Managing Milk Price Risk with Options Contracts

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Managing Dairy Based Futures Contracts

As illustrated in the Spring 1998 issue of the UW Dairy Pipeline, a cheese plant can use a hedging strategy to lock in an operating margin and protect against milk price increases. However, a hedging program has a disadvantage—it doesn’t allow you to capture the benefits of falling milk prices. As an alternative, cheese plant managers can use a call option to establish a milk price ceiling, which also allows them to take advantage of lower milk costs.

A futures option is a contract providing the owner the right, but not the obligation, to do something. A call option gives the owner the right to buy a particular futures contract (take a long futures position) at a predefined strike price (e.g., the price at which an option owner can purchase the futures contract). A put option gives the owner the right to sell a particular futures contract (take a short futures position) at a predefined strike price. The price for purchasing a particular option is referred to as the premium. The options premium is determined by a number of factors, including: time until expiration of the futures contract, recent cash market price volatility and associated futures contract settle price.

The difference between the strike price and the associated futures contracts current settle price is the option’s intrinsic value. A higher intrinsic value translates into a higher premium. For a put option, the higher the futures price in relation to a strike price, the lower the intrinsic value. This implies a lower premium. In contrast, shown in the example below, a call option’s intrinsic value increases as market price increases relative to a predetermined strike price. In general, the longer the time until an option expires, the higher the premium. This reflects the fact that the option owner has more flexibility in exercising the option compared to one which is closer to expiration. There is a greater probability of the option being in-the-money some time in the future. The more volatile the cash market, the more valuable the associated option and higher the premium. Volatility measures price movements. If a market is more prone to sudden sharp price changes, it also has a greater chance of coming in-the-money than if prices are not volatile. The option’s premium is equal to its intrinsic value plus any time (volatility) value.

To use a futures option in a price risk management program, the option buyer needs to decide first between a call and a put option (the right to have a buying hedge or a selling hedge), and then the specific strike price desired. A put option can be used to establish a minimum output price. For example, dairy farm operators can use BFP put options to set a floor on their mailbox price. In contrast, cheese plant managers can use a call option to establish a ceiling on its milk costs. A simple example will illustrate this.

Using a Call Option to Set Milk Cost Ceiling

Since June of this year, the dairy industry has seen continually increasing BFP. If a cheese plant had adopted a hedging strategy at the beginning of this trend, cheese plants could have locked in an operating margin (assuming an acceptable margin at the time of hedging strategy adoption). In contrast to the trend over
the last six months, lower BFP’s are forecast in early 1999. Therefore the plant may prefer not to hedge. To provide some price protection in case price forecasts are incorrect and milk prices actually increase, buying a call option is a strategy that helps eliminate the upside risk while allowing plant management the capability of capturing lower milk prices.

Suppose it is February 1, 1999 and you are a manager of procurement at XYZ Cheese, Inc. While your price forecasts are for lower BFP’s during March and April, you would like to protect your firm against any price increases in case the forecasts are incorrect. On this date you would like to set the maximum price for your March milk. You use one of the firm’s computers and access the Chicago Merchantile Exchange’s web site to obtain a listing of alternative call option strike prices and premiums for March 1999 BFP (Table 1). Note that there is a positive premium ($0.10/cwt) for the $12.75 call option. That is, even though there is zero intrinsic value to the option, the market places some positive time value to the option.

Combining your best guess of the price you are going to receive for your October cheese, you determine you would like to pay no more than $13.85 for your milk to maintain profitability. You also know that over recent months the difference between your pay price and the BFP has averaged about $.90/cwt (e.g., the XYZ Cheese Plant/BFP basis). Given that you are in charge of procurement and familiar with the operations of futures markets, you know that there are commodity broker commissions (fees) for purchasing options contracts in addition to any premium associated with such a purchase. The broker you use charges $70/call option ($0.035/cwt x 2000cwt), which includes the commission associated with purchasing and exercising an option.

You use the above information to identify the call option to purchase. If you choose to purchase 4 BFP call options at a strike price of $13.00 and pay a premium of $180/contract ($0.09/cwt x 2000 cwt) to cover the 800,000 lbs of milk you anticipate needing during October you would be able to establish the following maximum milk price for March (assuming the XYZ Cheese Plant/BFP basis remains constant at $0.90/cwt):

![Identifying the call option]

In this example we are trading on the CME where a BFP futures (and options) contract is for 200,000 lbs. of milk. At the CME there is also a mini-BFP options contract that trades for 50,000 lbs. of milk. Remember that the premium paid depends on the current futures contract settle price for the futures contract associated with the option being purchased.

On April 5th it turns out that your forecasts were a little off, the actual BFP is $13.50. By doing nothing, the call option previously purchased cash settles at the March BFP price of $13.50 announced on April 5th. With the futures transaction, the following profit is obtained:

![Profit calculation]

This is close to the target milk cost you desire. Without the use of the call option, the plant’s milk costs would have been $14.40/cwt. ($13.50 + $0.90) compared to the net cost of $14.025, a net saving of $0.375/cwt.

When purchasing a BFP call option, the purchaser has the choice of doing nothing and if the announced BFP is above the strike price, the call option will be automatically exercised. You do not need to call your broker to request that the option be exercised. Alternatively, if the announced price is less than strike price, doing nothing results in the option contract expiring worthless, the purchaser loses the option premium and any commission costs. Finally, before the BFP is announced, if it looks like the actual BFP will be less than the strike price, the purchaser may try to sell the contract to recoup acquisition costs. Using this

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**Table 1. Alternative Strike Prices and Premiums**

for March, 1999 BFP CME Call Option on Feb. 1, 1999

with March BFP Future’s Settle Price of $12.75

<table>
<thead>
<tr>
<th>Strike Price ($/cwt)</th>
<th>Premium</th>
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<tbody>
<tr>
<td></td>
<td>$/cwt</td>
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<tr>
<td>11.75</td>
<td>1.10</td>
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<tr>
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<tr>
<td>12.50</td>
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<tr>
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<tr>
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<td>0.09</td>
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<td>0.06</td>
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<td>13.75</td>
<td>0.03</td>
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Note: A BFP contract is for 200,000 lbs. of milk.
option is risky if, in fact, the announced BFP actual increases above the strike price.

Remember that the payment of the premium and brokerage fee occurs regardless of price movements. For example, if the BFP had actually decreased from $12.75 to $12.50 instead of increasing, you could elect let it expire worthless. Under this situation, net milk costs would be:

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\begin{align*}
\text{March BFP} & \quad 12.50 \\
\text{+ Local Basis} & \quad 0.90 \\
\text{+ Broker Commission} & \quad 0.035 \\
\text{+ Option Premium} & \quad 0.09 \\
\text{= Max. Milk Price} & \quad 13.525
\end{align*}
\]

instead of $13.40 that you would have had to pay for milk without the purchase of BFP call contracts. The uncertainty of having lower milk prices in the future and therefore losing the broker commission and option premium versus the potential for establishing a desirable price floor is known as the risk-return tradeoff. It is up to you as a plant manager to determine the degree of risk versus return you are willing accept.

It is very important to recognize that we have assumed perfect knowledge of the XYZ Cheese Plant/BFP Basis and that it does not change between the time of purchasing the BFP call and the cash settling of the March BFP futures contract. If this basis changes, then the "locked in" milk price could be higher or lower, depending on the change. As noted in an earlier issue of the Dairy Pipeline, the cash-futures basis tends to be less volatile than the actual price series, i.e., you face less risk when considering changes in the base versus the cash price. What would happen to the above locked in price if the actual basis paid in March was $1.20/cwt versus the expected $0.90? What would happen if it was $0.75? If you had known this basis ahead of time, would you chosen the same options contract?

And There is More
In the last three issues of the Dairy Pipeline we have attempted to show how you can use dairy-based future and options manage price risk. In forthcoming issues we will continue to explore how different types of dairy processing firms can use dairy futures to manage price risk. We will also review how to develop procedures for generating plant specific basis forecasts to use for marketing strategies.

Note:
To Hedge or Not to Hedge, is that the Question?
In the Spring, 1998 issue of the pipeline we reviewed how cheese plants can use the futures markets, via the adoption of a hedging strategy, to offer forward pricing contracts to their patrons. In Table 2, we reviewed how these contracts work under under BFP increase and decrease scenarios. The implicit assumption under the price increase (Case II) scenario was that the plant was either a cooperative or was a de-pooled plant.

Glossary
BFP (Basic Formula Price): Price used to set base milk in the Federal Milk Marketing Order System. Based on milk prices paid for milk by Grade B milk plants in Wisconsin and Minnesota and updated with a product formula using historical Cheddar cheese, non-fat dry milk and butter prices.

Broker Costs: Fees or commissions charged by a commodities broker for purchasing futures and options. These costs will vary by broker, but they are normally in the range of $0.05 to $0.07/cwt. Do ask your broker if the brokerage fee is for the initial purchase of the option only, or does it cover a round trip—that is, does it include the right to exercise the option? Many brokers charge an initial brokerage fee to purchase the option, and then another fee to exercise the option.

CME (Chicago Mercantile Exchange): One of the two markets that trade dairy-based futures and options. The other market is the New York Board of Trade, formerly the Coffee, Sugar and Cocoa Exchange.

Settle Price: The daily price established by a futures exchange associated with a particular futures contract (e.g., May BFP). The exchange's clearing house uses it to determine net gains and losses, margin requirements and the next day's price limits. On any particular day, the settle price represents the market's best guess regarding the future price of the commodity.

Strike Price: Also known as the exercise price, it is the price at which a person may purchase or sell the underlying futures contract upon exercising a commodity option.

In-the-Money, At-the-Money, Out-of-the-Money: An option is said to be in-the-money when it has a positive intrinsic value. For call options, this happens when the strike price is less than the market price for the underlying futures contract. For put options it occurs when the strike price is greater than the market price of the underlying futures contract. An option is referred to being out-of-the-money when it has no intrinsic value. For calls, this happens when the strike price is more than the market price for the underlying futures contract. For puts, the opposite would have to be true. When the option's strike price equals the current futures price it is an at-the-money option.

Resources:
Try these web sites:
CME:www.cme.com
New York Board of Trade : www.csce.com
CDR Dairy Futures: www.uaee.wisc.edu