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COMMODITY PRODUCTS

TRADING THE CORN FOR ETHANOL CRUSH

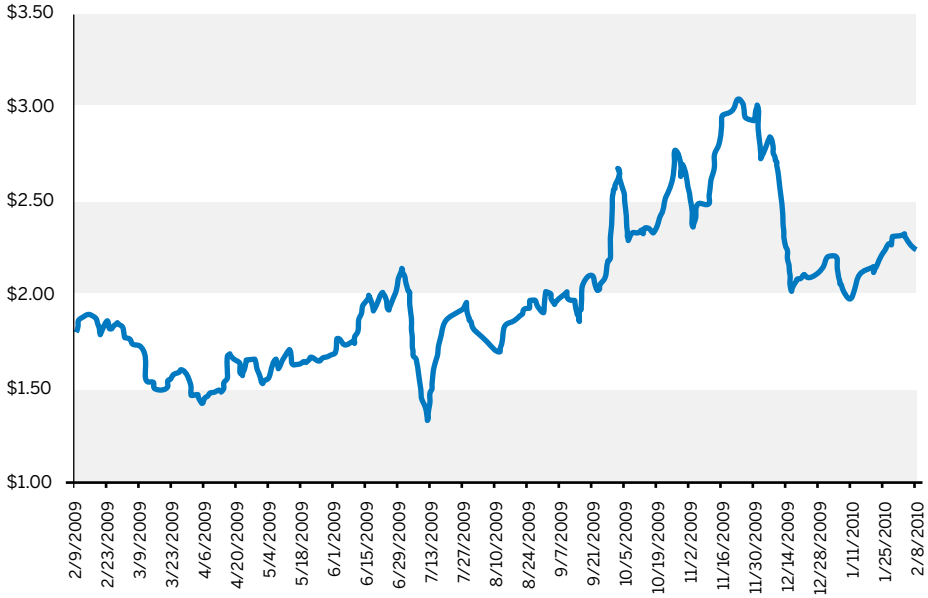
Introduction

In the ethanol industry, the term 'corn crush' refers both to a physical process as well as a value calculation. The physical crush is the process of converting corn into the byproducts of ethanol and distillers' dried grains (DDGs). The corn crush spread is a dollar value quoted as the difference between the combined sales values of the products (ethanol and DDGs) and the cost of corn. This value is traded in the cash or futures market based on expectations of future price movement of corn versus ethanol and DDGs. The relationship between prices in the cash market is commonly referred to as the Gross Production Margin (GPM). The corn crush value traded in the futures market (also referred to as the corn crush) is an intercommodity spread transaction in which corn futures are bought (or sold) and ethanol and DDGs are sold (or bought). The corn crush spread is often used by ethanol producers to hedge the purchase price of corn and the sales prices of ethanol and DDGs. It also offers many opportunities for speculators, as the spread relationship between the Corn, Ethanol, and DDG futures varies over time.

The December/January corn crush (buying/selling December Corn and selling/buying January Ethanol and DDG futures) is used to hedge new-crop gross production margins because the December/January prices often reflect the market's perception of conditions in the new corn crop year. Many seasonal, cyclical, and fundamental factors affect the corn crush spread; for example, corn prices are typically lowest at harvest and trend higher during the year as storage, interest, and insurance costs accumulate over time. Changes in demand for ethanol over the course of the year related to the driving season during the summer months and changing DDGs feed rations depending on the livestock cycle are additional factors than can affect the corn crush spread; others include crop size and yields, world feed demand, carryover stocks, increased protein consumption in developing counties, the price of gasoline, government programs, and weather. Fundamental and technical analysis can be used to help forecast the potential for repetitive market behavior, although there are many unpredictable elements (such as weather) that affect the corn crush spread. The historical data provided in this publication highlight some of the trends and market conditions that have prevailed in the corn crush spread over the past year.

Corn – Ethanol – DDG Crush Margin

Assume 1 Bushel of Corn Produces 2.8 Gallons of Ethanol and 17 Pounds of DDGs
Crush Margin Formula: (DDG Price x .0085) + (Ethanol Price x 2.8) – Corn Price



The Corn Crush Spread

The crush spread is quoted as the difference between the combined sales value of ethanol and DDGs and the price of corn. Corn is traded in dollars and cents per bushel, ethanol in dollars per gallon, and DDGs in dollars per short ton – because of these differences in units, conversion of ethanol and DDG prices to dollars and cents per bushel is necessary to determine the relationship of the three commodities and potential trading opportunities.

When a bushel of corn weighing 56 pounds is processed for ethanol, the conventional result is 2.8 gallons of ethanol and 17 pounds of DDGs.

To convert prices into cents per bushel

Corn:	No conversions required
Ethanol:	2.8 gallons of Ethanol = 2.8 x price of ethanol
DDGs:	17 lbs/2,000 lbs per short ton = .0085 x price of DDGs

Once all three commodities have been converted to a price per bushel, individual ethanol production facilities can compare these numbers to data on their own production efficiency to determine the profitability of processing – this calculation is referred to as the GPM or "corn crush."

To calculate the Corn Crush or GPM

[Price of Ethanol ($/gallon) x 2.8) + Price of DDGs ($/short ton) x .0085] – Price of Corn ($/bu.)

Typically, ethanol production is expanded or reduced to maintain sufficient profitability; the GPM is used to gauge the relative costs of production. When the margin exceeds processing costs, ethanol producers will most likely process more corn into ethanol; when the margin falls below processing costs, ethanol producers may scale back their operations.

An example of calculating the Corn Crush

To illustrate the calculation of the crush, assume the following prices and values for July/August 2010 futures contracts:

July Corn futures:	$3.59 per bushel (5,000 bushels)
August Ethanol futures:	$1.76 per gallon (29,000 gallons)
August DDG futures:	$105.00 per short ton (100 short tons)

Step 1 – Convert Prices into dollars per bushel:

Ethanol:	$1.76 x 2.8 = $4.928 per bushel
DDGs:	$105 x .0085 = $0.893 per bushel

Step 2 – Subtract the cost of corn from the combined sales value of the products:

Ethanol + DDGs ($4.928 + $0.893):	$5.821
– Corn	– $3.590
Corn Crush	$2.231

Although the previous example used a one-to-one-to-one ratio of futures contracts (one Corn futures contract to every Ethanol and DDG contract), the corn crush (and reverse corn crush) can also be traded as a "package," in which a bid or offer is made for a particular corn crush value rather than making individual trades in each of the spread legs. The corn crush "package" is based on a ratio of contracts that more accurately approximates the equivalent yields of ethanol and DDGs generated from one bushel of corn. For example, one Corn futures contract of 5,000 bushels would produce 14,000 gallons of ethanol and 42.5 short tons of DDGs. The Ethanol futures contract is for 29,000 gallons of ethanol and the DDG futures contract is for 100 short tons of DDGs. Thus, trading the corn crush in a one-to-one-to-one ratio (one Corn contract, one Ethanol contract, and one DDG contract) would result in Ethanol being over hedged by 15,000 gallons and DDGs being over hedged by 57.5 tons. A better corn crush combination would be two-to-one-to-one (two Corn contracts, one Ethanol contract, and one DDG contract). Here, two Corn contracts represent 10,000 bushels of corn, which would produce 28,000 gallons of ethanol and 85 tons of DDGs.

This combination of futures contracts results in ethanol being over hedged by only 1,000 gallons and DDGs being over hedged by 15 tons. Other common combinations would be 7:3:3 (seven Corn contracts, three Ethanol contracts, and three DDG contracts), which results in ethanol being under hedged by 11,000 gallons and DDGs being over hedged by 2.5 tons or 33:16:14 (33 Corn contracts, 16 Ethanol contracts, and 14 DDG contracts) which results in ethanol being over hedged by 2,000 gallons and DDGs being under hedged by 2.5 tons.

Corn Crush Spread Terminology

The difference between the price of corn and the sales value of ethanol and DDGs can vary over time. Expectations about the behavior of the spread offer different trading strategies, depending upon whether one expects the difference to "widen" or "narrow."

- A narrowing corn crush spread occurs when the price of corn rises relative to the sales price of ethanol and DDGs. When this occurs, the spread becomes less positive (or more negative). A trader expecting a narrowing corn crush spread "puts on a corn crush spread" – buying Corn futures and selling Ethanol and DDG futures.

An example of trading a narrowing crush spread

Put on Crush Spread	*Lift Crush Spread*
April 26	June 18
Buy	*Sell*
July Corn Futures	July Corn Futures
2 contracts at $3.59 per bushel	2 contracts at $3.66 per bushel
Sell	*Buy*
August Ethanol	August Ethanol
1 contract at $1.76 per gallon	1 contract at $1.73 per gallon
August DDGs	August DDGs
1 contract at $105 per short ton	1 contract at $100 per short ton

Results

Corn: $0.07 Gain ($3.66 - $3.59) x 10,000 (bu) =	$700.00
Ethanol: $0.03 Gain ($1.76 - $1.73) x 29,000 (gallons) =	$870.00
DDGs: $5 Gain ($105 - $100) x 100 (short tons) =	$500.00
Net gain:	**$2,070.00**

- A widening corn crush spread occurs when the sales price of ethanol and DDGs rise relative to the price of corn. When this occurs, the spread becomes more positive (or less negative). A trader expecting a widening corn crush spread "puts on a reverse corn crush spread" – selling corn futures and buying Ethanol and DDG futures.

An example of trading a widening or "reverse" crush spread

Put on Reverse Crush Spread	Lift Reverse Crush Spread
October 6	November 21
Sell	*Buy*
December Corn Futures	December Corn Futures
2 contracts at $3.60 per bushel	2 contracts at $3.74 per bushel
Buy	*Sell*
January Ethanol	December Ethanol
1 contract at $1.86 per gallon	1 contract at $1.98 per gallon
December DDGs	December DDGs
1 contract at $110 per short ton	1 contract at $117 per short ton

Results

Corn: $0.14 Loss ($3.60 - $3.44) x 10,000 (bu) =	($1,400.00)
Ethanol: $0.12 Gain ($1.98 – $1.86) x 29,000 (gallons) =	$1,350.00
DDGs: $7 Gain ($117 - $110) x 100 (short tons) =	$700.00
Net gain:	**$650.00**

Summary

The above examples provide alternatives for ethanol plants concerned about managing their price risk and profit margins of producing ethanol and distiller's dried grains. Some ethanol plants may elect to expand on the corn crush by including Natural Gas as an additional cost component. Although this text mentions different common ratios that can be used, it is the individual ethanol plant that will determine the best ratio for their production facility.

In addition to the hedging applications that are available to the ethanol industry, the corn crush also provides speculative trading opportunities for spreaders.

It is important to note, that all of the components of the Corn Crush including Corn, Natural Gas, Ethanol and DDGs, are listed for trading at CME Group Exchanges.

For more information, visit **www.cmegroup.com/ddg.**

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