# EVALUATION OF THE PROPOSED RULE FOR SETTING CLASS III AND CLASS IV MILK PRICES UNDER FEDERAL MILK MARKETING ORDERS

**AFPC Working Paper 98-5**

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AGRICULTURAL & FOOD POLICY CENTER
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# Evaluation of the Proposed Rule for Setting Class III and Class IV Milk Prices Under Federal Milk Marketing Orders

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The proposed rule establishes a Class III price for milk used for cheese, Class IV price for milk used for butter and nonfat dry milk, and a weighted moving average of the Class III and Class IV price (whichever is higher) to be used as a Class I price mover. In so doing, the basic formula price (BFP) is effectively eliminated.

The purpose of this report is to evaluate the proposed rule for pricing manufactured products. It uses the same statistical procedures as in the previous Agricultural and Food Policy Center reports.[1] As explained in the University Study Committee report, these procedures place emphasis on the extent to which price movements reflect changes in supply and demand conditions, the extent to which they reflect movements in products prices and the extent to which they generate prices that are relatively stable. They do not evaluate the level of prices generated by the proposed rule. However, some observations will be made on the price level issue in the concluding section of this report.

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[1]The most significant of these include University Study Committee, *An Economic Evaluation of Basic Formula Price Alternatives*, AFPC Working Paper 97-2, Agriculture and Food Policy Center (College Station: Texas A&M University System, June 1997) and Ronald D. Knutson, David P. Anderson and Titus Awokuse, *Evaluation of the "Final" Four Basic Formula Price Options*, AFPC Working Paper 97-9, Agricultural and Food Policy Center, (College Station: Texas A&M University System, August 1997).

## Prices Generated by the Proposed Rule

Under the proposed rule, the Class III price is established by the sum of the following component price formulas:

- Butterfat price = (NASS AA butter survey price - 0.079) / 0.82
- Protein price = ((NASS block cheese survey price - 0.127) x 1.32) + ((((NASS block cheese survey price - 0.127) x 1.582) - butterfat price) x 1.20)
- Other solids price = (NASS dry whey survey price - 0.10) / 0.968

The rationale for this formula is complex but is based on standard milk composition relationships. The calculation for the butterfat component uses the NASS AA butter survey price minus a make allowance of $0.079 per pound of butter divided by a moisture adjuster of 0.82 meaning that butter is 82 percent fat. The other solids component is equally simple utilizing the NASS survey price for whey minus a $0.10 make allowance for drying a pound of whey and adjusting for 3.2 percent moisture by dividing by 0.968.

The protein price formula is more complex. The first component subtracts the $0.127 per pound make allowance for a pound of cheese from the NASS cheese block survey price and multiplies the result by 1.32 which is the number of pounds of cheese made from an additional pound of protein. The second component represents the additional value of butterfat in cheese. It is included in the protein price to avoid the problem presented by having two prices for butterfat used in manufactured dairy products. The 1.582 is the number of pounds of cheese from an additional pound of fat. The additional value of butterfat is then multiplied by 1.20, which means that each pound of protein also creates 1.20 pounds of added value of milkfat in cheese, compared to butter.

The Class IV price is established by the sum of the following butter-powder formula components standardized to 3.5 butterfat and 8.7 percent nonfat solids:

- Butterfat price = (NASS AA butter survey price - 0.079) / 0.82
- Nonfat solids price = ((NASS NDM survey price - 0.125) / 0.96)

The rationale for this formula is much more simple and easy to explain than was the case for cheese. The butterfat component is the same as for cheese. The nonfat solids component is the NASS survey price for nonfat dry milk minus the make allowance of $0.125 per pound and adjusting for 4 percent moisture by dividing by 0.96.

The Class I price mover is a weighted formula using the higher of the Class III and Class IV prices. Its rationale is based on a perceived need for greater price stability and the maintenance of a fixed differential between the Class I price and the higher of the two prices for manufactured products. The use of the higher of the two prices presumably is based on the need to be able to provide a constant level of monetary incentives to move milk from manufacturing plants into fluid use.

It may be perceived that it is not legitimate to analyze movements in the Class I price by the same criteria as for manufactured product prices. However, most economists believe that movements in Class I prices should reflect changes in manufactured product prices and changes in stocks of manufactured products because the Class I price affects the quantity of milk available for manufactured products. A Class I price that did not correspond with supply-demand conditions for manufactured products would be expected to generate greater Class III and/or Class IV price instability.

Table 1 indicates the Class III price, Class IV price and Class I price mover that would have been generated by the proposed rule for the period January 1994 to August 1997 as published by

**Table 1. Class Prices Generated by the Proposed Rule and the Basic Formula Price (BFP), January 1994 - August 1997.**

| | | Class III Price | Class IV Price | BFP | Class I Mover |
|---|---|---|---|---|---|
| 1994 | JAN | 12.36 | 11.00 | 12.41 | 12.55 |
| | FEB | 12.43 | 11.01 | 12.41 | 12.55 |
| | MAR | 13.09 | 11.22 | 12.77 | 12.69 |
| | APR | 13.36 | 11.31 | 12.99 | 12.88 |
| | MAY | 11.69 | 11.08 | 11.51 | 12.57 |
| | JUN | 11.15 | 11.02 | 11.25 | 12.16 |
| | JUL | 11.85 | 11.08 | 11.41 | 12.01 |
| | AUG | 12.08 | 11.21 | 11.73 | 11.96 |
| | SEP | 12.44 | 11.25 | 12.04 | 12.03 |
| | OCT | 12.55 | 11.29 | 12.29 | 12.16 |
| | NOV | 11.88 | 11.29 | 11.86 | 12.14 |
| | DEC | 11.31 | 10.99 | 11.38 | 11.94 |
| 1995 | JAN | 11.44 | 10.83 | 11.35 | 11.78 |
| | FEB | 11.96 | 11.05 | 11.79 | 11.78 |
| | MAR | 12.17 | 11.14 | 11.89 | 11.85 |
| | APR | 11.42 | 11.17 | 11.16 | 11.72 |
| | MAY | 11.36 | 11.19 | 11.12 | 11.62 |
| | JUN | 11.69 | 11.28 | 11.42 | 11.64 |
| | JUL | 11.70 | 11.49 | 11.23 | 11.65 |
| | AUG | 12.36 | 11.72 | 11.55 | 11.83 |
| | SEP | 13.22 | 11.82 | 12.08 | 12.24 |
| | OCT | 13.69 | 12.45 | 12.61 | 12.74 |
| | NOV | 13.89 | 12.89 | 12.87 | 13.18 |
| | DEC | 14.01 | 11.99 | 12.91 | 13.54 |
| 1996 | JAN | 13.43 | 11.95 | 12.73 | 13.62 |
| | FEB | 13.31 | 11.54 | 12.59 | 13.59 |
| | MAR | 13.41 | 11.40 | 12.70 | 13.54 |
| | APR | 13.88 | 11.55 | 13.09 | 13.61 |
| | MAY | 14.32 | 12.66 | 13.77 | 13.80 |
| | JUN | 14.18 | 15.24 | 13.92 | 14.23 |
| | JUL | 14.86 | 16.33 | 14.49 | 14.91 |
| | AUG | 15.71 | 16.33 | 14.94 | 15.46 |
| | SEP | 16.31 | 17.17 | 15.37 | 16.10 |
| | OCT | 15.04 | 15.91 | 14.13 | 16.21 |
| | NOV | 12.45 | 13.12 | 11.61 | 15.42 |
| | DEC | 11.59 | 12.67 | 11.34 | 14.56 |
| 1997 | JAN | 11.92 | 12.48 | 11.94 | 13.77 |
| | FEB | 12.36 | 13.18 | 12.46 | 13.36 |
| | MAR | 12.47 | 13.73 | 12.49 | 13.25 |
| | APR | 11.51 | 13.06 | 11.44 | 13.12 |
| | MAY | 10.69 | 12.49 | 10.70 | 12.97 |
| | JUN | 10.76 | 12.98 | 10.74 | 12.98 |
| | JUL | 11.51 | 12.83 | 10.86 | 12.93 |
| | AUG | 13.07 | 12.69 | 12.07 | 12.94 |
| | AVERAGE | 12.68 | 12.32 | 12.26 | 13.04 |

Source: Proposed Rule.

USDA.  It is important to note that these are not the prices that would have existed had the proposed rule been in effect during this period.  In addition, due to the fact that spot market rather than survey prices were used in computing these Class prices, if these prices had been in effect, then resulting supply and demand conditions would have been different thus generating different product prices.  In the absence of market-generated prices, this analysis relied on the data generated by USDA from existing product prices.

Figure 1 provides a comparison between the Class III price and the BFP over the indicated time period.  It may be noted from Table 1 and Figure 1 that the Class III price tends to lead the BFP – one would expect commodity market prices to lead competitive farm prices.  Figure 2 compares the Class IV price with the BFP.  Here the tendency to lead is less clear, perhaps because of the dominant influence of cheese in determining the price of milk in the Minnesota-Wisconsin region.  Figure 3 compares the Class I price mover with the BFP.  Note that because it uses the higher of the Class III and IV prices, its level is almost always higher than the BFP –averaging $0.78 per cwt higher.

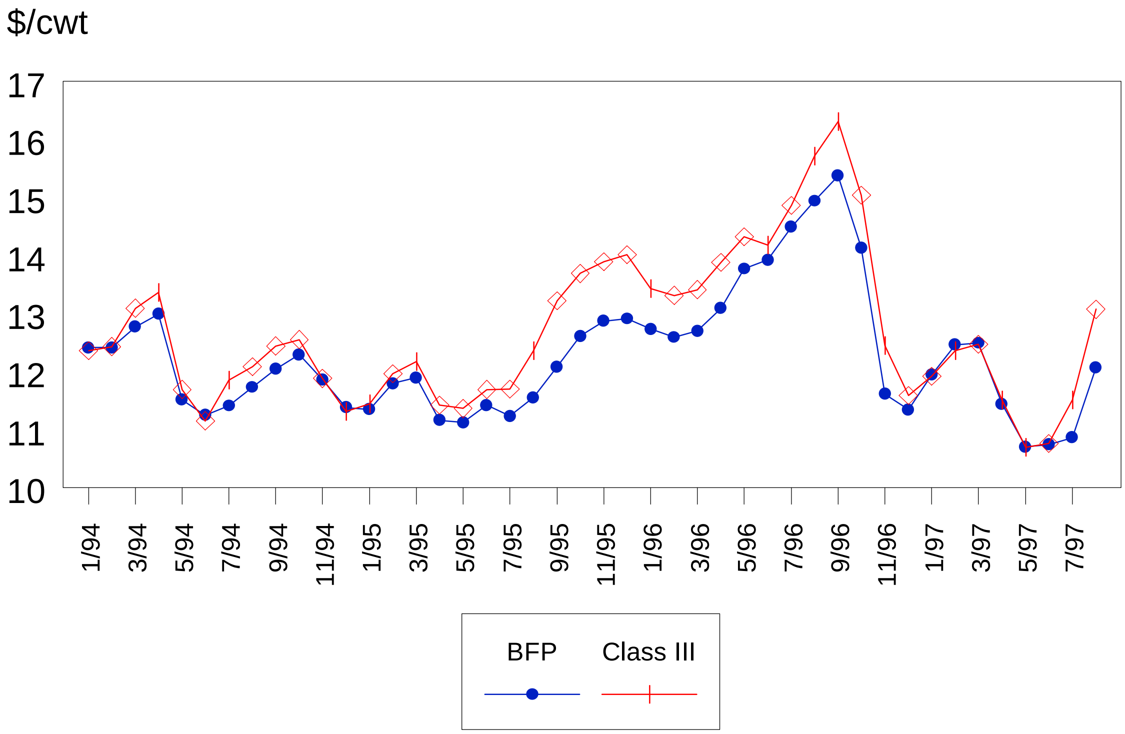
**Results of Statistical Analysis**

The University Study Committee developed three criteria for quantitatively evaluating the options for setting manufacturing milk prices, including:

- How well they respond to changes in national supply-demand conditions.
- How well they reflect the value of milk for manufacturing.
- How stable the prices are.

The statistical technique used to make those quantitative determinations is vector autoregression (VAR) time series analysis.  VAR was utilized to analyze the impacts of changes in the price of milk on changes in product prices.  It is a particularly useful technique in that

## Figure 1. Comparison of the Class III Price and the BFP Under the Proposed Rule, January 1994 - August 1997.




## Figure 2. Comparison of the Class IV Price and the BFP Under the Proposed Rule, January 1994 - August 1997

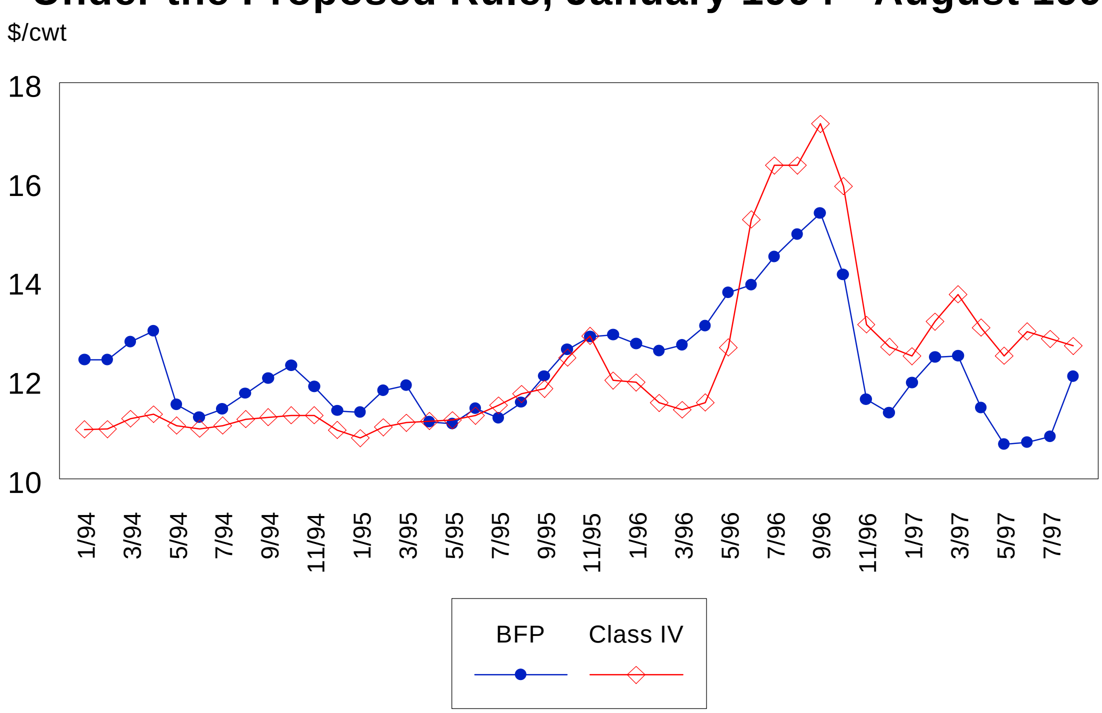
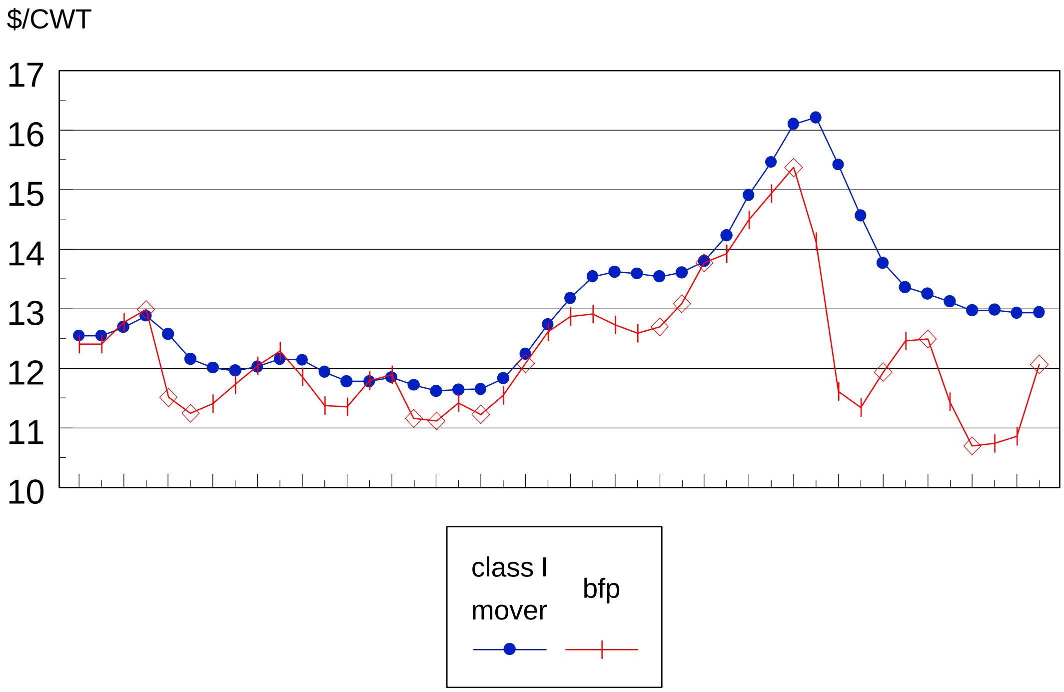


**Figure 3. Comparison of the Class I Price Mover and the BFP Under the Proposed Rule, January 1994 - August 1997**



feedback effects between milk prices and product prices are considered. At the same time, it allowed analyses of the relationship between milk prices and stocks -- a prime measure of responsiveness to changes in supply and demand conditions.

**Response to Changes in Supply-Demand Conditions**

The VAR technique was utilized to evaluate the impact of a one-time 248 million pound milk equivalent change in stocks (one standard deviation) on the Class III price, Class IV price, Class I price mover under the proposed ruled and the BFP. The results are presented in Table 2 and may be summarized as follows:

- For all four options there was the desired inverse relationship between stock levels and prices. That is, if stocks increased prices declined, as would be expected utilizing economic principles.
- For the proposed Class III price nearly 7 percent of the price variation was explained by changes in stocks. The BFP ranked next with 5 percent of its price variation explained by changes in stocks. The Class IV price performed almost identical to the BFP while stocks explained 3 percent of the price variation for the proposed Class I price mover.
- At the end of six months the cumulative influence of a one-time 248 million pound milk equivalent change in stocks was a high of $2.29 per cwt for the proposed Class III price and $2.27 for the Class I price mover. Stocks explained much more of the price variation for all three of the proposed Class prices compared with the BFP.
- At 6 months after the change in stocks, over 30 percent of the price variation was influenced by changes in stocks for the Class IV price and the Class I price mover -- twice the percentage for the Class III price.

**Table 2. Statistical Measures of the Extent to Which the Proposed Rule Class Price Options Reflect National Supply and Demand Conditions, January 1994 - August 1997.**

| Option | Price Decline (Initial reaction) | Percent of the Price Variation Explained | Cumulative Influence of Stocks on Price at 6 months | Price Variation Influenced by Stocks at 6 months |
|---|---|---|---|---|
| | Yes or No | Percent | $/cwt | Percent |
| Proposed Class III | Yes | 6.74 | -2.2880 | 14.4285 |
| Proposed Class IV | Yes | 4.96 | -1.0537 | 30.2271 |
| Proposed Class I Mover | Yes | 3.26 | -2.2650 | 31.6196 |
| BFP | Yes | 5.00 | -0.5316 | 20.6144 |

Overall the options contained in the proposed rule compared favorably with those analyzed previously.  Importantly, they represented a substantial improvement over the BFP.

**Reflection of Value of Milk for Manufacturing**

When product prices change, the BFP should adjust to reflect both the magnitude of change in product prices and the share of products in the sales mix of manufactured products. VAR was used to measure the proportion of price variation in each proposed Class price option and the BFP that is explained by the prices of cheese, butter and NDM.  The results are presented in Table 3 indicate:

- For the proposed Class price options, product prices explained between 12 and 18 percent of the price variation.  The BFP explained 7 percent.
- For the proposed Class price options, cheese prices have the largest impact, followed by NDM prices and butter prices.

Overall the options contained in the proposed rule compared favorably with those analyzed previously and represented a substantial improvement over the BFP.

**Stability of Options**

Milk price instability has become a major producer concern.  Economists are most concerned about price variability that cannot be explained by economic factors.  The standard deviation of the VAR model, as reported in the price stability at 6 months, indicates the amount of price variation that cannot be explained by either product prices or stocks -- the two economic factors influencing price that were considered in our studies (Table 4).  The results of these analysis indicate:

- The Class III and IV prices are inherently more unstable because product price changes are reflected directly in the price of milk.

**Table 3. Percentage of BFP Price Variation Explained by Changes in Product Prices for the Proposed Rule Class Price Options, January 1994 - August 1997.**

| Option | Percentage of BFP Price Variation Explained by | | | |
|---|---|---|---|---|
| | All Products | Cheese Price | Butter Price | NDM Price |
| | Percent | Percent | Percent | Percent |
| Proposed Class III | 12.68 | 4.85 | 1.13 | 5.87 |
| Proposed Class IV | 17.53 | 12.1 | 2.99 | 3.90 |
| Proposed Class I Mover | 12.32 | 6.49 | 6.36 | 6.34 |
| BFP | 6.92 | 0.12 | 0.77 | 6.07 |

**Table 4. Statistical Measures of the Extent to Which the Proposed Rule Class Price Options Generate Prices that are Stable, January 1994 - August 1997.**

| Option | Mean | Price Stability of Option | Price Stability at 6 Months |
|---|---|---|---|
| | | Standard Deviation | Standard Deviation |
| | | $/cwt | $/cwt |
| Proposed Class III | 12.68 | 1.3033 | 0.5566 |
| Proposed Class IV | 12.32 | 1.6117 | 0.6369 |
| Proposed Class I Mover | 13.04 | 1.2108 | 0.2909 |
| BFP | 12.26 | 1.0973 | 0.5330 |

- The Class I price mover and BFP are the most stable. The Class I price mover is more stable than the other two proposed Class prices because it is computed as a moving average. It is more unstable than the BFP because of the use of the higher of the Class III or IV prices. Yet even so, at six months the Class I price mover indicates a desirable feature of being more stable than any of the other options.

Once again the results for the options proposed compare favorably with those analyzed previously but also reflect the instability that is inherent in product prices where demands and supplies are highly inelastic.

**Summary and Concluding Observations**

Table 5 provides a rank ordering of the options included in the proposed rule compared with the BFP. Except from a stability perspective, the options consistently outperformed the BFP, and, therefore, represent an improvement over the current antiquated Minnesota-Wisconsin Grade B milk price survey.

While the VAR method of analysis is a powerful analytical tool, it does not give adequate attention to the level of price. It might be legitimately asserted that the proposed formulas generate prices that are too high relative to the BFP. The higher price is a result of the use of spot market prices as opposed to NASS survey prices, the assumed relatively low make allowance levels and the inclusion of dry whey as a by-product in the Class III price. If California, the number one milk-producing state, comes into the Federal Order System, these higher prices do not represent a significant concern. This is the case because if milk prices are too high, milk production will rise and, through supply-demand forces, will eventually lower the level of Class III, Class IV and the Class I mover prices. The opposite also is true.

**Table 5. Rank Ordering of the Performance of Proposed Rule Class III, Class IV and Class I Mover Options with BFP.**

| Option | Reflects National Supply-Demand Conditions | Reflects Product Prices | Price Stability |
|---|---|---|---|
| Class III | 1 | 2 | 3 |
| Class IV | 3 | 1 | 4 |
| Class I Mover | 2 | 3 | 1 |
| BFP | 4 | 4 | 2 |

In the absence of California becoming a part of the Federal Order System, conformity needs to be achieved in the pricing of milk used for manufacturing. Otherwise, major competitive problems could result. Over the period studied the California equivalent to the proposed rule Class III price would appear to be about $1.20 per cwt lower than the Class III price. The California equivalent of the proposed rule Class IV price would appear to be $0.70 lower.

These differences are sufficiently large to prompt a need to reevaluate the price levels generated by the proposed rule formulas. It is conceivable that some middle-ground, economically-sound compromise could be achieved between the two systems. In any event, these changes need to be known and agreed upon in advance to make informed decisions and avoid production and marketing disruptions. If such changes cannot be known in advance, an economic study of the implications of administering such disjointed milk pricing systems would appear to be a high priority.