Introduction to the LGM-Dairy Program

LGM-Dairy: A New Risk Management Tool

February 11, 2009
Introduction to LGM-Dairy

- General structure of the LGM-Dairy program
- Derivation of gross margin guarantee
- How is an indemnity determined
- Comparison with bundled option
Livestock Gross Margin Insurance for Dairy (LGM-Dairy)

- Available starting in August 2008
- Protects against unanticipated declines in Gross Margins where
  - Gross Margin = Milk Revenue – Feed Costs

- Purchased from crop insurance agents selling Federal crop insurance products
  - Need to be certified to sell LGM-Dairy products
LGM-Dairy: An Overview

- LGM-Dairy a natural extension of Feeder Cattle and Swine LGM products
  - Uses adjusted Class III, corn, and soybean meal futures prices to determine target expected and actual gross margins
    - Futures prices are adjusted via state and month specific All-Milk and corn basis.
  - 11-month insurance period (10 covered months)
  - Local market price received by producer not used
Who is eligible to purchase LGM-Dairy?

LGM-Dairy eligible states shown in yellow
LGM-Dairy: An Overview

- LGM-Dairy is customizable as to milk covered
  - Upper limit of 240,000 cwt over 10 months
  - Production of approximately 1,500 head with average Wisconsin cow productivity

- Can use LGM-Dairy to insure any month
- Under 1 Contract can insure from 1 to 10 months
- Can stack multiple LGM-Dairy Contracts
  - Cannot exceed certified production capacity
- Can range from 0-100% of expected production
LGM-Dairy: An Overview

- Example of one possible insurance strategy where insurance is purchased in January

Possible Production Months to Cover

<table>
<thead>
<tr>
<th>Jan '09</th>
<th>Feb '09</th>
<th>Mar '09</th>
<th>Apr '09</th>
<th>May '09</th>
<th>Jun '09</th>
<th>Jul '09</th>
<th>Aug '09</th>
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</tbody>
</table>

No Coverage

Purchase at End of Month

Covered Months

- Apr
- May
- Jun
- Oct
- Nov
- Dec

Elected Months to Cover

Insurance Contract Period
LGM-Dairy: An Overview

GMG
Gross Margin Guarantee

AGM
Actual Gross Margin

IND
Indemnity

 EG M
Expected Gross Margin

 DL
Deductible Level

 EM R
Expected Milk Revenue

 EMP
Expected Class III Price

 SMB
State Milk Basis

 ECC
Expected Corn Cost

 ESC
Expected SBM Cost

 TM
Target Marketings

 EF Q
Expected Feed Quantity

 EMP
Expected Feed Cost

 SMB
State Corn Basis

 ECC
Expected Corn Futures

 ESC
Expected SBM Futures

 CME
Actual Class III Price Settlement

 CBOT
Actual Feeds Costs Settlement

 CME
Class III Futures

 SCB
State Corn Futures

 CBOT
SBM Futures

 Policy Rules

 Exogenous Data

 Producer Data/Decision
LGM-Dairy: An Overview

- As implied above, LGM-Dairy can be used to reflect amount and type of feed used
  - Feed must be converted to corn and Soybean Meal (SBM) equivalent
  - Program rules do not specify an amount of corn or SBM used per cwt of milk production
  - Producer supplies expected feed use at sign-up
LGM-Dairy: Definition of Gross Margin

- Definition of Gross Margin
  - Gross Margin = Total Value of Covered Milk – Total Purchased Feed Costs
    - Feed does not actually need to be purchased but valued as if purchased
    - Does not include cost of growing home-grown feed (e.g. labor cost, energy cost, pesticides)
  - Both milk value and feed cost *NOT* based on actual farm prices
    - Milk price used: State All-Milk Price
    - Feed prices used: State Corn Price, U.S. Soybean Meal Price
LGM-Dairy: When Purchased?

- LGM-Dairy purchased within a limited time period at the end of each month
  - Purchased starting at the close of business on the 3rd to last business day of the month
  - Sales period ends on 9:00 AM CDT the following business day
    - Need to develop a system with your insurance agent on how to sign up
  - If expected milk and feed prices not available on RMA website, LGM will not be offered for sale for that insurance period
LGM-Dairy: Expected Price Calculation

January 2009

Average Settle Prices Over These Days for Expected Prices

Purchase Day

Last Business Day
LGM-Dairy: Expected Gross Margin

- Expected Gross Margin for entire contract period determined at sign-up
  - Expected Gross Margin
    - Sum over all contract months of *Expected* Value of Milk – *Expected* Feed Costs
  - *Expected* Value of Milk in a particular month
    - That month’s *Expected* Milk Price x *Expected* Monthly Production
  - *Expected* Feed Costs in a Particular Month
    - That month’s *Expected* Feed Price x *Expected* Amount of Feed Used
LGM-Dairy: Expected Gross Margin

- Expected Gross Margin
  - As long as actual production ends up within 75% of expected production ($EP_i$) no adjustments
  - Should be able to justify $TM_i$

- Expected Feed Use for each month specified by producer at contract sign-up
  - Feed Use adjusted by the % of each month’s production covered by contract, $Cover_i$
LGM-Dairy: Expected Price Calculation

- Above calculations done automatically when accessing RMA Premium Calculator website: www.rma.usda.gov/tools/premcalc.html
  - Purchase data only available at the end of EPM
  - Stays There Until Next Month

- University of Wisconsin LGM-Dairy Premium Calculator updated the day after purchase date
  http://future.aae.wisc.edu/lgm_dairy.html#2
  - More flexible than RMA site to undertake “what-if” type of analyses
  - Historical database of simulated prices
LGM-Dairy: Expected Price Calculation

- Calculation of Expected Prices for Jan. 09 contract
  - 10 Values
  - No problem for Class III with futures contract for every calendar month
  - A problem for Corn and SBM as for some months there are no futures contracts
    - For missing months average of surrounding months used in *Expected Price* calculation
LGM-Dairy: Expected Price Calculation

- January purchase month example
- What contracts used in *Expected Price* calculation?

<table>
<thead>
<tr>
<th>Class</th>
<th>Contract Month</th>
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<tbody>
<tr>
<td>III</td>
<td>Mar, Apr, May</td>
</tr>
<tr>
<td></td>
<td>May, Jun, Jul</td>
</tr>
<tr>
<td></td>
<td>Jul, Aug, Sep</td>
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<td>Oct, Nov, Dec</td>
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<table>
<thead>
<tr>
<th>Corn</th>
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<tr>
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</tr>
<tr>
<td></td>
<td>May, Jul, Jul</td>
</tr>
<tr>
<td></td>
<td>Jul, Sep, Sep</td>
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<tr>
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<td>Sep, Dec, Dec</td>
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<td></td>
<td>Dec</td>
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<table>
<thead>
<tr>
<th>SBM</th>
<th>Contract Month</th>
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<tr>
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<td>Mar, May, May</td>
</tr>
<tr>
<td></td>
<td>May, Jul, Jul</td>
</tr>
<tr>
<td></td>
<td>Jul, Aug, Sep</td>
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<tr>
<td></td>
<td>Oct, Oct, Dec</td>
</tr>
<tr>
<td></td>
<td>Dec</td>
</tr>
</tbody>
</table>
LGM-Dairy: Expected Feed Costs

- We need to convert *Expected* feed use to Corn and SBM equivalents
  - Corn used to account for energy
    - SBM used to account for protein
  - Program rules specify feed equivalents need to be in very broad ranges:
    - Corn: 0.00364–0.02912 tons/cwt
      - 0.13 – 1.04 bu/cwt
    - SBM: 0.000805–0.006425 ton/cwt
      - 1.61 – 12.85 lb/cwt
  - *Each Month’s* feeding rates must be between limits
LGM-Dairy: Expected Feed Costs

- Feed conversion example: 140 bu of oats

- Conversion of oats requires 2 steps
  - Step 1: Convert feed to tons
    - 140 bushels of oats x (32 pounds/bushel of oats)
      X (1 ton/2000 pounds) = 2.24 tons
  - Step 2: Use any acceptable conversion rates for Corn and SBM equivalents
    - 0.120 tons SBM/ton of oats
    - 0.779 tons corn/ton of oats
LGM-Dairy: Expected Feed Costs

- Conversion of oats
  - Step 2 (Continued):
    - ✓ 2.24 tons of oats x 0.120 = 0.2688 tons of SBM equivalents
    - ✓ 2.24 tons of oats x 0.779 = 1.7450 tons of corn equivalents
LGM-Dairy: Expected Feed Costs

- Expected feed use converted to Corn and SBM equivalents
  - As noted above, any reasonable conversion system acceptable to RMA
  - UW *Understanding Dairy Markets* Website has conversion software available with an extensive database of forages and concentrates: future.aae.wisc.edu/lgm-dairy/excel_files/feed_conversions_2.xls
  - Based on 1995 Dairy Reference Manual Data (NRAES Publication #NRAES-63)
LGM-Dairy: Insurance Deductible

- Producer chooses amount of gross margin (Milk Value – Feed Costs) per cwt not covered by contract
  - Referred to as insurance deductible
  - Similar to your auto insurance deductible
  - Allowed to exclude from $0 - $1.50/cwt gross margin from insurance coverage
  - The greater the deductible:
    - The lower the premium
    - You are assuming more risk as deductible portion of your gross margin not guaranteed
LGM-Dairy: Indemnity Determination

- LGM-Dairy defines indemnity as:
  - Indemnity = Max[0, Total GMG – Total AGM]
    - Total refers to sum over all contract months
  - If Total GMG > Total AGM → An indemnity is paid
  - Evaluate indemnity after last covered month’s actual prices are available
A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

- As noted above, LGM-Dairy similar to a bundled option

- How do LGM-Dairy costs compare to the costs of setting a similar revenue floor via use of Class III puts and Corn/SBM calls?

- Difficult to compare given lumpiness of options
  - Assume options perfectly divisible
  - Compare costs under alternative deductible levels
  - Use data for January 2008 LGM-Dairy contract given availability of actual price data
A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

- Farm Characteristics
  - 250 Milk Cows
  - Average Cow Productivity: 19,815 lbs
    - 2007 WI 200-499+ Herd Size Category Average
  - 41,481 cwt produced over 10 months

- Insurance Contract Purchased on January 29th
  - 10-Month Insurance Period: Mar `08 – Dec `08
  - Amount of Feed Expected to be Used
    - 966 Tons Corn Equivalent
    - 213 Tons Soybean Meal Equivalent
  - Insure 100% of Production
A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

- Procedure for determining option premium costs
  - Use expected prices observed on January 29\textsuperscript{th} to determine nearby option
  - To determine ending option value we use final settle price of futures contract
    - For missing months, we use the futures contract on last business day prior to the 15\textsuperscript{th} of the missing month(s)
## Expected Prices for Jan. 2008 LGM-Dairy purchase

<table>
<thead>
<tr>
<th>Month</th>
<th>Expected Prices</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Class III ($/cwt)</td>
</tr>
<tr>
<td>Mar '08</td>
<td>17.08</td>
</tr>
<tr>
<td>Apr '08</td>
<td>16.40</td>
</tr>
<tr>
<td>May '08</td>
<td>16.17</td>
</tr>
<tr>
<td>Jun '08</td>
<td>16.11</td>
</tr>
<tr>
<td>Jul '08</td>
<td>16.28</td>
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<tr>
<td>Aug '08</td>
<td>16.46</td>
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<td>Sep '08</td>
<td>16.62</td>
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<td>Oct '08</td>
<td>16.38</td>
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<tr>
<td>Nov '08</td>
<td>16.21</td>
</tr>
<tr>
<td>Dec '08</td>
<td>16.20</td>
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</table>
## A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

### Puts and Calls on January 29, 2008

<table>
<thead>
<tr>
<th>Month</th>
<th>Class III Put ($/cwt)</th>
<th>Class III Premium ($/cwt)</th>
<th>Corn Call ($/bu)</th>
<th>Corn Call Premium ($/bu)</th>
<th>SBM Call ($/Ton)</th>
<th>SBM Call Premium ($/Ton)</th>
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<tbody>
<tr>
<td>Mar `08</td>
<td>17.00</td>
<td>0.65</td>
<td>5.00</td>
<td>0.1775</td>
<td>340</td>
<td>11.60</td>
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<tr>
<td>Apr `08</td>
<td>16.50</td>
<td>0.84</td>
<td>5.10</td>
<td>0.3275</td>
<td>340</td>
<td>23.10</td>
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<tr>
<td>May `08</td>
<td>16.25</td>
<td>0.92</td>
<td>5.10</td>
<td>0.3275</td>
<td>340</td>
<td>23.10</td>
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<td>Jun `08</td>
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<td>5.20</td>
<td>0.4137</td>
<td>350</td>
<td>25.25</td>
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<tr>
<td>Jul `08</td>
<td>16.25</td>
<td>1.00</td>
<td>5.20</td>
<td>0.4137</td>
<td>350</td>
<td>25.25</td>
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<td>Aug `08</td>
<td>16.50</td>
<td>1.14</td>
<td>5.20</td>
<td>0.4912</td>
<td>340</td>
<td>27.25</td>
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<td>Sep `08</td>
<td>16.50</td>
<td>1.14</td>
<td>5.20</td>
<td>0.4912</td>
<td>340</td>
<td>27.25</td>
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<td>Oct `08</td>
<td>16.25</td>
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<td>0.5537</td>
<td>330</td>
<td>26.75</td>
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<td>Nov `08</td>
<td>16.25</td>
<td>1.30</td>
<td>5.10</td>
<td>0.5537</td>
<td>320</td>
<td>30.40</td>
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<tr>
<td>Dec `08</td>
<td>16.25</td>
<td>1.35</td>
<td>5.10</td>
<td>0.5537</td>
<td>320</td>
<td>30.40</td>
</tr>
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</table>

Note: The values in green correspond to the following months options given that options are not available for these months.
## A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

- We can compare the *net costs* of the two programs

<table>
<thead>
<tr>
<th>Month</th>
<th>Class III Put ($/cwt)</th>
<th>Corn Call ($/bu)</th>
<th>SBM Call ($/Ton)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Put</td>
<td>Actual Class III</td>
<td>Put Value</td>
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<tr>
<td>Mar '08</td>
<td>17.00</td>
<td>18.00</td>
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<td>Apr '08</td>
<td>16.50</td>
<td>16.76</td>
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<td>May '08</td>
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<tr>
<td>Jun '08</td>
<td>16.00</td>
<td>20.25</td>
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<td>Sep '08</td>
<td>16.50</td>
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<td>16.25</td>
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<td>Nov '08</td>
<td>16.25</td>
<td>15.51</td>
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<td>Dec '08</td>
<td>16.25</td>
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<td>0.97</td>
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### A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

We can compare the *net costs* of the two programs

<table>
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<tr>
<th></th>
<th>Gross Cost</th>
<th>Gross Cost/Cwt</th>
<th>Net Cost</th>
<th>Net Cost/Cwt</th>
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<tbody>
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<td><strong>Put/Call Options</strong></td>
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<tr>
<td>$0 Deductible</td>
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<td>$1.524</td>
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<tr>
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<td>$55,301</td>
<td>$1.333</td>
<td>$24,898</td>
<td>$0.600</td>
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<td><strong>LGM-Dairy</strong></td>
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<tr>
<td>$0 Deductible</td>
<td>$36,107</td>
<td>$0.870</td>
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<td>$12,144</td>
<td>$0.293</td>
<td>$12,144</td>
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</table>

Note: Under the options based strategy we reduce the options costs by the % reduction in GMG observed under the LGM-Dairy scenarios.
LGM-Dairy: Summary

- LGM-Dairy a flexible insurance program
  - Need not insure all months or all production
    - Could make sense to overlap contracts

- Can be thought of as a combination of use of Class III Put and feed price Calls
  - Premium may be considered reasonable
  - Premiums are sensitive to deductible chosen

- LGM-Dairy Drawbacks
  - Short sign-up window at the end of each month
  - Total contract premium due at sign-up
Livestock Gross Margin Insurance for Dairy Cattle

This section of our website provides information concerning the Livestock Gross Margin for Dairy (LGM-Dairy) program made available by the Risk Management Agency of USDA. The site will be under construction over the next few months as new information becomes available and related new materials are added. Please come back often to see what's new.

As with other sections of this website by clicking on an active link, you may generate an expanded menu. To make this menu disappear, click on the link again. If you have material that you think you would find useful please contact Prof. Brian W. Gould with your suggestions.

The material contained within this site is for informational and research purposes only. The official website concerning material related to the Livestock for Gross Margin for Dairy program is the USDA Risk Management Agency website (http://www.rma.usda.gov).

- **Background Material Made Available by the RMA**
  This is a collection of information provided by USDA as to introduce the LGM-Dairy program

- **Supporting Software**
  This is a collection of spreadsheet and other software used to exemplify the use of LGM-Dairy

- **Underlying Data**
  This is a collection of data used in the implementation of LGM-Dairy

- **Additional Material Explaining LGM-Dairy**
  Background Material Related to LGM-Dairy

http://future.aae.wisc.edu/lgm_dairy.html