greater price volatility.

This environment of higher risk has resulted in market participants requiring additional price risk management tools and looking for protection beyond the typical two- to three-year crop year cycles. These hedging needs often are more individualistic in character and are not as easy to satisfy on a traditional standardized futures contract where contract terms do not vary and liquidity is concentrated within the first couple of crop years. Instead, some market participants have looked to specialized swap dealers in the over-the-counter (OTC) market to draw up customized swap contracts and find counterparties to take the opposite size of these contracts. This introduces a new problem: counterparty risk. Since such swaps are not guaranteed by centralized clearing, such as offered by the CME Clearing House, these market participants can be at risk for default. One potential solution to this problem is to have centralized clearing clear these OTC swaps. However, Commodity Futures Trading Commission (CFTC) rules exempt exchanges from clearing agricultural OTC swaps. If the CFTC grants exemptions to exchanges to clear agricultural OTC swaps, swaps can be available to more market participants without the risk of counterparty default.

Swaps

A swap is an agreement between counterparties to exchange cash flows over some period of time. The oldest and most popular swaps are exchanges of interest rates. For example, assume a pension fund owns significant debt that pays variable-rate interest while a community bank owns significant debt that pays fixed-rate interest. In this situation, the

pension fund manager may want to lower her exposure to variable-rate interest payments while the community banker may want to increase his exposure to variable-rate interest payments. In this scenario, the pension fund manager may agree to pay a floating interest rate on \$5 million dollars to the community bank while the community banker agrees to pay a fixed interest rate on \$5 million dollars to the pension fund. Assume the community banker agrees to pay a fixed rate of 6.2 percent to the pension fund (\$310,000) and in return, the pension fund manager agrees to pay the London Interbank Offer Rate (LIBOR) plus 200 basis points to the community bank (see figure 1.1).

If the LIBOR is 5 percent at the time of the swap payment, the pension fund is obliged to pay the community bank \$350,000 (5 percent LIBOR plus 200 basis points is 7 percent times \$5 million dollars is \$350,000). Meanwhile, the community bank is obliged to pay the fixed 6.2 percent rate of \$310,000. The pension fund is obliged to pay \$350,000 and the community bank is obliged to pay \$310,000; so the swap is settled with the pension fund paying the community bank the difference in obligations or \$40,000 ($\$350,000 - \$310,000 = \$40,000$). In this example, the pension fund manager was able to reduce her exposure to variable interest rates and received a fixed rate, 6.2 percent, on outstanding variable-rate debt. On the other hand, the community banker was able to take advantage of higher interest rates through exposure offered in the swap. Had the swap not been possible, the community banker would have had to be content with the largely fixed interest payments characteristic of the outstanding debt owned by the bank.

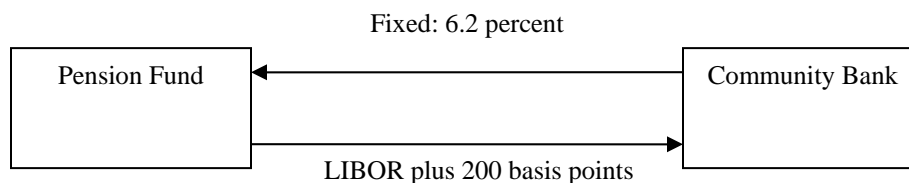


Figure 1 – Plain Vanilla Interest Rate Swap between Two Counterparties

A commodity swap is similar to an interest rate swap, but the parties are exchanging a fixed price for a commodity with a floating or variable price for the commodity. For example, suppose a farmer is interested in managing the price risk of his corn crop while an ethanol plant, which needs to buy corn to produce ethanol, is also interested in managing the price risk he faces when buying corn. One way these two could manage their respective risks is to enter a commodity swap. In this particular case, the ethanol producer could agree to pay the farmer a fixed price for corn, say \$5 per bushel. In return, the farmer agrees to pay the ethanol producer a variable price for corn, for example, the price of CBOT Corn futures on the day the swap expires. Assuming the swap expires on April 30, on that day the ethanol producer will pay the farmer \$5 per bushel for corn and the farmer will pay the ethanol producer the settlement price on May CBOT Corn futures on April 30. Just as in the case of the interest rate swap, there is a fixed for floating exchange with the fixed side of the equation set at \$5 per bushel and the variable side of the equation to be determined by the May CBOT Corn futures contract (see figure 2).

Now assume that April 30 arrives and the May CBOT Corn futures contract settles at \$6 per bushel. The ethanol producer is obliged to pay the farmer the fixed price of \$5 per bushel and the farmer is obliged to pay the ethanol producer \$6 per bushel. In actuality, this swap would be settled with the farmer paying the ethanol producer the difference in obligations or \$1 per bushel ($\$6 - \$5 = \1).

Commodity swaps are usually settled financially and there is no physical delivery. In this example, the farmer would now sell his corn crop to his local elevator or coop while the ethanol plant would now buy corn in his local cash market. However, the commodity swap has filled its purpose. When the farmer goes to sell his crop in the cash market, his corn is now worth \$6 per bushel because his cash price is highly correlated with the futures prices used to price the variable side of the swap. The farmer must pay \$1 per bushel to the ethanol producer, but is compensated because his cash corn is now worth \$6. The farmer has effectively locked-in \$5 per bushel for his corn crop – his exact desire when he entered the swap. The ethanol producer has similar results. He must go into the cash market and now pay \$6 per bushel for corn, but he also receives \$1 from the farmer in settlement of the swap. Thus, the ethanol producer has also succeeded in locking in \$5 per bushel for the corn he must buy.

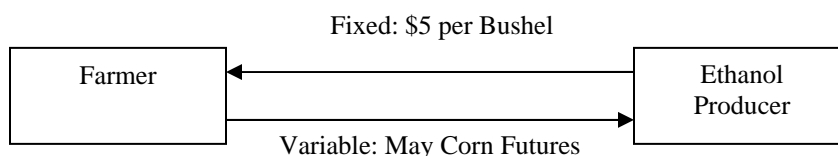


Figure 2 - Plain Vanilla Commodity Swap between a Farmer and Ethanol Producer

In this example the price of corn could have probably been more efficiently hedged by both the farmer and ethanol producer by trading May CBOT Corn futures contracts on the exchange. However, in reality, an ethanol producer must continually contract corn because he is continually producing ethanol. As such, he would likely be more interested in entering into a long-term arrangement that prices corn each month for the next year or two. It would be more difficult for the ethanol producer to hedge this exposure using just futures contracts. In the OTC swap market, he may be able to find a counterparty, a cash merchandiser for example, that would be interested in selling corn every month at a fixed price. They could enter into a series of swaps (called a strip) that expire each month for the next, say, 12 months.

An inherent limitation of the swap market is that a potential counterparty must find another counterparty willing and able to take the opposite side of the transaction. In the case above, the ethanol producer would have to find the cash merchandiser who just happens to have the exact opposite risk as the ethanol producer. Because of this problem, a significant industry has emerged of swap dealers who help facilitate trade between potential counterparties. In fact, many counterparties will not even know who ultimately takes the other side of their transactions as their interactions are with a swap dealer.

Cleared Agricultural Swaps at CME Group

CME Group has petitioned the CFTC to receive an exemption from regulations that would allow the exchange to clear agricultural swaps. A major disadvantage of the OTC swap market is counterparty risk; OTC swap transactions typically have no financial guarantor. To alleviate this shortcoming, CME Group plans, pending CFTC exemptions, to begin clearing corn, wheat and soybean calendar swaps as well as corn basis swaps for Northeastern Iowa, Northwestern Iowa, Southern Iowa, Eastern Nebraska, Eastern South Dakota and Southern Minnesota.

CME Group will publish daily settlement prices as well as daily volume and open interest for all swaps listed for clearing. This will bring additional transparency to the OTC markets. These products will continue to trade as OTC products with private negotiations between potential counterparties or between a market participant and a swap broker. There will be no market with bids and offers. However, once an agreement is reached with another counterparty or a swap broker, the positions can be brought to CME Group for clearing. Entering positions for clearing is easy through CME Group Front End Clearing and/or EOS Trader.

CME Clearing will act as central counterparty for all swaps submitted for clearing. CME Clearing intends to guarantee performance for cleared swap products, and will utilize mark-to-market and the establishment of clearing level performance bond requirements (“margin”) as key risk management tools to underpin its guarantee services. In particular, the mark-to-market process is particularly useful as a risk management tool as it prevents the accumulation of debt associated with market participants’ positions in the system. CME Clearing intends to maintain flexibility in offering clearing services for cleared swap products, and, depending on the structure of clearing services for particular cleared swap products, plans to provide multi-lateral netting, post-trade give-up, real-time trade confirmation, and risk offsets against other highly correlated products as a part of its service offering.

Calendar Swaps¹

Corn, Wheat, and Soybean calendar swaps contain features similar to CBOT Corn, Wheat, and Soybean futures contracts; the primary difference being the settlement process. Corn, Wheat, and Soybean futures contracts have physical delivery while the swaps are cash settled to an underlying futures contract.

The variable price component in calendar swaps is based on an underlying futures contract. For example, May CBOT Corn futures underlie the May corn calendar swap. Each day the calendar swaps are settled to the underlying futures contract. For example, the May corn calendar swap is assigned the same settlement price as the May CBOT Corn futures contract. Calendar swaps expire on the last business day of the month preceding the month of the calendar swap; hence May calendar swaps expire on the last business day in the month of April. During the final month of clearing, the daily settlement price is calculated as the cumulative average of the settlement prices for the underlying futures contracts. For example, on the first business day in April, the settlement price for the May corn calendar swap is equal

¹ See Appendix 1 for salient features for corn, wheat and soybean calendar swaps.

to the settlement price for the May CBOT Corn futures contract. On the second business day in April, the settlement price for the May corn calendar swap is equal to the sum of the settlement prices for the May CBOT Corn futures contract on the first two business days in April divided by two. This procedure continues throughout the month of April until the final settlement price is calculated as the sum of the settlement prices for each business day in April of the May CBOT Corn futures contract divided by the total number of business days in April. The final settlement price for the May corn calendar swap is the average of the May CBOT Corn futures contract during the month of April.

Listing & Expiration Schedule

Calendar swaps are listed for each calendar month and are priced off the corresponding futures contract closest to the calendar swap expiration. The following table indicates which futures contract underlies each listed calendar swap:

Calendar Swap Contract	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Corn Futures	Mar	Mar	Mar	May	May	Jul	Jul	Sep	Sep	Dec	Dec	Dec
Soybean Futures	Jan	Mar	Mar	May	May	Jul	Jul	Aug	Sep	Nov	Nov	Jan
Wheat Futures	Mar	Mar	Mar	May	May	Jul	Jul	Sep	Sep	Dec	Dec	Dec

For each listed CBOT Corn, Soybean or Wheat futures contract, all corn, soybean or wheat calendar swaps corresponding to the listed futures contracts shall also be listed. Each calendar swap expiration date shall be on the last business day of the month preceding the month of the calendar swap. For example, if a March 09 CBOT Soybean futures contract is listed, then a February 09 soybean calendar swap would also be listed that expires on the last business day in January and a March 09 soybean calendar swap would also be listed that expires on the last business day in February.

Application: Basic Swap Trade

A country elevator, anxious to begin drawing down his stocks of wheat in storage, would like to sell 50,000 bushels of wheat per month for the next three months. The elevator manager would like more predictable cash flows on the expected sale of this wheat, so he enters into a three-month swap with a swap dealer to hedge these expected wheat sales at a fixed price of \$5.00 per bushel. The swap hedge is financially equivalent to a forward sale of 50,000 bushels of wheat per month for 3 months. The elevator enters into the swap in early April with the swap settlements are due on the last business day in April, the last business day in May, and the last business day in June.

On each settlement date, the elevator receives a fixed payment equal to \$5.00 per bushel from the swap dealer. The elevator, in exchange, makes a floating payment to the swap dealer based on an arithmetic average of the daily settlement prices of the CBOT Wheat futures contract nearest each settlement date. For example, the April settlement will be based on the

average settlements of the May CBOT Wheat futures contract in April; the May settlement will be based on the average settlements of the July CBOT Wheat futures contract in May; and the June settlement will be based on the average settlements of the July CBOT Wheat futures contract in June.

By mutual agreement, the swap dealer and the elevator manager agree to bring this swap to the exchange for clearing. The elevator is assigned short positions in May, June, and July wheat calendar swaps at \$5.00 per bushel and the swap dealer is assigned a long position opposite the elevator at \$5.00 per bushel. Each counterparty would receive 10 positions in each of the May, June, and July calendar swaps because each calendar swap represents 5,000 bushels so 10 calendar swaps represents 50,000 bushels. Note that the fixed price in the swap, \$5.00 per bushel, is negotiated between the elevator and the swap dealer and is not published by the exchange.

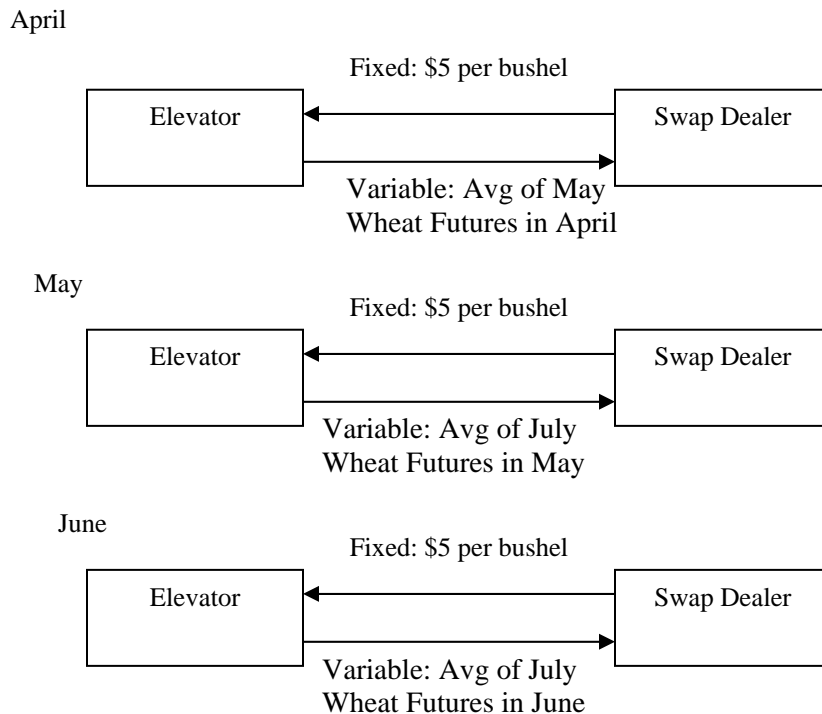


Figure 3: Wheat Calendar Swap between an Elevator and Swap Dealer

Results: Suppose the average price of the May CBOT Wheat futures contract in April was \$5.86 per bushel; the average price of the July CBOT Wheat futures contract in May was \$5.05 per bushel, and the average price of the July CBOT Wheat futures contract in June was \$4.82 per bushel. The final settlement for the May wheat calendar swap would be \$5.86; the final settlement for the June wheat calendar swap would be \$5.05 per bushel; and the final settlement for the July wheat calendar swap would be \$4.82 per bushel. The table below shows the swap transaction results for the elevator. The elevator receives a positive pay-off from the swap if wheat prices fall. However, the elevator is obligated to make payments when wheat prices rise.

Results of Wheat Calendar Swap for the Elevator Operator

	April (May Swap)	May (June Swap)	June (July Swap)
Fixed Payment (Received by Elevator)	\$5.00/bu	\$5.00/bu	\$5.00/bu
Floating Payment (Paid by Elevator)	\$5.86/bu	\$5.05/bu	\$4.82/bu
Swap Result	(\$0.86/bu)	(\$0.05/bu)	\$0.18/bu

Basis Swaps²

Corn basis swaps allow market participants the ability to hedge their basis risk. In the past, most market participants wanted exposure to basis risk and the need for basis risk management tools was limited. Recently, however, increased price risk has resulted also in increased basis risk. This increased basis risk has many market participants looking for basis risk management tools. Basis swaps allow these market participants to enter OTC basis swaps and bring those positions to the exchange for clearing.

Like calendar swaps, the counterparties agree on a fixed basis price. The variable component is based on the difference between the cash price index and the CBOT Corn futures contract corresponding to the basis swap. For example, the May Northeastern Iowa corn basis swap is settled to the difference between the Northeastern cash price index and the May CBOT Corn futures contract. Basis swaps expire on the last business day of the month preceding the month of the basis swap; thus, May basis swaps expire on the last business day in the month of April. During the final five days of clearing, the daily settlement price is calculated as the cumulative average of the difference between the cash index and the underlying futures contract. For example, on the 5th to the last business day in April, the settlement price for the May Northeastern corn basis swap is equal to the Northeastern Iowa corn price index on the 5th last business day in April minus the May CBOT Corn futures contract on the 5th last business day in April. On the 4th last business day in April, the settlement price for the May Northeastern corn basis swap is equal to the average of the Northeastern Iowa corn price index minus the CBOT Corn futures contract on the 5th last business day in April and the 4th last business day in April. This process continues until final settlement, which is calculated as the average of the Northeastern Iowa corn price index minus the CBOT Corn futures contract on the 5th, 4th, 3rd, 2nd, and last business days in April.

Listing and Expiration Schedule

Like calendar swaps, basis swaps are listed for each calendar month and are priced off the cash index and the corresponding futures contract closest to the basis swap expiration. The following table indicates which futures contract underlies each listed corn basis swap:

² See Appendix 2 for salient features for Northeastern Iowa, Northwestern Iowa, Southern Iowa, Eastern Nebraska, Eastern South Dakota, and Southern Minnesota Corn basis swaps.

Basis Swap Contract	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Underlying Corn Futures	Mar	Mar	Mar	May	May	Jul	Jul	Sep	Sep	Dec	Dec	Dec

For each listed CBOT Corn futures contract, all corn basis swaps corresponding to the listed futures contracts shall also be listed. Each basis swap expiration date shall be on the last business day of the month preceding the month of the basis swap. For example, if a March 09 CBOT Corn futures contract is listed, then January 09 basis swaps for all territories would be listed, February 09 basis swaps for all territories would be listed, and March 09 basis swaps for all territories would be listed.

Application: Basis Swap

A country elevator in Eastern Nebraska is concerned about basis volatility and would like to assure sufficient basis appreciation to provide a return on storage for 100,000 bushels of corn. Meanwhile, an ethanol plant manager would like to assure a reasonable basis level for upcoming corn purchases. A swap dealer, negotiating on both the elevator and ethanol plant's behalf, establishes a basis swap between the counterparties at \$0.30 per bushel under. Both parties enter the swap in early April with expiration slated for the last business day in June.

On final settlement date (the last business day in June), the elevator receives a fixed payment equal to \$0.30 per bushel under July CBOT Corn futures from the ethanol plant. The elevator, in exchange, makes a floating payment to the ethanol plant based on an arithmetic average over the last five days in June of the Eastern Nebraska corn price index and the July CBOT Corn futures contract settlement.

By mutual agreement, the ethanol plant manager and the elevator manager agree to bring this swap to the exchange for clearing. The elevator is assigned short positions in July Eastern Nebraska basis swaps at -\$0.30 per bushel and the ethanol plant is assigned a long position opposite the elevator at -\$0.30 per bushel. Each counterparty would receive 20 positions because each basis swap represents 5,000 bushels so 20 basis swaps represents 100,000 bushels. Note that the fixed price in the swap, -\$0.30 per bushel, is negotiated between the elevator and the ethanol plant through the swap dealer and is not published by the exchange.

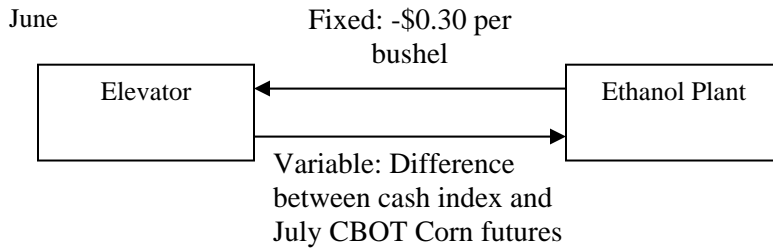


Figure 4: Wheat Calendar Swap between an Elevator and Swap Dealer

Results: Suppose the average difference over the last five business days in June between the Eastern Nebraska cash index and the July CBOT Corn futures contract was \$0.50 per bushel under. The final settlement for the July Eastern Nebraska basis swap would be \$0.50 per bushel under. The table below shows the swap transaction results for the country elevator. The elevator receives a positive pay-off from the swap if the corn basis weakens below \$0.30 under. However, the elevator is obligated to make payments when the corn basis strengthens above \$0.30 under.

Results of Corn Basis Swap for the Elevator Operator

June (July Swap)	
Fixed Payment (Received by Elevator)	\$0.30/bu Under
Floating Payment (Paid by Elevator)	\$0.50/bu Under
Swap Result	\$0.20/bu

In this example, the basis ended up \$0.20 per bushel weaker than expected. The country elevator would have lost that amount on storage absent the basis swap. The basis swap, however, paid the elevator manager \$0.20 per bushel to counteract the weaker than expected basis.

Summary

Futures markets have been and will continue to be the linchpin of price discovery and price risk management for the agricultural community. However, worldwide demand has changed historical market structures and market participants are looking for additional tools to manage their risk. Agricultural swaps have begun trading in the OTC markets and these tools allow market participants the ability to personalize their hedge programs. However, OTC swaps do not typically have clearing house guarantees and can induce significant counterparty risk. Current CFTC regulations do not allow futures exchanges the ability to clear and, thus, guarantee OTC agricultural swaps. Those regulations may be relaxed allowing CME Group the ability to clear some common basis and calendar swaps. This will provide market participants with additional tools to hedge their basis and price risks without the worries of counterparty risk. CME Group plans to launch clearing services for corn, soybean, and wheat calendar swaps as well as Northeast Iowa, Northwest Iowa, Southern Iowa, Eastern Nebraska,

Eastern South Dakota and Southern Minnesota corn basis swaps. CME Group is committed to innovation and bringing the necessary tools to manage risk in the agricultural market participants.

**Appendix 1
Calendar Swap
Salient Features**

Available Calendar Swaps

Corn, Soybeans, and Wheat

Clearing Unit

5,000 Bushels

Price Quotation

Cents and quarter cents per bushel.

Minimum Price Fluctuation

One quarter of one cent (\$0.0025) per bushel.

Clearing Hours

6:30 pm to 4:00 pm the following day, Sunday through Friday, Chicago Time.

Contract Pricing

The average settlement price of the corresponding futures contract during the month prior to the futures contract expiration.

Clearing Months

Calendar swaps are listed for each calendar month with the corresponding futures contract being the contract closest to the swap's expiration date.

Termination of Clearing

The last business day of the month preceding the month of the calendar swap. For example, a May calendar swap will expire on the last business day in April.

Daily Settlement

Settled to the corresponding CBOT Corn, Soybean or Wheat futures contract. During the last month a calendar swap is listed, daily settlement shall be a running cumulative average of the settlement prices for the corresponding futures contract.

Final Settlement

Cash settled to the average of the corresponding CBOT Corn, Soybean or Wheat futures contract settlement prices for each business day in the month preceding the month of the calendar swap.

For example, the final settlement for a May corn calendar swap would be the average of daily settlement prices for the May CBOT Corn futures contract during the month of April.

**Appendix 2
Corn Basis Swap
Salient Features**

Corn Basis Swap Regions (Swaps Listed for Each Region)

Northeastern Iowa, Northwestern Iowa, Southern Iowa, Eastern Nebraska, Eastern South Dakota and Southern Minnesota

Clearing Unit

5,000 Bushels

Price Quotation

Cents and quarter cents per bushel.

Minimum Price Fluctuation

One quarter of one cent (\$0.0025) per bushel.

Clearing Hours

6:30 pm to 4:00 pm the following day, Sunday through Friday, Chicago Time.

Contract Pricing

The basis for each listed region, defined as the cash price index from a region minus the price for the corresponding Corn futures contract.

Clearing Months

Basis swaps are listed for each calendar month with the corresponding CBOT Corn futures contract being the contract closest to the swap's expiration date.

Termination of Clearing

The last business day of the month preceding the month of the basis swap. For example, a December corn basis swap would expire on the last business day in November.

Daily Settlement

Settled to the preliminary cash price index for the respective region minus the corresponding CBOT Corn futures contract price. During the last five days a corn basis swap is listed, daily settlement shall be a running cumulative average of the cash price index for the respective region minus the corresponding CBOT Corn futures contract.

Final Settlement

Cash settled to the average of the cash price index for the respective region minus the corresponding CBOT Corn futures contract over the five business days preceding the month of the basis swap.

For example, the final settlement for the December 2008 Northeastern Iowa corn basis swap would be the average of daily settlement prices of the Northeastern Iowa cash price index minus the December CBOT Corn futures contract on November 21, 24, 25, 26, and 28.