University of Wisconsin-Madison
Department of Agricultural Economics
Marketing and Policy Briefing Paper Series

Department of Agricultural Economics, College of Agricultural and Life Sciences, University of Wisconsin-Madison Cooperative Extension Service, University of Wisconsin-Extension

Paper No. 43 (Revised)
May 1993

Options Trading in Cheese Futures Contracts: How Will it Work?

by

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OPTIONS TRADING IN CHEESE FUTURES CONTRACTS: HOW WILL IT WORK?

Edward V. Jesse and Robert A. Cropp[1]

In a previous paper, we discussed the proposed new futures contract for block cheddar cheese and how futures trading might affect risk management in the dairy industry through hedging.[2] The Coffee, Sugar, and Cocoa Exchange, Inc. (CSCE) is seeking approval from the Commodity Futures Trading Commission for trading in cheddar cheese futures contracts. At the same time, the CSCE is requesting authorization to trade options in the futures contract for cheddar cheese. Options trading offers another risk management tool to cheese manufacturers, cheese distributors, and dairy farmers; one that may be preferable to futures market hedging in some cases.

In many ways, options trading is similar to futures contract trading. The same regulatory procedures generally apply. Trading rules are similar. The same players are involved (hedgers, speculators, brokers, floor traders, locals, etc.). Placing trading orders is the same. Since these aspects were covered in our discussion of futures trading for cheese, they are not discussed here.

Trading options is somewhat more complicated than trading futures. There are more alternatives, more confusing terminology, and more need to watch the markets. There is one big advantage to using options instead of futures for risk management: Hedgers can preserve the benefits of favorable price movements while protecting themselves against unfavorable movements. But there is a cost of gaining this benefit in the form or options premiums.

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[2] Robert A. Cropp and Edward V. Jesse, *Futures Trading in Cheese: How Will it Work?* Marketing and Policy Briefing Paper No. 42 (Revised), Department of Agricultural Economics, University of Wisconsin-Madison, May 1993.

In this paper, we discuss how options trading works and how options can be used by cheese manufacturers, cheese buyers, and dairy farmers to shift price risk. Our purpose is to present only the basics of options trading and only from the perspective of hedgers. Those interested in more sophisticated options trading alternatives should contact a broker or the CSCE.[3]

What are futures contract options?

In a generic sense, the purchase of an option gives the buyer the right to purchase something else. The right does not involve an obligation. Options are common in real estate markets. You might buy an option to purchase property at a negotiated price. For example, you might buy the right to purchase a vacant lot in Madison, Wisconsin, for a price of $25,000 anytime between May 1, 1993, and December 31, 1993. If the real estate market in Madison goes up between May and December, you would likely exercise your option and buy the property. If the market falls, you would let your option expire.

What you pay for the option depends on two factors: (1) The price for the real estate that is listed in the option relative to its current value; and (2) general expectations with respect to real estate market conditions. If the current market value of the property is $25,000 and the price listed in the option is $30,000, then the option value would be much smaller than if the listed option price was $25,000. In a rising real estate market, you would expect to pay more for the option to purchase the property at a pre-negotiated price than in a stagnant or falling market.

In any case, you can dispose of your option in one of three ways. You can exercise the option and purchase the property. Or, you can let it expire. The third alternative is to sell the option to someone else, hopefully for a profit.

Futures contract options are similar to real estate options. You can buy a call, which is the right -- but not the obligation -- to purchase a futures market contract at a specified price. You can then exercise the call, which allows you to buy the underlying futures contract at the set price. You can let the call expire.[4] Or, you can sell the call to someone else. If you sell a call, then you take on the obligation to provide the futures contract if the buyer of the call decides to exercise.

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[3] Readers interested in more information on options trading should contact the Coffee, Sugar & Cocoa Exchange, Inc., 4 World Trade Center, New York, NY 10048. The toll-free telephone number for the CSCE is 1-800-HEDGE IT.

[4] Letting an futures contract option expire may not be a viable alternative in some cases because the option might be automatically exercised.

If the futures contract price rises *above* the fixed price in your call, you would have an incentive to either exercise your right to purchase the contract at the lower price or sell the call if you were not interested in taking on the commitment to receive delivery of the commodity. It is likely that you could sell the call for more than you paid for it if the price of the futures contract was increasing. If the futures contract price falls *below* the fixed price in your call, you would likely let the call expire -- you would not want to buy the contract at more than what it is currently selling for in the futures market.

There is a second type of futures contract option, a put. A put is the right -- but not the obligation -- to sell a futures contract at a specified price. Like calls, put options are both bought and sold. Put buyers can exercise them, sell them, or allow them to expire. If the futures market price falls *below* the price specified in the put, then it would normally be profitable for the buyer to either exercise or sell the put. If the futures market price rises *above* the price specified in the put, then the buyer would normally allow the put to expire -- you would not want to sell the futures contract at less than what it is currently selling for in the futures market. The seller of a put option has the obligation to purchase the underlying futures contract if the buyer of the put decides to exercise.

Both calls and puts have two essential elements: (1) The futures contract delivery month; and (2) the futures contract price (called the *strike price*[5]). For example, a put (option to sell) a May 1994 cheddar cheese contract at a price of $1.20 per pound is denoted a May 120 put. A call (option to buy) a February 1994 cheddar cheese contract at a price of $1.35 is a February 135 call.

Like in all markets, there has to be buyers and sellers on each side of the options transaction. Buyers of puts and calls are called option holders. Sellers are called option writers. Generally, the writers or sellers of options are speculators. The use of options for hedging purposes normally involves buying calls and puts.

What does it cost to buy a futures contract option?

The price of an option is called its premium. The premium represents the maximum amount the option holder can lose. Premiums for puts and calls are related to two primary factors. The first is the strike price relative to the current trading value of the underlying futures contract. The difference is known as the *intrinsic value* of the option, and is equal to the gross profit an option holder could earn if the option were exercised. The second factor affecting the value of options is the time between the option transaction and the expiration of the option contract. This affects the *time value* of the option.

[5] The strike price is sometimes called the striking price or the exercise price.

At any time, there will be trading in several options for the same contract month representing different strike prices. Some strike prices will be above the current contract price, some below. The premium will be related to the benefits of being able to buy or sell the contract at the strike price. For example, if the current price of the July 1994 cheddar cheese contract is $1.25, a July 120 call would be expected to have a premium of at least 5 cents. The right to buy a July futures contract at 5 cents less than its current value would be worth 5 cents or more. The call option has an intrinsic value of five cents and may have additional time value. A July 120 put would have a much smaller premium. The right to sell a July futures contract at less than its current value would not be worth much since it has no intrinsic value, only time value.

Call options with strike prices *below* the current futures price and put options with strike prices *above* the current futures price have intrinsic value. That is, there is a clear economic benefit of being able to purchase the contract at less than its current cost (call) or sell it at more than its current cost (put). Options that have intrinsic value are called "in the money" options; those without intrinsic value are "out of the money;" and those with strike prices equal to the current futures contract price are, not surprisingly, "at the money." In general, the more in the money an option, the higher will be the premium.

Even out of the money options may have time value. We noted above that a July 120 put would not be worth much if the current July 1994 futures price were $1.25. This would be especially true if we were talking about June 1994 and the futures market for cheese was stable. But if the July 120 put is purchased in July 1993, then it could have considerable time value. The buyer is essentially paying for a whole year to see whether the July 1994 futures contract price will fall below $1.20, thereby permitting a profit. In general, the more time between option purchase and expiration, the higher will be the premium. Time value also may change at different strike prices. At higher strike prices there is less of a chance that the call option will come into the money during the time prior to option expiring.

Volatility in the price of the underlying futures contract also affects the time value of options contracts. If there are rapid and frequent price movements for a futures contract, then there is a greater likelihood that prices will move to a level that will make exercising the option profitable than if futures prices are relatively stable. Therefore, the option writer will want a greater premium for taking a greater risk of having the option exercised. In general, the greater the volatility in futures prices, the greater the premium for the options contract.

Assume that the July 1994 cheese futures contract is trading at $1.20 per pound. Hypothetical premiums for "in the money", "at the money" and "out of the money" options are illustrated below. The premiums are illustrative only, and should not be construed as representing likely values.

Call Option

Strike Price			*Intrinsic Value*		*Time Value*		*Total Premium*
$1.00	}		$.20		$.06		$.26
1.05	} > In The Money	.15		.05		.20	
1.10	}		.10		.04		.14
1.15	}		.05		.03		.08
1.20===>	At the money		.00		.02		.02
1.25	} > Out of the Money	.00		.01		.01	
1.30	}		.00		.01		.01

Put Option

Strike Price			*Intrinsic Value*		*Time Value*		*Total Premium*
$1.00	}		$.00		$.01		$.01
1.05	} > Out of the Money	.00	.01		.01		
1.10	}		.00		.02		.02
1.15	}		.00		.02		.02
1.20===>	At the money		.00		.03		.03
1.25	} > In the Money	.05		.04		.09	
1.30	}		.10		.05		.15

Why have both call and put options? Aren't they just two sides of the same coin?

Isn't buying a put just the opposite of selling a call? Absolutely not. The difference is in both the risk and the potential gain involved. Let's say the May 1994 cheddar cheese futures contract is trading in July 1993 at $1.20 per pound. You expect cheese prices to be less than $1.20 by May. Consequently, you might sell an "at the money" call for the May 1994 cheddar cheese futures (a May 1994 120 call). Let's say the call premium is $.05 per pound. The buyer of the call is willing to pay $.05 per pound to buy the futures contract at a price of $1.20 per pound sometime between July 1993 and the expiration of the call option.

Now, let's suppose that April 1994 rolls around, and you find out that you were dead wrong. The May 1994 futures price is trading at $1.40 per pound. The buyer of the call option that you sold decides to exercise. The call holder is placed in a long position in the futures market for one May cheddar cheese futures contract at the $1.20 per pound strike price. As the writer of the call that was exercised, you are placed on the opposite side of the transaction and are now short one May futures contract at the $1.20 per pound strike price. To offset your short

futures position, you buy one May cheddar cheese contract at the current price, $1.40 per pound.[6] You lose $.20 per pound. What looked like a good bet and a profit of $2,000 turned into a loss of at least $6,000 ($8,000 futures market loss plus $2,000 options gain less broker fees).

But what if you had bought a put instead of selling a call? By purchasing an "at the money" put, you gain the right to sell the May 1994 cheddar cheese contract at $1.20 per pound. Let's assume that the cost of this right to sell, the premium, is $.05 per pound, the same as the call premium at the same strike price. By buying a put, you are banking on a cheese price decline, just as you are when you sell a call.

But there's a big difference. Come April 1994, when the May 1994 cheese futures price has jumped to $1.40, the value of your put option has dropped to zero; nobody is very interested in selling the May 1994 futures contract for $1.20 when they can sell it for $1.40 in the futures market. So you're out your $2,000. But, unlike the call option case, that's all you've lost. Your put option is worthless, but you have not risked the potentially large losses associated with selling a call.

How would you fare as a call seller and put buyer if your price prediction had been correct? Let's assume that near the expiration of the options, the May 1994 cheddar cheese futures price is $1.05 per pound. The call option -- the right to buy the futures contract at $1.20 -- is worthless, and the buyer lets it expire. As the seller, you pocket $2,000 (and breathe a sigh of relief). The put option is now trading at $.15 or more -- it's worth at least 15 cents per pound to be able to sell the futures contract for 15 cents more than its current value. You sell your put and pocket $4,000 profit ($6,000 sales price minus $2,000 purchase price).

The same difference applies to buying calls and selling puts if a futures market price increase is expected. The general principle is: Buyers of puts and calls face unlimited gains and limited losses (the option premium). Sellers of puts and calls face limited gains (the option premium) and unlimited losses.

So why in the world would anyone sell puts and calls and subject themselves to unlimited risk and only limited gains? Why wouldn't they always buy calls if they expected prices to increase and buy puts if they thought prices would fall? There are several answers to these questions. Writing put and call options may be part of a larger package of risk management strategies. Obtaining a short futures market position by being exercised may be just fine for a short hedger who writes a call, for example. Sometimes, the *limited* gain to the seller of the option may be more than the *unlimited* gain to the buyer of the option. And the risk, while unlimited in principle, may be small in reality.

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[6] If the call is exercised, writers are not obligated to immediately offset their short futures market position. They may hold on to their short position in hopes of a price decline and a resulting lower cost of offsetting. Or they may elect to deliver on the futures contract.

Suppose we change the numbers a bit in the example above. Let's say that the May 1994 cheddar cheese futures price did fall from it's July 1993 trading level of $1.20 per pound, but only to $1.18. The holder of the May 120 call may not exercise the option, in which case the writer of the call makes $2,000. The put option premium may be more than the $.05 premium when it was purchased, but, on the other hand, it may only be worth only $.02, its intrinsic value, if the option is close to expiration. Hence, the holder of the put may experience a loss, even though the price has moved in the expected direction. Depending on the amount of price movement, options writers can do very well relative to options holders. And as long as the options market is liquid, writers can cover their positions quickly through an offsetting purchase.

What do the CSCE cheddar cheese options look like?

The cheddar cheese options are very similar to the underlying futures contract. Specifications include:

Contract Size:	One cheddar cheese futures contract (40,000 pounds)
Price Quotation:	Cents per pound
Minimum Fluctuation:	One "point," equal to 0.01 cents per pound or $4.00 per contract
Contract Months:	February, May, July, September, and November
Strike Prices:	· Every 250 points (2.5 cents) when futures prices are less than $1.00 per pound (this is very unlikely) · Every 500 points (5 cents) when futures prices are more than $1.00 per pound (expect these spreads)
Expiration Date:	Last Friday of the calendar month preceding the contract month

How can options be used for hedging price risk?

Like futures trading, options trading can shift the risk of unfavorable price movements in the cash market to speculators. The difference is that hedgers using options can lock in minimum or maximum price objectives (subject to the same basis risk as applies to futures market hedging) and simultaneously benefit from favorable price movements. However, there is a cost to achieve this asymmetric protection in the form of the options premium. There is no such premium involved in futures market hedging.

Purchasing an option can be viewed as buying price protection insurance for future cash market transactions. The insurance premium in this case is the option premium. If you don't need the insurance (prices move in your favor), you still pay the premium. If you do need the insurance (prices move against you), then the insurance pays off in the form of helping to ensure a price or profit objective through offsetting options market gains.

The insurance analogy can be carried further to look at purchasing options at different strike prices. When you buy automobile insurance, you can select from different deductibles for the collision and comprehensive portions of the package. If you choose a zero or very low deductible, then your cost will be relatively high in comparison to choosing, say, a $1,000 deductible. By choosing a high deductible, you are limiting your risk, but, at the same time, you are self-insuring up to the deductible amount. In other words, you are willing to bear part of the cost of having a wreck, but not all of it.

If you buy "at the money" options to provide price protection, then you will pay more than if you buy put or call options that are "out of the money." An "at the money" option is the same as a "zero deductible" insurance policy; it protects the current futures contract price. An "out of the money" option will cost less; the further "out of the money," the smaller the premium. But, at the same time, the "out of the money" option will protect a price objective that is less than (put) or greater than (call) the current futures contract price -- there is a "deductible" representing the willingness of the purchaser to self-insure the difference between the strike price and the current futures contract price.

To illustrate the use of put options to protect against a price decline, suppose you are holding cheese inventory in July 1993 and you are worried about a price collapse before you sell your cheese in December 1993. You see that the cheese futures contract in February 1994 is trading at $1.20 per pound. Given your basis prediction, this cheddar cheese price would allow you to achieve your price objective for the cheese you will be selling in the cash market.

To hedge your inventory value, let's say you buy an "at the money" February 1994 put option for cheddar cheese (a February 120 put). The premium for this option is 3 cents per pound, or $1,200 (there will also be broker costs, which we will ignore). Since this is an "at the money" put, it has no intrinsic value but a 3-cent time value.

You have paid a premium of $1,200 to ensure your price objective. That is your maximum liability in the options market. Your put option will either expire worthless, in which case you are out $1,200; you may be able to sell it at a profit (if the futures price falls far

enough below $1.20); or you might exercise it, which will allow you to take on a short position in the February 1994 cheddar cheese futures contract at $1.20 per pound. Your hope is that the option will expire worthless, which will mean that your cash market price objective will be exceeded.

In December, you are ready to sell your cheese. First, let's assume that the February 1994 cheddar cheese contract is trading at $1.15, five cents under the strike price in your put option. At the same time, the value of your cheese inventory has fallen five cents. You get five cents less than you expected for your cheese. But your put option is now worth 6 cents, three cents more than you paid for it. Note that the put is now "in the money" by 5 cents. The other penny is the remaining time value. Since it is nearer the expiration date of the option, the time value is less than it was when you purchased the option.

You sell the put, pocketing the three cent per pound profit to offset most of the cash market loss. You have achieved your price objective less two cents per pound. Alternatively, you could exercise the option and take on a short position in the February 1994 futures contract at $1.20. You could then cover the short position by buying the February 1994 futures contract at $1.15. This would fetch you five cents per pound futures market profits (less brokerage fees), but you still have the options premium of 3 cents, for a net gain of 2 cents per pound from futures and options trading.

But what if prices went up from what you expected? Suppose that at the time you are ready to sell your cheese, the February 1994 cheddar contract is trading at $1.40 per pound? Your put option is worthless; you are out the $1,200 premium. But your cheese is now worth 20 cents more than you expected. Hence your net gain is 17 cents per pound (20-cent cash market gain less 3-cent premium).

This example illustrates the difference between futures contract hedges and options hedges. If you had attempted to lock in your cash market price objective using a short futures contract, you would have done better with falling prices than using the put option. Because of the declining time value of the option, you did not achieve your price objective, even with a constant basis. With a constant basis, the gain from the futures market hedging transaction would have completely offset the cash market loss.

But with a rising market, the option hedge can be preferable to the futures hedge. Assuming a constant basis, the futures hedge would have meant exactly offsetting gains and losses in the cash and futures markets. You would have achieved your price objective, but you would not have benefitted from the rising cash market. In contrast, the options hedge allowed you to garner all of the cash market increase except for the option premium.

How would cheddar cheese options trading be used in the dairy industry?

Hedging with options can be used by cheese manufacturers, cheese distributors, retailers, and others with a cash market interest in cheese and related dairy products, including farm level milk. Firms with cheese to sell would normally buy put options to hedge; those with cheese to buy would normally purchase call options. In any case, the use of options limits the risk of unfavorable price changes while preserving the gains from favorable price movements. But hedging with options involves a premium cost that does not apply to hedging with futures contracts.

Illustrated here are examples of how cheese manufacturers and cheese distributors may use cheese options. The use of cheese options to protect farm level milk prices is also illustrated.

The purpose of these examples is to illustrate the essentials of hedging through options trading. Accordingly, we use some simplifying assumptions and ignore some important considerations. Of particular importance:

- We use cash, futures, and options market prices expressed per pound of cheese, and ignore total values associated with the transactions. In hedging, the volume of trades is important; hedging involves approximately equal and offsetting transactions in cash and futures or options markets. Option trading volumes that are substantially in excess of cash market positions represent speculation.

- We ignore broker commissions for both options and futures market transactions. These are an important consideration in determining the cost of purchasing price protection through options trading. Unlike broker commissions for futures trading, commissions for options trades are not "round turn;" there are separate commissions for entering into and closing out an options trade. We also ignore interest costs on options premiums, which also must be considered in calculating hedging costs.

- We consistently illustrate "at the money" option trades. In reality, most hedgers trade "out of the money" options, just like most people select a deductible when they purchase casualty insurance. Premiums for "out of the money" puts and calls behave differently from premiums for "in the money" options. Premiums do not necessarily move one-for-one with futures market prices; premiums for "out of the money" options never do.

- We consistently assume fairly large price changes for futures contracts and associated large changes for options premiums in our examples. Put and call options are assumed to be deep in the money when they are exercised or offset. Smaller futures contract price changes could lead to different hedging results.

Illustration #1: Cheese Manufacturer:

Farmers' Pride cheese company purchases milk from dairy farmers and manufactures 40 pound cheddar blocks. Farmers' Pride is worried that cheddar cheese prices could decline in the fall, and that they would suffer from declining value of cheese in inventory and/or from less favorable plant operating performance because of lower cheese prices than anticipated. The purchase of a cheese put option may reduce this risk of declining cheese prices without sacrificing the opportunity to gain if cheese prices should happen to increase.

In May, the November cheese futures contract is trading at $1.30 per pound and the "at the money" cheese put option (strike price of $1.30 per pound) is trading with a premium of 3 cents per pound. Farmers' Pride purchases November cheese options with a strike price of $1.30 per pound to protect its cheese inventory value or its selling price objective for November. As with hedging in futures contracts, the basis (cash price minus futures price) needs to be considered in projecting final effective prices. Assuming the normal basis is 5 cents per pound, the projected November cash price for 40# cheddar blocks is $1.35 per pound ($1.30 futures plus $.05 basis).

Suppose that, just as feared, the cash price of 40# cheddar blocks by October has declined to $1.25 per pound and November cheese futures contracts are trading at $1.20 (no change in basis). The November cheese put option purchased in May is "in the money". Farmers' Pride calls its broker to exercise the option and a November short (sell) position is established on the futures market at the strike price of $1.30 per pound. Farmers' Pride then instructs the broker to cover that position by going long (buy) on the futures. With the November cheese futures contract trading at $1.20 per pound, a futures gain of $.10 per pound ($1.30 - $1.20) is realized. Subtracting the $.03 options premium, a net gain of $.07 cents is realized. Farmers' Pride sells its 40# cheddar blocks on the cash market for $1.25 per pound. Adding the net futures gain of $.07 results in an effective selling price of $1.32 per pound.

Remember, an option holder has three alternatives: let the option expire, exercise the option or offset the option. When the option is "in the money," as is this situation, Farmers' Pride would not let the option expire. However, it may be more profitable to *offset* the option rather than *exercise* it. The purchase of a put option may be offset by selling a put option at the *same* strike price. By offsetting, the futures transactions (and futures commission cost paid to the broker) are avoided and the net effective cash price may be higher than if the option is exercised. However, offsetting will still require a broker commission for the options trade, since commissions for options trades are not round turn, as they are for futures contract trades.

When an option is "in the money" the option can be sold at a premium that reflects both its intrinsic value and, possibly, some time value (depending on the time remaining before expiration of the option). In this case the intrinsic value would be $.10 per pound ($1.30 strike price - $1.20 futures contract price). Further, let's assume there is a time value of $.02 per pound. A November 40# cheddar block cheese put option could then be sold at a premium of $.12 per pound. By offsetting, a net gain of $.09 per pound ($.12 selling premium minus the $.03 purchase premium) is realized. By offsetting, Farmers' Pride can realize an effective cash price

for its 40# cheddar blocks of $1.34 per pound ($1.25 cash price plus $.09 net options gain), which is $.02 per pound better than if the option had been exercised.[7]

Usually, the net price result is better by offsetting rather than exercising an option when the option is "in the money." Consequently, most options are offset rather than exercised. As illustrated latter, it may also be advantageous to offset "out of the money" options rather than letting them expire.

But what if cheese prices had increased instead of declining? Let's assume that in October, 40# cheddar blocks are selling for $1.40 per pound on the cash market and that the November futures market contract is trading at $1.35 per pound. The November 130 put option purchased last May by Farmers' Pride is "out of the money." Clearly, Farmers' Pride will not exercise the option. By letting the option expire, Farmers' Pride will realize an effective cash cheddar cheese price of $1.37 per pound ($1.40 cash price minus $.03 option premium).

This "out of the money" November cheese option would not have any intrinsic value, but it could have some time value. If time value remains, Farmers' Pride would gain by offsetting the November put option rather than letting it expire. Let's assume there is a time value of $.01 per pound. Farmers' Pride would gain by offsetting, selling a November put option at the same strike price, for a premium of $.01. Offsetting reduces the premium loss to $.02 ($.03 purchase premium minus $.01 selling premium). The net effective cash price for 40# cheddar blocks would now be $1.38 per pound ($1.40 cash price minus $.02 premium loss), $.01 per pound better than if the option were allowed to expire.

Illustration #2: Cheese Distributer:

Flavor Fresh cheese company buys 40# cheddar blocks for processing. It sells processed cheese to buyers on a cash forward contract at a specified price. Flavor Fresh has a processing cost of $.20 per pound (including a net profit objective). Flavor Fresh fears that the cost of 40# cheddar blocks could rise after a cash forward contract price for processed cheese to a buyer is established. The purchase of a call option for 40# cheddar block futures contracts may be used to reduce the risk of a price increase for 40# cheddar blocks and not sacrifice gains if block prices decline.

In May, the November 40# cheddar block futures contract is trading at $1.25 per pound and the November at the money call (November 125 call) is trading at a premium of $.03 per pound. Again basis is important here. Flavor Fresh assumes the normal basis is $.05, that is, it can usually purchase 40# cheddar blocks at $.05 per pound over the futures contract price. With the purchase of a November 125 call, Flavor Fresh estimates it can purchase 40# cheddar

[7] The gain relative to exercising the option is in the remaining time value of the option, which is captured by offsetting.

blocks in November at $1.30 per pound ($1.25 plus $.05 basis). With processing costs of $.20 Flavor Fresh negotiates a processed cheese forward contract with a buyer for November delivery at $1.50 per pound.

Assume that what was feared comes true. In October, the November futures contract price is $1.35 per pound and the cash market price for 40# cheddar blocks has increased to $1.40 per pound. The November call option purchased in May with a strike price of $1.25 per pound is "in the money". Flavor Fresh calls its broker to exercise the call option and a November long (buy) position is established on the futures market at the strike price of $1.25 per pound. Flavor Fresh then instructs its broker to cover by taking a short (sell) position on the futures market with a November futures contract at $1.35 per pound (no change in the basis is assumed). With November futures contracts trading at $1.35 per pound a futures gain of $.10 is realized ($1.35 short minus $1.25 long). The net futures gain is $.07 per pound ($.10 minus the $.03 call option premium). Flavor Fresh purchases 40# cheddar blocks on the cash market for $1.40 per pound. Its net effective cash price for 40# cheddar blocks is $1.33 per pound ($1.40 cash price minus $.07 net futures gain).

Flavor Fresh could also elect to keep its long position in the November contract and take delivery of the cheese. Assuming no change in either the futures contract or cash market price from the time of exercising the call until delivery, Flavor Fresh would receive cheese at the futures market price of $1.25 per pound. Its net cost would be the $1.25 cash market price plus the $.03 option premium, or $1.28 per pound. While this appears to be a better result than offsetting the futures contract, Flavor Fresh cannot control where the cheese will be delivered. Consequently, it will likely incur freight costs that are about equal to the local basis ($.05 per pound.[8] Hence, taking delivery will yield about the same results as offsetting the long futures contract and purchasing cheese locally.

Flavor Fresh would probably be better off by offsetting its November call option instead of exercising the option. The November call option can be offset by selling a November call option at the same strike price. The November call option would have an intrinsic value of $.10 per pound ($1.35 November futures contract price minus $1.25 strike price). In addition, let's assume an additional time value of $.02 per pound. Thus, Flavor Fresh can sell a November 40# cheddar block call option with a strike price of $1.25 per pound at a premium of $.12. The net options gain by offsetting is $.09 per pound ($.12 selling premium minus $.03 purchase premium). The net effective cash price for 40# cheddar blocks by offsetting is now $1.31 per pound ($1.40 cash price minus $.09 options gain), $.02 per pound lower than by exercising the call option.

What if the cash price for 40# cheddar blocks had declined to $1.20 per pound? In that case, the November call with a strike price of $1.25 per pound is "out of the money" and Flavor

[8] If the normal basis in Flavor Fresh's region is $.05 per pound for cheese that is exactly the same as the specifications of the futures contract, then delivery costs are likely to be about $.05 per pound.

Fresh would not exercise the call option. If Flavor Fresh lets the November call option expire, its effective cash price for 40# cheddar blocks would be $1.23 per pound ($1.20 cash price plus $.03 premium loss). If there is some remaining time value left in the out of the money put option, then Flavor Fresh could sell the option and further reduce its effective cash price for cheese.

Illustration #3: Use of Options To Protect Farm Level Milk Prices Through the Use of Cash Forward Contracts:

A dairy plant could use cheese options to offer dairy farmers a cash forward contract for milk purchased at a fixed price or a *minimum* price. Note that hedging with futures contracts only permits forward contracting at a fixed price, because losses offset gains regardless of price movements. With options hedging, the hedger can benefit from favorable price movements. This feature allows the writing of a minimum price contract and obtaining price protection through options trading.

Let's assume that Farmers' Pride offers its dairy farmers a forward pricing plan that works as follows: To price their milk, patrons can select any options trading month for cheddar cheese futures contracts and any traded strike price within the put option. The contracted price per hundredweight of milk that they will receive is guaranteed to be *at least* ten times the strike price they select (based on a cheese yield of 10 pounds per hundredweight) less a deduction that will vary according to the strike price. The higher the strike price, the higher the deduction. This is because the option premium that Farmers' Pride will have to pay to hedge its forward price guarantee will increase as the strike price increases.

The financial risk to Farmers' Pride is a decline in farm level milk prices below the offered cash forward contract price. If this happens, Farmers' Pride would have a higher raw milk cost for cheese than its competitors, and less favorable plant operating margins from milk purchased under the fixed priced cash forward contract. By purchasing a cheese put option Farmers Fresh can protect itself against farm level milk prices dropping below its offered cash forward contract price to dairy farmers.

Let's assume a dairy farmer is concerned that milk prices will decline in the fall. In May, he/she contacts Farmers' Pride and signs a cash forward price contract. He/she picks the November cheese put option at a strike price of $1.40 per pound. The current premium for the November 140 put is $.03. To derive the cash forward contract price at the strike price of $1.40, Farmers' Pride deducts $1.30 per hundredweight of milk equivalent in arriving at the cash forward contract price. This deduction covers the plant's operating margin per hundredweight of milk ($1.00) plus the put option premium expressed in terms of equivalent cost per hundredweight of milk ($.30). The plant expects to make ten pounds of cheese per hundred-weight of milk. Ut will sell that cheese at the November cheddar cheese futures price plus the local cash market basis, which we will assume to be zero in this case (cash market price equals futures market price). It needs $1.00 per hundredweight to meet its costs and profit objective.

In addition, it will have to buy put options at a premium of $.03 per pound, or $.30 per hundredweight of milk, to hedge its forward price position.

The cash forward contract price for the contracting farmer's November milk will be $12.70 per hundredweight ($1.40 strike price X 10 = $14.00 minus $1.30 deduction). Farmers' Pride signs the minimum price contract and immediately purchases a November cheese put option with a strike price of $1.40 per pound (November 140 put) to protect the offered cash forward milk price of $12.70 per hundredweight.[9]

Let's look more closely at this forward pricing program. Note that nothing has been said about what the plant expects to get for the cheese it makes from the forward-priced milk. Neither have we said anything about the current futures market price for the November cheddar cheese contract. Surprisingly, neither of these really matter. The deduction in the contract will take into account the normal *basis* (in this case, the difference between 10 times the cheese price and the milk price). The deduction will vary directly with the selected strike price. If the farmer selects a put strike price that is very deep in the money (strike price much higher than the current futures market price), then the deduction will be large enough to bring the milk price back to a level that is consistent with the current futures contract price and the expected basis. What Farmers' Pride is really saying with its contract is, "If I can get the current futures market price for cheese, then I can afford to pay ten times that price for milk less my manufacturing margin less the cost of hedging my position in the options market."

Now, what happens if cheese and milk prices fall? Assume that in October, farm level milk prices are at $12.00 per hundredweight, $.70 below the $12.70 per hundredweight forward cash contract price obligation. But November 40# cheddar cheese futures contracts are trading at $1.30 per pound. Thus, the November cheese option with a strike price of $1.40 per pound is "in the money" by 10 cents per pound.

Farmers' Pride can now profitably exercise its put option, obtaining a short futures market position in the November cheddar cheese contract. It could then cover the short position with an offsetting futures contract purchase, making 10 cents per pound of cheese on the deal. Alternatively, it could hold its futures market position and make delivery at the $1.40 per pound price. But exercising the put option would require brokerage fees for the futures market transactions on top of the option premium that Farmers' Pride has already incurred.

More likely, the plant will offset its put option purchase with a put option sale at the $1.40 strike price. With November 40# cheddar cheese futures contracts trading at $1.30 per pound, a November cheese put option with a strike price of $1.40 per pound has an intrinsic value of $.10 per pound ($1.40 minus $1.30). In addition, let's assume it also has a time value

[9] In this example, we are implicitly assuming that the volume of milk contracted against a particular put option is equivalent to 40,000# of cheddar cheese, the volume of the options contract. This might require the combined volume of several dairy farmers.

of $.02 per pound. Farmers' Pride can, therefore, liquidate its position in the options market and collect a premium of $.12 per pound. The net options gain by offsetting is $.09 per pound ($.12 selling premium minus $.03 purchase premium) or $.90 per hundredweight milk equivalent.

So by liquidating its options position, how does Farmers' Pride fare with its cash forward milk contract? Assuming a zero basis, the cheese price in the cash market is $1.30 per pound (if the basis were non-zero, then Farmers' Pride would build the predicted basis into its pricing contract). The milk price consistent with the current cheese futures market price is $12.00 per hundredweight (ten times the cheese price less $1.00 per hundredweight). This is the competitive price for milk that Farmers' Pride has to worry about.

Farmers' Pride has guaranteed a milk price of $12.70. By offsetting its purchase of a put option, Farmers' Pride has $.09 in options market revenue to add to its cheese market revenue of $1.30. Therefore, it has $1.39 per pound of cheese or $13.90 per hundredweight of milk in gross revenue. Subtracting its manufacturing margin of $1.00 means that it can pay its contracting farmers at least the $12.70 guaranteed price and as much as $12.90 per hundredweight; 90 cents per hundredweight more than its competition. Even if there were no time value in the option, Farmers Price would still have enough gross revenue (including cash and options market transactions) to pay the $12.70 guaranteed price and meet its gross margin objective.[10]

But what would have happened if farm level milk prices and cheese prices had increased? Let's assume that October milk prices are $13.50 per hundredweight, $.80 higher than the cash forward contract price of $12.70 per hundredweight. November 40# block cheese futures contracts are trading at $1.45 per pound. The November cheese put option with a strike price of $1.40 per hundredweight is "out of the money." Clearly, Farmers' Pride cannot gain by exercising the November cheese put option that it purchased in May. The option may have some remaining time value, but let's assume that it is worthless and Farmers' Pride lets it expire.

Farmers' Pride has guaranteed a milk price of $12.70. Its competitors are paying $13.50. The firm can sell cheese in the cash market at $1.45 per pound, or $14.50 per hundredweight of milk equivalent. Subtracting the margin objective of $1.00 per hundredweight and the $.30 per hundredweight equivalent cost of the put option that expired worthless leaves $13.20 per hundredweight to pay farmers who signed up for the cash forward price program. Farmers Price can easily meet its price guarantee of $12.70. But in this case, it cannot afford to pay the competitive milk price to contracting farmers because of the build-in cost of its hedging operations. In effect, contracting farmers have incurred a $.30 per hundredweight cost to guarantee themselves a minimum price.[11]

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[10] The 20-cent "slack" is attributable to the contracting dairy farmers paying the full cost of the put option premium, while Farmers' Pride gets part of the premium back when it offsets its put.

[11] Note that if the out of the money put option had time value, Farmers Pride could have offset and increased its ability to pay contracting farmers.

Illustration #4: Use of Options by a Dairy Farmer to Protect Milk Prices Received:

For a dairy farmer, the advantage of using cheese options over hedging in cheese futures contracts is that options can protect against declining farm milk prices without sacrificing the opportunity to take advantage of rising milk prices. With hedges on the futures market, both losses and gains on the cash market are offset by gains and losses on the futures market. Options protect against down side risk. But, by not exercising the option or by offsetting the option, price increases may also be captured.

In Illustration #3 above, rather than entering a cash forward contract with Farmers' Pride, the dairy farmer could have independently purchased a November cheese put with a strike price of $1.40 per pound at a premium of $.03 per pound. This action would protect the farmer from declining milk prices but allow for taking advantage of rising milk prices. The dairy farmer has to know the basis, the difference on a milk equivalent basis between the cash milk price and the cheese put strike price.[12] Let's use $1.00 per hundredweight. Thus, if the farmer in May purchases a November 40# block cheddar put with a strike price of $1.40 per pound at a premium of $.03 per pound, he/she is trying to protect a November milk price of $12.70 per hundredweight ($14.00 milk equivalent cheese price minus $1.00 basis and $.30 option premium). This is really no different from what Farmers' Pride was doing to help ensure its ability to pay its guaranteed price.

If farm milk prices fall to $12.00 per hundredweight, reflecting a cheese price of $1.30 per pound, the farmer would most likely find the November put option "in the money." One strategy is to exercise the option. Exercising the option puts the farmer in a short (sell) position on the futures market with a November 40# cheese futures contract at the strike price of $1.40 per pound. He/she can cover this position with a long (buy) in November cheese futures at $1.30 per pound. The futures gain is $.10 ($1.40 sell minus $1.30 buy). From this gain is subtracted the $.03 options premium, netting a gain of $.07 per pound of cheese or $.70 per hundredweight of milk. By exercising the option, the farmer nets $12.70 per hundredweight for November milk ($12.00 cash price plus $.70 net futures gain).

Instead of exercising the November option the farmer could have offset by selling a November cheese put at the same strike price. The November cheese put would have an intrinsic value of $.10 per pound ($1.40 strike price minus $1.30 November futures contract trading price). If there is also some time value, say $.02 per pound, then the farmer could sell a November cheese put at with a strike price of $1.40 at a premium of $.12 per pound. The net options gain would be $.09 per pound ($.12 selling premium minus $.03 purchase premium) or $ .90 per hundredweight of milk. The net cash price received for November milk would be $12.90 per

[12] See Marketing and Policy Briefing Paper No. 42 (Revised) for a discussion of basis as related to dairy farmers' use of hedging.

hundredweight ($12.00 plus $.90 net options gain), $.20 per hundredweight better than if the option had been exercised.

If fall milk prices had increased to $13.50 per hundredweight, the farmer could clearly benefit with the purchase of a cheese put option over a futures market hedge or entering into a cash forward contract at a fixed price. At a cash milk price of $13.50 per hundredweight and November 40# cheddar cheese futures trading at $1.45 per pound, the November cheese put purchased in May at a strike price of $1.40 per pound is "out of the money". The farmer would not exercise the option, but unlike hedging in cheese futures or entering into a cash forward contract, the farmer can still take advantage of this price rise by either not exercising the option or by offsetting. If the option is not exercised, the premium of $.03 per pound or $.30 per hundredweight of equivalent milk value is lost and the net cash milk price is $13.20 per hundredweight ($13.50 cash price minus $.30 premium loss.

If the November cheese put with a strike price of $1.40 per pound had any remaining time value, then an even better milk price might be realized by offsetting. For example, if the time value is $.01, the November cheese put could be sold at a premium of $.01, reducing the premium loss to $.02 per pound or $.20 per hundredweight of milk equivalent. The net November cash milk price received by the farmer would be $13.30 per hundredweight ($13.50 cash price minus $.20 net premium loss), but $.10 per hundredweight better than letting the November cheese put option expire.

Dairy farmers with monthly milk volume less than 400,000# (equivalent to the 40,000# cheese option contract) can still use options trading to obtain downside price protection, but their effective premium -- cost of price insurance -- would be greater if prices turned out to be higher than expected. In this example, the $.03 per pound put option premium equated to $.30 per hundredweight of milk. If the farmer marketed only 100,000 pounds of milk per month, then the premium would be $1.20 per hundredweight. On the other hand, the option market gains in a falling market expressed per hundredweight of milk would be proportionately larger. But option trades that exceed cash market volume represent speculation on the excess volume.

Illustration #5: Use of a Call Option to Protect Against a Price Decrease:

We noted earlier that hedgers normally buy options to protect cash market positions, and that option sellers (writers) are normally speculators. Selling calls can provide downside price protection and buying puts can provide upside protection. But these transactions provide only limited protection and establish maximum and minimum prices, respectively.

In Illustration #1, a cheese manufacture purchased a cheese put option to protect against a price decline. The selling (writing) of a call option may also be used to protect against a price decline, but by doing so a maximum cheese price is set. For example, Farmers' Pride is interested in protecting against declining fall cheese prices. In May, the November cheddar cheese contract is $1.30 per pound and the at the money November call option is trading at a

premium of $.03 per pound. Farmers' Pride could sell (write) an at the money November call and collect a $.03 per pound premium from an option buyer (holder). If cheese prices drop to $1.20 per pound by fall, the November cheese call with a strike price of $1.30 per pound is "out of the money" and the option holder will either let the option expire or offset. In either case, the call option writer, Farmers' Pride gains the premium collected.

In this situation Farmers' Pride sells its cheese on the cash market for $1.20 per pound and adds the $.03 call premium collected for an effective cash price of $1.23 per pound. The only price protection is the amount of premium collected form writing the option. As can be clearly seen, writing a call option offers only limited protection from declining cheese prices as compared to purchasing a cheese put option. This is why most writers of options are speculators hoping to profit by the option holder not exercising option.

If November cheese futures increased to $1.40 per pound, the November cheese call option with a strike price of $1.30 per pound would be "in the money" and the holder may choose to exercise rather than offset the option. If the holder exercises the call option, the writer, Farmers pride, is immediately placed into a short position in the futures market at the $1.30 per pound strike price of its call option. Farmers' Pride can offset its position at the current November 40# cheddar block futures price of $1.40 per pound, in which case it will suffer a loss of $.10 per pound on the futures market ($1.30 long minus $1.40 short). Farmers' Pride sells its 40# cheddar blocks at $1.40 per pound (assuming a zero basis) but must subtract the $.10 per pound loss on the futures market. The net effective cash cheese price received by Farmers' Pride would be $1.33 per pound ($1.40 cash price minus the $.10 futures plus the $.03 option premium).

A price of $1.33 per pound is the maximum that Farmers' Pride can receive by writing a call. If November cheese futures had increased to $1.50 per pound, and the call holder exercised the option, the effective cash cheese price would still be $1.33 per pound. The loss to Farmers' Pride on the futures market would be $.20 per pound (long at $1.50 minus short at $1.30). The offsetting option premium of $.03 per pound would net an effective cash price of $1.33 per pound.

The short position on the futures market that is obtained when the call is exercised does not have to be offset. Farmers' Pride may elect to wait to see what happens to the contract price. If futures and cash prices decrease, then Farmers' Pride has locked in the $1.33 per pound price just as if it had sold short in a futures market hedge. If prices continue to increase, then the company can do no worse that the $1.33 it gets from offsetting the short position immediately. It can also elect to deliver on the contract, receiving $1.30 per pound plus the $.03 call premium it received earlier.

Of course, Farmers' Pride does not have to wait around until the call it sold is exercised. It can offset its sale with the purchase of a November call at the same strike price. But the results would be about the same, since the value of the option will usually increase by about the same amount as the price of the underlying futures contract once the call is deep in the money

in a rising market. The advantage to offsetting would be in avoiding the broker costs of the futures transactions associated with having the call exercised. This would result in a slightly higher maximum price.

Conclusions

Trading cheese futures options offers the dairy industry an alternative to hedging in cheese futures contracts as a means to reduce market price risks. Cheese futures options offer some advantages over hedging in cheese futures. The holder of options receives protection against adverse price movements without sacrificing benefits from favorable price movements. With hedging in futures contracts, both maximum and minimum prices are set. Buying put and call options also have an advantage over hedging in futures in that margin money and margin calls are avoided. The option premium -- the maximum outlay for an option purchase -- is known in advance. If options are offset rather than exercised, futures transactions and associated brokers commission are also avoided.

Put options also afford dairy plants the opportunity to offer minimum price forward contracts to dairy farmers. A cash forward contract hedged through the sale of futures contracts sets the maximum as well as the minimum milk price. In contrast, plants could afford to pay more than the minimum price if the forward price contract were backed by the purchase of a put option. Put options can also be used directly by dairy farmers to provide downside price protection while preserving upside gains.

The use of options is no easier then hedging on the futures market. Understanding basis and the basis risks is just as important with options as with hedging on the future. Options traders need to closely watch futures contract prices in comparison to the option strike price in order to take advantage of "in the money" options opportunities. With "out of the money" options a comparison of net results from letting the option expire or offsetting the option should be compared. This involves careful monitoring of premiums.

Price protection through the purchase of put or call options also involves a cost that is not incurred when hedging is done through futures market transactions. That cost is the premium for the put or call. Buying a put option to protect against a price decline will be an inferior strategy to selling short in the futures market if prices do, indeed, fall. Similarly, buying a call is inferior to going long in the futures market if prices increase. Consequently, whether hedging is done through options or futures trading depends partly on how confident the hedger is in the direction of price movements.

Cheese futures options will be preferred by some over hedging on the futures market. Others will use cheese futures options in addition to or in combination with hedging on the futures market. Our illustrations provide only a few, limited examples of how futures and options contracts can be used to manage price risk. Many other creative hedging alternatives are possible.