EVALUATION OF "FINAL" FOUR BASIC FORMULA PRICE OPTIONS

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Department of Agricultural Economics
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Since the early 1960s, the price of milk for manufacturing (Class III) under most Federal Milk Marketing Orders (FMMO) has been based on the Minnesota-Wisconsin (M-W) price series (Manchester, p. 166). The M-W price has also been used to move the price of milk used for fluid purposes (Class I).

The M-W price series is derived from a monthly survey of prices paid by plants manufacturing Grade B milk in the two states.[1] As the quantity of Grade B milk declined (Figure 1), questions arose over the reliability of the M-W series.

As early as 1973, when Grade B production was still about 15 percent of the U.S. milk supply, the Milk Pricing Advisory Committee concluded that "The need that we move to a new pricing system in Federal orders is sufficiently urgent so that we cannot wait for imperfections in the alternatives to be removed (p. 16)." In 1991, the Agricultural Marketing Service issued a report presenting the results of analyses of over 16 alternatives to the M-W series. In 1995, as a temporary measure, it began updating the M-W series to reflect changes in product prices. This new updated series became known as the Basic Formula Price (BFP).

The 1996 Farm Bill mandated reform of the FMMO system. One aspect of this reform process has involved the role of the M-W price series as a component of the BFP. The internal AMS/USDA Basic Formula Price Committee was established to evaluate and make recommendations for changes in the BFP. At the same time, it organized a University Study Committee (USC) to develop and analyze BFP options. The USDA/BFP Committee issued its interim report in April 1997 and its final report in June 1997, although it continues to do research on the impacts of the options being considered, as is reflected in this report.

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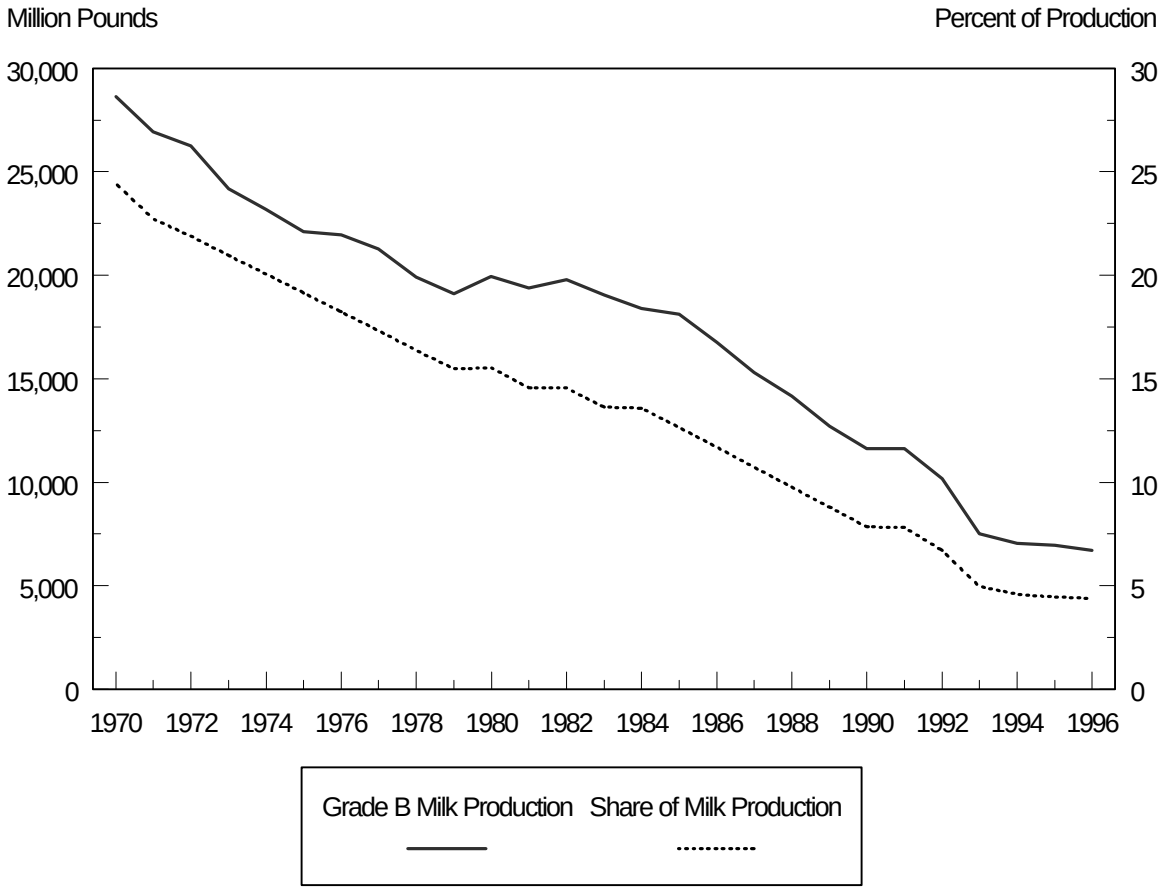
[1]These plants are often referred to as being "unregulated," which is the case for their Grade B supply. They frequently also receive Grade A supplies which may be regulated.

Figure 1. Quantity of Grade B Production and Share of Total U.S. Milk Production, 1970-1996.



This paper summarizes the results of USDA/BFP and USC reports and utilizes the same methodology to evaluate the final four options presented by the USDA's BFP Committee. It begins by discussing the controversy surrounding the competitive nature of product markets which arose during the 1996-97 time frame in which the two studies/reports were being completed. It then analyzes the findings of the USDA/BFP Committee.

Product Pricing Controversy

About 40 percent of the milk in the United States is used to make cheese. Therefore, cheese is the largest single factor determining the price of milk. About 90 percent of the milk manufactured by plants that make up the M-W survey is made into cheese. In March 1996 Mueller, Marion, Sial and Geithman issued a report which concluded that the National Cheese

Exchange (NCE) was subject to "price manipulation ... to the detriment of consumers and farmers as well as some industry participants (p. 2)." Because of the key role that cheese plays in milk pricing, the results of this study created substantial political and economic controversy over both the reliability of the M-W price series and the use of the NCE price quote as the basis for updating the M-W price. In an attempt to put out the firestorm, a study for the National Cheese Institute by Bruce Gardner concluded that the NCE was not manipulated and was playing the role for which it was designed in discovering the price of cheese.

The result of the NCE controversy was a conclusion by USDA that it needed to find a substitute for the NCE as an M-W updating price. In response, the USDA/BFP Committee initiated a Dairy Commodity Price Survey to obtain transaction prices from sales by manufacturers of cheese, butter and nonfat dry milk (NDM).

USC analyzed the 30 months of data collected from the commodity price survey covering the period January 1994-June 1996. It concluded that cheese pricing was considerably more complex than the conventional wisdom displayed in the Mueller, Marion, Sial and Geithman analysis that the transaction price for cheese is determined by a formula off the NCE. The commodity price survey data indicated that average cheese prices were, at times, higher and, at other times, lower than the NCE price. Consequently, it is believed that the overage is the subject of considerable buyer-seller negotiation in response to forces of supply and demand. The negotiated price is believed to be heavily influenced by stock conditions and other factors although research is still in process on the specific nature of these relationships. In the meantime, the NCE was closed and the Chicago Mercantile Exchange (CME) began trading cheese.

In reaction to these findings, USC suggested that USDA initiate a weekly transaction price survey in March 1997. After receiving a few weeks of data with strong industry cooperation, and subsequent to the closing of the NCE, USDA began calculating the BFP by updating the M-W price using the weekly transaction prices for cheese along with the CME butter price and the Central States NDM price. Interestingly, the CME butter price could be subjected to the same criticism as the NCE in terms of the thinness of the market. It is believed that the reporting of weekly transaction prices for butter, NDM and cheese has the potential for substantially improving the performance of whatever BFP option is selected by the FMMO reform process.

USDA/BFP Committee Options

Both the USDA/BFP Committee and USC studied a wide range of BFP pricing options. Included were competitive pay prices for raw milk, product price formulas, component pricing, futures markets, cost of production, economic formulas, California pricing, informal rulemaking, and pooling differentials only. The USDA/BFP Committee then settled on four options:

- A Grade A competitive pay price alternative to the M-W price series.
- A butter/NDM-cheese product price formula using seasonal yields and a California cost-based make allowance.
- A multiple component pricing plan which computes prices for protein, butterfat, and other solids.
- A four class component pricing plan which computes separate NDM and butterfat prices for Class IV and prices for protein, butterfat and lactose for cheese (Class III).

Grade A Competitive Pay Price

In 1989, the Minneapolis FMMO Administrators Office began reporting a Grade A price series from prices paid for Grade A milk used for manufacturing in Minnesota and Wisconsin (Schmit, Sebastian and Halverson). This was done by subtracting the amount of money FMMO plants draw from the pool from order sales at the Class I price. The result was combined with the M-W price to create what is referred to as the A/B price series. A perceived problem with the A/B series is that it averaged $0.84 per cwt above the M-W price in 1994-96. The reason is believed to be keen competition that exists for supplies of Grade A milk used for manufacturing due to the excess processing capacity that exists in the region. This suggests that the A/B series may not reflect national supply and demand conditions.

It is important to note that reform discussions and evaluations place too much emphasis on the level of price generated by an option. While the price level may be a symptom of a problem with an option, if the price is initially set too high, farmers will respond by increasing milk production. If it is set too low, they will respond by decreasing production. In the long run, all of the options will generate about the same national price level regardless of the initial price level. What is really important is how the price moves over time.

USC evaluated the performance of the A/B series utilizing the vector autoregression (VAR) time series analytical technique. This technique was used to test whether the price changes reflected in each option reacted as would be expected in a competitive national market. In another sense, the price should be one that is representative of what competitors pay in a national market.

USC found that over the 1991-95 time period, the A/B price reacted perversely when stocks changed. That is, when the stocks rose there was a tendency for price to rise and vice versa. This tendency disappeared over the longer 1991-October 1996 time period which included the turbulent 1996 price movements. Relative to the other options, USC found no redeeming merit associated with the performance of the A/B price series in terms of reflecting supply-demand conditions or maintaining price stability. Of course, being Minnesota and Wisconsin-based, it did a superior job of reflecting the price of cheese.

Early in its deliberations, USC requested that the USDA/BFP Committee develop a Grade A series that reflected the value of milk used for manufacturing in a broader range of markets. In June 1997, USDA issued a report on a national Grade A pay price which included 36 months of data, 1994-96. The states covered by this national Grade A pay price included California, Idaho, Iowa, Minnesota, New Mexico, New York, Pennsylvania, Washington, and Wisconsin. Figure 2 compares the new national Grade A pay price series with the M-W and A/B series. The Grade A series price averages $0.81 per cwt lower than the A/B series and $0.03 per cwt higher than the M-W series. This suggests that competitive conditions in the Minnesota-Wisconsin region for Grade A milk used for manufacturing are unique, leading to a higher price compared with other areas such as Idaho, California and New Mexico.

Table 1 presents a ranking of the four USDA/BFP options for three criteria utilized — reflection of national supply-demand conditions, reflection of product prices and stability. The complete VAR results are included in the Appendix tables.

The performance of the new national Grade A pay price series indicates that it does a superior job of reflecting national supply and demand conditions, as indicated by price response to changes in stocks. However, the cumulative influence of stocks on price at six months was less than for any of the other options. As anticipated, it did a poor job of reflecting product prices, ranking at the bottom of the options for all products and at or near the bottom for each individual

Figure 2. Comparison of the National Grade A, M-W and A/B Milk Price Series, 1994-96.

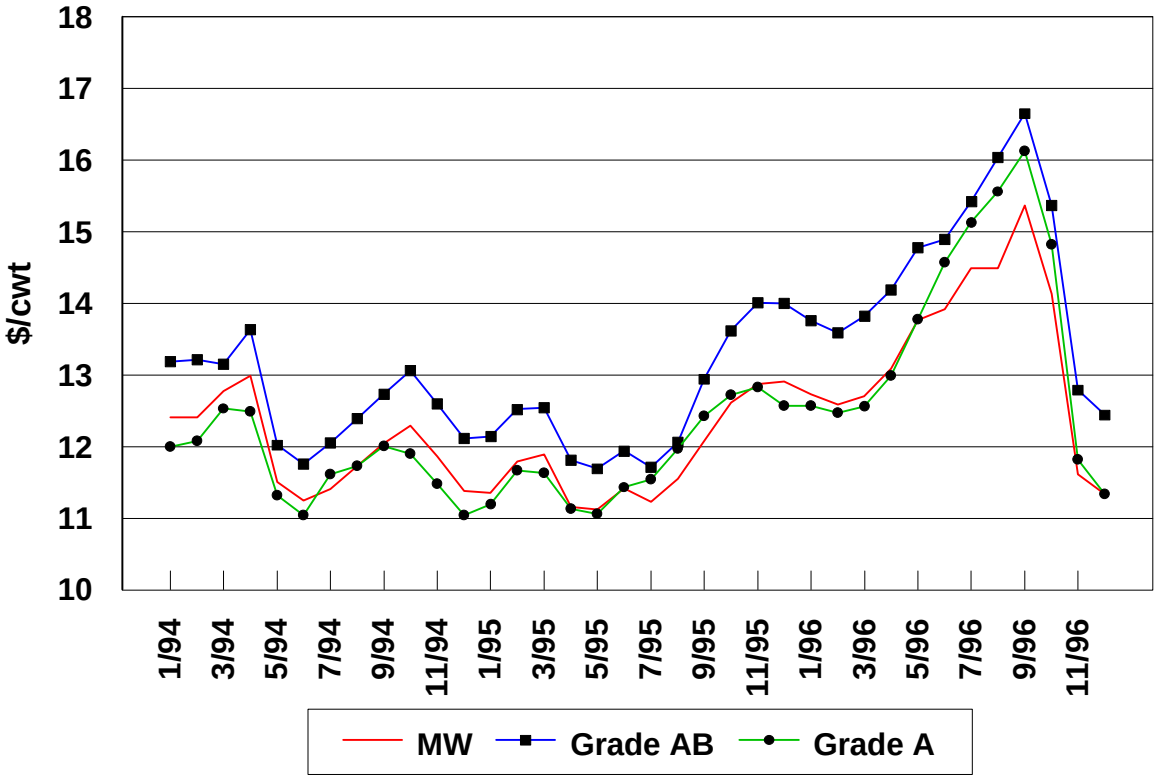


Table 1. Rank Ordering of the Performance of USDA/BFP Options by USC Criteria Utilizing VAR Time Series Analysis, 1994-96.

Option	Reflects National Supply-Demand Conditions	Reflects Product Prices	Price Stability
National Grade A	4	5	2
Butter/Powder Cheese Formula	3	3	1
Pricing Components	2	2	3
Cheese Components	1	4	1
Butter/Powder Formula	5	1	4

Source: Appendix Tables 1-3.

product. From a stability perspective, the Grade A price was among the most stable over the whole period, as well as at six months following a stocks shock. In summary, the national Grade A series overcame the problems presented by the A/B series but did not indicate superior overall performance.

Aside from this statistical analysis, USC has concern about the nature of the adjustment process under a national Grade A series. If the price was updated by the cheese price, the burden for adjustment in the national Grade A price would fall disproportionately on cooperatives that manufacture most of the cheese.

Butter/Powder-Cheese Product Formula

In its set of four options, the USDA/BFP Committee included a butter/powder cheese formula analyzed by USC. In its simplest form, a product formula subtracts a processing or "make" allowance from the gross product receipts derived from 100 pounds of milk. A major issue in a product formula involves the make allowance. This formula used seasonal product yields, a California cost-based make allowance, and was weighted by the contribution of each product to U.S. production. Weighting by U.S. production of butter, NDM and cheese is a substantial difference from either the M-W or A/B price where about 90 percent of the weight is on cheese. The California make allowance was used because it was the only available cost-based indicator of manufacturing expenses per product unit. The price support make allowance had been held constant for many years.

This formula generates a price that is $0.98 per cwt lower than the M-W price and $1.82 lower than the A/B price over the period 1994-96. The reason for the lower price results primarily from the higher cost-based make allowance[2] and the lower cheese price that would be developed from a national average cheese price than appears to be implied by either the M-W or A/B price series.

[2]The California cost-based make allowance is not the make allowance actually used by the State of California in operating its marketing orders. Rather, it is the weighted average costs actually collected for California plants. California costs were used because they are the only actual plant costs that are available.

This product formula ranked third among the options in reflecting national supply-demand conditions. The influence of stocks at six months was particularly strong. It likewise ranked third in reflecting product prices, although none of the individual product price relationships were particularly strong. As would be expected, this product formula, along with the Class III cheese formula, indicated higher levels of stability than the other options.

USC concluded that if a product formula was to be utilized, a three-product butter/powder-cheese formula made the most economic sense. It suggested deriving the appropriate make allowance from a set of model plants that were representative of the major production areas — in particular, the West, Upper Midwest and Northeast.

Pricing Components

The BFP Committee also included among its final set of options a component pricing option analyzed by USC. This option derived a protein value from the cheese price, it used the butter price to value butterfat, and it valued other solids based on the price of NDM after subtracting the protein value.

Statistically, USC found that the pricing components option performed the best of the options analyzed. It was clearly superior in reflecting national supply and demand conditions. It directly translated product prices into component values and, therefore, did a superior job of reflecting product prices in the aggregate and for individual products. During periods of relative price stability, it was the most stable of the options although, when product prices were unstable, this instability was directly reflected in milk prices. With the California cost-based make allowance, the pricing components option generated the lowest milk price — $1.48 per cwt below the M-W price over the 1994-96 time period.

Four Class Component Pricing

This option, developed by USDA's BFP Committee, established separate component prices for milk used in butter and NDM (Class IV) from that used in cheese (Class III). The Class III price would be determined by a butter/powder formula with the value of butterfat being based on the Grade AA butter price. Both the protein and butterfat values in the Class III price are proposed to be derived from the price of cheese, while the lactose value was set using the price

reported by USDA's Market News Service. The result was a higher butterfat value for milk used in cheese than in butter.

The last two options in Table 1 and the Appendix Tables reflect the results of USC analyses of this four-class pricing option. The cheese component (Class III) option performed in an outstanding manner in reflecting supply-demand conditions, ranking first in all categories. As would be expected, it did not perform nearly as well in reflecting product prices. This cheese component pricing option was also among the most stable.

The butter/powder formula (Class IV) performed the poorest of the options in reflecting national supply and demand conditions. However, it ranked first in reflecting product prices while placing last in price stability.

Despite what would appear to be superior statistical performance, USC concluded that a four class FMMO pricing system has the potential to undermine classified pricing. This occurs when commodity price levels create an incentive for NDM to be purchased at a lower price and as a raw milk substitute in the production of higher price Class cheese and soft products. NDM use is common in the manufacturing of Italian cheese, ice cream and yogurt. Its use for these purposes was found to increase when the lower FMMO price Class IIIA was established. While substitution of these lower price class ingredients might be curbed through the use of an upcharge, this requires increased regulation — which is contrary to the reform objectives. It also runs contrary to the increasingly common practice of manufacturing and selling individual components using ultrafiltration, microfiltration, and related technologies.

Conclusions

Of the four options set forth by USDA's BFP Committee, pricing components performed superior to the other options. The pricing components option set separate prices for protein, butterfat and other solids. While, from a statistical perspective, it might be asserted that the four Class alternatives performed in a superior manner, USC concluded in a previous report that establishing separate price classes for cheese versus butter and NDM run the risk of undermining the classified pricing system, a foundation of FMMOs.

Aside from evaluating the "final" four options set forth by USDA's BFP Committee over the same time period, this is the first report that analyzes the new Grade A competitive pay price

series developed by the BFP Committee. This series overcomes the problems previously reported for the A/B series and, like all competitive pay prices, it does not require a make allowance. However, in terms of all other criteria analyzed, it performed at or near the bottom among the final four options set forth by USDA's BFP Committee.

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Appendix Table 1: Statistical Measures of the Extent to Which BFP Options Without By-Product Values Reflect National Supply and Demand Conditions, 1994-1996.

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
Product Formulas				
National Grade A	Yes	11.16	-0.6996	19.2174
Butter/powder-cheese formula with seasonal yields weighted by US milk production and California cost-based make allowance	Yes	9.35	-1.0758	24.7588
Price Components with NO BFP and California cost-based make allowance	Yes	9.97	-0.9677	27.6718
Cheese milk value	Yes	11.79	-1.1589	24.0165
Butter/powder formula milk value	Yes	5.35	-0.7537	19.0365

Appendix Table 2: Proportion of BFP Price Variation Explained by Changes in Product Prices for Selected BFP Options Without By-Producs, 1994-1996.

Option	Proportion of BFP Price Variation Explained by			
	All Products	Cheese Price	Butter Price	NDM Price
	Percent	Percent	Percent	Percent
Product Formulas				
National Grade A	18.04	3.25	5.96	3.48
Butter/powder-cheese formula with seasonal yields weighted by US milk production and California cost-based make allowance	25.59	1.36	4.33	1.67
Price components with NO BFP and California cost-based make allowance	31.62	20.01	20.16	13.51
Cheese component price	18.89	6.13	8.90	3.21
Butter/powder formula	36.75	15.24	18.68	0.44

Appendix Table 3: Statistical Measures of the Extent to Which Selected BFP Options Without By-Products Generate Prices that are Stable, 1994-1996.

Option	Mean	Price Stability of Option	Price Stability at 6 Months
		Standard Deviation $/cwt	Standard Deviation $/cwt
Product Formulas			
National Grade A	12.43	1.3411	0.5923
Butter/powder-cheese formula with seasonal yields weighted by US milk production and California cost-based make allowance	11.42	1.3151	0.4656
Price components with NO BFP and California cost-based make allowance	10.92	1.7209	0.7193
Cheese component value	12.55	1.3214	0.4238
Butter/powder milk value	12.26	1.8173	0.7287

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