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How Sensitive are the Frequencies and Magnitudes of MPP-Dairy Indemnities?

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Establishment of the Margin Protection Program offers dairy producers a guaranteed margin based on a set formula and fixed premiums for the life of the 2014 Farm Bill. The results of this work provide valuable framework and insight into the frequency, magnitude, and sensitivity of indemnity payments with respect to changes in prices. Current price expectations suggest limited payout expectations during the time period for the baseline scenario. However, the frequency and magnitude of indemnity payments can change significantly if milk and feed costs vary from the baseline scenario.

Key words: 2014 Farm Bill, dairy, margin protection program, safety net, simulation

The evolution of the United States dairy program has taken the American dairy farmer from the Dairy Price Support (DPS) Program, established in the 1949 Farm Act, to now the Livestock Gross Margin (LGM-Dairy) and the Margin Protection Program (MPP-Dairy). The 2014 Farm Bill established MPP-Dairy and continued the LGM-Dairy program established in the 2008 Farm Bill. Producers are permitted to enroll in either or neither program, but not both.

Dairy producers have faced numerous challenges over the years, many of which have stemmed from variability in milk prices and feed costs. Figure 1 below shows this pattern since January 1992 by plotting US All Milk price per hundredweight of milk and the feed cost proxy per hundredweight for a 16% protein dairy feed ration. The range of the all milk price for 2008 through 2014 was 1.2 times greater than it was from 1992 to 2007, and the range of the 16% protein feed ration was 1.3 times greater for the 2008-2014 period than for the 1992 to 2007 period. It was around 2008 that dairy policy tools started shifting towards becoming more margin orientated, as opposed to focusing solely on the price of milk.

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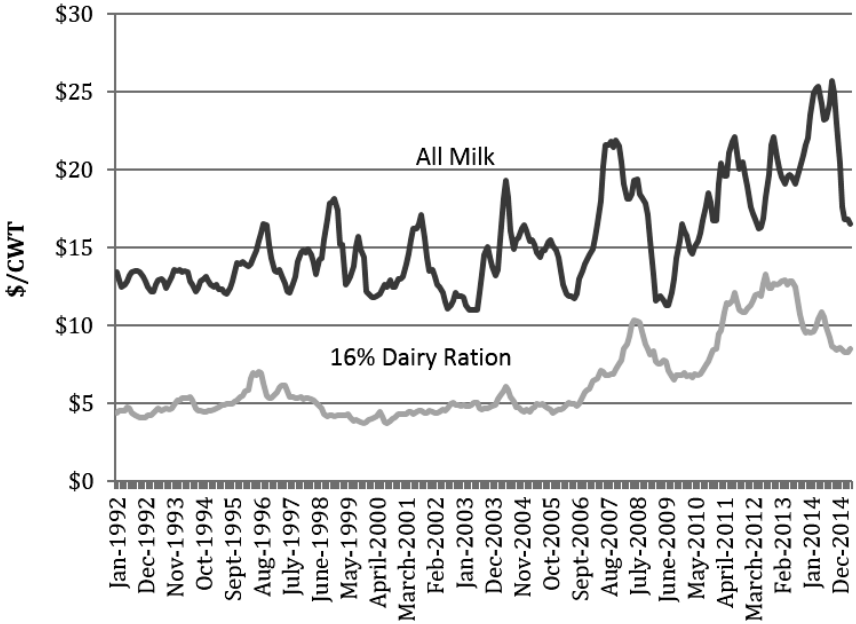

Figure 1: Average U.S. All-Milk and 16% Dairy Ration
Source: USDA/NASS (2015) and Gould (2015)

There is a long history of policy and programs providing some level of protection from this variability. The DPS program supported milk prices through government purchases of surplus dairy products. The Milk Income Loss Contract (MILC) program, which continued to exist until MPP-Dairy became effective in the fall of 2014, provided some level of protection against low milk prices by providing payments to dairy producers when the Boston Class I milk price fell below $16.49/cwt. An adjustment was made to the MILC program in 2008 to incorporate feed costs, which likely represented a movement in the direction of the MPP-Dairy program that was established in 2014.

Outside of the policy arena, futures and options provide an opportunity to manage risk and have been shown to be effective. However, many producers have struggled to become comfortable with their use (Maynard, Wolfe, and Gearhardt, 2005) and scale issues made it difficult for smaller operations to rely heavily on them (Ibendahl, Maynard, and Branstetter, 2002). Scale issues are also often a barrier to using futures and options contracts as smaller producers are challenged by their 200,000 pound contract size (Harwood et al., 1999).

These scaling challenges were one of the primary advantages of the LGM-Dairy program that has been available since the 2008 reinsurance year (October 2007-September 2008). The LGM-Dairy program remains available to producers who do not enroll in MPP-Dairy. LGM-Dairy allows producers to "lock-in" a margin (class III milk futures price minus corn and soybean meal futures prices) that was available on the futures market. Premiums are subsidized and producers have flexibility on the amount of coverage they choose, as well as the scaling of milk and feed quantities. LGM has been found to be an effective risk management tool (Bozic et al., 2012; Bozic et al., 2014; Burdine et al., 2014a; Burdine et al., 2014b), but limited funding has largely prevented producers from fully utilizing it (Wright, 2012). LGM-Dairy was a movement towards a more market oriented approach to risk management as well as a program that aimed to protect dairy producers from declining milk prices and rising feed costs.

The newly established MPP-Dairy was first made available to dairy producers in the fall of 2014. The MPP-Dairy program allows dairy producers the opportunity to protect a calculated margin of milk price over feed costs. The Actual Dairy Production Margin (ADPM) that can be guaranteed is calculated using monthly U.S. all milk price, national corn and alfalfa hay price, and Central Illinois soybean meal price. ADPM is based on a set formula established in the 2014 Farm Bill. The ADPM, as it is defined in the bill is calculated as shown in equation 1,

$$(1) \qquad ADPM_t = M_t - (C_t * 1.0728 + SBM_t * 0.00735 + Alf_t * 0.0137);$$

where during month t, M is the announced all milk price, C is the announced corn price per bushel, SBM is announced soybean meal price per ton in Central Illinois, and Alf is the announced alfalfa hay price per ton. Unlike LGM, producers do not have the ability to modify the assumed feed ratio.

Producers who enroll in the program receive payments when this margin falls below their chosen margin level for a two-month period (Jan-Feb, Mar-Apr, etc). On an annual basis producers will choose their desired margin level that ranges from \$4.00 to \$8.00, in \$0.50 increments. Premiums for the \$4.00 level are \$0 and require only a \$100 enrollment fee each year. Premiums increase for higher coverage levels up to \$8.00 and also increase substantially once covered production exceeds four million pounds per year. Additionally, producers can choose to cover between 25-90% of their production history in 5% increments. The production history is set by the highest annual production level from 2011-2013 (USDA, 2014).

For a historical perspective, with couplet margins calculated using equation 1, the MPP-Dairy margin fell below the \$4.00 level on two occasions between 1992 and 2014, as shown in Figure 2. The first period was from February to July of 2009. The second period was from May to August 2012. Put simply, if available over the time period from 1992-2014, the MPP-Dairy would have paid producers during two short time periods at the catastrophic $4 level, but would have paid out more often at coverage levels above $4.00. The average couplet margin from 1992-2014 was $8.53, which is $0.53 higher than the $8.00 coverage level.

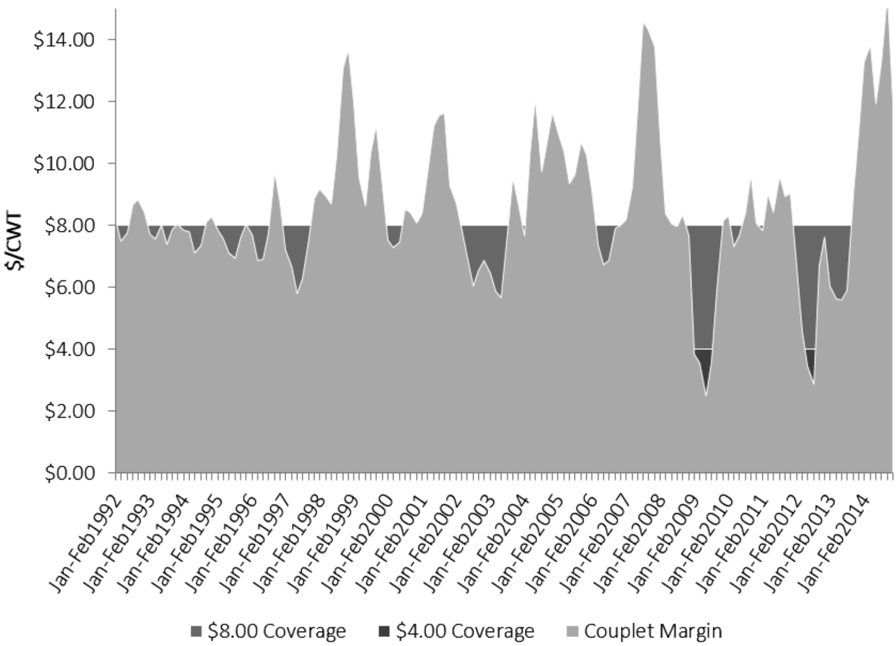

Figure 2: Historical ADPM Couplets Compared to $4.00 and $8.00 Coverage Levels

The initial signup period for participation in MPP-Dairy ended on December 19, 2014. The signup statistics showed that approximately 55% of dairy operations in the United States enrolled in the program for 2015 (USDA/FSA, 2015). For the dairies enrolled in MPP for 2015, approximately 56% of them purchased coverage above the $4.00 coverage level. According to USDA/FSA (2015), this program is estimated to be covering 166.3 billion pounds of milk production with 142.06 billion pounds eligible for payment (85% of total production history). In January 2015 the Congressional Budget Office (CBO, 2015) updated its baseline projections for Farm Programs and MPP-Dairy is projected to cost $3 million in 2015 (CBO, 2015). Annual costs less premiums and administrative fees are forecasted to range from a low of $3 million in 2015 to a high of $90 million in 2018. Over the life of the 2014 Farm Bill, MPP-Dairy is projected to cost

$221 million. CBO projects the U.S. dairy herd to continue to increase in size and for the U.S. All Milk price to fall from a high of $23.66/cwt in 2014 to $17.75/cwt in 2017.

The purpose of this paper is to assess MPP-Dairy from a policy perspective by evaluating the likelihood and magnitude of indemnities over the time period from Jan. 2015 to Dec. 2018. Secondly, comparisons between this study and the CBO's projections are given for the baseline assumptions and three additional price change scenarios during the life of the Farm Bill.

Data and Methodology

Data for this work came from several sources including Understanding Dairy Markets Website, the National Agricultural Statistics Service (NASS), the Agricultural Marketing Service (AMS), and the Food and Agricultural Policy Research Institute (FAPRI) (Gould, 2015; USDA/NASS, 2014; USDA/AMS, 2014; FAPRI, 2014). Data for U.S. All Milk Price and prices received by farmers for corn and alfalfa hay were attained from the monthly Agricultural Prices report. Soybean meal prices in Central Illinois were available in the AMS Market News-Monthly Soybean Meal Price, and forecasts for milk and feed prices were available in the FAPRI August 2014 Baseline Update for U.S. Agricultural Markets.

Analyzing this new policy is more complex than simply considering how it would have worked had it been available on a retroactive basis. FAPRI baseline forecasts were used as a starting point for the analysis in order to project the likelihood of indemnities for MPP-Dairy given current market expectations (Table 1). FAPRI baseline forecasts incorporate current policies into their process, are widely used forecasts, and are easily accessible (FAPRI, 2014). However, these price forecasts are only available on an annual basis and needed to be converted into monthly price estimates. Additionally, baseline prices were only available for all hay rather than alfalfa. To overcome this hurdle, an adjustment factor was created in a similar fashion to monthly index described below, but utilized historical alfalfa and all hay price relationships. Once these conversions were completed, a monthly index was calculated for each of the four commodities and applied to the baseline forecasts for January 2015 through December 2018 to convert annual forecasts into a monthly forecast based on FAPRI forecasts and historical price seasonality.

Table 1: FAPRI Baseline Projections

Year	2014	2015	2016	2017	2018
Milk	$22.80	$19.57	$18.62	$18.44	$18.52
Year	14/15	15/16	16/17	17/18	18/19
Corn	$3.89	$4.09	$4.09	$4.12	$4.21
SBM	$357	$336	$350	$356	$361
Alfalfa[1]	$211	$183	$185	$188	$192

**Source: FAPRI, August 2014*

[1]Alfalfa price is not actually reported in the baseline projects. However, adjustment factors are utilized to adjust the all hay price that is reported to a projected alfalfa price.

Equation 2 outlines how the monthly price index was determined for each of the commodities.

(2) $$x_{cij} = \frac{P_{cij}}{\overline{P_{cj}}},$$

where *x* is the monthly commodity index, *P* is the historical price, $\bar{P}$ is the average yearly price, *c=(milk, corn, SBM, and alfalfa), i=(January,…, December),* and *j=(2007,…,2014).* The time period from 2007 to 2014 was selected due to the increased volatility of milk prices and feed costs relative to the prior time periods, as demonstrated by Newton, Thraen, and Bozic (2013) and in Figure 1. Using the index created, the annual forecasted prices are converted to monthly prices for the four commodities as shown in equation 3:

(3) $$\hat{x}_{cik} = \bar{x}_{cij} * Base_{ck},$$

where $\hat{x}$ is the forecasted monthly price, $\bar{x}$ is the average monthly price index from equation 2, *Base* is the updated annual baseline projection forecast by FAPRI, *c=(milk, corn, SBM, and alfalfa), i=(January,…, December), j=(2007,…,2014),* and *k=(2015,…,2018).* The only caveat to this is that corn, SBM, and alfalfa needed to be converted from monthly marketing year forecasts to monthly calendar year forecasts. This was accomplished by a simple rearranging of the months from marketing to calendar years and applying the same seasonal index approach.

Numerous (Paulson and Schnitkey, 2012; Barnett and Coble, 2012; Paulson, Woodard, and Babcock, 2013) simulation models have been used to evaluate the implications of policy changes as a result of new farm bills. Specifically, MPP-Dairy is evaluated for both the frequency and magnitude of indemnities resulting from program enrollment. The values determined in equation 3 become the monthly forecasts used as the starting point for the simulation analysis. The simulation model that is constructed follows the multivariate empirical framework described by Richardson (2010) and Richardson, Schumann, and Feldman (2008). By utilizing an empirical distribution, we avoid enforcing a specific distribution on the data and limiting the models ability to deal with correlation and heteroskedasticity (Richardson, Klose, and Gray, 2000). Additionally, normality tests reveal the data was not normally distributed so a multivariate normal distribution was eliminated.

The multivariate framework was selected to allow for the historical inter and intra-correlation between milk, corn, SBM, and alfalfa prices to be expressed in the simulated data. This method also allows for the historical relationships between months to be retained as well in the simulated data. Ignoring these correlations in a simulation model would result in the model results either being under or over stated (Richardson, 2010). Specifically, for this situation, a 16x16 correlation matrix is created because there are four variables to be simulated for four years. The simulated data is tested to insure the historical relationships have been maintained in the simulated data for the time period January 2015 to December 2018.

The prices for the time period from January 2007 to December 2014 are utilized to determine the historical correlations and extract the covariance matrix. The covariance matrix is used in conjunction with the values determined in equation 3. Equation 4 illustrates how the prices are generated in the simulation:

(4) $$\tilde{x}_{cik} = MVEMP(\hat{x}_{cik}, \sum \mathbf{P_{cij}})$$

where $\tilde{x}$ is the simulated price for the four commodities for each month 2015-18, value, $\hat{x}$ is the forecasted monthly price, $\sum \mathbf{P}$ is the covariance matrix for historical data, and *i, c, k, and j* are as defined above. For each commodity, 5000 iterations are simulated and ADPM is determined for each iteration using equation 1.

This model is used to evaluate three different *ad hoc* scenarios in addition to the base scenario. The simulation model framework allows for the same random deviates or risk level to be used in each of the scenarios (Richardson, 2010). For the base case, or scenario 1, prices for the four commodities follow the FAPRI baseline projections. In scenario 2, a 20% decrease in the baseline price of milk is evaluated, while baseline commodities prices for corn, SBM, and alfalfa are held constant. An increase in U.S. dairy herd (USDA/ERS, 2014), reduction in exports of dairy products, or other supply shocks could potentially lead to all milk prices falling. Low milk prices are not uncharted waters and as recently as 2009 all milk price averaged $12.83/cwt (USDA/NASS, 2014).

Scenario 3 investigates what might happen if there was a prolonged drought in the U.S. In this scenario, corn and SBM prices are increased 20% and 10%, respectively. Milk and alfalfa prices are held constant at baseline levels. This would not represent the severity of the 2012 drought, but does allow for the evaluation of increasing feed costs above baseline levels. Scenario 4 examines the effect of an extended period of 10% lower than expected milk prices starting in January 2015 and persisting until December 2018.

In an effort to account for the growth/decay of the price shocks utilized in scenarios 2 and 3, the exponential decay function in equation 5 is used.

$$P_c = P_{int} e^{kt} \tag{5}$$

where P is price, *c=(milk, corn, SBM, and alfalfa),* P_{int} represents the initial price, k is the rate of growth/decay, and t is time. Specifically, for this study an *ad hoc* rate of 0.1% per month growth is utilized for scenario 2. This level of growth is selected because All Milk prices tend to be less volatile than other milk prices so we expect prices to increase slowly. Furthermore, the milk price shock is assumed to occur in August 2015. The stated growth factor will then allow the All Milk price to grow on a monthly basis until it returns to the FAPRI forecasted level. For scenario 3, it is assumed the feed price shock will take place in July 2015 and have a decay rate of 0.25%. Corn and soybean meal prices tend to have increased volatility, so we are allowing them to adjust back to forecasted levels quicker than All Milk price. As with All Milk price, corn and soybean meal prices will decay on a monthly basis until they return to the FAPRI forecasted level.

Utilizing the 5,000 iterations of the simulation, the magnitude of the average indemnity for each scenario and each couplet over the time period, January 2015 to December 2018, was evaluated for the \$4.00, \$6.00 and \$8.00 coverage levels. Average indemnity cost is determined by equation 6:

$$IC_{ys} = \overline{\sum_{m=1}^{n} (L_y - \widetilde{x_{cik}})_s}, \tag{6}$$

where IC is the average indemnity, L is the coverage level, $\tilde{x}$ is from equation 4, *y=(\$4.00, \$6.00, and \$8.00)* coverage levels, *s=(1,2, 3, and 4)* scenarios, *m=(1,…,5,000)* iterations, and *c,i,k* follow above definitions. Calculating the average indemnity for each of the scenarios allows for a comparison between premium payments and estimated indemnities received by participants. Annual premiums set in the 2014 Farm Bill for three coverage levels (\$4.00, \$6.00, and \$8.00) are considered in this paper. Finally, net payouts from MPP-Dairy are estimated annually over the time period from January 2015-December 2018 for each scenario and coverage level by subtracting premiums paid annually from indemnities received. This allows for an estimation of net payout for each cwt of milk covered at each coverage level for each of the four scenarios examined by year.

The comparison of the cost of MPP-Dairy to CBO projections is carried out by utilizing net payouts for each of the four different scenarios previously described assuming participation statistics available through the U.S. Department of Agriculture (USDA), Farm Service Agency (FSA) for 2015. Specifically, production history information is used for pounds eligible for payments published on April 9, 2015 (USDA/FSA, 2015) which provides the pounds of milk eligible for payment for all coverage levels ($4.00-$8.00) and percentages (25%-90%). One limitation of this data is that pounds eligible for payment are summed for coverage level by margin level such that the distribution of coverage level is unknown. However, the most important component for program cost determination is what margin level was selected and this information is available.

One other important piece of information that is not known is the share of pounds that were insured above and below the four million pound level. While indemnities are the same per hundredweight, higher premium levels on covered production exceeding four million pounds result in lower net payouts as more total premium is collected. Given this uncertainty, two payout estimates are made to provide some perspective on the sensitivity of net payouts to the proportion of pounds covered at the higher premium levels. The first estimate assumes that all pounds were covered at levels below the four million pound threshold. This would result in minimum premium levels being paid and therefore can be considered an upper-bound cost estimate given current enrollment. The second estimate assumes that 50% of pounds were covered at the higher premium level and 50% of premiums were covered at the lower premium level. Given the lower premiums available for covered production under four million pounds and the fact that large producers can cover up to the four million pound level at the lower rate, it is likely that this second estimate can be considered a lower-bound cost estimate for the program. Finally, a limitation of this work should be recognized in that enrollment for 2015 is utilized for cost estimation throughout the life of the program. However, given the nature of annual enrollment it is very likely that participation will grow and producers will choose higher coverage levels and percentages as market conditions change in the future. Therefore, the estimates in this study will understate the costs of the program after the first year should increases in participation be seen.

Results

The utilization of this multivariate empirical framework allows us to simulate the projected couplet margins for the duration of the 2014 Farm Bill and determine the frequency with which these couplet margins fall below three selected coverage levels ($4.00, $6.00, and $8.00). It also allows for net indemnities to be estimated and total costs to be compared to the CBO's projected baseline costs of the program. This simulation model also allows for the historical inter and intra correlations of the data to be maintained in the simulation data. This has been tested for each of the simulated datasets and all datasets were found to have correlation matrices that are not significantly different from the historical data.

Average couplet margins are calculated in dollars per hundredweight of milk for each of the four scenarios and shown in Table 2. Standard deviations, minimums, and maximums are also show per hundredweight of milk. For scenarios 1 through 3, annual average couplet margin is expected to be above the $8.00 coverage level, except for 2016 in scenario 2. However, for scenario 4 it is expected that average annual couplet margins for 2016-2018 will fall below the $8.00 margin offered by MPP-Dairy, after 2015.

Table 2: Summary Statistics for Couplet Margin Simulation

	Year	Mean ($/cwt)	St. Dev.	Max ($/cwt)	Min ($/cwt)
Scenario 1	2015	$10.36	$2.62	$20.12	$0.26
	2016	$9.13	$2.57	$18.67	($1.57)
	2017	$8.85	$2.54	$18.16	($0.23)
	2018	$8.79	$2.54	$18.87	($2.44)
Scenario 2	2015	$8.39	$2.30	$16.88	($1.84)
	2016	$7.63	$2.23	$15.91	($1.02)
	2017	$8.85	$2.55	$18.12	($2.05)
	2018	$8.79	$2.51	$18.35	$0.37
Scenario 3	2015	$9.79	$2.42	$18.69	$1.02
	2016	$8.99	$2.62	$19.45	($1.04)
	2017	$8.85	$2.54	$18.93	($0.30)
	2018	$8.79	$2.54	$18.31	($0.50)
Scenario 4	2015	$8.40	$2.39	$16.75	($1.25)
	2016	$7.26	$2.34	$16.19	($2.74)
	2017	$7.01	$2.34	$15.14	($1.35)
	2018	$6.93	$2.34	$15.91	($1.65)

Scenario 1 assumes that mean prices for milk, corn, soybean meal, and alfalfa hay follow the FAPRI baseline projections for the time period. The simulation estimates that 2015 monthly couplet margins will average $10.36, with a high of $12.35 occurring in the Nov-Dec couplet and a low of $9.01 in the Mar-Apr couplet. The average annual couplet margin is expected to decrease throughout the 2014 Farm Bill as FAPRI projects declining milk prices and increasing feedstuff costs. For scenario 1, the simulation model predicts there will be six couplets out of twenty-four that will fall below the $8.00 coverage level and provide an indemnity payment to those producers buying up to the $8.00 coverage level. The six couplets that fall below the $8.00 coverage level occur in the Mar-Apr and May-June couplets for 2016-2018.

Scenario 2 investigates the impact of a milk price shock that occurs in August of 2015. The assumed shock we investigate is a 20% decrease in the expected price of milk that dissipates over the next 17 months. We utilize an exponential function to simulate the slow increase of milk price back to the expected price. Overall, scenario 2 has slightly lower average annual couplet margins compared to scenario 1. For 2016 the model predicts an average couplet margin of $7.63. For this scenario the number of couplets that fall below the $8.00 coverage level increases to 8 over the four year period. The milk price shock that occurred in August of 2015 resulted in a drop in the margin couplet level below $8.00 for six straight couplets starting with the Sept-Oct 2015 couplet.

Average annual couplet margins for scenario 3 fall between scenarios 1 and 2. This demonstrates the sensitivity that MPP-Dairy has to changes in milk price versus changes in feed costs. In scenario 3, corn and SBM prices were increased by 20% and 10%, respectively. The same exponential function is used to decrease the prices of corn and SBM back to projected levels. The only change relative to milk prices is that corn and SBM prices are expected to respond quicker and this is carried out by using a faster rate of decay. For scenario 3 there are seven couplets that are projected to be lower than the $8.00 coverage level. Six of the seven couplets that fall below this level occur in the couplets between March and June.

Scenario 4 examines what would happen if there was a fundamental change in the dairy industry that results in a 10% decrease in the price of milk. Utilizing the FAPRI Baseline projections as a starting point, this drop would result in a price decrease of between $1.84 and $2.28 per hundredweight of milk. The model also predicts that if this scenario were to occur, 15 of the 24 couplet margins evaluated would fall below the $8.00 coverage level. Additionally, under this scenario, the $6 coverage level would be triggered for the first time. If this scenario was to occur and a producer purchased a $6.00 coverage level, a payment would triggered for the first time in Mar-Apr 2017.

In addition to evaluating the couplet margins, we evaluated the frequency of the couplet margins falling below three different coverage levels for each of the different scenarios. Table 3 shows the results of this evaluation. As eluded to in Table 2, there is a relativity low probability of payments at either the $4.00 or $6.00 margin level under the first scenario. For scenario 2 the model predicts there is a 5% or less chance of the $4.00 coverage level payment being triggered. The increased frequency in 2016 is a result of the milk price shock in August of 2015 that persists into the beginning of 2016. Scenario 3 overall has a lower frequency of payments being triggered, which provides evidence that MPP-Dairy is most sensitive to fluctuations in milk prices rather than feed costs. Scenario 4, as expected, has the highest frequency of payments being triggered with frequencies increasing in the later years of the 2014 Farm Bill. FAPRI is predicting increased feed costs in 2017 and 2018 while milk price is forecast to be relatively flat.

Table 3: Average Annual Percentage of Couplet Margin Iterations Below $4.00, $6.00, and $8.00 Coverage Levels

	Year	$4.00	$6.00	$8.00
Scenario 1	2015	1%	5%	18%
	2016	2%	11%	34%
	2017	2%	13%	38%
	2018	3%	14%	38%
Scenario 2	2015	3%	15%	44%
	2016	5%	24%	56%
	2017	3%	13%	38%
	2018	3%	13%	39%
Scenario 3	2015	1%	6%	23%
	2016	2%	13%	36%
	2017	2%	13%	38%
	2018	3%	14%	39%
Scenario 4	2015	3%	16%	44%
	2016	8%	30%	63%
	2017	10%	34%	67%
	2018	10%	35%	68%

From a policy perspective, having a handle on the frequency of payout is important, but the overall cost of the program is going to be more driven by the magnitude of those payouts. Table 4 shows the indemnity cost per hundredweight of milk and the net payout per hundredweight. Net payout is defined as indemnity minus premium costs per hundredweight. This table only considers the premium level for dairies less than four million pounds. For dairies over four million pounds they will have higher premium levels to consider. For simplicity, the $100 enrollment fee is not included in the premium calculation, nor is the subsidy that applies to 2014 and 2015 premiums.

Several key points become evident in Table 4. For scenario 1, the expectation is that indemnities will exceed premiums for all but 2015 at the $6.00 and $8.00 coverage level. This would also be consistent with the expectation of the CBO for MPP-Dairy to only cost $3 million in 2015. CBO also predicts that costs for the program will increase annually throughout the life of the 2014 Farm Bill. This is consistent with our study in that net payout each year to producers increase. In scenario 2, average annual indemnities increase over those in scenario 1. Specifically, it is evident the decrease in milk price will increase net payout for 2015 and 2016, then decrease as the milk price grows back to its FAPRI forecasted level.

Scenario 3 has similar net payout to those found in scenario 1, which is consistent with our expectations that feed cost increases do not impact the magnitude of indemnities as much as decreases in milk prices. The highest net payout scenario evaluated is scenario 4 where milk prices are decreased by 10% for the life of the 2014 Farm Bill. In this scenario, the combination of low milk prices and increasing feed costs create net payouts at the $8.00 coverage level of $1.06 and $1.10 for 2017 and 2018, respectively. While this scenario may be unlikely, it provides perspective on program costs should a significant and prolonged change in milk price occur. Should this happen, program costs would increase well beyond those projected by the CBO.

Some comparisons can be drawn between expected costs predicted by this model and the CBO baseline. Table 5 shows the estimated net costs of MPP-Dairy over the life of the 2014 Farm Bill under all four scenarios. As described previously, the low premium scenario can be thought of as an upper-bound cost estimate while the 50% low premium scenario can likely be thought of as a lower-bound cost estimate. Estimates also assume that MPP-Dairy participation levels remain at 2015 levels for the life of the 2014 Farm Bill. According to initial enrollment statistics for 2015, 166.3 billion pounds production history are enrolled in the program, with 142.06 billion eligible for payments (USDA/FSA, 2015).

Table 4: Average Indemnity Cost per CWT by Year*

Scenario 1						
Indemnities				**Net Indemnity for All Scenarios**		
	$4.00	$6.00	$8.00	$4.00	$6.00	$8.00
2015	$0.00	$0.05	$0.25	$0.00	($0.01)	($0.23)
2016	$0.02	$0.13	$0.55	$0.02	$0.08	$0.08
2017	$0.02	$0.15	$0.64	$0.02	$0.10	$0.17
2018	$0.02	$0.17	$0.67	$0.02	$0.12	$0.20
Scenario 2						
Indemnities				**Net**		
	$4.00	$6.00	$8.00	$4.00	$6.00	$8.00
2015	$0.02	$0.18	$0.74	$0.02	$0.12	$0.27
2016	$0.05	$0.31	$1.09	$0.05	$0.25	$0.62
2017	$0.02	$0.16	$0.64	$0.02	$0.10	$0.17
2018	$0.02	$0.16	$0.65	$0.02	$0.10	$0.18
Scenario 3						
Indemnities				**Net**		
	$4.00	$6.00	$8.00	$4.00	$6.00	$8.00
2015	$0.01	$0.06	$0.33	$0.01	$0.01	($0.15)
2016	$0.02	$0.15	$0.62	$0.02	$0.10	$0.15
2017	$0.02	$0.15	$0.64	$0.02	$0.10	$0.17
2018	$0.02	$0.16	$0.66	$0.02	$0.11	$0.19
Scenario 4						
Indemnities				**Net**		
	$4.00	$6.00	$8.00	$4.00	$6.00	$8.00
2015	$0.03	$0.19	$0.76	$0.03	$0.14	$0.29
2016	$0.08	$0.43	$1.36	$0.08	$0.38	$0.89
2017	$0.10	$0.51	$1.53	$0.10	$0.46	$1.06
2018	$0.10	$0.53	$1.57	$0.10	$0.48	$1.10

* Assumes premiums are not discounted for 2015 and $100 administration fee is not accounted for in this table. The premiums utilized are for less than four million pounds. Negative numbers, represented by parentheses, imply premiums exceed indemnities.

Table 5: Net Costs of MPP-Dairy Program by Scenario*

Scenario	Low Premium	50% Low Premium
Scenario 1	$208,787,321	$20,128,016
Scenario 2	$453,202,907	$264,543,602
Scenario 3	$238,789,711	$50,130,406
Scenario 4	$1,148,416,535	$959,757,230

*Assumes premiums are not discounted for the first two years and $100 administration fee is not accounted for in this table.

Over the study period, we estimate the MPP-Dairy to payout between $208.8 million and $1.15 billion depending on the scenario for the Low Premium case. The low premium estimate for scenario 1 is comparable to the CBO projection of $221 million over the life of the program (CBO, 2015). However, since the number of pounds covered at the higher premium rate is unknown, this cost is likely overstated for the baseline scenario. Of the alternative scenarios evaluated, the highest program cost estimate was associated with scenario 4, the persistent 10% decrease in U.S. all milk price. If something of this nature were to occur, estimated net cost of the program approaches $1.15 billion over the course of the farm bill for the low premium case. Again, this would likely be overstated since some pounds would be covered at the higher premium level. While a persistent price shock such as this is unlikely, these results do speak to the sensitivity of program costs to milk prices. Cost estimates for scenarios 2 and 3 fall between this range, and again suggest that milk price is likely be have more impact on program cost than feed prices as costs for scenario 2 are considerably higher than costs for scenario 3.

Considering the 50% low premium case provides an opportunity to examine a lower-bound cost estimate for the program. Lower-bound cost estimates under the four scenarios range from $20.1 million for the baseline scenario to $959.8 million for scenario 4. Results continue to speak to the fact that persistent changes in milk price are likely to have the largest impact on program cost and that changes in milk price have greater impact than changes in feed costs. Again, as in the low premium scenario, if All Milk and feed prices follow the FAPRI estimates expected cost of the MPP-Dairy program should be below CBO estimates, but costs have the potential to greatly exceed those estimates should prices significantly change.

Conclusions

This work evaluates couplet margin levels, frequency of payments being triggered, magnitude of indemnities, and estimated costs of the MPP-Dairy over the life of the 2014 Farm Bill. The implications of this work are relevant for both dairy producers and policy makers.

Producers have the opportunity to insure fixed margin levels from 2015 to 2018 at fixed premium levels. While dairy margins during the initial signup period were well above available coverage levels, market conditions are likely to be very different during the second signup period from July-September of 2015. MPP-Dairy enrollment statistics indicate that over 50% of dairies in the United States enrolled in the program for 2015 and many purchased coverage beyond the $4.00 level (USDA/FSA, 2015). Based on FAPRI projections made in 2014, producers should expect to see few indemnities from MPP-Dairy over the life of the 2014 Farm Bill. This finding suggests that in the current market environment, the MPP-Dairy does not appear to be an expensive policy program.

Results for alternative scenarios provide insight into the sensitivity of the program to changes in milk price versus changes in feed costs. Scenarios 2 and 4 evaluated MPP-Dairy's sensitivity to milk prices. In scenario 2, a milk price shock was introduced into the model and demonstrated that a 20% decrease in milk price can drive the couplet margins down to levels that would trigger payments. To put this in perspective, a 20% decrease in the baseline would put the All Milk Price in the $15-$16 per cwt range. Scenario 4 evaluated a change in the fundamentals underlying the dairy market and considered a 10% decrease in milk price that persisted over the life of the Farm Bill. This 10% decrease only represents a couple dollars per hundredweight, but would trigger payments for producers at both the $6.00 and $8.00 coverage levels. None of the scenarios evaluated triggered a payment at the $4.00 coverage level, on average.

The frequency of indemnities being triggered was also evaluated. These results further confirmed our findings from the couplet margins. A producer utilizing the minimum $4.00 coverage level has a very small likelihood of receiving any indemnities without market changes. It also confirmed our findings of MPP-Dairy being relatively more sensitive to milk prices compared to feed prices. For example, the 10% decrease in milk price evaluated in this study, resulted in the frequency of triggering a payment increasing to over 60% of the time during 2016 through 2018.

This work suggests that significant decreases in milk prices have the potential to greatly impact indemnities to producers participating in the MPP-Dairy. These indemnities will certainly be much greater at higher coverage levels, which become especially interesting when one considers the annual enrollment stipulation. This allows a producer to adjust their coverage level and percent of coverage based on expected market conditions. While the feed price increases evaluated in this work do not trigger indemnities near that of scenarios 2 and 4, it is worth noting that they do have the potential to trigger a large number of small payouts at the $8.00 level. Based on the first year of signup, many producers selected the catastrophic $4.00 level, as it was offered for only the $100 enrollment fee, regardless of the size of the operation. Furthermore, this would help to guard against decreasing milk prices and rising feed costs that put pressure on the margin from both directions. In short, current market conditions do not suggest that large payments are likely to result from the MPP-Dairy. However, changes in market prices, especially for milk, have the potential to greatly impact the expected payouts to program participants.

It is not surprising that MPP-Dairy program cost estimates from this analysis are largely consistent with CBO projections for the baseline scenario, low premium case. It is very likely that CBO's estimates assumed most covered milk was subject to the lower premium rates and market expectations were near FAPRI projections. However, evaluation of scenarios 2-4 provide evidence that program costs can be greatly impacted as market conditions change. Results also suggest that additional premium collected from high premium levels have limited ability to offset indemnities when market conditions change such that significant indemnities are paid. This is best evidenced by considering scenario 4, which estimates total costs in a range of $960 million to $1.15 billion.

Overall the MPP-Dairy program provides producers with a margin protection program that works similar to insurance. During the initial signup period in fall 2014, the MPP-Dairy program was viewed very much as a catastrophic program that was unlikely to pay. However, as can be seen in figure 1, milk prices fell drastically from fall 2014 to spring 2015. This study demonstrates how those types of unexpected market changes can trigger indemnities and impact the total cost of a program such as MPP-Dairy. FAPRI projections from 2014 suggested limited indemnities from MPP-Dairy and therefore relatively low program costs. However, this work suggests that if prices significantly change and start to trigger indemnities, the only limit to payments would be the coverage levels chosen (i.e. a producer choosing $8.00 coverage could receive up to $8.00/cwt. of milk covered). From a policy perspective, this paper moves the discussion from the expectation of payouts from the MPP-Dairy program towards a discussion of scenarios under which those payment expectations can be expected to change and the implications for program costs.

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