



**The Fundamentals of Forward Contracting, Hedging,
and Options for Dairy Producers in the Northeast**

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The Fundamentals of Forward Contracting, Hedging, and Options for Dairy Producers in the Northeast

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Introduction

Dairy farmers today face much more revenue risk than they did just a few years ago. Milk prices today are subject to tremendous shifts from month to month due to volatility in the underlying prices for dairy commodities (primarily cheese and butter). Prices for dairy commodities in turn are volatile due to the gradual reduction in purchase prices under the dairy price support program since 1987. And, milk production continues to be highly vulnerable to changes in the weather.

The result is milk revenue is very uncertain from month to month and year to year. For example, Figure 1 below illustrates monthly milk production and the all-milk price in Pennsylvania for the years 1998-2000. Milk prices alone varied from a high of \$18.30 per cwt in January 1999 to a low of \$12.60 per cwt in April 1999.

This degree of volatility makes it very difficult to plan the cash flow needs for the dairy business. Dairy farmers need to budget each month for feed purchases, hired labor, veterinary expenses, and inputs such as parlor and cropping supplies (i.e. seed, fertilizer, etc.). Cash flow problems occur when milk prices fall below expected levels.

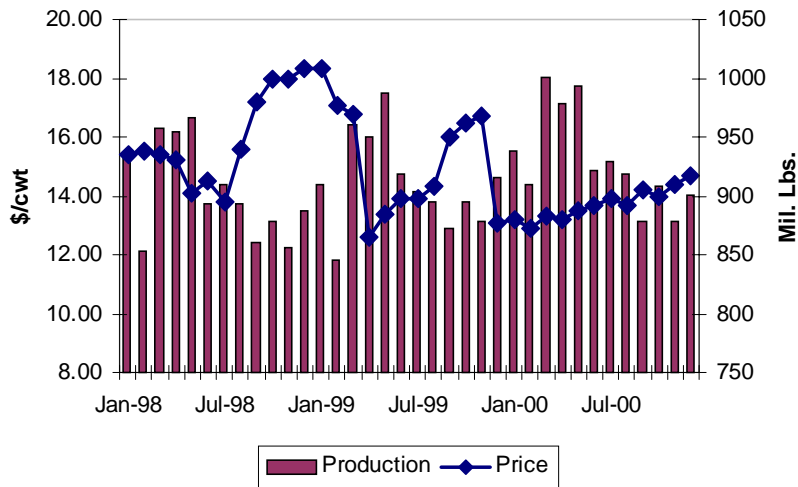


Figure 1. Pennsylvania Milk Production and All-milk Price

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Sources of Risk on the Farm

There are many sources of risk on today's dairy farm that could adversely affect profits. Some of these risks are as follows

- Milk prices
- Milk production:
 - Herd health
 - Reproduction
 - Heat stress
 - Milk quality
- Crop production
- Purchased feed prices
- Hired labor
- Interest rates
- Neighbors/environment
- Loss of assets due to a weather event

Any factor that could lower revenue or increase expenses is a source of risk to the economic performance of the dairy business. Lower milk quality, for example, could cause the farm to lose valuable quality premiums, thus lowering revenue. Higher interest rates could result in higher operating costs. And a crop failure would not only adversely affect an important source of forage for the dairy operation, but would also result in a loss of cash outlays for inputs such as seed and fertilizer. The net result is higher expenses.

Dairy farmers face a lot of risks operating a dairy business. Farm operators should consider taking the necessary steps to avoid or reduce the degree of risk they currently face. Standard milking procedures are used to maintain high milk quality and avoid milk quality problems. Crop insurance is purchased in order to avoid catastrophic losses from a crop failure. General farm insurance is purchased to protect farm assets from losses due to floods and hurricanes. And vaccinations are used to protect the dairy herd from disease. The question is, why aren't these same efforts used to protect the milk price from adverse changes?

Methods of Dealing With Milk Price Risk

The objective of this report is to discuss tools that can be used by dairy farmers to manage a major source of income risk, that of falling milk prices. The tools to be discussed are: 1) forward contracts, 2) the straight hedge, and 3) options.

Example: Spring 2001

Let's provide an example dairy farm in order to illustrate the use of dairy risk management tools. Joe is a dairy farmer in Pennsylvania who owns ABC Dairy. He milks 75 cows and produces 18,500 pounds of milk per cow per year. Joe also markets 1.4 million pounds of milk a year, or 115,625 pounds per month. It is early March 2001 and Joe just completed an

analysis of his 2000 milk production, prices, revenue and profits. It was not a good year for milk prices. He took on more debt in 2000 than he expected; the bills had to be paid despite low milk prices. Joe is now in the process of budgeting milk income and expenses monthly for 2001.

Joe is concerned about the stability of milk revenue in 2001. He consulted his local extension office. They explained that Joe markets his milk into the Northeast federal order where about 33 percent of the blend price is determined by the Class III milk price (milk used to make cheese), and 67 percent is driven by the Class IV milk price (milk used to make butter and nonfat dry milk).³ Class III and IV prices are reported each month by USDA.

Joe can “lock in” his milk price relative to a Class III and/or Class IV price on the Chicago Mercantile Exchange. The local extension agent provided historical Class III and IV prices in Table 1 for January and February 2001, and futures market prices as of March 2, 2001 for March – December 2001. Joe notes that as of March 2, 2001 the “futures market” expects the Class III price to be 14-36 percent higher and the Class IV price to be 11-20 percent higher (between March and October) than a similar period in 2000. These prices look good to Joe.

So, what would you do if you were in Joe’s shoes? Most of your neighbors may decide to wait. That’s exactly what Joe did in 2000. By March 2000, most people Joe talked with were expecting the Class III price to rise to \$12.50 by the fall. In fact it reached \$10.76 per cwt in September and then fell to a 20-year low of \$8.57 in November.

Joe quickly reached two conclusions. First, the futures market prices for both Class III and IV during the months of March through October 2001 were much better than similar months in 2000. Second, as he looked into the future, Joe realized actual prices would either be

Table 1. Class III and Class IV Futures Market Settlement Prices¹

	Class III		% change from year before	Class IV		% change from year before
	2000	2001		2000	2001	
Jan	10.05	9.99	-0.6%	10.73	12.13	13.0%
Feb	9.54	10.27	7.7%	10.80	12.70	17.6%
Mar	9.54	11.35	19.0%	11.00	13.30	20.9%
Apr	9.41	11.05	17.4%	11.38	13.70	20.4%
May	9.37	11.08	18.2%	11.91	13.72	15.2%
Jun	9.46	11.62	22.8%	12.38	13.75	11.1%
Jul	10.66	12.15	14.0%	11.87	13.75	15.8%
Aug	10.13	12.23	20.7%	11.87	13.85	16.7%
Sep	10.76	12.27	14.0%	11.94	13.80	15.6%
Oct	10.02	12.25	22.3%	11.81	13.42	13.6%
Nov	8.57	11.70	36.5%	13.00	13.70	5.4%
Dec	9.37	11.44	22.1%	13.27	12.85	-3.2%
Annual	9.74	11.45	17.6%	11.83	13.39	13.2%

¹ Futures prices for March - December 2001 as of March 2, 2001.

³ To learn more about milk pricing in the Northeast, see “Understanding Your Milk Check,” a Penn State extension report.

higher or lower than the futures market prices depicted in Table 1. In other words, while they could get better, they could also get a lot worse. Joe decided to take action to protect his bottom line.

Forward Contracting

One way to lock in milk prices and avoid uncertainty is to “forward contract” milk. This option is only available at this time to dairy farmers who are members of a dairy cooperative. The limitation regarding who can offer forward contracting opportunities to dairy farmers has to do with federal order rules that prevent farmers from being paid a milk price below the federal order minimums. USDA, however, now has a pilot program that will allow private buyers of milk (proprietary plants) to offer their dairy producers a forward contracting program on all milk not used for fluid purposes. Now, let’s provide an example of forward contracting.

Let’s go back to ABC dairy. Suppose it is March 2, 2001 and as the owner/operator of ABC dairy Joe is worried about milk prices collapsing by August 2001. Joe recalled what happened in 2000. Joe contacted his cooperative and found out he can forward contact milk relative to either the Class III or IV price. Joe’s county extension agent reminded him again that about 67 percent of farm-gate milk prices in the Northeast during 2000 were determined by the Class IV price. Joe decides to “lock in” ABC’s August milk price relative to a Class IV contract. Here are the steps Joe will need to forward contact milk.

Step 1. Which month and how much milk? Let’s assume that Joe has already signed a participation agreement with his cooperative to forward contract milk. Joe identified August 2001 as the month he wanted to forward contract. ABC Dairy produces about 115,625 pounds per month. Joe decides to forward contract 65 percent of this, or 75,000 pounds.

Step 2. Compute the basis. Joe understands that he gets much more each month on his milk check than the announced Class III or IV price because of federal milk marketing orders. Joe computed the monthly relationship between the announced Class IV price and the net milk price on his milk check in 2000. The data in Table 2 shows Joe’s average net milk price during 2000 was \$13.73 and the average Class IV price was \$11.83. The difference, called the basis, was \$1.90. With this information Joe can predict his net milk price if the Class IV price is known. A more detailed discussion regarding basis will be presented later in this report.

Step 3. Agree on a contract price. Joe decides to lock in an August 2001 Class IV price of \$13.85. That was the Class IV price available on March 2, 2001 for August 2001 milk. Given a basis of \$1.90 per cwt, Joe is expecting a net milk price of \$15.75. He recalls that his August 2000 net milk price was just \$13.70. Thus locking in a milk price of \$15.75 looks very promising.

Step 4. Confirm the trade with your cooperative. Joe decides to forward contract 75,000 pounds of milk for August delivery at a Class IV price of \$13.85 per cwt. He calls his cooperative and receives confirmation of the trade.⁴

Table 2. Computation of Joe's Basis Under a Forward Contract

Data for 2000:	
Net milk price:	13.73
Average Class IV price	11.83
Basis	1.90
Forward contract for August 2001:	
Class IV contract	13.85
Expected basis	1.90
"locked in" net milk price	15.75

Step 5. Wait. Joe participated in the forward contract on March 2, 2001. Now he must wait until August when the contract expires. Most forward contracting programs will not allow the producer to liquidate their trading position prior to the expiration of the contract.

Step 6. Market milk as normal in August. It is now August 2001. Joe shipped his milk to the cooperative as he normally does. Nothing has changed in terms of how he markets his milk.

Step 7. Compute how you would have done. By locking in an August milk price Joe is unaffected by the ups and downs of the marketplace. However, it is recommended that you compare how you would have done had you not locked in a milk price.

In reality, how Joe did in August depends on a) what percent of his milk was locked in, and 2) what happened with the August Class IV price. The actual Class IV price announced for August could very easily have been higher or lower than the \$13.85 per cwt that Joe locked in.

Assuming a Rising Cash Market

Table 3 indicates how Joe would have done had the actual August Class IV price ***rose to \$14.25*** rather than the \$13.85 he planned for. The net milk price would have been \$16.15 per cwt (which includes a basis of \$1.90) instead of the \$15.75 planned on. For the 75,000 pounds of milk contracted, revenue would be \$11,813 ($\$15.75 \times 75,000/100$). For the milk not contracted, revenue would be \$6,561 ($\$16.15 \times 40,625/100$). In hindsight, Joe would have been better off not forward contracting. Since the actual gross milk price was \$16.15 and he locked in \$15.75, Joe effectively gave up an opportunity for \$0.40 per cwt on 75,000

⁴ It should be noted that the Chicago Mercantile Exchange offers a Class IV contract for 200,000 pounds only. Most cooperatives offer smaller contract sizes of 20,000 - 25,000 pounds. The 75,000-pound contract size used here is only an example used for illustrative purposes.

pounds of milk. That's equal to -\$300 on all the milk contracted for ($-\$0.40 \times 75,000/100$). The impact of Joe's forward contract on the milk check is illustrated in Table 4.

In the scenario just described, some might say Joe lost money. Here is another way of looking at it. He protected 65 percent of his milk supply and allowed the rest to "float with the market." Joe is pleased since he a) had protection on the bulk of his August milk supply, and b) realized a market gain on the balance that wasn't protected. Since the Class IV price rose from an expected \$13.85 per cwt to \$14.25, the net milk price from Joe's cooperative rose from an expected \$15.75 per cwt to \$16.15 (see Table 4). Thus Joe realized a market gain of \$0.40 per cwt on the 40,625 pounds he did not forward contract. That's equal to a net gain of \$163 ($\$0.40 \times 40,625/100$).

Table 3. Computing How You Did with a Rising Class IV Market

	Contract	Non-contract	Total
Class IV (\$/cwt)	13.85	14.25	
Basis (\$/cwt)	1.90	1.90	
Net milk price (\$/cwt)	15.75	16.15	
Pounds of milk	75,000	40,625	115,625
Revenue (\$)	11,813	6,561	18,373
Gain/loss (\$)	-300		

Table 4. Example Milk Check Under a Rising Class IV Price

	Milk Price	Pounds of milk	Revenue
	\$/cwt	lbs.	\$
Net milk price paid by cooperative	16.15	115,625	18,673
Futures contract:			
Class IV contract	13.85		
Actual Class IV	14.25		
Difference	-0.40	75,000	-300
Grand Total			18,373

Assuming a Falling Cash Market

But how would Joe assess this forward contract had the Class IV price *fallen to \$13.45* rather than the \$13.85 he planned for? This example is illustrated in Tables 5 and 6. Revenue from the 75,000 pounds of milk contracted for remains unchanged at \$11,813. What does change in Table 5 is the revenue from the milk not contracted. Since the Class IV price fell to \$13.45 per cwt, the actual net milk price was \$15.35 (which includes the basis of \$1.90 per cwt). Thus revenue on the milk not contracted was \$6,236 ($\$15.35 \times 40,625/100$).

The impact of a lower Class IV price on the milk check is illustrated in Table 6. The net milk price is \$15.35 per cwt and is determined by adding \$1.90 for the basis to the Class IV price of \$13.45. Milk revenue without the contract is \$17,748 ($\$15.35 \times 115,625/100$). An adjustment is then made to the milk check to reflect the contract on 75,000 pounds of milk.

Since the actual Class IV price was \$13.45 per cwt and the contract price was \$13.85 per cwt, there was a gain of \$0.40 per cwt. On 75,000 pounds of milk, that is equal to \$300 ($\$0.40 \times 75,000/100$). This amount is added to the milk check, bringing the total to \$18,048.

In this scenario, where the Class IV price fell from the expected price, some might say Joe made money. Again, here is another way of looking at it. Joe protected 65 percent of his milk supply and allowed the rest to “float with the market.” Joe is pleased since a) 65 percent of his milk supply did not face a falling market price, and b) he only realized a market loss on just 35 percent of his milk. Since the Class IV price fell from an expected \$13.85 per cwt to \$13.45, the net milk price paid by Joe’s coop fell from an expected \$15.75 per cwt to \$15.35. Thus Joe realized a market loss of \$0.40 per cwt on the 40,625 pounds of

Table 5. Computing How You Did with a Falling Class IV Market

	Contract	Non-contract	Total
Class IV	13.85	13.45	
Basis	1.90	1.90	
Net milk price	15.75	15.35	
Pounds of milk	75,000	40,625	115,625
Revenue	11,813	6,236	18,048
Gain/loss	300		

Table 6. Example Milk Check Under a Falling Class IV Price

	Milk Price	Pounds of milk	Revenue
	\$/cwt	lbs.	\$
Net milk price paid by coop	15.35	115,625	17,748
Futures contract:			
Class IV contract	13.85		
Actual Class IV	13.45		
Difference	0.40	75,000	300
Grand Total			18,048

milk he did not forward contract. That’s equal to a net loss of \$163 ($\$0.40 \times 40,625/100$). In this case, Joe was very pleased he made the decision to forward contract the bulk of his August milk.

Cooperatives are offering more innovative ways to forward contract milk. Some cooperatives offered cheese price contracts that paid farmers whenever the monthly average market cheese price fell below the planned price, and made deductions when market prices exceeded the planned price. Those contracts paid handsomely in 1999 and 2000. Other contracts were relative to Class III and IV contracts. Land O’Lakes is now offering members in the Northeast an opportunity to contract in relation to a “blend price” that will mirror the Northeast Federal Order 1. This will essentially be a blend of both Class III and IV milk prices.

One of the advantages of forward contracting through the coop is that the coop contract sizes are much smaller than those offered through brokers who contract on the Chicago Mercantile Exchange. While a cooperative milk contract may be 20,000 – 25,000 pounds, the Chicago Mercantile Exchange contract size is 200,000 pounds. This is a tremendous advantage to smaller producers.

Another advantage of contracting through a cooperative is that there are no “margin calls.” Margin calls, to be discussed below, are taken care of by the cooperative. The producer just deals with a signed agreement with the cooperative.

Take home points regarding forward contracting milk:

- Figure out which months and how much milk to contract
- Understand the relationship between the contract price and the net milk check price, otherwise known as the basis. Again, more about this later.
- After the contract is signed, milk is marketed as normal.
- At the end of the contract, after the milk is sold, the gain or loss from the contract is added to or subtracted from the milk check.

Hedging

Let’s suppose that ABC dairy is not a member of a dairy cooperative and Joe markets his milk through a proprietary handler (a private bottler). In this case, Joe will take a different approach if he wants to protect milk prices.

One option is to hire a commodity broker and “hedge” milk through the futures markets. This is an organized market where people come to buy or sell standardized futures contracts in order to lock in prices. According to Phil Plourd, a senior market analyst with Blimling and Associates and author of the book *From Price Taker to Price Maker* “a futures contract is a standardized, legal document calling for delivery of a particular commodity (or its cash equivalent) at a predetermined point in the future.”

The Chicago Mercantile Exchange has a “Milk Futures” contract. It calls for Class III milk, is cash settled (there is no physical delivery), and has separate contracts for each month of the year. The Chicago Mercantile Exchange also has a “Class IV Milk Futures” for Class IV milk. It is also cash settled and has separate contracts for each month of the year. Both the Class III and IV contracts are for 200,000 pounds of milk.

Understanding the futures market can be very intimidating. It’s hard for most people to understand the terminology (a short hedge; a long hedge) or follow the transactions. For example, when you “buy” a futures contract you aren’t buying milk. Likewise, when you sell a futures contract you aren’t selling milk. You are just taking a position in the market. Also, with a futures contract, you can sell a contract one day, and then buy it back later in the year. In other words, you don’t have to own it first before you sell it.

That said, the objective of hedging is very simple: to lock in a milk price. It is very similar to forward contracting. The difference is, milk prices are locked in through a broker rather than a cooperative or milk buyer.

Let's provide an example using ABC dairy, which produces 115,625 pounds of milk each month. In this example it will be assumed that Joe has the opportunity to hedge a 100,000-pound Class IV contract. In the real world, however, the Class IV contract size on the Chicago Mercantile Exchange is for 200,000 pounds of milk. The example below is just to serve as an illustration and as a comparison to forward contracting.

Again, it is March 2, 2001 and Joe notices that milk prices on the futures markets are very strong. Buyers and sellers are exchanging futures contracts each day. In that process they determine Class III and IV futures prices for the months March through December 2001 (see Table 1). To see actual daily futures and options prices for milk on the Chicago Mercantile Exchange, go to the following website:

<http://www.aers.psu.edu/dairyoutlook/BFPfutures.htm> .

In the example that follows the futures market as of March 2, 2001 believes the Class IV price will rise to \$13.85 and the Class III price will rise to \$12.23 by August. Joe surmises that these are excellent prices and understands that the "actual" Class III and IV prices on August 2001 will either be higher or lower than the March 2 contract prices. Joe decides to take action and protect part of his milk check for August by locking in the Class IV price of \$13.85 per cwt. Given an historical basis of \$1.90, a Class IV price of \$13.85 would likely result in a net milk price of \$15.75. In other words, locking in a Class IV price of \$13.85 is the same as locking in a net milk price of \$15.75.

To understand the analysis that follows we need to discuss two markets: the CASH market and the FUTURES market. The cash market is simply the market where milk is normally sold. ABC dairy sells their milk each month to a fluid bottler and is paid in relation to the local federal milk marketing order blend price. There are also cash markets for cheese, butter, and nonfat dry milk. The futures market for milk has already been described. It is traded daily on the Chicago Mercantile Exchange.

Here are the steps ABC dairy will take to hedge August Class IV milk at \$13.85 per cwt.

Step 1. Which month and how much milk? Joe has already set up a brokerage account and deposited margin funds. He identified August 2001 as the month he wants to hedge milk. ABC Dairy produces about 115,625 pounds of milk each month. Joe decides to hedge 86 percent of this, or 100,000 pounds, since his broker says that is the smallest contract available.⁵

Step 2. Compute your basis. Joe realizes he gets much more each month on his milk check than the announced Class III or IV price due to the presence of federal milk marketing orders. There is a relationship between the announced Class IV price and the net milk price

⁵ In reality, a dairy producer cannot hedge milk through a broker on just 100,000 pounds. The smallest contract size for Class III and IV milk on the Chicago Mercantile Exchange is 200,000 pounds. This example is for illustrative purposes only.

on the milk check. The data in Table 2 shows the average net milk price in 2000 was \$13.73 and the average Class IV price was \$11.83. The difference, known as the basis, was \$1.90. Joe can now estimate his net milk price if the Class IV price is known.

Step 3. Agree on a contract price. Joe decides to lock in an August Class IV price of \$13.85. That is the Class IV price available on March 2, 2001 for August 2001 milk. Given a basis of \$1.90 per cwt, locking in a Class IV price of \$13.85 would result in a net milk price of \$15.75. You recall your August 2000 gross milk price was just \$13.70. Therefore locking in an August 2001 milk price of \$15.75 looks very promising. Note that steps 1-3 above are identical to the first three steps used to forward contract milk.

Step 4. Hire a broker and sell a Class IV futures contract at \$13.85 per cwt. Selling a futures contract does not mean an individual just sold their milk. Rather, they took a position in the futures market. Later in the year, that individual will reverse this position by buying back a futures contract prior to expiration of the contract, or cash settling at maturity. The actual order in which these two transactions occur (selling today, buying back later) is not the important issue. What is important is that one has the opportunity to sell high and buy low, thus realizing a profit on the transaction. That will occur if the cash market (where milk is sold) weakens between March 2 and the date the August 2001 contract expires (September 5, 2001). Any profits from these futures market transactions can be used to offset a lower cash price for milk.

Step 5. Wait. Joe sold a milk futures contract for 100,000 pounds on March 2, 2001. He knows he can liquidate his position (buy a futures contract) if his position is favorable, but that would leave him exposed to risk until he markets his milk. Joe decides instead to wait until the August futures contract expires (on September 5, 2001).

Step 6. Market milk as normal in August. It is now September 5th. USDA announced the August 2001 Class IV price. Joe shipped his milk to the bottler during August as normal. Nothing has changed in terms of how he markets his milk.

Step 7. Compute how you would have done. By locking in an August milk price Joe was unaffected by the ups and downs of the marketplace. Let's compare how he did hedging milk as compared to those who stayed with the cash market.

Assuming a Rising Cash Market

Table 7 indicates how Joe would have done had the actual August Class IV price *rose to \$14.25* rather than the \$13.85 planned for.

A Class IV price of \$14.25 per cwt for August translates into a net milk price of \$16.15 on the milk check ($\$14.25 + \1.90). Since Joe shipped 115,625 pounds of milk to the bottler as normal, net sales on the milk check should be \$18,673. Joe's milk check is determined by market conditions and is therefore unaffected by the hedge.

Now that USDA announced the Class IV price, Joe wants to settle with his broker. Recall that he planned for a milk price of \$15.75 ($\$13.85 + \1.90) when he locked in a Class IV

price of \$13.85. Joe's broker did this by selling an August Class IV contract (100,000 pounds) for \$13.85 per cwt. Since Joe held his position until USDA announced the Class IV price, the Clearing House for the Chicago Mercantile Exchange cash settled Joe's Class IV contract at \$14.25. Since the original sale price (\$13.85) on the contract was less than the cash settled price (\$14.25), Joe faced a loss in his brokerage account of \$0.40 per cwt (\$13.85-\$14.25), or \$400 (\$0.40 X 100,000). While Joe's brokerage account is completely separate from his milk check, this loss can be subtracted from the net revenue on his milk check to determine a balance of \$18,273 (\$18,673-\$400).

Let's assess how Joe did. First, he hedged milk in March in order to lock in a Class IV price of \$13.85 for August 2001. Given a basis of \$1.90, that would imply a net milk price of \$15.75. Joe did this on just 100,000 pounds of milk. By September 5th the USDA announced the Class IV price for \$14.25 per cwt. Thus the cash market price on Joe's August milk check rose above the planning price of \$15.75 to \$16.15 (Class IV price of \$14.25 plus basis of \$1.90). However, because of the hedge, Joe only received that higher cash market price on just 14 percent of his milk, or the amount he did not contract (115,625-100,000). Instead, Joe received the planned price of \$15.75 (\$13.85 Class IV price plus \$1.90 basis) on 84 percent of his milk, or 100,000 pounds. Thus the loss in Joe's brokerage account (-\$400=(15.75-16.15)*100,000/100) was partially offset by the gain in the cash market above the expected price for the milk not contracted (\$63=(16.15-15.75)*(115,625-100,000)/100).

This still doesn't answer the question, how did Joe do? The implied milk price for Joe after considering the hedge is \$15.80 for August 2001. This was computed by dividing the grand total of \$18,273 (Joe's milk check plus the loss in his hedging account) by the hundredweights of milk sold for the month (115,625/100). This is very close to the planned price of \$15.75. The difference is due to the fact that Joe did not hedge 100 percent of his milk.

Table 7. Example August 2001 Hedge Under a Rising Class IV Price

	Milk Price	Pounds of milk	Revenue
	\$/cwt	lbs.	\$
Announced Class IV price	14.25		
Implied basis	1.90		
Net milk price	16.15	115,625	18,673
Class IV Futures Contract:			
Sell contract March 2, 2001	13.85		
Buy contract Sept. 5, 2001	14.25		
Futures gain/loss	-0.40	100,000	-400
Grand Total			18,273
Implied milk price	15.80		

Assuming a Falling Cash Market

While it is entirely possible that the cash market price can rise as the futures contract nears expiration, the exact opposite is also possible. Table 8 indicates how Joe would have done had the actual August Class IV price *fallen to \$13.45* rather than the \$13.85 planned for.

A Class IV price of \$13.45 per cwt for August (announced September 5th) would result in a net milk price of \$15.35 on Joe's milk check (\$13.45 + \$1.90). Since he shipped 115,625 pounds of milk to the bottler as normal, net revenue on Joe's milk check would be \$17,748. Recall that Joe's milk check is unaffected by the hedge.

Let's see how Joe did with his hedge. Recall that Joe planned for a milk price of \$15.75 (\$13.85 + \$1.90) when he locked in a Class IV price of \$13.85. Joe's broker carried out the hedge by selling an August Class IV contract of 100,000 pounds at a contract price of \$13.85 per cwt. Essentially, Joe's broker took a market position (with a sell) on March 2, 2001 with an August contract. Joe's broker reversed this contract (or bought a futures contract) the day before it expired, or allowed the Clearing House to cash settle the contract on September 5th after USDA announced the August Class IV price of \$13.45. Since Joe sold a futures contract on March 2 for \$13.85 and bought a contract prior to September 5 or allowed it to cash settle for \$13.45, Joe realized a gain in his brokerage account of \$0.40 per cwt (\$13.85 - \$13.45) or \$400 (\$0.40 X 100,000). While Joe's brokerage account is completely separate from his milk check, this gain can be added to the net revenue on his milk check to determine a balance of \$18,148 (\$17,748 + \$400).

Table 8. Example August 2001 Hedge Under a Falling Class IV Price

	Milk Price	Pounds of milk	Revenue
	\$/cwt	lbs.	\$
Announced Class IV price	13.45		
Implied basis	1.90		
Net milk price	15.35	115,625	17,748
Class IV Futures Contract:			
Sell contract March 2, 2001	13.85		
Buy contract Sept. 5, 2001	13.45		
Futures gain/loss	0.40	100,000	400
Grand Total			18,148
Implied milk price	15.70		

Let's review how Joe did under a falling milk price. First, recall that Joe hedged milk in March in order to lock in a Class IV price of \$13.85. Given a basis of \$1.90, that implied a net milk price of \$15.75. You contracted on just 100,000 pounds of milk. By September 5th the cash market price on Joe's August milk check fell from an expected price of \$15.75 to \$15.35 (Class IV price of \$13.45 plus a basis of \$1.90). However, because of the hedge, Joe

only received the lower cash price on 14 percent of his milk, or the amount of milk he did not contract (115,625-100,000). Instead, Joe received a net milk price of \$15.75 (\$13.85 Class IV price plus a \$1.90 basis) on 84 percent of his milk, or 100,000 pounds. That's because the loss in the cash market (fall in the net price from an expected \$15.75 to an actual \$15.35) was offset by a gain in Joe's brokerage account of \$0.40 (\$13.85-\$13.45).

So, on balance, how did Joe do? His average net milk price on all the milk he produced was \$15.70 for August. This was computed by dividing the grand total of \$18,148 (which includes the net price on Joe's milk check plus the gain in his hedge account) by the hundredweights of milk sold for the month (115,625/100). This is very close to Joe's planned price of \$15.75. Again, the difference is due to the fact that Joe did not hedge 100 percent of his milk.

Take home points regarding hedging milk:

- Hedging milk is virtually identical to forward contracting milk. The difference is a broker is used instead of a cooperative or milk buyer.
- Joe chose a futures contract that has a strong relationship with his milk check. This relationship is called the "basis."
- Milk is marketed as normal and producers receive a milk check as normal.
- Hedging works to support the milk price when markets decline by using gains in the hedging account to offset losses in the cash market.
- The downside of hedging is that producers forego the benefit of higher prices if cash market prices rise above the planned (hedged) price. In this case, the higher cash price on the milk check is offset by losses in the hedging account.

The Basics of Milk Futures Markets

The details of hedging have not been introduced yet in order to avoid confusion with the definitions. The objective so far has been to introduce to the reader how futures markets can provide price protection. Let's learn more about the details of milk futures.

Futures Contracts

As stated earlier, a futures contract is a legally binding obligation to buy or sell a commodity that meets set grades and standards on some future date. For example, the Chicago Mercantile Exchange has "Milk Futures" contracts for 200,000 pounds of fluid milk and has contract listing of 18 consecutive months. These contracts are cash settled to the announced USDA Class III price (more about this later). Thus one can buy or sell a Milk Futures contract for milk to be delivered in say September 2001. That contract will trade daily and will settle to the announced September 2001 Class III price announced on October 5, 2001.

The Chicago Mercantile Exchange also has "Class IV Milk Futures contracts." These contracts are for 200,000 pounds of milk, have listings of 12 consecutive months, and are cash settled to the announced USDA Class IV price.

Contract Buyers and Sellers

The concept of buying or selling a futures contract has already been discussed. The reader understands that this is not the same as buying or selling milk, grain, cattle or anything else in the cash market. The futures markets are different. Rather, buying and selling a futures contract results in taking a position in the market. There are two types of positions:

Sell = Short. An individual is said to “short the market” if they sell a futures contract. This describes what a dairy farmer would do to protect milk prices. A farmer will sell a futures contract if they are concerned that milk prices will fall in the intervening months. A short position gains when prices fall. This same position will lose money when prices rise.

Buy = Long. An individual is said to “be long” if they buy a futures contract. This would best describe what a cheese plant would do to protect against rising procurement costs for milk. A cheese plant will buy a futures contract if they are concerned that milk prices will rise in the intervening months. A long position gains when prices rise. They lose money when prices fall.

Brokers

Brokers are responsible for actually placing buy or sell orders on behalf of their customers. Brokers place these orders with floor brokers who attempt to execute the trade. Brokers charge a fee for their service, called a commission. Usually this commission is for a sell and a buy. For example, a broker may charge a client \$50 per transaction to sell a futures contract and to later buy that contract back.

Offsetting Contracts

All futures contracts require a fulfillment, or binding obligation, on the part of the trader at some time before the contract expires. For many futures contracts a long position (buy) requires the trader to accept delivery of the product. For contract with a short position (sell) the trader is required to deliver the product. Most of the time traders “offset” this obligation by taking an opposite position in the market place before the contract expires.

For example, if you “buy” a butter contract at the Chicago Mercantile Exchange, you are obligated to **take** delivery of 40,000 pounds of Grade AA butter when the contract expires. Most traders want to avoid that, so they “offset” the contract obligation by “selling” a futures contract.

Likewise, if you “sell” a butter contract at the Chicago Mercantile Exchange, you are obligated to **make** delivery of 40,000 pounds of Grade AA butter when the contract expires. Traders can “offset” the contract obligation by “buying” a futures contract.

The butter futures contracts require the trader to either make delivery or take delivery of the product in the event the contract expires and no offsetting transactions occurred. The Milk Futures and Class IV futures contracts are different in that they are “cash settled.” That means there is no requirement to deliver the product. Instead, if the contracts are not offset, the obligations are fulfilled by accepting an automatic offset equal to the announced Class III

or Class IV price. So, if you “sold” a December Class IV futures contract at \$14 and USDA announced the actual December Class IV at \$13, your futures position would automatically be offset with a December buy at \$13.

Bids and Offers

Plourd notes that futures prices are simply determined by the intersection of buyers’ and seller’s opinions (pp. 35). It takes both a buyer and a seller to have a transaction. So, if you “sell” a futures contract, someone must “buy” a futures contract.

Typically the buy and sell occurs in an open outcry on the trading floors at the Chicago Mercantile Exchange. Various bids (order to buy) and offers (orders to sell) by exchange members result in transactions on the floor.

Clearing House

At the end of the day all executed trades go to a clearinghouse. The clearinghouse is a third party that provides the financial backbone for the exchange. Plourd notes that the clearinghouse is made up of brokerage firms that are clearing members. Clearing members are “the repository for trader’s positions at the end of each business day.

There are a number of reasons why a clearinghouse is used. First, they eliminate “counterparty credit risk” by guaranteeing the financial performance of all transactions. If I “sell” a contract and experience a gain in my account, I don’t have to worry about whether I can collect that money from the person on the “buy” side of this transaction. That’s because my position is guaranteed by the Clearing House.

Another reason for the clearinghouse is to allow a buyer to be independent of a seller. I can reverse my position with a “buy” without considering the person on the other side of my original transaction. The clearinghouse will simply match my “buy” with someone else. The clearinghouse oversees the transfer of monies between buyers and sellers.

Margin Requirements

As discussed earlier the clearinghouse ensures financial stability and performance of the futures market by requiring that money be on hand to transfer between parties. Brokers therefore require their customers to deposit funds into a margin account before a futures contract is bought or sold. While these dollars belong to the client, they are held in the account in order to meet the performance requirements of the contract.

Funds must be deposited into the margin account before a futures position is taken. An initial margin deposit is required in order to ensure performance of the terms of the contract. Additional maintenance margins may be needed to hold a futures market position if market conditions change. The additional maintenance margin requirement can increase (called a

margin call) if the futures market moves in an unexpected direction. The Exchange sets the minimum amount of money required in a margin account.⁶

An example may provide insight into margin requirements. Lets suppose its June 1999 and our producer decided to open an account with a broker in order to hedge milk. The broker requires a minimum \$1,000 per contract for an initial security deposit. Our producer realizes that additional funds may be need later, so he deposits a total of \$5,000. Most producers, however, would only deposit the minimum requirement. Remember, this is your money (at least for the moment!).

On June 9 our producers sells (shorts) one December Milk Futures contract for \$13. Each contract is for 200,000 pounds. Recall the broker requires at least \$1,000 on deposit per contract. With \$5,000 in the margin account our producer will have more than enough to meet the minimum requirement.

Now suppose it is July 1, 1999 and the Class III futures price falls to \$12.95 per cwt. The account now takes on additional value since the futures price has fallen below the initial sell price of \$13. In fact, the account at the end of the day is credited with \$100 to reflect

Table 9. Margin Account With One Short Position

Date of Settlement: July 1, 1999						
ACCOUNT BALANCE:						5,000.00
Date	Long	Short	Market	Price	Settle	Value
09-Jun-99	0	1	CME DEC Class III	13.00	12.95	100.00
Open Trade Equity						100.00
Total Equity						5,100.00
Maintenance Margin						1,000.00
Margin Excess/Deficit						4,100.00

the difference between \$13 and \$12.95 on 200,000 pounds of milk ($13 - 12.95 \times 200,000$). The account is credited with \$100 in open trade equity. Together with the initial deposit of \$5,000 our producer now has \$5,100 total equity. Recall the broker requires a minimum of \$1,000 in maintenance margin, thus our producer has an excess of \$4,100 in the account ($5,100 - 1,000$).

Milk prices then begin to rise. On July 28, 1999 our producer decides to take advantage of the higher milk prices in the futures market by selling another 200,000-pound milk futures contract for \$14 per cwt. By August 1, 1999 the December futures contract price rises to \$14.70 per cwt. This price exceeds the initial contract price of \$13 per cwt on June 9 and \$14 on July 28. Our producer receives a margin call from the broker for \$1,800 to be deposited into the margin fund immediately.

⁶ See the following URL for updates on the performance bond requirements at the Chicago Mercantile Exchange: <http://www.cme.com/clearing/pbrates/index.htm>.

Table 10. Margin Account Balance with Two Short Positions and a Rising Milk Price

Date of Settlement: August 1, 1999							
Date	Long	Short	Market	Price	Settle	Value	ACCOUNT BALANCE:
09-Jun-99	0	1	CME DEC Class III	13.00	14.70	-3,400.00	5,000.00
28-Jul-99	0	1	CME DEC Class III	14.00	14.70	-1,400.00	
							Open Trade Equity -4,800.00
							Total Equity 200.00
							Maintenance Margin 2,000.00
							Margin Excess/Deficit -1,800.00
							MARGIN CALL (1) \$1,800

Let's review what happened. By August 1 the first futures contract is \$1.70 per cwt (13.00 – 14.70) above the initial sell price of \$13. On 200,000 pounds of milk that contract could be liquidated on August 1 for a negative \$3,400 ($-\$1.70 \times 200,000/100$). The second futures contract is \$0.70 per cwt (14 – 14.70) above the initial sell price of \$14. On 200,000 pounds of milk, that contract could be liquidated on August 1 for a negative \$1,400 ($-\$0.70 \times 200,000/100$). Open trade equity as of August 1 is equal to $-\$4,800$ ($3400 + 1400$). Given an initial deposit of \$5,000, equity in the account has fallen to just \$200 ($\$5,000 - \$4,800$). However, recall the broker requires \$1000 per contract, or \$2000 for both contracts, on hand as a maintenance margin. Therefore the account is \$1,800 short of requirements ($\$200 - \2000). Thus you get the margin call for \$1,800 and send these funds immediately to your broker. Our producer decides to take no further action in terms of hedging milk.

On January 5, 2000 the broker calls and notes that the futures market declined significantly from \$14.70 on August 1 to \$9.63 on the closing day of the contract. A down market is always bad for dairy farmers. However, since our producer protected part of his milk, there is less to fear. The broker informs our producer that losses in the cash market (a \$9.63 per cwt Class III price) were offset by large gains in the futures markets. Let's review how he did.

First, our producer sold one futures contract for \$13 and a second contract for \$14. The market closed when the Class III price was announced on January 5, 2000 for \$9.63 per cwt. Since our producer took no further action, his futures positions were automatically reversed; both contracts were bought at \$9.63 per cwt. Since both contracts were sold high and bought low, there were gains on the contracts. Our producer gained \$6,740 on the first contract ($[\$13.00 - \$9.63] \times 200,000/100$) and \$8,740 on the second contract ($[\$14.00 - 9.63] \times 200,000/100$) for a total of \$15,480 ($\$6,740 + \$8,740$).

On average, our producer gained \$3.87 per cwt ($\$15,480/[400,000/100]$) from both positions. So, the actual Class III price was \$13.50 since the low cash price of \$9.63 was offset by a gain of \$3.87 in the futures market.

Table 11. Final Account Settlement for Two Short Positions

Date of Settlement: January 5, 2000							
Date	Long	Short	Market	Buy	Sell	Value	ACCOUNT BALANCE:
							6,800.00
09-Jun-99	0	1	CME DEC Class III		13.00	6,740.00	
28-Jul-99	0	1	CME DEC Class III		14.00	8,740.00	
05-Jan-00	2		CME DEC Class III	9.63			
							Open Trade Equity 15,480.00
							Total Equity 22,280.00
							Commissions (100.00)
							Other fees (5.00)
							Net Profit/(Loss) 22,175.00

The settlement sheet indicates our producer has \$22,280 of equity in the brokerage account. That's equal to the gain of \$15,480 from the futures transactions, plus the \$5,000 initially deposited, plus the \$1,800 margin call. The margin call is used by the futures industry to maintain the integrity of the account. A commission for a "round turn," was deducted from the proceeds. A round turn is a sell followed later by a buy in broker language. This was equal to \$50 per contract for a total of \$100. After other fees of \$5 the balance as of January 5, 2000 was \$22,175.

You may be thinking at this point that the example used was not very realistic since it showed futures prices falling, then rising significantly, followed by a crash. In reality, that's exactly what happened in 1999. This example shows the power of protecting the milk price buy using the futures market. The market opinion for the December milk price changed dramatically throughout the year.

Take home points regarding your margin account:

- A margin account is used to maintain the financial integrity of the futures market.
- Money deposited in the account is your money and is used to settle the account when the contract is closed.
- For dairy farmers, a margin call means milk prices are rising above the selling price. In other words, you get a margin call when milk prices exceed expectations and rise above the sell price on the contract.
- Margin calls are offset by higher milk prices when the milk is eventually sold through normal channels (i.e. through your cooperative or proprietary bottler).

Introduction to Dairy Options

The beauty of locking in milk prices via forward contracts or hedging milk is that you have some certainty regarding your future milk checks. That very feature, however, can be a problem if the market suddenly strengthens and milk prices rise. True, you probably locked

in a milk price that was profitable, but there is that sizeable deduction on your milk check or that margin call from the broker. Wouldn't it be nice if there was an alternative?

Options have the advantage of allowing a dairy producer to set a price floor (i.e. milk prices cannot fall below a certain price). The major advantage, however, is that a producer can keep higher milk price gains if the market suddenly strengthens. A third advantage is all of this is done without the need for and worry about a margin account. If milk prices rapidly rise, there is no dreaded margin call from the broker.

Options work like price insurance. Essentially a producer buys insurance at a premium. The insurance provides the opportunity to hedge milk at a certain price (called the strike price). If the market drops below the strike price, you can invoke the insurance and hedge milk at the strike price. However, if the market strengthens and milk prices rise into the stratosphere, you walk away from the insurance policy and allow it to expire. You then sell your milk and profit from the higher milk price.

The down side of options is that they cost money. Just as you would insure your crops against bad weather, you can insure your milk price against declines. You do this by paying for an insurance premium.

Puts and Calls

Options are the right, but not the obligation, to buy or sell something. In the case of milk options, it represents the right but not the obligation to buy or sell milk at a specified price on or before an expiration date.

There are two types of options: puts and calls.

A **put** option buyer has the right, but not the obligation, to sell (go short) a futures contract at a predetermined price before an expiration date. People buy put options if they are concerned that prices in the future will **fall**. Dairy farmers would be interested in put options since it provides them the opportunity to place a floor price on milk by selling (or shorting) a milk futures contract at a specified price. They could also allow the option contract to expire worthless if milk prices rise above that specified price.

A **call** option buyer has the right, but not the obligation, to buy (go long) a futures contract at a predetermined price before an expiration date. People buy call options if they are concerned that prices in the future will **rise**. A cheese processor would be interested in call options since it provides them the opportunity to place a ceiling on their milk costs by buying (or going long) a milk futures contract at a specified price. They also have the option to allow the contract to expire worthless if milk prices suddenly fall below the specified price level.

Since we are focusing on dairy farmers, the rest of our discussion will center on **put** contracts. It should be noted, however, that there are opportunities to use "calls" with more advanced pricing strategies (i.e. covering a forward contract or a hedge with a call if you are concerned that milk prices could rise).

Buyers and Sellers

While a dairy producer would be interested in “buying” a put option, someone must be at the opposite end of that transaction. In other words, there must be a “seller.” Let’s discuss the difference between an option “buyer” and an option “seller.”

An **option buyer** has the right to take a futures position. They hold the option contract for a period, and then have the right but not the obligation to exercise that option. For example, a dairy producer could buy a Class III put option at say \$12 per cwt (called a strike price). Once they have the put contract they can hold the contract, exercise the contract, or allow it to expire.

For every option buyer there is an **option seller**. According to the Chicago Mercantile Exchange, an option seller is also known as a writer or grantor. Option sellers are obligated to take the opposite futures position if the buyer exercises their right to enter into a futures contract. Let’s say the seller to the Class III option our dairy producer above purchased was a speculator. The decision to exercise the option is in the hands of the dairy producer since they bought the put option. If milk prices suddenly rise just before expiration, our dairy producer may do nothing. Thus the option seller, the speculator, will not be obligated to a Class III futures contract. However, if milk futures prices sharply decline to say \$11 per cwt just before expiration, our dairy producer will likely decide to exercise their option. In that circumstance, our producer is assigned a position where they are short or sold at the \$12 strike price. That decision to exercise a Class III futures contract will result in the option seller being assigned the opposite position in the futures market (a long position or a buy) at the original strike price. Once these positions are reversed upon expiration of the contract, the dairy producer will be ahead \$1 per cwt and the speculator will face a shortfall of \$1 per cwt.

Strike Price and Premiums

The strike price, also known as the exercise price, is the futures price at which you may buy or sell the underlying milk futures contract. In other words, it is the futures price obtained when an option is exercised.

For example, if you buy a put option at a \$12 strike price and you exercise the option when milk futures prices decline to say \$11 per cwt, you will actually “sell” or short a futures contract at the \$12 strike price.

The main difference between hedging milk and buying a put option is that you have a choice with options as to the price you want to lock in. Suppose it is March 2001 and September Class III futures contracts are trading at \$12 per cwt. If you sell or short a futures contract that day you do it at a price of \$12. However, with options, you have more choice. You are presented with a range of strike prices from which to choose in \$0.25 increments. You may see strike prices range from \$10.00 to \$14.00 for a September 2001 put option.

With hedging you decide the futures price you want to lock in. With options you select the strike price and the option premium. In the example above you note a September Class III settlement price of \$12 per cwt in March. You also note that a September Class III put with a

strike price of \$12 will have a premium of \$0.57 per cwt. A strike price of \$12.25 has a premium of \$0.60 per cwt, and a strike price of \$12.50 has a premium of \$0.65 per cwt. You consider the tradeoffs between a higher strike price and a higher premium.

Recall our earlier discuss regarding option buyers and sellers. One of the benefits of being an options seller is that you collect the premium from the option buyer. That is the reason sellers are willing to obligate themselves in the event the option is exercised. For a put option, the option seller collects the put premium and stands ready to take an opposite position in the futures market in the event the put buyer (the dairy producer) decides to exercise their put option by shorting (selling) a futures contract.

Exiting the Option Position

A put option buyer has three decisions to make once they purchase an option. One decision is to simply do nothing. That is the strategy to use if milk prices rise above the strike price. There is nothing else to do but allow the option to expire worthless.

A second decision is to exercise the option in the event milk prices fall below the strike price and thereby enter into a futures contract. In fact, this is similar to the “simply do nothing” strategy above with the exception that the market price has now fallen below the strike price. If you do nothing and the put contract expires with value (i.e. settlement price falls below the strike price), you will be assigned a short position at the strike price. This position will then be immediately reversed with a buy at the announced class price. The option gain will then be deposited into your account.

A third decision is to sell the option before it expires. You may have an opportunity to do this if the option takes on value prior to the expiration date. This would occur if the futures price falls below the strike price. You may have paid a \$0.25 premium for a put contract and now have an opportunity to sell it for more prior to expiration.

Example: Buying a Class III Put Option Contract

Put options are basically very simple: select a strike price, pay the premium, and create a price floor for milk. If milk prices fall below the strike price, exercise the option. If milk prices rise above the strike price, allow the option to expire worthless and collect the higher revenue from the marketplace.

Let’s provide an example to illustrate how options work. We’ll go back to our Pennsylvania dairy farmer who owns ABC dairy and markets 115,625 pounds of milk per month. It’s March 16, 2001 and our producer is concerned about the August milk price. The broker is called and a put option is purchased in order to protect the August milk price. Our producer would like to buy a Class IV put contract on the Chicago Mercantile Exchange, but finds out the contract for Class IV milk is for 200,000 pounds. Since he plans to market no more than 115,625 pounds of milk, he looks for a smaller contract size. The broker notes that the Chicago Mercantile Exchange still offers a Class III “mid-size option” that is for just 100,000 pounds.⁷ Most of our producer’s milk check moves with the Class IV price. However, while

⁷ The CME recently announced that the 50,000 lb. mini contract is no longer available.

it is preferable to deal with a Class IV contract, our producer settles on the protection afforded by a Class III mid-size contract. At this time, there is no Class IV option contract that is less than 200,000 pounds.

The settlement price for an August Class III contract is \$12.85 per cwt (see Table 12). Our producer observes that strike prices below \$12.85 per cwt have premiums that range between \$0.22 per cwt for an \$11.00 strike price up to \$0.76 per cwt for a \$12.75 strike price (Table 11). Strike prices below the futures price of \$12.85 are considered “out-of-the-money.” Strike prices above the settlement price are “in-the-money.” Your broker advises you to consider a strike price that is at least \$0.10 per cwt below the futures settlement price. In other words, look for a strike price that is at or below \$12.75 per cwt (\$12.85 - \$0.10). That’s because the premiums for strike prices above the \$12.85 threshold are very expensive. That makes sense since the insurance cost for strike prices that are “in-the-money” should be higher.

The question then is whether this is a good price (\$0.10 per cwt out-of-the-money). The broker reviews our producer’s historical milk checks and computes that on average, a Class III price of \$12.75 will translate into a gross milk price of \$15.00. In other words, the gross milk price has averaged \$2.25 higher than the announced Class III price.

Our producer settles for a Class III strike price of \$12.75 per cwt on 100,000 pounds of milk at a premium of \$0.76 per cwt. This will provide price protect on 86 percent of August milk deliveries. But how much milk price protection? Let’s compute the price floor (see Table 13). Recall a \$12.75 Class III price normally translates into a \$15.00 gross milk price on the milk check. However, in order to calculate the price floor, we must deduct the cost of the premium. Given a \$0.76 per cwt premium, the floor price will be \$14.24 per cwt (\$12.75 Class III + \$2.25 basis – \$0.76 premium). Our producer decides to buy the put option.

Table 12. Class III Futures and Options Prices as of March 16, 2001 at the Chicago Mercantile Exchange

Date: March 16, 2001

August 2001 Futures Price: \$12.85

Put Option Strike Prices \$/cwt	August Put Premiums \$/cwt	
11.00	0.22	Out
11.25	0.29	Out
11.50	0.38	Out
11.75	0.44	Out
12.00	0.53	Out
12.25	0.62	Out
12.50	0.72	Out
12.75	0.76	Out
13.00	0.80	In
13.25	0.93	In
13.50	1.09	In
13.75	1.26	In
14.00	1.43	In

Table 13. Calculation of the Floor Price on a Put Option Contract

August 2001 strike price = \$12.75
 August put premium = \$0.76
 Basis = \$2.25

Strike price	12.75
+ Basis	2.25
- Premium	-0.76
= Floor price	14.24

To close the deal the broker requires our producer to write a check for the amount of the premium. Given a premium of \$0.76 per cwt and a contract size of 100,000 pounds, a check is written for \$760 ($\$0.76 \times 100,000/100$). Some brokers also require a producer to pay part or all of the commission up front also. The broker turns the premium over to the exchange which then forwards it on to the seller of the put option contract. Recall that for every buyer there is a seller of a put option contract. Also, the buyer pays the premium and the seller collects the premium. As an options buyer one understands that \$760 is the cost of the insurance premium to protect a Class III price of \$12.75 per cwt. In effect, our producer is also providing a price floor of \$14.24 per cwt on the gross milk price.

Assuming a Rising Cash Market

Let's fast forward to September 5, 2001. That is the day that the actual Class III price was announced by USDA. Recall that the Class III futures contracts are cash settled at the announced Class III price. How our producer did on the options contract depends on what occurred in the cash market. Assume that the Class III price rose above expectations of \$12.75 per cwt to an announced price of \$13.25. First let's review the cash market. The announced August Class III price as of September 5, 2001 was \$13.25 per cwt. The cooperative paid our producer a gross milk price of \$15.50 per cwt. Note that the basis relative to the Class III price was \$2.25 per cwt as expected. Given sales of 115,625 pounds of milk, gross revenue was \$17,922 (see Table 14).

Next our producer contracts the broker. Recall our producer bought a 100,000 pound August put option for \$12.75 per cwt and paid a premium of \$0.76 per cwt. The actual Class III price rose above the expected price to \$13.25 per cwt. Thus the option contract expired worthless. There was a net loss of \$760 on the option contract (the cost of the premium). Deducting the loss on the options contract from the gross milk sales results in net revenue of \$17,162 ($\$17,922 - \760). With marketings of 115,625 pounds of milk, that averages out to a gross milk price of \$14.84 per cwt ($\$17,162/115,625/100$). Thus your implied milk price after considering gains/losses from the options contract was less than the actual market price of \$15.50 per cwt. The difference reflects the cost of the options contract.

Table 14. Impact of a Rising Class III Milk Price on the Put Options Position

	Milk Price	Pounds of milk	Revenue
	\$/cwt	lbs.	\$
Announced Class III price	13.25		
Implied basis	2.25		
Gross milk price	15.50	115,625	17,922
August Class III Options Contract:			
Buy a Class III option	12.75		
Option premium	0.76		
Announced Class III price	13.25		
Net options gain/loss	-0.76	100,000	-760
Grand Total			17,162
Implied milk price	14.84		

Assuming a Falling Cash Market

What would happen if the actual August Class III milk price announced by USDA fell to \$10.25 per cwt. How would this affect the options position? Recall that an August Class III put was bought for \$12.75 per cwt on 100,000 pounds of milk for a premium of \$0.76 per cwt. The plan was to create a price floor of \$14.24 per cwt on a major portion of August milk marketings (see Table 13).

The coop milk check reflects a gross milk price of \$12.50 per cwt on the 115,625 pounds of milk sold in August. This price reflects a Class III price of \$10.25 and an implied basis of \$2.25 per cwt (see Table 15). Our producer did not do very well in the cash market.

Table 15. Impact of a Falling Class III Milk Price on the Put Options Position

	Milk Price	Pounds of milk	Revenue
	\$/cwt	lbs.	\$
Announced Class III price	10.25		
Implied basis	2.25		
Gross milk price	12.50	115,625	14,453
August Class III Options Contract:			
Buy a Class III option	12.75		
Option premium	0.76		
Announced Class III price	10.25		
Net options gain/loss	1.74	100,000	1,740
Grand Total			16,193
Implied milk price	14.00		

Our producer protected 86 percent of milk marketings for the month of August. The put option took on value since the announced Class III fell below the strike price. In fact, the difference was equal to \$2.50 per cwt on 100,000 pounds of milk. The broker reports that \$2,500 was deposited into the brokerage account after the put option was exercised. This occurred when the producer was assigned a sell contract at the strike price of \$12.75 per cwt and the contract was reversed with a buy contract at the announced Class III price of \$10.25 per cwt. After deducting the cost of the options premium (\$760), our producer realized a net gain of \$1,740 on the options contract.

The gains from the options contract are added to the gross sales from the cash market to realize a grand total of \$16,193 (\$14,453 + \$1,740). Dividing this total by the pounds of milk marketed computes an implied milk price of \$14.00 per cwt ($\$16,193/115,625/100$). On the one hand the producer is pleased that the implied gross milk price of \$14.00 is well above the actual cash market price of \$12.50 per cwt. However, this price is still well below the planned floor price of \$14.24. What happened? Well, only 86 percent of the milk was protected. The rest (about 14 percent) received a market price well below the floor price of \$14.24.

In hindsight, ABC dairy was better off purchasing the 100,000-pound put contract and protecting 86 percent of milk marketings under a scenario with a falling milk price. Recall that under a rising milk price ABC dairy would have been better off not purchasing a put option. The point is, you don't know what the milk price will do at the time you purchase a put option. Thus a good strategy is to weigh the cost of the premium against the benefit of protecting the milk price. At the end of the contract period, after all the computations are completed, don't second-guess your decision.

Take home points regarding options contracts:

- A “put” options contract is the right, but not the obligation, to sell or short a futures contract.
- For buyers, options represent price insurance.
- The options premium is the cost of the price insurance.
- Farmers choose their level of protection by selecting a “strike price.”
- Options contracts work with existing futures markets.

USDA's Dairy Options Pilot Program

Before we end this section on options contracts, dairy producers should consider the benefits of participating in USDA's Dairy Options Pilot Program (DOPP). Round III of the program provides producers an opportunity to learn about options contract by actually buying one or more put option contracts (either a Class III or IV contract).

The benefits of options contracts have already been discussed. The downside of dairy options—the high cost of premiums—are greatly reduced under USDA's DOPP program

since 80 percent of the cost of the premium and up to \$30 of the brokers commission is paid by USDA.

For more information on the DOPP program contact USDA's Risk Management Agency, or go to their URL: <http://www.rma.usda.gov/training/programs/dopp/index.html> .

What You Need to Know Before You Lock in a Milk Price

The objective of this staff report is to provide dairy producers in the Northeast a basic understanding of the options currently available to deal with volatile milk marketing. This report would not be complete without a basic discussion of farm management concepts and some background on the market in which milk is sold in the Northeast.

Economics of Milk Production

The milk price is just part of the economic equation that determines profitability. Farm profits can be characterized as follows:

Farm Profits (\$) = Milk Margin X Milk Volume – Other Variable costs – Fixed costs

Milk Margin (\$/cwt) = Milk Price – Feed Costs

The mathematical equation above states that farm profits are equal to the “milk margin” times the volume of milk shipped less other costs. Other variable costs are things like parlor supplies, electricity, BST, vet costs, fuel, etc. These are costs that rise with higher levels of milk production. Fixed costs are expenses that are unrelated to higher levels of milk production such as insurance, depreciation, and taxes.

The milk margin is equal to the milk price less feed costs on a cwt basis. This margin is important since it represents the dollars left over to pay for other costs and realize a profit. And yet the components of the milk margin—milk prices and feed costs—are often the most volatile elements to the profit equation. Your objective is to protect your margin on a portion of the milk you sell. In affect you will also be protecting a portion of your profits.

Cost of Production and the Breakeven Milk Price

Measuring cost of production is important if you want to know whether or not you are making a profit. While you can see your milk price right on the milk check, it is often very difficult to measure milk production costs and profits. For example, are cull sales revenue or loss on the sale of an asset? How do you account for farm-raised feed when computing milk production costs? And, should you compute production costs on the whole farm or on the dairy enterprise?

It is strongly recommended that dairy producers visit with their local county extension agent and compute their “break-even” milk price. This is the milk price that is needed on your farm to pay all milk production expenses, to contribute to debt reduction and capital replacement, and to realize dollars for family living.

Some dairy farms in the Northeast can squeak by in a bad year on \$11 per cwt. Other find they can't pay the bills when milk prices fall below \$13-15 per cwt. Whatever that price is for your farm, you need to know it BEFORE you engage in protecting milk prices through forward or futures contracts.

Setting a Target Price Range

Knowing your breakeven milk price is powerful information when determining whether to lock in a milk price. For example, suppose you compute your breakeven milk price for your farm is \$15 per cwt (gross milk price before premiums and deductions). Anything less and you have to borrow funds to cash flow. In that case would it make sense to lock in a Class IV price of \$12 per cwt? If you know your basis is \$1.90 you will be locking in a gross milk price of \$13.90, well below your breakeven milk price of \$15.

Part of your objective then is to monitor the futures market and not lock in any price below your cost of production. For your farm that means setting a minimum Class IV target price of \$13.10 per cwt. With a \$1.90 basis, locking in any Class IV price above \$13.10 will protect a profit for your farm.

Basis in the Northeast

The concept of a "basis" was introduced earlier in the discussions of hedging and options. A basis is simply a statistical relationship between a price and a hedging instrument (i.e. the Class III or IV futures, or a combination of the two). Of interest here is the relationship between the milk price on your milk check and a futures price that you can hedge against. The futures price should move up and down with your actual milk check. Your objective is to protect your milk check by hedging.

It is important to note that your objective here is not to pick a futures contract (i.e. Class III or IV) that provides the highest price, or one that will offer you the best "profit." For example, don't pick the Class IV contract if it is higher than the Class III. It may decline later in the year. Besides, this has nothing to do with a hedge. Or, don't pick a Class III contract if you expect Class III futures prices will bottom out later in the year. That is speculation. Your objective is to protect your milk price. So, look for a futures contract that moves up and down with your milk check each month.

Let's review your milk price, the futures price you want to protect, and how to compute your basis.

Farm Milk Price

A good starting point is the milk check. There are a number of prices there. The component value is made up of prices for butterfat, protein and other solids. Next, the Producer Price Differential, or PPD is equal to the federal order "blend price" less the average component value at standard levels (i.e. Class III). Then there are other premiums for 1) above average component levels, 2) over-order premiums, 3) quality premiums, and 4) volume premiums.

Don't forget deductions on the milk check for 1) hauling, 2) advertising, and 3) cooperative/marketing fees.

Most industry professional recommend using the **net milk price** in order to develop a hedging strategy and compute your basis. The net milk price is the milk price at the bottom of your milk check that is before any assignments (i.e. loan payments, deductions for purchases, etc.). This is equal to your component value (i.e. sum of the value of butterfat, protein and other solids) plus the locally-adjusted PPD, plus all premiums, and minus deductions for hauling, advertising and cooperative/marketing fees.

The reason for using the net milk price is that it represents the price your farm received. Thus it is very personal. Producers should list their monthly net milk prices for both 2000 and 2001. This will be compared to the monthly Class III and IV prices below.

Table 16 shows a calculation for the gross milk price in Lancaster, Pennsylvania in 2000. It is equal to the announced Class III price, plus the Boston PPD, less \$0.35 per cwt to reflect the adjustment in the PPD from Boston to Lancaster. This is very easy to compute from your milk check. This data, however, does not show other premium and deductions that individual dairy producers will see on their milk checks.

Table 16. Example Basis Relative to Lancaster, Pennsylvania for 2000

Months	Utilization Rates				Weighted Average Index \$/cwt	Boston PPD \$/cwt	Gross Milk Price \$/cwt	Basis to:	
	Class I,II, IV	Class III	Class III Price	Class IV Price				Class IV	Weighted Average Index
	%	%	\$/cwt	\$/cwt				\$/cwt	\$/cwt
Jan	72.6	27.4	10.05	10.73	10.54	2.30	12.00	1.27	1.46
Feb	72.6	27.4	9.54	10.80	10.45	2.67	11.86	1.06	1.41
Mar	72.1	27.9	9.54	11.00	10.59	2.85	12.04	1.04	1.45
Apr	69.8	30.2	9.41	11.38	10.79	3.05	12.11	0.73	1.32
May	71.1	28.9	9.37	11.91	11.18	3.53	12.55	0.64	1.37
Jun	69.9	30.1	9.46	12.38	11.50	3.79	12.90	0.52	1.40
Jul	68.2	31.8	10.66	11.87	11.49	2.86	13.17	1.30	1.68
Aug	69.6	30.4	10.13	11.87	11.34	3.26	13.04	1.17	1.70
Sep	71.2	28.8	10.76	11.94	11.60	2.87	13.28	1.34	1.68
Oct	72.7	27.3	10.02	11.81	11.32	3.30	12.97	1.16	1.65
Nov	71.5	28.5	8.57	13.00	11.74	4.79	13.01	0.01	1.27
Dec	70.6	29.4	9.37	13.27	12.12	4.35	13.37	0.10	1.25
Ann. avg.	70.8	29.2	9.74	11.83	11.22	3.30	12.69	0.86	1.47

Note: Includes a -\$0.35 adjustment to the Boston PPD.

Source: http://www.fmmone.com/Northeast_Order_Prices/New_Prices_main.htm#Uniform .

Selection of a Futures Price

What futures price or prices should dairy producers in the Northeast use to contract their milk relative to? Ideally it should be a futures market price that rises and falls with an individual dairy producers net milk price. That may be a combination of both Class III and IV in any particular month. However, since the contract sizes are 200,000 pounds at the Chicago Mercantile Exchange, this may present a limitation to many producers that hedge their milk through a broker. Producers who ship their milk through a cooperative may have smaller contract sizes (i.e. 20,000 – 25,000 pounds) on say Class III contracts, but may not have access to the Class IV contracts yet.

Again, which futures contract should a producer in the Northeast use? For example, one may have observed that the market price of home heating oil moves up and down each month with their milk check (in reality, it hasn't). If the price of home heating oil moves up 10 percent in one month, so also did your milk check. In theory one could lock in a home heating oil futures contract and thereby protect the milk price. The problem with this idea, however, is that while it may have shown some movement up and down with your milk check in 2000, it will likely not be a reliable predictor of the milk check in 2001 and beyond.

Basically there are three choices for a futures price in the Northeast: 1) the Class III futures, 2) the Class IV futures, or 3) some combination of the two. A weighted average index was computed in Table 16 as an average of the Class III and IV price. Utilization rates were reported in Table 16 for the Northeast Federal Order 1 for each month in 2000. About 29 percent of all milk used in this order was for Class III or cheesemaking uses. The rest was used for Class I, II, and IV purposes. Based on the formulas used in 2000 for computing class prices, the Class IV price was the main driver of Class I and II prices in every month of 2000. Thus 71 percent of all milk used in the Northeast Federal Order was priced relative to the Class IV price. Thus a futures index was computed for 2000 based on a weighting between Class III (29 percent) and Classes I, II, and IV (71 percent). The index price averaged \$11.22 per cwt in 2000. In theory, a dairy producer in the Northeast could use some combination of Class III and IV futures contracts when locking in their milk price. An ideal weighting for 2000 was 29 percent Class III and 71 percent Class IV. This weighting will be different in 2001 due to new volatility in the Class IV price due to reduced prices for nonfat dry milk (due to the butter/powder tilt).

Computing the Basis:

The next step is to compute a historical “basis” between your monthly net milk price and a futures price or index. Three basis calculations were computed in Table 16 for possible use. One is simply the Boston PPD. This is computed by USDA as the difference between the statistical uniform price for the Northeast federal order pool and the announced Class III price. The statistical uniform price simply reflects the blend price for the pool at standard component levels (i.e. 3.5 percent milkfat). A Class IV basis was computed by subtracting the announced Class IV price from the gross milk price in Lancaster, PA (we did not have access to an actual producers net milk check price). This would seem to be a strong candidate for a good basis since about 70 percent of the milk check in the Northeast is a

result of the Class IV price. A third option is to subtract the weighted average index computed earlier from the gross milk price. Recall the index is a weighted average of the Class III and IV prices.

Three basis calculations were graphed in Figure 2. Notice that the Boston PPD, our Class III basis, seems to move in the opposite direction of the Class IV basis. This makes sense since the PPD is simply the gross milk price without the influence of the Class III price, and the Class IV basis is the gross milk price without the Class IV price. Thus, if the Class III and IV prices move in opposite directions each month, so also will the basis calculations.

Notice that the weighted Class III/IV index appears to be the most stable of the three basis calculations. That index ranged between \$1.25 and \$1.70, much more stable than the BPF or Class IV basis.

Next observe the direct relationship between the gross milk price and the Class III and IV prices in Figure 3. It becomes very clear that neither the Class III or IV price is a good candidate for hedging your milk price since neither moves with the Gross Milk Price. However, the weighted average index of both the Class III and IV price does appear to move statistically each month with the Gross Milk Price.

Conclusion: *dairy producers in the Northeast who want to protect their milk price should ideally use some combination of Class III and IV futures contracts each month. That weighting should be 30-40 percent Class III and 60-70 percent Class IV. However, due to contract sizes, a producer in the Northeast may be limited to using just the Class IV contract.*

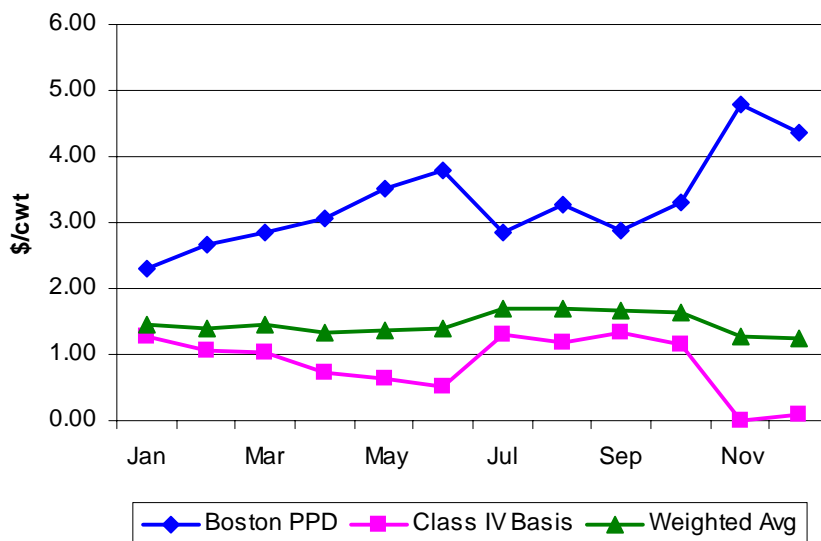


Figure 2. Suggested Basis Indexes for the Northeast Federal Order for 2000

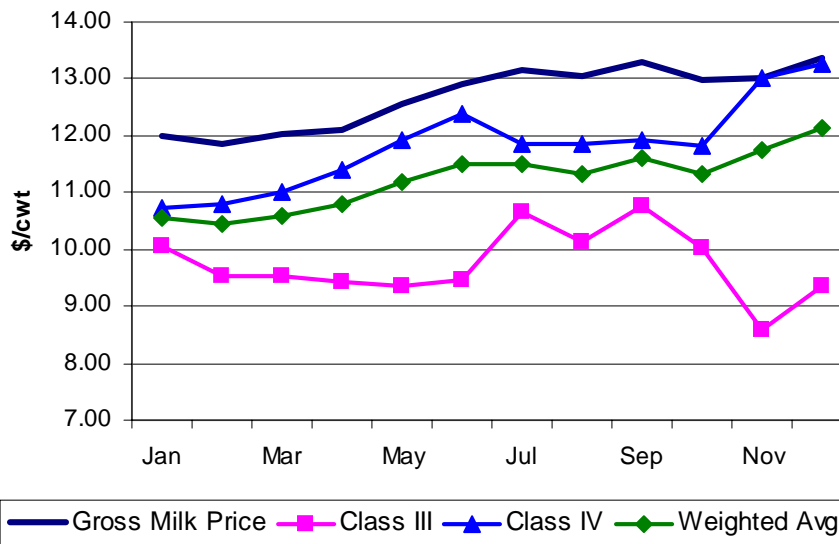


Figure 3. Decomposition of the Gross Milk Price in Lancaster, Pennsylvania, 2000

Putting it All Together: Developing A Marketing Plan

Thus far we have reviewed the basics of risk management: forward contracting, hedging, options, and basis. It’s now time to discuss how to take all this theory and put it into practice.

Understanding Your Milk Market

The first thing one must do is to understand what drives your milk check. That begins with understanding which federal order your milk is marketed into. For most of the Northeast that is one of two federal orders: the Northeast Federal Order No. 1, and the Mideast Federal Order 33. Next one needs to understand the relationship between dairy commodity prices such as cheese and butter and class prices announced by USDA. Finally, one should understand component pricing and how the PPD is calculated and adjusted to the local market.

You can learn more about these subjects by reviewing the extension report, “Understanding Your Milk Check.” (see the URL:

<http://dairyoutlook.aers.psu.edu/FedOrderData/UnderstandingYourMilkCheck.htm>).

Marketing Strategies

A marketing strategy is simply looking ahead and figuring out how to market milk. Producers may want to protect just a part of their monthly milk production using a forward contract through a cooperative or a hedge through a broker. The rest can be left unprotected to “roll with the marketplace.” A producer may also decide they are more concerned about

milk prices in the spring months than in the fall months. So, they may elect to protect more of their milk supply in those months.

Also, producers new to forward contracting and hedging may want to take a very conservative strategy their first year. In other words, don't lock in more than say 20-30 percent of their milk the first year. That will allow for time to learn about the markets and hedging strategies.

All of this involves developing a milk marketing strategy. There are a couple of principles to keep in mind when locking in milk prices:

1. **Don't lock in low prices.** If milk prices are terribly low and the futures prices are just as bad, locking in milk prices makes no sense. It's better to wait for a better day. Or, if you think milk prices could get lower, you may want to consider using put options.
2. **Wait for milk prices to rise.** Lock in milk prices when they are rising. That way there is a better chance you can protect a profitable milk price. In theory you are better to wait until the market has peaked before you lock in a price. However, you may never know the true peak. Therefore use a strategy to "average into" a month by hedging a little milk each week.
3. **Don't lock it all in.** Never lock in 100 percent of your milk. Lock in part of your milk when prices strengthen. That way you can lock in more milk at higher prices if market conditions improve.
4. **Break up the year into quarters.** It is logical to think of milk marketing conditions in the spring as different than the fall or winter. Consider what percent of your milk you want to protect each quarter. If you are more worried about the spring, lock up more milk in those months. Alternatively, you may be more worried about the outer months.
5. **Avoid close in and far out contract months.** Don't hedge too much of next month's milk. That's because the price for next month likely won't change significantly from the futures prices. Producers are better off looking out at least two months. Also, don't hedge too much milk beyond 9-12 months out. Milk prices in those months are too uncertain.

Estimating Your Local Basis

Producers must have an understanding of their local basis before protecting the milk price. One can begin this process by filling out Appendix Table 1. This worksheet guides you through the process of computing the monthly basis from 2000. Any information prior to 2000 is not valid since federal order prices substantially changed with order reform effective January 1, 2000.

Use your milk checks to fill out the table. Make sure you match up the proper dates: don't use the information from your milk check dated February 18, 2000 for your February 2000 data since that check reflects your January 2000 milk prices.

Locate your PPD, or producer price differential on the milk check. What you are looking for is the Boston PPD adjusted to the plant your milk is delivered to. Your PPD will normally range between \$2-\$3 per cwt. You are reporting the local PPD just for informational purposes. It is not actually used in the calculation of the basis. This is just to provide you with an idea how your local PPD varies with the announced PPD for the Northeast federal order.

Next, record your Net Milk Price in column f. This reflects your milk price plus all premiums less milk check deductions. Then compute your “basis” by subtracting either the Class III/IV index, the Class III price, or the Class IV price from the Net Milk Price.

If you plan to use the Class III futures contract then use the Class III price to compute your basis. Likewise, use the Class IV or some combination of Class III and IV to compute your basis if you intend to use these contracts to lock in your milk prices.

For example, you know an index equal to 30 percent of the Class III price and 70 percent of the Class IV price would be the ideal price to use to compute your basis in 2000. If you market milk through a cooperative, they may be willing to offer you a combination of Class III and IV contracts within a given month. It depends on their minimum contract size and how much milk you produce. In that case, use the combination index to compute your basis. If your cooperative does not provide a Class IV contract, you may want to compute your basis using the Class III contract.

The reality is whatever price you use to compute your basis, it will only be an approximation. It is very likely that by the time you receive your milk check the “actual” basis will be different than what you planned for. This is called “basis risk.” Keep track of your actual basis each month in order to develop a database. It may begin to show a pattern (i.e. lower or higher basis in the spring).

Developing a Monthly Milk Marketing Plan

Once you have established the basis in 2000 it is now time to develop a marketing plan for 2001. Appendix Tables 2-5 were developed to guide you through the planning process. First start by computing how much milk you expect to have available for sale each month. This requires an estimation of the number of milking cows and daily tank average.

Next fill in your monthly basis and compute your planning price. You may decide to transfer the monthly basis calculation from Appendix Table 1 to Appendix Tables 2-5. Or, you may collect basis information from 2000 and 2001 and compute a monthly or quarterly basis average. Compute your planning price by adding the appropriate price to your basis. If you computed your basis in 2000 relative to the Class III price, then use a forecast of the Class III price in computing the planning price. Likewise, if you used the Class III/IV index price to compute your basis in 2000, then use a forecast combination of those prices when computing the planning price.

And finally, estimate what percent of your milk supply each month to contract. Contracts are often in fixed amounts (i.e. 20,000 pounds for a cooperative, or 200,000 pounds for the Chicago Mercantile Exchange). You may also decide to purchase multiple contracts each

month. It depends on your goals and attitudes towards risk. In any event, fill out the appropriate contracts for each month of the year.

Communicating Your Plan to Family and Business Partners

A final thought before we end this chapter is that contracting milk should also involve communicating your plan to other family members and business partners. The last thing you want to do is to hedge a lot of your milk supply and then have to explain to your spouse what a margin call is. Or, what would happen if you forward contracted milk and the market significantly improved? Would you be able to explain that large negative deduction on the milk check to your business partners?

Appendix Table 6 was designed to communicate the marketing plan to family members and business partners. The idea is to sit everyone down and explain the fundamentals of your marketing plan. That way everyone understands the objectives of the marketing plan and the possible implications. A margin call or negative deduction in one or two months is not a problem if you also realized gains in other months and locked in a very profitable price. It is just a matter of communicating a sound risk management plan to others.

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Chicago Mercantile Exchange, "Self Study Guide to Forward Pricing with BFP Milk Put Options." 1998.

Plourd, Phil. "From Price Taker to Price Maker: A Guide to Dairy Risk Management Using Futures and Options." Coffee, Sugar & Cocoa Exchange, Second Edition, May 1998.

Appendix Table 1. Worksheet for Computing a Historical Basis in 2000 for Producers in the Northeast

Column:	Class III	Class IV	Weighted	Boston	Your	Record	Compute Your Basis Relative To:		
	Price	Price	Average	PPD	PPD	Net Milk	Index 3/	Class III 4/	Class IV 5/
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(I)
	\$/cwt	\$/cwt	\$/cwt	\$/cwt	\$/cwt	\$/cwt	\$/cwt	\$/cwt	\$/cwt
Months									
Jan	10.05	10.73	10.54	2.30					
Feb	9.54	10.80	10.45	2.67					
Mar	9.54	11.00	10.59	2.85					
Apr	9.41	11.38	10.79	3.05					
May	9.37	11.91	11.18	3.53					
Jun	9.46	12.38	11.50	3.79					
Jul	10.66	11.87	11.49	2.86					
Aug	10.13	11.87	11.34	3.26					
Sep	10.76	11.94	11.60	2.87					
Oct	10.02	11.81	11.32	3.30					
Nov	8.57	13.00	11.74	4.79					
Dec	9.37	13.27	12.12	4.35					
Ann. avg.	9.74	11.83	11.22	3.30					

1/ Reflects a 29/71 weighting between the Class III and IV prices (columns a and b).

2/ This is the milk price that includes all premiums as well as deductions. This does not include milk assignments.

3/ Equal to the Net Milk Price (column f) less the Weighted Average Index (column c).

4/ Equal to the Net Milk Price (column f) less the Class III price (column a).

5/ Equal to the Net Milk Price (column f) less the Class IV price (column b).

Appendix Table 2. Worksheet for Developing Your Milk Marketing Plan for January through March

Marketing Year: _____

Planned Milk Production:

- 1 No. milking cows
- 2 Daily tank average
- 3 Days in the month
- 4 Monthly avg. milk shipments 1/

Units Jan Feb Mar

<i>head</i>			
<i>lbs</i>			
<i>days</i>			
<i>cwts</i>			

Estimated Milk Price:

- 5 Class III forecast 2/
- 6 Class IV forecast 2/
- 7 Weighted average
- 8 Your Basis
- 9 Planning price 3/
- 10 **Expected Milk Revenue: 4/**

<i>\$/cwt</i>			
<i>\$/cwt</i>			
<i>\$/cwt</i>			
<i>\$/cwt</i>			
<i>\$</i>			

Futures Contracts:

- 11 **Contract Numbers:**
- 12 Pounds of milk contracted
- 13 Percent of expected shipments
- 14 Contract price
- 15 Contract type (Class III, IV, or other)

<i>cwts</i>			
<i>%</i>			

- 16 **Contract Numbers:**
- 17 Pounds of milk contracted
- 18 Percent of expected shipments
- 19 Contract price
- 20 Contract type (Class III, IV, or other)

<i>cwts</i>			
<i>%</i>			

- 18 **Contract Numbers:**
- 19 Pounds of milk contracted
- 20 Percent of expected shipments
- 21 Contract price
- 22 Contract type (Class III, IV, or other)

<i>cwts</i>			
<i>%</i>			

1/ Equal to the number of milking cows (row 1), times daily tank average (row 2), times days in the month (row 3), divided by 100.
 2/ Use Chicago Mercantile Exchange futures prices.
 3/ Equal to the weighted average price (row 7) plus the basis (row 8).
 4/ Equal to milk shipments (row 4) times the planning price (row 9).

Appendix Table 3. Worksheet for Developing Your Milk Marketing Plan for April through June

Marketing Year: _____

Planned Milk Production:

- 1 No. milking cows
- 2 Daily tank average
- 3 Days in the month
- 4 Monthly avg. milk shipments 1/

Units Apr May Jun

<i>head</i>			
<i>lbs</i>			
<i>days</i>			
<i>cwts</i>			

Estimated Milk Price:

- 5 Class III forecast 2/
- 6 Class IV forecast 2/
- 7 Weighted average
- 8 Your Basis
- 9 Planning price 3/
- 10 **Expected Milk Revenue: 4/**

<i>\$/cwt</i>			
<i>\$/cwt</i>			
<i>\$/cwt</i>			
<i>\$/cwt</i>			
<i>\$/cwt</i>			
<i>\$</i>			

Futures Contracts:

- 11 **Contract Numbers:**
- 12 Pounds of milk contracted
- 13 Percent of expected shipments
- 14 Contract price
- 15 Contract type (Class III, IV, or other)

<i>cwts</i>			
<i>%</i>			

- 16 **Contract Numbers:**
- 17 Pounds of milk contracted
- 18 Percent of expected shipments
- 19 Contract price
- 20 Contract type (Class III, IV, or other)

<i>cwts</i>			
<i>%</i>			

- 18 **Contract Numbers:**
- 19 Pounds of milk contracted
- 20 Percent of expected shipments
- 21 Contract price
- 22 Contract type (Class III, IV, or other)

<i>cwts</i>			
<i>%</i>			

1/ Equal to the number of milking cows (row 1), times daily tank average (row 2), times days in the month (row 3), divided by 100.
 2/ Use Chicago Mercantile Exchange futures prices.
 3/ Equal to the weighted average price (row 7) plus the basis (row 8).
 4/ Equal to milk shipments (row 4) times the planning price (row 9).

Appendix Table 4. Worksheet for Developing Your Milk Marketing Plan for July through September

Marketing Year: _____		Units	Jul	Aug	Sep
Planned Milk Production:					
1	No. milking cows	head			
2	Daily tank average	lbs			
3	Days in the month	days			
4	Monthly avg. milk shipments 1/	cwts			
Estimated Milk Price:					
5	Class III forecast 2/	\$/cwt			
6	Class IV forecast 2/	\$/cwt			
7	Weighted average	\$/cwt			
8	Your Basis	\$/cwt			
9	Planning price 3/	\$/cwt			
10	Expected Milk Revenue: 4/	\$			
Futures Contracts:					
11	Contract Numbers:				
12	Pounds of milk contracted	cwts			
13	Percent of expected shipments	%			
14	Contract price				
15	Contract type (Class III, IV, or other)				
16	Contract Numbers:				
17	Pounds of milk contracted	cwts			
18	Percent of expected shipments	%			
19	Contract price				
20	Contract type (Class III, IV, or other)				
18	Contract Numbers:				
19	Pounds of milk contracted	cwts			
20	Percent of expected shipments	%			
21	Contract price				
22	Contract type (Class III, IV, or other)				

1/ Equal to the number of milking cows (row 1), times daily tank average (row 2), times days in the month (row 3), divided by 100.
 2/ Use Chicago Mercantile Exchange futures prices.
 3/ Equal to the weighted average price (row 7) plus the basis (row 8).
 4/ Equal to milk shipments (row 4) times the planning price (row 9).

Appendix Table 5. Worksheet for Developing Your Milk Marketing Plan for October through December

Marketing Year: _____

Planned Milk Production:

- 1 No. milking cows
- 2 Daily tank average
- 3 Days in the month
- 4 Monthly avg. milk shipments 1/

Units Oct Nov Dec

<i>head</i>			
<i>lbs</i>			
<i>days</i>			
<i>cwts</i>			

Estimated Milk Price:

- 5 Class III forecast 2/
- 6 Class IV forecast 2/
- 7 Weighted average
- 8 Your Basis
- 9 Planning price 3/
- 10 **Expected Milk Revenue: 4/**

<i>\$/cwt</i>			
<i>\$/cwt</i>			
<i>\$/cwt</i>			
<i>\$/cwt</i>			
<i>\$/cwt</i>			
<i>\$</i>			

Futures Contracts:

- 11 **Contract Numbers:**
- 12 Pounds of milk contracted
- 13 Percent of expected shipments
- 14 Contract price
- 15 Contract type (Class III, IV, or other)

<i>cwts</i>			
<i>%</i>			

- 16 **Contract Numbers:**
- 17 Pounds of milk contracted
- 18 Percent of expected shipments
- 19 Contract price
- 20 Contract type (Class III, IV, or other)

<i>cwts</i>			
<i>%</i>			

- 18 **Contract Numbers:**
- 19 Pounds of milk contracted
- 20 Percent of expected shipments
- 21 Contract price
- 22 Contract type (Class III, IV, or other)

<i>cwts</i>			
<i>%</i>			

1/ Equal to the number of milking cows (row 1), times daily tank average (row 2), times days in the month (row 3), divided by 100.
 2/ Use Chicago Mercantile Exchange futures prices.
 3/ Equal to the weighted average price (row 7) plus the basis (row 8).
 4/ Equal to milk shipments (row 4) times the planning price (row 9).

Appendix Table 6:

Memorandum of Understanding Between Family/Business Partners Before Entering Into a Forward Contract, Hedge or Options Contract

We the undersigned agree to the following:

1. We produce _____ cwts of milk each month.
2. Our goal is to protect _____ percent of our milk marketings a year.
3. We understand the difference between speculating and hedging (we want to hedge).
4. Our average cost of producing milk is \$_____ per cwt.
5. We agree that a monthly average net milk price (including premiums and deductions) of \$_____ to \$_____ would be good for our farm year in and year out.
6. We have talked over the risks/rewards of risk management practices with our family member and business partners.
7. We are not concerned about margin calls or lost opportunity for higher milk prices on an individual contract because:
 - a. We agreed to lock in a milk price that was above our cost of production
 - b. We understood at the time we arranged the contract that milk prices could rise or fall from present levels,
 - c. Gains in the cash market will offset reductions in the futures markets, and
 - d. We make money on milk that is not protected with futures contracts when milk prices rise.
8. We have computed our maximum gain/loss and/or maximum exposure to margin calls on each contract after taking into consideration all costs of contracting milk (i.e. broker fees and commissions).

Name of Business: _____

Business Partners:

- | | | |
|----|-------|-----------|
| 1. | _____ | _____ |
| | name | signature |
| 2. | _____ | _____ |
| | name | signature |
| 3. | _____ | _____ |
| | name | signature |
| 4. | _____ | _____ |
| | name | signature |
| 5. | _____ | _____ |
| | name | signature |
| 6. | _____ | _____ |
| | name | signature |