An Analytical Review of a Growth Management Plan for Dairy Producers

Charles Nicholson, Ph.D. and Mark Stephenson, Ph.D.[1]

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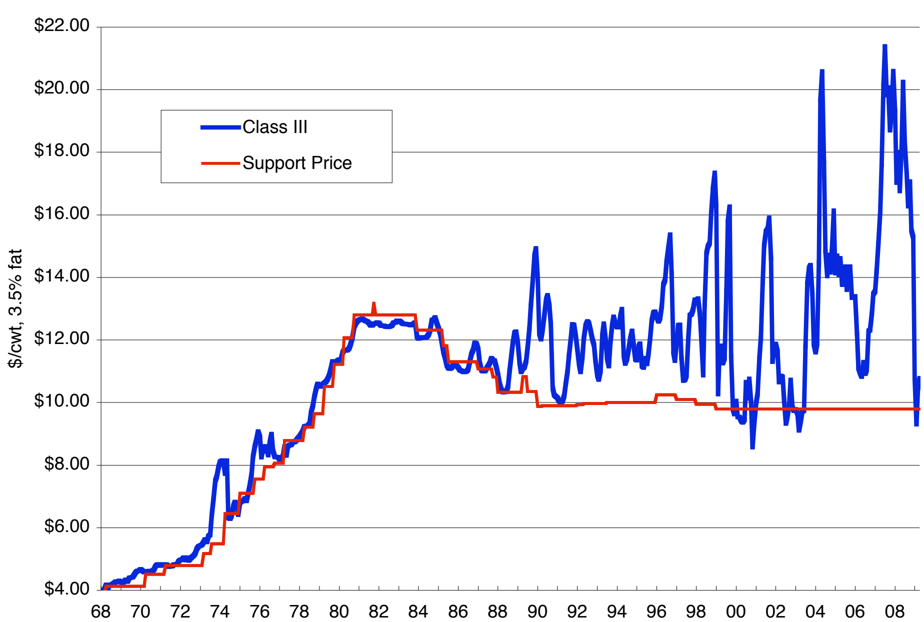
Introduction

One of our colleagues[2] has characterized the milk price problem as having three aspects: price volatility, price predictability, and price adequacy. **Volatility** really has to do with the dramatic price swings that have characterized milk and dairy product prices during the last 15 years (illustrated by the marked variation in the Class III price in Figure 1). High milk price years like 2004 and 2007, provide recovery years if dairy producers make it through the low price troughs, like 2002, 2006 and 2009. Price volatility would be less an issue if prices were more **predictable**—that is, if dairy producers and processors knew with a high level of certainty what prices were going to be, well in advance. Then, business plans could be altered to accommodate the price volatility. Finally, price **adequacy** is an issue. If the average price is too low to cover long-run average costs, then a producer will be out of business regardless of the peaks and troughs.

Figure 1. Manufacturing Grade Milk at 3.5% Fat Test.



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[1] The authors are Senior Research Associate and Senior Extension Associate respectively with the Cornell Program on Dairy Markets and Policy at Cornell University. (www.dairy.cornell.edu)

[2] Andrew Novakovic, Director of the Cornell Program on Dairy Markets & Policy.

Since the late 1980s, various producer groups have indicated interest in programs or policies to limit variation in milk prices. Two basic types of responses to price variation exist: price risk management on individual farms and policy or programmatic interventions that influence the degree of price variation in the market. Futures, options and forward contracting have been available to dairy producers for more than a decade [3], and have been used successfully by a subset of US dairy farmers. These tools facilitate planning by making prices more predictable (even if still variable) and often allow producers to lock in a profitable price—one above their costs of production. Managing price risk with these tools should, on average, result in somewhat lower net returns due to the costs associated with them. Nicholson and Fiddaman (2003) noted some of the factors that appear to have limited the use of price risk management tools by dairy farmers.

Despite the availability of individual price risk management tools, many dairy producers continue to voice concerns about the milk price volatility and express a desire to develop policies or programs to reduce it. This is particularly true since the high prices of 2004 were followed by the low prices of 2006; there exists a perception that prices have become more volatile in the last five years. Two years ago, we analyzed a *Refundable Assessment Plan* for dairy producers at the request of the Milk Producers Council of California [4] and *Herd Retirement and Export Subsidy Plan* for Dairy Farmers Working Together [5]. Our analyses, using two dynamic national dairy sector simulation models developed at Cornell, indicate that milk price volatility can be reduced by these programs. More recently, we analyzed milk price cycles to see if there was some underlying order in what appear to be chaotic price swings. We employed a statistical modeling approach known as "Spectral Decomposition" to identify price cycles in the U.S. All Milk Price[6] that might be used in price forecasts.

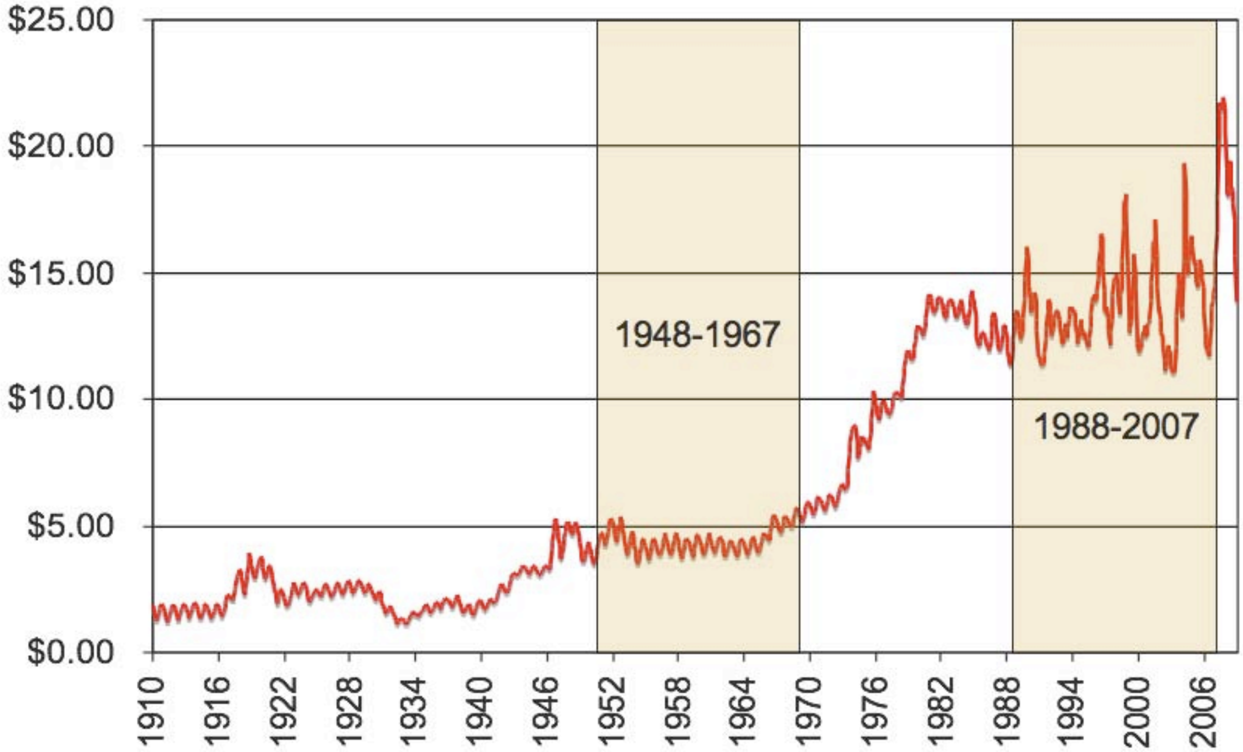
[3] Livestock Gross Margin insurance to address the issue of margin, rather than price, risk management also became available in 2008 but has been very little used by dairy farmers to date.

[4] An Analytical Review of a Refundable Assessment Plan for Dairy Producers. http://www.dairy.cornell.edu/CPDMP/Pages/Publications/Pubs/Refundable%20Assessments.pdf, April, 2007.

[5] An Analytical Review of a Voluntary Herd Retirement and Export Subsidy Plan for Dairy Producers. http://www.dairy.cornell.edu/CPDMP/Pages/Publications/Pubs/DFWT_report.pdf, August, 2007.

[6] The All Milk Price is determined monthly by the National Agricultural Statistics Service. It is a weighted average price paid by processors regardless of grade (A or B), class, region, or composition.

Figure 2. U.S. All Milk Price, 1910 to 2007

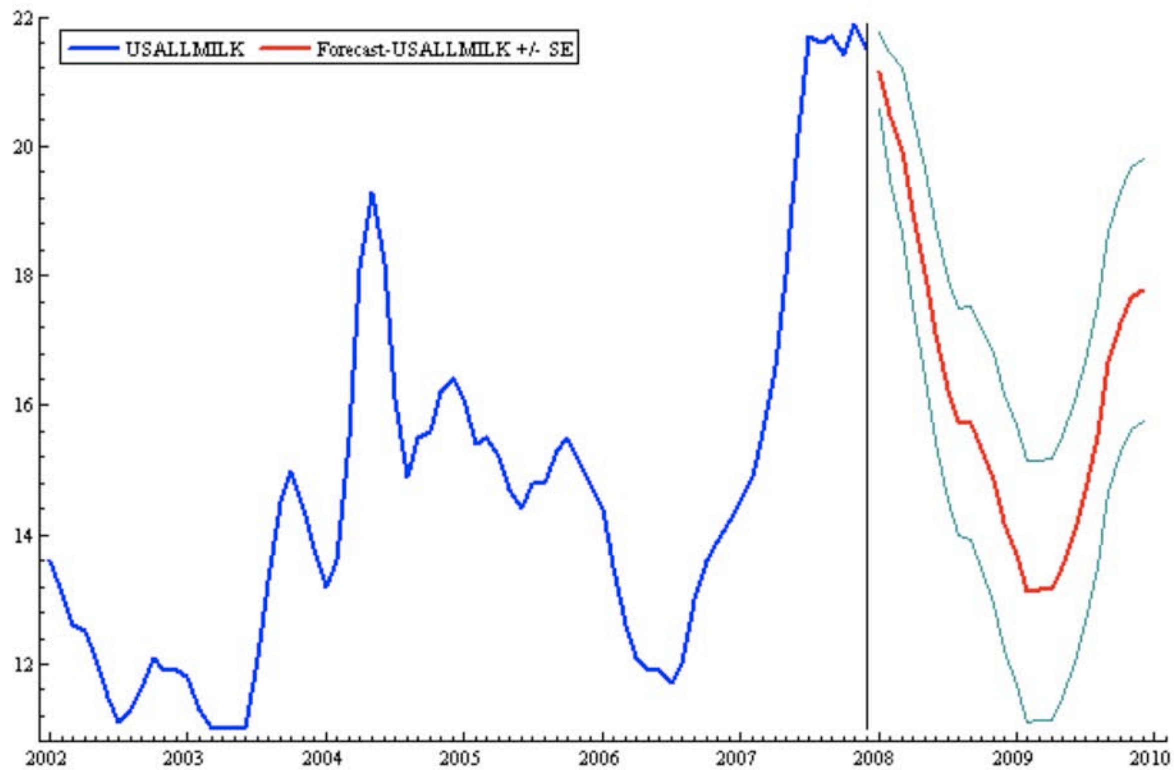


We analyzed two twenty-year periods (Figure 2): the years 1948-67 and 1988-07, to compare the cycles observed in each. The 1948-67 period was a time characterized by strong seasonal cycles. Other cycles were also found but they tended to be relatively short in frequency and of low amplitude (importance). The more recent period, 1988-07, demonstrated a seasonal cycle that was just as large as in the earlier time period but also the presence of three other cycles of differing frequency and amplitude. In addition to seasonal cycles, the latter time period showed a cycle of 9 months, one of 26 months and one of 36 months in length. The amplitude of the 36-month cycle appears to be getting larger, which may imply even more variable prices in the future.

To date we have not completely identified the biological and behavioral origins of these price cycles, although various possibilities have been discussed previously (Nicholson and Fiddaman, 2003). However, it is clear from our previous dynamic modeling work and from a large body of work on commodity prices (Sterman, 2000) that price cycles are endemic to a wide variety of commodities, from oranges to steel. These cycles arise endogenously from decisions made by individual producers, processors, retailers and consumers although they can also be influenced by what are often called "external shocks". The argument is sometimes made that price variation arises primarily from these unpredictable shocks. Our analysis of price cycles and previous simulation modeling efforts suggest that this is not the case. In addition, the argument that price variability arises primarily from unpredictable shocks does not explain why current policies, programs, or decision rules used by different dairy industry actors cannot mitigate the impacts of these shocks on prices (Nicholson and Fiddaman, 2003).

The spectral decomposition approach that we used relies only on previous values of the all-milk price, but can be used to forecast future values of the all-milk price. The price cycles identified during 1988-2007 were used to forecast the all-milk price for a two-year period beginning in January 2008. Based on previous cycles, the model predicted that January through March of 2009 would be the next low point and that it would come from a precipitous drop from the highs in late 2007 and early 2008 (see Figure 3).

Figure 3. Forecast of the 2008-2010 All-Milk Price with the Spectral Decomposition Model: Mean and Confidence Interval



Although somewhat erratic, the cycles in milk price appears to have an underlying order. If the peaks or troughs of the four cycles happen to coincide, the highs or lows in prices will be expressed at extreme values. Or, if the peak of one cycle coincides with the valley of another, they may largely cancel one another out.

As influential as these cycles are, unanticipated economic shocks can influence their timing and amplitude. These shocks temporarily increase or decrease either the supply or demand for goods. In recent years, we have experienced several shocks to the dairy industry. High oil prices and biofuel production have had profound impacts on feed prices for dairy producers. This was a shock that reduced milk supplies. The weak U.S. dollar and strong economies overseas also gave us a “positive” demand shock with quite large export opportunities in 2007. Together, these two shocks boosted milk prices beyond the range that typical price cycles would have taken us. Feed prices have now moderated from their highs. With the global recession, export and domestic markets have experienced a large "negative" demand shock in late 2008. The negative shocks have occurred at a time when our analysis of price cycles suggests a low milk price would have occurred anyway. The combined effects of cycles and shocks have had significant negative effects on the profitability of most U.S. dairy farms during late 2008 and early 2009.

The Proposed Growth Management Plan

As noted above, there are many possible mechanisms that might be used to address price volatility. We have undertaken an initial analysis of a program developed by the California Milk Producers Council (MPC). This program has been called the "Growth Management Plan" (GMP) and has the stated objective of managing growth of US milk production to moderate milk price volatility. The proposed idea is relatively straightforward: if a production facility increases its quarterly milk output by more than an *allowable growth* (that is, a percentage increase) from the same quarter in the previous year, then the facility would pay a *market access fee* per cwt for **all** of their production in that quarter. The collected pool of dollars from the market access fees would be distributed to all other producers in the country who hadn't exceeded the allowable growth. Thus, participation in the program would be mandatory, but whether producers pay or receive payments depends on their decisions about production increases.

As envisioned by the MPC, the allowable growth under the GMP would be greater than zero in most circumstances to allow increases in production to meet growing demands for milk and dairy products. In contrast to a more rigid quota system, all US producers could produce as much milk as they want (as long as they pay the applicable market access fee if their allowable growth was exceeded), and the production "base" that is established would not be transferable to other producers. New entrants into milk production or existing farms who wish to undergo a significant expansion would incur a one-time market access fee for the expansion year.

Analysis of the GMP

We analyzed the likely market impacts of the GMP using a dynamic simulation model. The Cornell Program on Dairy Markets and Policy has developed and maintains a suite of models specific to the dairy industry (Appendix 1). The GMP was analyzed using a modified version of the *Dairy Farm Structural Change Simulator* first developed by Pagel (2005).

Basic Model Characteristics

The model is a dynamic simulation model run for the period 2004 to 2014, with the GMP assumed to be implemented in 2007. This model has been used previously to assess the impacts of the Dairy Price Support Program on farm-level structural change (Pagel, 2005), to assess various policy options for the farm bill (Nicholson, 2006), and to analyze a Refundable Assessment Program (Stephenson and Nicholson, 2007). The basic model characteristics are:

Four farm-size categories that track farm numbers (these are based on number of cows per farm, with categories <50, 50-100, 100-250, 250+);

Financial performance (for example, Net Farm Operating Income) calculated for each farm category;

Farm expansion (to next size category) and exit rates are determined by basic demographics but are modified by profitability (NFOI), off-farm business opportunities, ability to service debt and price variability;

In addition to NFOI the model tracks farm-size specific indicators such as cows per farm, milk per cow, farm assets and debt status;

The farm-level categories are linked to a market model that includes the effects of the Dairy Price Support Program and MILC. Classified pricing and pooling of returns under Federal Milk Marketing Orders are represented in a simplified manner, with perishable and manufactured product categories. The model does not incorporate international trade flows or US trade policy;

The market is represented by two aggregated product categories, perishable (Class I and II) and manufactured (Class III and IV) products. The demand for these products is assumed to grow over time (that is, the demand curves for these products shift out). Growth for perishable product demand is assumed to be 0.1% per year, whereas growth for manufacturing product demand is assumed to be 1.0% per year based on growth rates from 2000 to 2004 (Schmit and Kaiser, 2006);

The model includes inventories of manufactured products. The price of manufactured products responds to commercial “inventory coverage” (current inventories divided by current sales). Inventories of perishable products are not represented;

Government inventories of manufactured products depend on market prices versus CCC purchase prices. Purchases increase government inventories and sellbacks decrease government inventories;

<u>Elements of the Model Related to the Growth Management Plan</u>

Our analysis of GMP makes assumptions about a) the per cwt level of the market access fee, b) the manner and timing in which monies collected under the assessment will be paid out, c) what production increases will be allowed for participating farmers and d) the percentage of dairy farmers that participate by limiting production increases to less than the allowable growth percentage.

The market access fee was modeled either as one value fixed for the period 2007-2014, or as a value that could be updated annually. For some of the analyses, we assumed a given value of the market access fee and assessed the outcomes, but we also used optimization routines to have the model select the level(s) of market access fee that would minimize the simulated variation in the all-milk price during 2009-2014.

Monies collected from the market access fee are equal to the amount of the market access fee per cwt, times the total number of cwt produced on farms that increased production more than the allowable growth. Milk produced on farms that did not increase production more than the allowable growth is referred to as “qualifying milk.” All monies collected are assumed to be paid back to producers of qualifying milk on a per cwt basis. Payments to participating farms are based on the amount of milk production (that is there are no payment caps based on total production per farm). Refunds are paid out to qualified farmers with a delay of one quarter.

The allowable annual percentage increase in production is analyzed in a manner similar to the market access fee. It is important to note that this allowable growth does not imply that all “qualifying” farms will increase production by this amount, and the value is somewhat independent of the amount of expected demand growth. This is a threshold value that is set to ensure that a certain proportion of farms will participate. Together, the per cwt market access fee and the allowable percentage increase for qualified farms are the two key policy variables analyzed with the model.

Farmer decisions are one of the more challenging aspects to include in the modeling work. Because our model aggregates all farms to four farm-size categories (and therefore ignores the variation among farms of similar sizes about how their response to an assessment would vary) we first assume a distribution that indicates what percentage of farms in each size category will grow by a certain percentage during the current year[7]. We then assume that this percentage is affected by expected profitability (NFOI), including the effects of the GMP. The decision making structure assumes that farmers in each size category compare the NFOI they expect to earn if they don’t qualify with the NFOI they expect to earn if they do qualify under the GMP. The expected value of NFOI if a farm chooses not to qualify is based on expectations about recent years’ income. To estimate NFOI with qualification, the expectation is adjusted to account for lower milk production (which would have a decreasing effect on revenues from milk sales), but expectations of higher milk prices because of lower total supply, potential labor savings and the expected value of the payment if they qualify (which of course depends on how many farms are unqualified in any quarter).

The control of milk supplies in the model is assumed to take place primarily through cow numbers. That is, we allow for year-on-year increases in genetic potential and assume that farms will feed cows to obtain more milk production when milk prices are higher. (Thus, we may not fully capture the productivity effects of a GMP.) For farms that do not qualify, they can expand cow numbers in response to higher NFOI. That is, non-qualifying farms can increase milk supplies as much as they would like to in response to

[7] In each case, many farms in each category will choose not to expand in a given year. Because information upon which to base these distributions is limited, we conducted a series of sensitivity analyses to assess their impacts on outcomes of importance.

economic incentives. Qualifying farms are assumed to make cow culling or retention decisions based on how many cows would be required to produce the amount of milk allowed based on their previous year's milk production for the same quarter and the allowable annual percentage increase in production for qualifying farms discussed above. In addition, if an increase in milk production is allowed, it is assumed that farmers in each size category will make decisions about culling and retention to achieve that rate of growth in milk production.

Analyses with the Model

The model is used to simulate a number of outcomes of interest under different assumptions about how the program is structured and about underlying market conditions. As mentioned above, the two key assumptions about the program are:

- The value of the market access fee per cwt;

- The allowable growth (percentage increase) in milk production for qualifying farms.

The outcomes of different combinations of assumptions (called scenarios) are compared to one another to determine the likely impact of the refundable assessments program. The outcomes of particular interest include:

1) The value of the all-milk price over time and its average through 2014;

2) Variation in milk prices, as measured by the difference between the actual all-milk prices and a moving average of the all-milk price and by a cumulative indicator of milk price variation through 2014;

3) The value of the payment for qualified milk per cwt and per farm.

The Scenarios

Many scenarios were simulated to evaluate the likely impacts of the GMP, but for simplicity we report a small number of scenarios for each of three different market conditions. Those market conditions analyzed include:

The absence of major shocks, (so that the impact of the GMP on volatility under cycles that result from time lags based on the biology and technology of production can be assessed);

A supply shock due to increases in feed costs during 2006 to 2010. These scenarios assume increases in feed costs per cwt of milk increase from around $5 in 2006 to nearly $8 in 2010 and remain at that level thereafter;

A demand shock involving a precipitous decline in manufactured dairy product demand and feed cost increases. These scenarios assume a reduction in the growth rate of US manufactured product demand from 1% per year to -2% per year (that is, a decline in US manufactured product demand of 2% per year) for the 18 months beginning in January 2008, followed by six months of zero growth during the second half of 2009 and a return to 1% growth per year in January 2010 [8];

Scenarios run for each market condition include:

A baseline scenario without the implementation of the GMP (for comparison with the GMP scenarios)

A fixed 25-cent market access fee with 2.5% allowable growth

The combination of market access fee and allowable growth set once over the life of the life of the program to minimize variability in the all-milk price;

The combination of market access fees and allowable growth set annually to minimize variability in the all-milk price[9];

All model simulations were run from January 2004 to January 2014, assuming implementation of the GMP provisions in January 2007.

Results

<u>Results without Shocks</u>

The baseline run indicates projected price cycles in the absence of shocks (red-colored line in Figure 4). The three scenarios compared against this baseline demonstrate the simulated impacts of the GMP. The brown-colored line indicates the scenario where the market access fee is set at 25 cents per cwt with allowable growth of 2.5%. The coefficient of variation (a measure of the volatility in prices equal to the standard deviation divided by the mean value) of the all-milk is decreased from 7.6% in the baseline to 4.5% and the average price has increased from $15.04 to $16.39 (Table 1). However, the basic cyclical variation has been only somewhat reduced by the GMP operated with these values of the market access fee and allowable growth.

Two additional scenarios are identified to further asses the ability of the GMP to minimize volatility. The first scenario determines the combination of the market access fee

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[8] Note that these scenarios are not intended to provide forecasts of the recovery of dairy product demand or milk prices. Rather, they are designed to be illustrative of the impact that a GMP would have under market conditions roughly similar to those observed during the past 6 to 8 months.

[9] The values of the market access fee and the allowable growth that minimize the cumulative absolute deviation between the current and moving average all-milk prices are selected using optimization techniques available in Vensim ® software from Ventana Systems, Inc. Essentially, this involves running a large number of simulations until the simulation with the parameter values that minimize the variation is identified using certain criteria. Although this approach illustrates the potential of the GMP to achieve reductions in price variability when program management parameters are set “optimally,” it does not identify the decision rules (or information) that GMP managers would need to employ to minimize variation. Subsequent analyses would be necessary to identify these program management rules.

and the allowable growth set once over the entire time period (2007-2014) that minimizes variability, and the second scenario finds the combination of the two parameters that minimizes volatility if set once every year. The outcomes are shown in the blue and green-colored lines respectively (Figure 4). Both one-time and annual setting of the market access fee and the allowable growth appear to nearly eliminate the systematic variation in milk prices caused by price cycles in the absence of economic shocks. The GMP would markedly reduce the values of the coefficient of variation (CV) for the all-milk price, but would also increase the average all milk price over the relevant period by $1.45 and $1.98 per cwt. This price enhancement would undoubtedly be welcomed by many dairy producers, but would also reduce sales of dairy products and may decrease processor revenues.

Figure 4. GMP and "Normal" Cyclical Variation

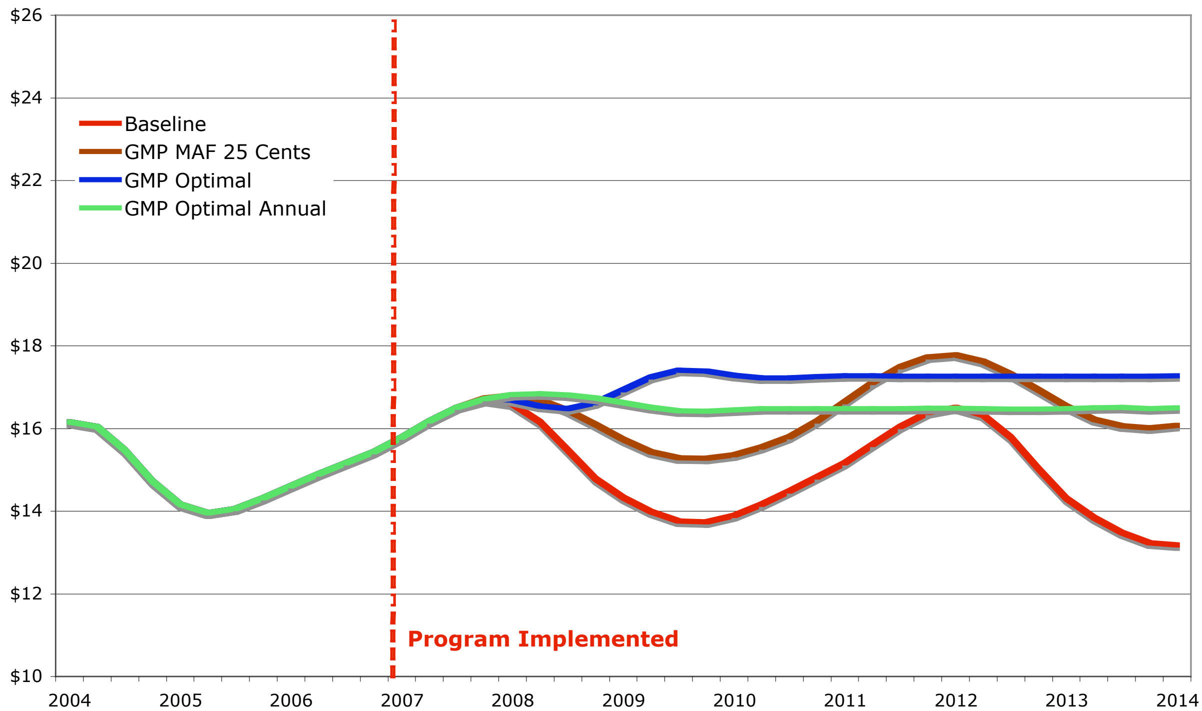


Table 1. Simulated Summary Outcomes of the GMP Without Shocks

	Baseline	25¢ Market Access Fee	One-time Set of MAF and AG	Annual Changes in MAF and AG
Market Access Fee, $/cwt	--	0.25	0.55	0.35*
Allowable Growth, %/year	--	3.0%	2.9%	1.4%*
Refund, Qualifying Milk, $/cwt	--	0.19	0.32	0.39

Results with Feed Costs Shock

The second baseline scenario evaluates price cycles under the feed price shock assumed for 2006 to 2010 (red line in Figure 5). With the feed cost shock, price variation (as indicated by the CV) is larger than in the absence of the shock—as expected. In addition, the late-2007 to early 2008 price peak has increased from about $17 per cwt without the shock to about $21 per cwt. The price peak occurs somewhat earlier than in the baseline without the feed cost shock (in Figure 4).

Figure 5. GMP and Cyclical Variation with Feed Price Shock.

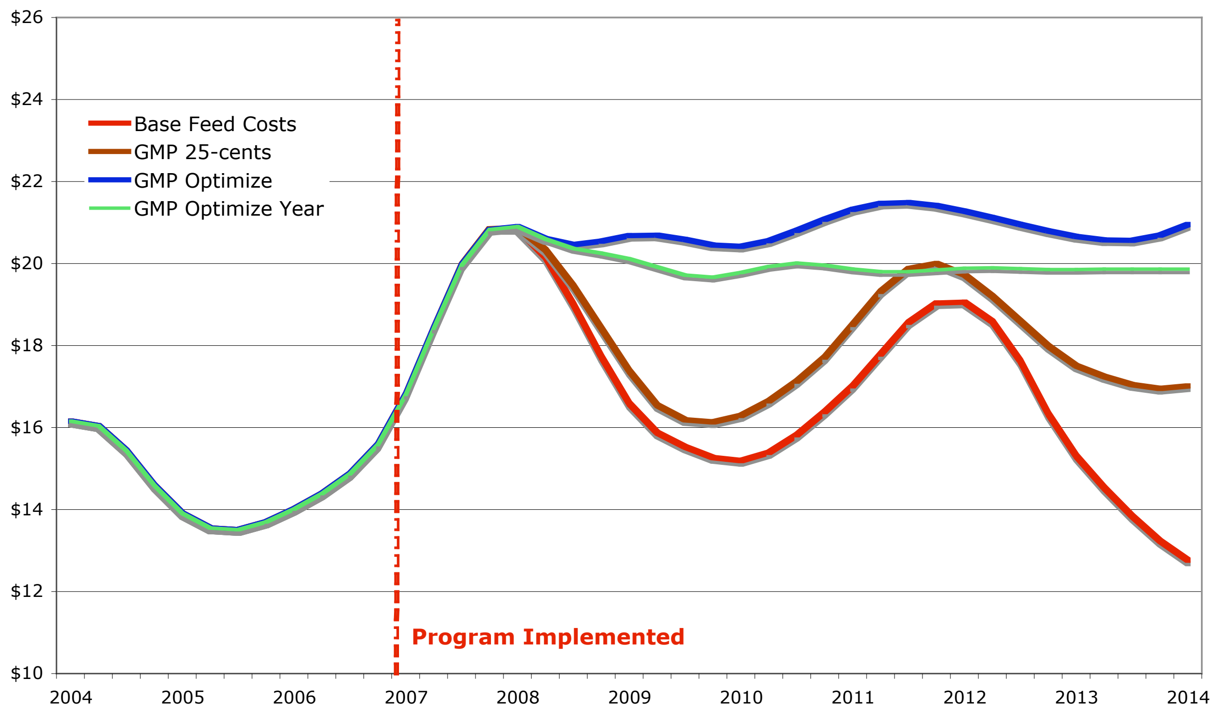


Table 2. Simulated Summary Outcomes of the GMP with a Feed Cost Shock

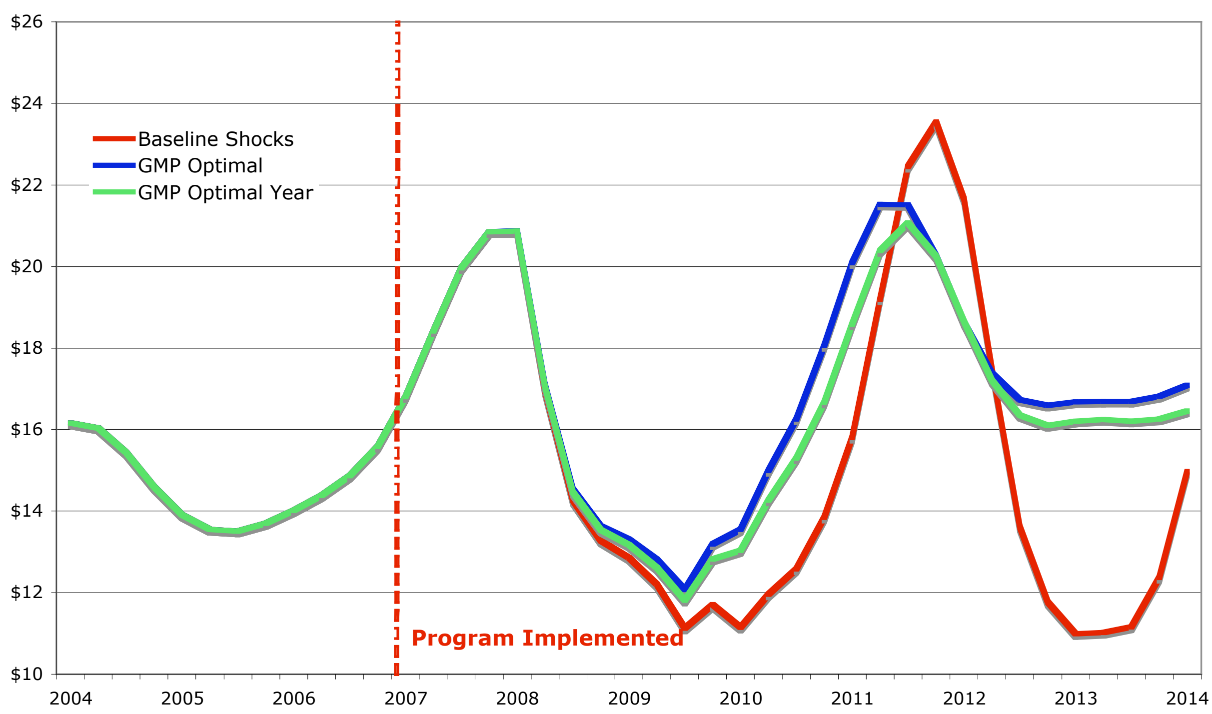
	Baseline	25¢ Market Access Fee	One-time Set of MAF and AG	Annual Changes in MAF and AG
Market Access Fee, $/cwt	--	0.25	1.50	0.74*
Allowable Growth, %/year	--	2.5%	3.0%	2.7%*
Refund, Qualifying Milk, $/cwt	--	0.59	0.51	0.61
Average All Milk Price, $/cwt	17.02	18.21	20.59	19.84
Coefficient of Variation, %	12.9%	8.1%	4.5%	3.6%

The GMP is simulated to significantly reduce the price volatility under the three different assumptions about its implementation with a feed cost shock. The largest reduction in variability occurs when the program is implemented with market access fee and the allowable growth allowed to change each year. However, the GMP is not able to suppress as much variation in milk prices as it did in the absence of the feed cost shock. We conjecture that that the shock simply causes larger waves that require a bit more time for the GMP to stabilize. As in the baseline case, there is significant price enhancement as well as greater price stability. The average all-milk price under the GMP operating with annual changes in the market access fee and allowable growth is simulated to be $2.82 per cwt larger than in the baseline without the GMP.

<u>Results with Demand and Feed Cost Shocks</u>

The final baseline scenario examines cyclical variations in price with both the negative demand shock and the feed cost supply shock The red-colored baseline (Figure 6) now more closely approximates the prices that were actually observed through early 2009, including the rapid price decrease that led to prices about $4 per cwt lower than scenarios with only the feed shock (from Figure 5). Economic shocks of this magnitude appear to reset the timing of underlying cycles (which begin again at a slightly different time period) and seem likely to increase the amplitude as well (Figure 6).

Figure 6. GMP, Cyclical Variation with Feed and Demand Shocks.



The combination of demand and feed cost shocks has also altered the immediate effectiveness of the GMP. Both the one-time and annual setting of the market access fee and the allowable growth reduce volatility compared to the baseline, but both still have a substantial amount of volatility. The bottom of the 2009 price trough is higher by about $1 per cwt and the GMP is simulated to promote a faster price recovery. After the peak of the next price cycle in 2011, the GMP helps bring prices back into a more stable pattern by 2012. Price enhancement also occurs under the GMP with the demand shock, although the increases in the average all-milk price of $1.10 to $1.27 per cwt are much lower than in the presence of only the feed cost shock.

Table 3. Simulated Outcomes of the GMP with Demand and Feed Cost Shocks

	Baseline	**One-time Set of MAF and AG**	**Annual Changes in MAF and AG**
Market Access Fee, $/cwt	--	0.10	0.32*
Allowable Growth, %/year	--	3.0%	1.5%*
Refund, Qualifying Milk, $/cwt	--	0.23	0.46
Average All Milk Price, $/cwt	15.34	16.61	16.44
Coefficient of Variation, %	26.0%	16.3%	16.5%

**indicates varies over time*

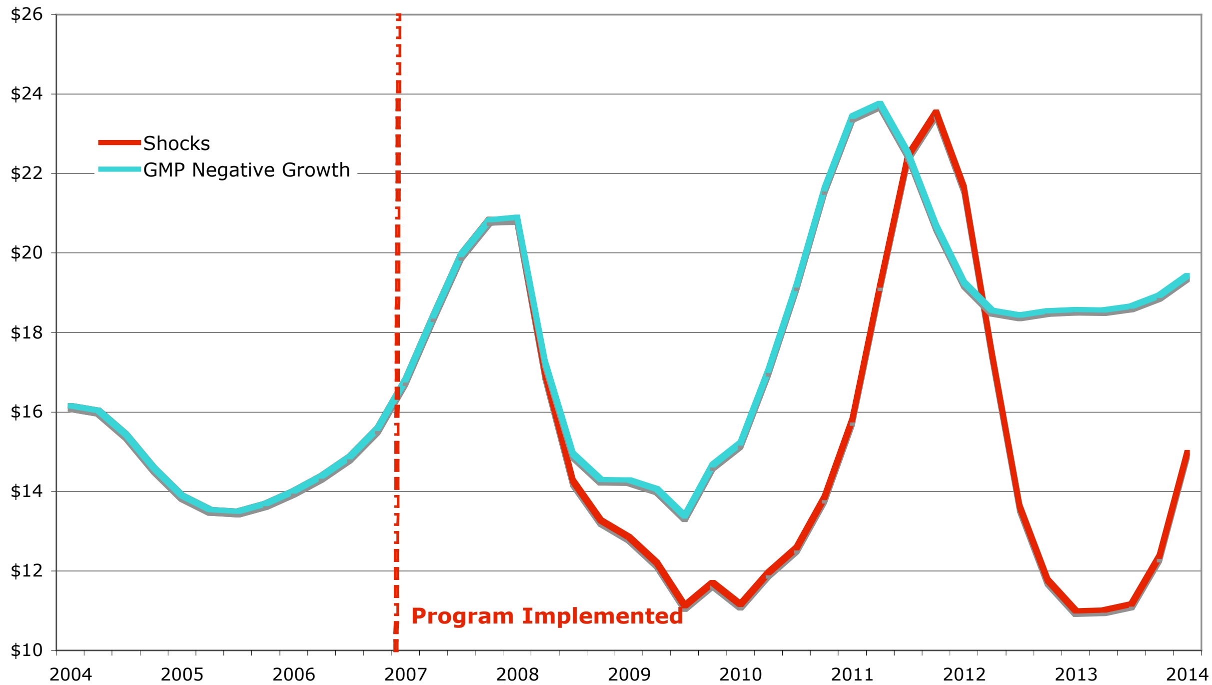
The low value of the market access fee ($0.10 per cwt) when GMP program parameters would be set only once is a reflection of the challenges of minimizing price variability in response to a large drop in dairy product demand. Given the underlying instability due to the demand and feed cost shocks, the volatility-minimizing strategy for the GMP is one of relatively minimal intervention (i.e., a low market access fee and relatively high allowable growth). When the program parameters could be changed each year in response to market conditions, the degree of intervention is somewhat higher, and there are some years in which the allowable growth is zero to minimize price fluctuations.

Results with Negative Allowable Growth

Our initial analyses of the GMP assumed that the allowable percentage increase in milk production would be positive, but this need not be the case. Under rapid reductions in demand growth and feed cost shocks, a GMP might more effectively reduce variation if it required reductions in milk supply. This could be implemented under the GMP by requiring a negative allowable growth in milk production for farms to have qualifying milk. A negative allowable growth essentially rewards producers to cull their herds by a certain percentage. Culling would not be mandatory, but there would be GMP payments for producers who reduce marketings and market access fee payments by producers exceeding the (negative) allowable growth. As an initial examination of the impacts of negative allowable growth under the demand and feed cost shocks, we imposed a rather arbitrary 5% negative allowable growth for two years (2009 and 2010) following the collapse of prices that began in 2008, using a fixed $1.00 per cwt market access fee[10].

Under these assumptions the GMP somewhat reduces variation in the all-milk price (Table 4) and increases the low point of the 2009 price trough by about $2 per cwt (Figure 7). The GMP is simulated to promote faster recovery in prices so that that average all-milk price through 2014 increases by $3.18 per cwt compared to the simulation without the GMP. Stabilization of volatility begins somewhat earlier in 2012 compared to the scenario with the GMP that did not assume negative production growth.

Figure 7. Baseline with Feed and Demand Shocks and GMP with Negative Allowable Growth



[10] The allowable growth was 2.5% per year for years other than 2009 and 2010. These parameter values were chosen to provide simple examples of the impacts of negative allowable growth and undoubtedly are not the choices that might minimize price variation. Future work could more fully examine the potential for this type of approach under the GMP.

Table 4. Simulated Outcomes of the GMP with Demand and Feed Cost Shocks With Negative Allowable Growth

	Baseline	18 Months of Negative Allowable Growth
Market Access Fee, $/cwt	--	1.00*
Allowable Growth, %/year	--	0.1%*
Refund, Qualifying Milk, $/cwt	--	2.64
Average All Milk Price, $/cwt	15.34	18.52
Coefficient of Variation, %	26.0%	16.0%

**indicates varies over time*

Summary

The Growth Management Plan proposed by the California Milk Producers Council would provide incentives for limiting growth in milk production with the objective of moderating milk price volatility. The GMP as proposed would be a national, mandatory program that would levy a market access fee on all milk if a facility's milk production in the current quarter exceeds an allowable percent growth in milk production from the year-earlier quarter. Facilities that did not exceed the allowable growth would receive a per hundredweight payment for their "qualified milk" from the national pool of dollars collected as market access fees.

A detailed dynamic model of the U.S. dairy industry was used to determine combinations of market access fees and allowable growth levels to minimize price variability under three different market conditions. Our analyses indicate that implementation of a GMP could decrease milk price volatility, particularly cyclical price variation that occurs in the absence of major cost or demand shocks. For example, cyclical milk price variation could be moderated with an annually-adjusted market access fee averaging 35 cents per hundredweight and an average allowable annual growth of 1.4% (Table 1).

Economic shocks, such as dramatic feed price increases or changes in export demand, are unexpected sources of milk price volatility that influence the timing and amplitude of price cycles. A GMP is not as effective at reducing price volatility due to shocks as it is for cyclical volatility, but could moderate price volatility in the face of these events and hasten price recovery.

In addition to the impacts on price variability, the GMP had the effect of enhancing average all-milk prices compared to the situation with no GMP for all of the scenarios modeled, sometimes by substantial amounts. This price enhancement is not a stated objective of the GMP, but would undoubtedly be attractive to many dairy producers. However, price enhancement of the magnitude suggested by our analyses may have a variety of unintended consequences, including capitalization into other asset values (land and cows, for example), reductions in sales and margins of processors, impacts on the development and use of dairy ingredients and reductions in the competitiveness of US dairy product exports.

Additional Issues

We view this analysis of the GMP as providing a "Proof of Concept". That is, our analyses suggest that under a variety of circumstances such a program would reduce variability in the all-milk price. However, a number of other legitimate questions about the program and its potential impacts have been raised that our analyses do not directly address. These include:

What would be the impact of a GMP on export markets and US dairy product imports? Would more stable dairy product prices allow us to be a more consistent player in export markets, especially if there is a degree of price enhancement? Would price increases be large enough to allow more imports of dairy products into the US, given that we still have some significant trade barriers in place? What products might be most affected?

Will there be WTO issues with the GMP, given that it would probably not enhance or subsidize US exports? The USITC examined a proposed Refundable Assessment program in 2007[11] and provided an informal determination that it would not be categorized as "domestic support" and would be in the "green box" and consistent with current US obligations under the WTO because it does not rely on public expenditures. The analysts note, however, that this determination "must be tempered in the knowledge that WTO dispute settlement panels are legally opaque and not required to follow prior case precedent..." Moreover, although the Doha round continues to move quite slowly, the GMP may render future changes in US obligations under the WTO more difficult.

Will the expected enhancement move prices above long-run average costs of production? If so, would the benefits of the program be capitalized into higher asset values (for land, cows, etc.)? Is there any way to lower the amount of price enhancement while still lowering variation?

What will be the regional distribution of payments and benefits? (A similar question can be raised for farm sizes.)

If there are significant effects of this program on expansion of milk supply in particular regions, will this create issues for processing companies that want to expand plant capacity? Will it make coordination between producer groups and processors more difficult, or more necessary?

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[11] Memo by John Fry, Lead Analyst and Dan Cook, Analyst, dated June 1, 2007.

What variables would the program managers need to look at to make decisions about whether to adjust the market access fee or the allowable annual growth? As noted above, the analysis allows us to run numerous different scenarios to select these optimally, but program administrators would have to develop their own decision rules (or tools).

To what extent would production bases be transferable among farms, and what would be the impact of different rules in this regard? For example, within family, out-of-family sale of existing facility, move production to new facility (perhaps distant), etc.

How would the program affect prices if it were initiated during a downturn, given that analyses of the program assumed implementation in 2007 when prices were increasing?

Should a GMP and the CWT (Cooperatives Working Together) program be operated simultaneously? How would a GMP affect the operation or effectiveness of CWT?

Who would administer the GMP—USDA, a farmer board or some combination of the two (perhaps with processor and/or consumer representation as well)?

Price risk is clearly a part of our contemporary dairy industry and can be a problem for producers, processors and even consumers. To some degree, price risk can be managed by individuals with futures or forward contracts. However, if the objective of the policy intervention is to moderate price volatility in the marketplace, our initial analysis of the GMP suggests that combinations of an allowable annual growth and a market access fee can achieve this objective.

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Appendix Table 1. Cornell Dairy Sector Models Developed Since the Mid-1990s

Model	Description	Purpose	Base Year
USDSS (Pratt et al., 1997)	Static spatially disasggregated model of US dairy sector with five product categories and two components. No policy elements included. LP model that minimizes assembly, processing and distribution costs.	Identification of normative location values for milk (e.g., indications of location differentials). Has also been used to assess impacts of specific plant closures and changes in location of milk supplies since 1995.	1995; selected updates to 2001 and 2005
Dairy Price Volatility Model (Nicholson and Fiddaman, 2003)	National dynamic (monthly) dairy sector model with detailed product disaggregation, detailed representation of FMMO and DPSP policies. No imports or exports.	Analysis of the origins of price volatility in the US dairy industry and how various policy options would influence price variation.	2001
Dynamic Dairy Product Classification Model (Nicholson et al., 2004)	National dynamic (monthly) dairy sector model with four products and detailed representation of FMMO pricing. No imports, exports or DPSP. Simplified milk supply response.	Analysis of the impacts of the classification of a new dairy product in Class I or Class II on dairy farmer revenues.	2001
Dairy Farm Structural Change Simulator (originally developed by Pagel, 2005)	National dynamic (annual) dairy sector model with detailed representation of farm accounting for four farm size categories and linkages with national dairy markets. Two product categories, simplified representation of Federal Orders, DPSP, DTP, MDP and MILC. No imports or exports.	Assessment of how the DPSP influenced changes in dairy farm structure (number and size of farms) over the period 1972-2004. Has also been used to assess selected options of the current Farm Bill, and was the basis for the analysis of Refundable Assessments (given the need to model farm participation decisions).	1972-2004 data are used for most analyses
CHUNK (Nicholson and Bishop, 2006)	Static market equilibrium model with two US regions, detailed domestic and trade policy representation, detailed product disaggregation and three components. Formulated as Mixed Complementarity Program (MCP).	Analysis of the impacts of milk protein concentrate imports and policy alternatives to address them. Has also been used to assess impacts of the Australia-US free trade agreement and selected changes to classified pricing formulas.	2001
Cornell Dynamic National Dairy Sector Model (Nicholson and Stephenson, 2006)	National dynamic (monthly) dairy sector model with detailed product disaggregation, detailed representation of FMMO, DPSP, trade and MILC policies, explicit component balance, detailed dairy product imports and exports.	Model originally developed to assess dynamic market impacts of increases in whey protein product sales. Has also been used to assess dynamic effects of generic advertising expenditures for fluid milk and cheese and to assess the dynamic impacts of changes in make allowances.	2004