



Milk Check
GUIDE

HighGround Dairy's guide to understanding milk pricing and its contributions to your milk check.



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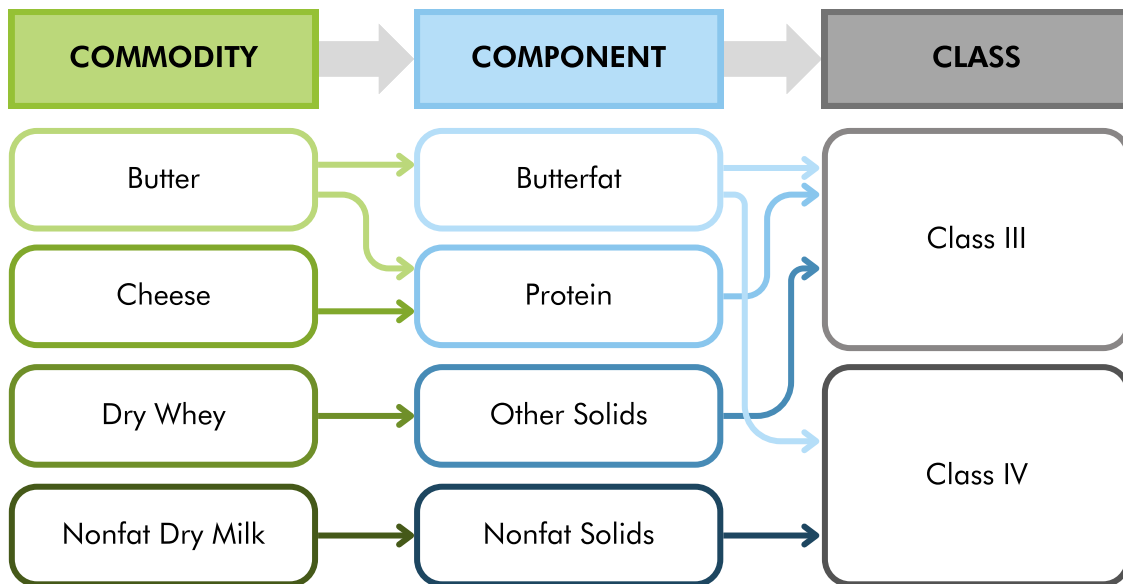


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END-PRODUCT PRICING

Raw milk, or milk from the farm, is priced according to its end use, a method of pricing known as end-product pricing. End-product pricing acknowledges that the value of milk transformed into different products varies. For example, butter and cheese, though originating from the same homogeneous commodity—milk—fetch different prices due to variations in demand and manufacturing costs. Thus, a cheese plant values milk differently from a butter plant. In order to quantify those differing values, Federal Milk Marketing Orders (FMMOs) utilize formulas to calculate the price of milk from its end products. The inputs and outputs of those formulas are known as the “three C’s” of dairy pricing: commodities, components, and classes. Each month, USDA publishes dairy prices for the “three C’s”.

Figure 1: The “Three C’s” of Milk Pricing



COMMODITY PRICES

Monthly commodity prices are determined using the USDA’s National Dairy Product Sales Report (NDPSR). Each week, USDA surveys dairy processors, collecting data on sales prices and quantities for four key dairy products: butter, block & barrel cheese, dry whey, and nonfat dry milk. The resulting information is compiled into the NDPSR, which features weekly average prices and sales figures for each product. Subsequently, the USDA transforms these weekly values into monthly commodity prices, drawing from the most recent four or five weeks of the NDPSR. The monthly commodity prices then feed into the FMMO pricing formulas to determine component and class prices.



COMPONENT PRICES

The FMMO price formulas utilize butter, cheese, dry whey, and nonfat dry milk to establish component prices for butterfat, protein, other solids, and nonfat solids. Component prices are generally calculated by deducting a make allowance (representing the cost of manufacturing the product) from the product price and multiplying the result by a yield factor (indicating the pounds of the product required to produce one pound of the component). The formula for component prices generally follows this structure:

$$\text{Component Price} = (\text{Commodity Price} - \text{Make Allowance}) \times \text{Yield Factor}$$

CLASS PRICES

Component prices then contribute to the formulation of class prices, reflecting the value of milk going into plants that produce different products. The four classes of milk are as follows:

1. Class I: milk made into fluid products such as whole milk or eggnog
2. Class II: milk made into soft manufactured products like ice cream, yogurt, or sour cream
3. Class III: milk made into hard cheeses
4. Class IV: milk made into butter or powders

Component prices are first used to calculate the skim price associated with each class. The pricing formula for Class III bases the skim price on the protein and other solids prices, while Class IV's skim price is derived from the nonfat solids price. Both skim formulas incorporate fixed component factors, representing the pounds of components in 100 pounds of skim milk. These component factors align with the industry standard established many years ago, specifying 3.1 pounds of protein, 5.9 pounds of other solids, and 9.0 pounds of nonfat solids in 100 pounds of skim milk.

$$\text{Class III Skim Price} = (\text{Protein Price} \times 3.1) + (\text{Other Solids Price} \times 5.9)$$

$$\text{Class IV Skim Price} = \text{Nonfat Solids Price} \times 9.0$$

The Class III or IV skim price, in dollars per hundredweight, is then weighted by 96.5 pounds of skim milk in 100 pounds of milk and added to the butterfat price weighted by 3.5 pounds of butterfat in 100 pounds of milk. These component factors are also derived from industry standards established years ago.

$$\text{Class III Price} = (\text{Class III Skim Price} \times 0.965) + (\text{Butterfat Price} \times 3.5)$$

$$\text{Class IV Price} = (\text{Class IV Skim Price} \times 0.965) + (\text{Butterfat Price} \times 3.5)$$

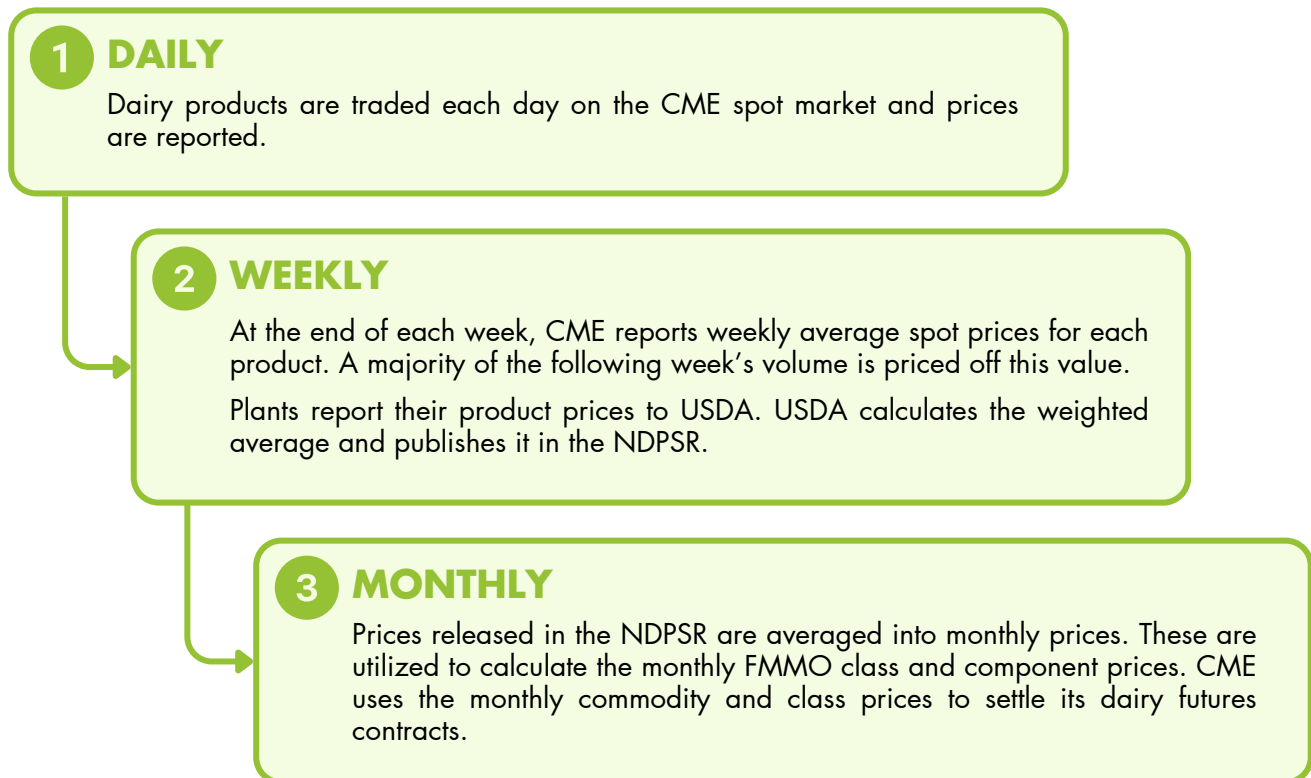


PRICE DISCOVERY: CME

Milk price discovery begins with the CME, an organized exchange for trading futures and options in sectors such as agriculture, energy, and metals. In addition to futures and options, the CME offers a spot market for four dairy products: cheese in two forms (block and barrel), butter, dry whey, and nonfat dry milk.

The CME spot market serves as an electronic platform for buying and selling physical products. Notably, every trade on the CME spot market results in the physical delivery of product, making product buyers and sellers the exclusive participants in this exchange. Open every trading day, the spot market facilitates the discovery of dairy product prices daily, reflecting the most current market conditions. At the end of each week, a weekly average CME spot price is calculated for each product, and most of the following week's volume is based upon this reference price. As expected, trends in the CME spot markets eventually show up in the NDPSR with a roughly two-week lag due to the nature of commodity pricing and surveying intervals.

Figure 2: **Milk Price Discovery Timeline**



DIGGING INTO YOUR MILK CHECK

Depending on where a producer ships their milk to, there can be slight variations as to how they are paid. However, milk checks can generally be broken down into two parts: the base price and adjustments.

BASE PRICING

This core part of the milk check drives the majority of the price that producers receive. While not all producers are subject to FMMO minimum pricing due to pooling requirements and marketing area boundaries, most milk in the United States, including some in unregulated areas, is paid on FMMO pricing formulas. Of the eleven FMMOs, seven utilize component pricing to establish their minimum price, while four use skim-fat pricing. Let's take a deeper dive into how milk is priced in these markets.

- ▶ **Skim-Fat Pricing Orders:** In skim-fat pricing, base milk checks are determined using uniform skim and butterfat prices. The base milk check is generally calculated by multiplying the hundredweights of skim by the uniform skim price and adding it to the pounds of butterfat times the uniform butterfat price. The uniform skim price includes a location differential that varies based on the location of the plant to which the producer ships their milk.

$$\text{Base Price}_{SF} = (\text{Uniform Skim Price} \times \text{Cwts of Skim}) + (\text{Uniform Butterfat Price} \times \text{Butterfat Lbs})$$

- ▶ **Multiple Component Pricing Orders:** In multiple component pricing, base milk checks are determined using Class III component prices and the Producer Price Differential (PPD). The Class III component prices include butterfat, protein, and other solids and are calculated using end-product pricing as described earlier in this guide. In addition to milk being priced off its components, multiple component pricing also utilizes a PPD. The PPD serves as an accounting mechanism for the FMMO pool. A location differential is included in the PPD, varying based on the location of the plant receiving the producer's milk.

$$\begin{aligned} \text{Base Price}_{MCP} = & (\text{Butterfat Price} \times \text{Butterfat Lbs}) + (\text{Protein Price} \times \text{Protein Lbs}) \\ & + (\text{Other Solids Price} \times \text{Other Solids Lbs}) + (\text{PPD} \times \text{Cwts of Milk}) \end{aligned}$$

While the PPD has received much criticism for contributing to "deductions" in producer milk checks, it is simply a way for the FMMO pools to balance the money that comes in with the money that comes out. In skim-fat orders, each class of milk is priced on its skim and butterfat pounds. The value put into the pool for skim and butterfat is equal to the value that comes out of the pool for skim and butterfat. In multiple component pricing orders, however, each class of milk is priced on different components. For example, while Class I is priced on skim and butterfat, Class III is priced on butterfat, protein, and other solids. Further, Class II and Class IV are priced on butterfat and nonfat solids. Some components contributing to the pool are not explicitly priced (for example, protein in Class I or other solids in Class IV), while they are priced when paying out of the pool. This leads to a difference between what goes into the pool, known as the classified value, and what gets paid out of the pool, known as the component value. To rectify this difference and ensure that the money coming in and out of the pool is balanced, the PPD is added to the calculation of FMMO minimum prices.



Four of the seven FMMOs with multiple component pricing also include Somatic Cell Count (SCC) adjustments in their minimum price calculations, as high SCC can have a negative impact on manufacturing yields and product shelf life. Under these Orders, producers get paid additional money if their SCC averages below 350,000 cells/mL and receive negative adjustments for milk with higher counts. Price adjustments are calculated on a per hundredweight basis for every 1,000 SCC variation from the 350,000-standard. The adjustment's magnitude fluctuates monthly, determined by the wholesale price of cheese.

- ▶ **Unregulated Areas:** For producers who ship to plants that do not pool on a Federal Order, their base milk check will often be a form of the individual components utilized in the class of milk that their milk gets made into. For example, a producer shipping to a cheese plant that does not pool would likely be paid on the Class III butterfat, protein, and other solids prices and likely will not be paid on the PPD. Similarly, a producer shipping to a butter plant that does not pool would likely be paid on Class IV butterfat and nonfat solids. Plants that do not pool their producers on an Order may have more freedom over the base milk price they give to producers.

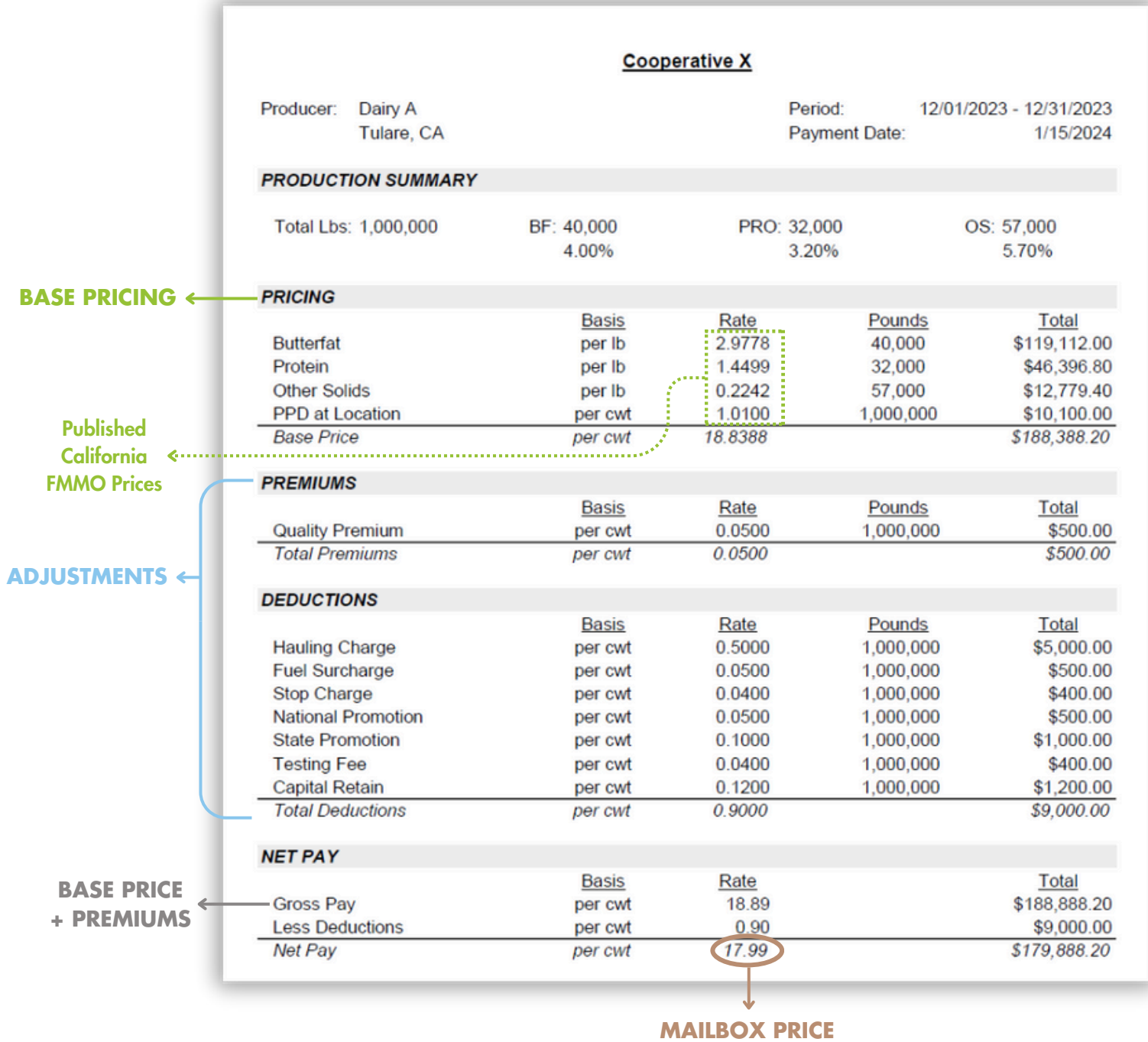
ADJUSTMENTS

There are many forms of adjustments that can be applied beyond the base price. Many handlers will add premiums based on specific established criteria. For example, some processors or cooperatives will add a quality bonus to producers' milk checks for low SCC levels if that is not already in their base price. Other examples of premiums added to milk checks can include other quality bonuses (raw bacteria counts) or volume incentives.

Negative adjustments to producer milk checks are often costs associated with marketing the milk that get passed along from the milk handler to the producer. The most common deductions include state and national promotion dues, hauling deductions, and laboratory or testing costs. In addition, if a producer ships to a cooperative, they will often see cooperative dues or retains on their milk check. Sometimes handlers place deductions on a milk check that don't fall under these categories. Some examples of these deductions include "market adjustments", "marketing fees", "balancing fees", or "inventory adjustments".



Figure 3: Milk Check Example



MANAGING RISK

The milk market can be highly volatile from month to month, but opportunities are available to help producers manage their risk. Many of those opportunities—including hedging, options, and DRP insurance—involvement the futures market at the CME.

A futures contract is a legally binding obligation to buy or sell a fixed quantity and quality of a product at a specific point in time. Futures contracts are standardized in terms of size of the contract, number of contract months, grade of commodity, and delivery points. The futures market allows for transparency of buyer and seller intentions, as the buyer and seller are anonymous to each other.

The CME futures market has two purposes: (1) price discovery and (2) transfer of risk. At the CME, dairy futures contracts are available up to 24 months out and can be purchased for Class III milk, Class IV milk, butter, cheese, block cheese, dry whey, and nonfat dry milk. *The dairy futures contracts settle to their respective FMMO monthly product or class price, making it applicable to the base price that producers are paid in their milk checks.* The goal of this section is not to examine risk management strategies available to producers but rather to explain how your milk check equates to the values displayed in the futures market.

The difference between the mailbox price—the price received by producers in their milk check—and the Class III or IV futures price is known as basis. Essentially, basis reflects the relationship between a producer's milk check and the Class III and IV price. A stronger correlation leads to greater success of the risk management strategy. Several factors may impact basis risk.

Figure 4: **Basis Risk**



COMPONENT LEVELS

When discussing end-product pricing in the first section of this guide, we showed the formulas used to calculate Class III and IV milk prices from its components. FMMO class prices as well as CME Class III and IV futures contracts are standardized to specific component levels of 3.5% butterfat, 2.99% protein, and 5.69% other solids.

Producers who get paid on their components, however, are not paid on this industry standard. Rather, producers get paid on the actual pounds of components in their milk, which often equate to levels greater than the industry standard established many years ago. The difference in components levels is a major influence of the basis risk between the mailbox price and futures price.



PRODUCT MIX

An individual producer's milk isn't always made into the same product each day. Cooperatives often ship milk to many different plants. In addition, processors can send contracted or excess milk to other plants as well. This causes a producer's mailbox price to be a function of multiple classes of milk. Producers may opt to purchase both Class III and IV futures contracts to try to reflect their handler's product mix and their milk check more closely.

PPD

In multiple component pricing orders, the PPD can have a positive or negative impact on the milk check. The PPD is a value added to or subtracted from the core of the milk check to account for balancing money in and out of the FMMO pool. Depending on the Order and its pooling regulations, the PPD can be one of the hardest pieces to forecast, but it does correlate with the spread between the Class III and IV prices.

MILK CHECK ADJUSTMENTS

Added to or subtracted from the base price in the milk check, premiums and deductions create a difference between a producer's mailbox price and the Class III or IV price.

WHAT'S NEXT?

Milk pricing is complex with many layers, but there are ways to calculate and forecast prices at the farm level. Contact us today to explore strategies for managing your milk price risk!



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If you have questions or comments about our market analysis, have interest in signing up to receive our reports directly or have interest in trading dairy futures and options, please call or email below.

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