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# Assessing Livestock Gross Margin for Cattle

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Livestock Gross Margin (LGM) insures the feeding margin on finishing cattle and swine. This pilot program is sponsored by the Risk Management Agency (RMA). Private insurance companies first offered LGM covering cattle in South Dakota and major feeding states in late January of 2006.

LGM determines the expected feeding margin adjusted by basis tables that vary by state and month. The program's features can be complicated, but it is a viable insurance product that deserves consideration. Using this guide, producers can decide whether LGM-Cattle is appropriate to manage risk and whether it is more cost-effective than other tools. More information on LGM-Cattle is available from the RMA and the insurance industry.

## Overview and availability

LGM-Cattle covers the feeding margin only; it does not cover production risk such as death loss or poor feeding performance.<sup>1</sup> LGM-Cattle places a floor price under the margin—the difference between the value of fed cattle and a combination of feeder cattle and corn values. Coverage is similar to Livestock Risk Protection (LRP)—another pilot program—and put options. Producers cannot purchase LGM-Cattle and LRP on cattle simultaneously.

LGM-Cattle insurance only applies to the finishing margin on cattle. As such, it may be attractive as a tool for those who retain ownership or are considering doing so in the future. Cattle feeders and commercial feedlots may also be interested in LGM-Cattle.

LGM-Cattle has two different types of endorsements, one for those finishing yearlings and another for those finishing calves. Coverage for yearlings is designed for producers with 750-lb feeder cattle to be finished to 1,250 lb. Coverage for calves is designed for 550-lb feeders to be finished to 1,150 lb.



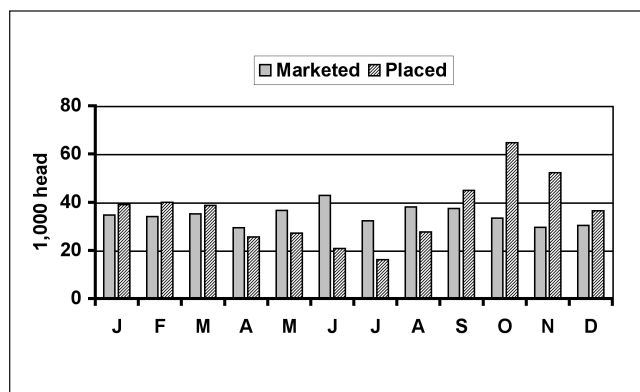
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National Agricultural Statistics Service (NASS) data shows a weak seasonal pattern in fed cattle marketings in South Dakota for large feedlots (Fig 1). However, the marketings mainly follow the strong seasonal pattern of placements, which peak in October (presumably with calves). Marketings by all South Dakota feedlots totaled 683,000 head in 2005.

Producers choose a deductible (from \$0 to \$150 per head) at costs announced by RMA before sales occur. A recent survey (Fields and Gillespie 2003) found that cattle producers look favorably on livestock insurance and prefer products with low deductibles. The \$0 deductible of LGM-Cattle is distinct from the lowest deductible available using LRP, which is at least 5% of the coverage price.

Coverage can be purchased during a narrow 24-hour sales window at the end of a month to cover cattle that will be finished over the next 11 months. Producers can insure up to 5,000 head per insurance period. There is no minimum number to insure.

Fig 1. Average placements and marketings in South Dakota, 2001-2005.



Source: USDA-NASS

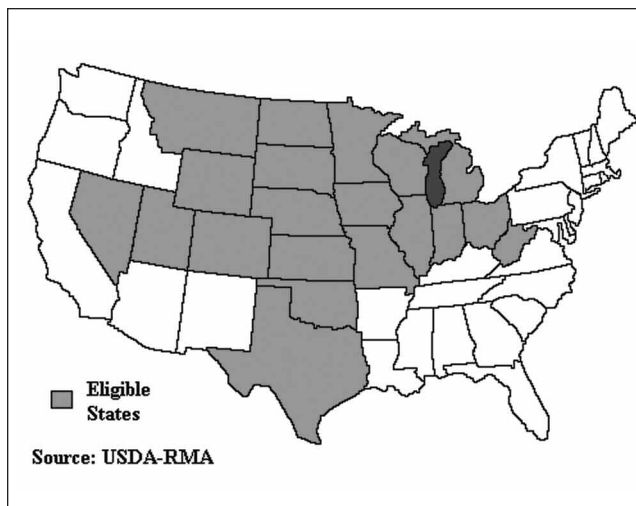
Producers who want basic policy information should contact a crop insurance agent licensed to sell LGM. In addition, the RMA website has a section dedicated to livestock products, <http://www.rma.usda.gov/livestock>. Of note are the policy, underwriting rules, a long handbook with details on necessary forms and paperwork geared to insurance agents, an endorsement (which gives the state-level basis by month), and a question and answer bulletin. Special provisions are also listed in actuarial documents. A link to a quotes site is also available.

LGM-Cattle is available to producers in major feeding states (Fig 2) who meet certain regulatory requirements. Based on early sales activity, adoption of the program has been slow. RMA reported that producers in four states with 23 policies covered 2,741 head of cattle on the initial sales day. Since then, producers in

10 states have paid premiums on 141 policies covering 25,655 head (Table 1). As of July 6, 2006, 11 policy holders received indemnity payments of \$98,020.

In South Dakota, nine LGM-Cattle policies covered 823 head. To put the South Dakota sales in perspective, producers bought 13 LRP-Fed Cattle policies covering 2,016 head and 230 LRP-Feeder Cattle policies covering 27,864 head in fiscal year 2006.

Fig 2. States eligible for Livestock Gross Margin Cattle program.



### Margin example

The expected margin follows a formula dependent on whether the coverage is for yearlings or calves. The LGM-Cattle margins are computed for a given selling month  $t$  as follows:

**Expected margin (yearlings)<sub>t</sub> =**

$$12.5 \text{ cwt} * \text{Basis-Adjusted Live Cattle}_t - \\ 7.5 \text{ cwt} * \text{Basis-Adjusted Feeder Cattle}_{t-5} - \\ 57.5 \text{ bu} * \text{Basis-Adjusted Corn}_{t-2}$$

**Expected margin (calves)<sub>t</sub> =**

$$11.5 \text{ cwt} * \text{Basis-Adjusted Live Cattle}_t - \\ 5.5 \text{ cwt} * \text{Basis-Adjusted Feeder Cattle}_{t-8} - \\ 54.5 \text{ bu} * \text{Basis-Adjusted Corn}_{t-4}$$

The live cattle, feeder cattle, and corn prices for a given month are the respective average futures prices from the last three trading days of that month. In non-contract months the commodity price is calculated using a weighted average of surrounding contract month prices. Basis adjustments are then used to modi-

fy prices to the relevant state level. The basis levels for South Dakota are shown in Table 2. These basis levels apply when the coverage is purchased and when the policies settle. They are subject to change in future coverage endorsements.

In early 2006 producers were able to purchase LGM for yearlings (placed on feed in May) expected to be finished in October (using corn priced in August). The October Live Cattle (Oct LC) and May Feeder Cattle (May FC) futures prices can be observed directly.

Table 1. LGM-Cattle sales activity, FY2006.

State	Policies earning premiums	Head covered
Iowa	92	15,273
Kansas	4	3,300
Michigan	1	100
Minnesota	2	470
Missouri	1	17
Nebraska	22	2,613
North Dakota	3	840
Oklahoma	4	1,951
South Dakota	9	823
Wisconsin	3	268
Total	141	25,655

Source: RMA Summary of Business Report generated July 6, 2006

Table 2. Monthly LGM-Cattle basis adjustments for South Dakota.

	J	F	M	A	M	J	J	A	S	O	N	D
Fed (\$/cwt)	7.00	4.28	4.00	3.90	4.11	5.49	3.11	4.80	4.88	<b>8.59</b>	8.60	7.52
Yrlg (\$/cwt)	5.08	4.41	5.42	4.73	<b>2.29</b>	2.17	-1.53	-1.26	-0.30	3.17	3.64	3.54
Calf (\$/cwt)	10.09	9.39	11.06	10.53	8.35	9.50	5.88	6.13	6.01	7.23	7.83	8.63
Corn (\$/bu)	-0.40	-0.39	-0.39	-0.37	-0.42	-0.30	-0.33	<b>-0.32</b>	-0.37	-0.46	-0.46	-0.36

Source: USDA-RMA (Commodity Exchange Endorsement, January 25, 2006)

Table 3. South Dakota yearlings to be finished and sold in October.

Formulas	Prices in January	Values (per head)
12.5 cwt * Oct LC + Basis	12.5 cwt * \$87.45 + \$8.59	\$1,200.50
- 7.5 cwt * May FC + Basis	- 7.5 cwt * \$111.20 + \$2.29	- \$851.18
- 57.5 bu * Aug Corn + Basis	- 57.5 bu * \$2.42 - \$0.32	- <u>\$120.75</u>
	Approximate Margin (per head)	\$228.57

The August corn price (Aug Corn) is an average of the July and September corn futures prices in January. The basis levels are those shown in italics in Table 2.

The approximate margin is \$228.57 per head in this example (Table 3). The expected margin, as reported by RMA, from January 31, 2006, was \$228.35 (Table 4). LGM-Cattle insurance can be purchased with deductibles that range, in \$10 increments, from \$0 to \$150 per head. The insurance premiums vary by coverage type, month, and deductible level (Table 4). For example, the cost for the coverage on cattle to be finished and marketed in October was \$42.00 per head. Indemnity payments are made by the insurance company as margin losses are incurred.

As mentioned above, producers and insurance agents can only obtain the official premium levels on the day coverage is available at the RMA website. However, approximate quote levels are available in advance to help producers choose among LGM-Cattle and other tools. Iowa State University maintains a premium estimator on the Center for Agricultural and Rural Development website, <http://www.card.iastate.edu/>, which can be used to approximate LGM premiums. The estimator prompts

users for deductible, type, state, and program. Based on current futures prices, the estimator adjusts for basis and returns approximate quotes for coverage.

### LGM-Cattle margin vs. farm-level margin

People in the insurance industry and Extension have questioned the relevance of the basis tables. At issue is whether the basis levels (by state and month) accurately reflect the expected difference between cash prices and futures prices. Accuracy matters from the standpoint of matching a producer's feeding budget and sales expectations to the LGM-Cattle coverage. Inaccurate basis levels may confuse insured or potentially insured producers about the scope of coverage obtained or available.

For example, the approximate expected margin was computed with prices from January 31, 2005 (Table 5). The approximate ending margin was computed using the October Live Cattle futures close, the May Feeder Cattle futures close, and the average of the July corn futures close and the August 31 close of the September corn futures contract. The farm level margin components represent what the margin likely was in

Table 4. Monthly South Dakota coverage levels and premium costs (for a \$0.00 deductible) for January 2006.

	<b>M</b>	<b>A</b>	<b>M</b>	<b>J</b>	<b>J</b>	<b>A</b>	<b>S</b>	<b>O</b>	<b>N</b>	<b>D</b>
<b>Calf Finish (\$/head)</b>										
Margin	385.67	367.10	305.06	273.88	231.14	245.20	264.96	329.14	332.70	320.29
Premium	22.00	30.00	31.00	35.00	34.00	38.00	38.00	42.00	44.00	49.00
<b>Yearling Finish (\$/head)</b>										
Margin	221.90	195.23	166.53	140.60	121.63	131.10	150.30	228.35	233.98	255.70
Premium	23.00	32.00	32.00	37.00	32.00	37.00	41.00	42.00	40.00	46.00

Source: RMA

Table 5. 2005 margin-component prices for similar coverage in South Dakota.

<b>Component</b>	<b>Expected margin</b>	<b>Ending margin</b>	<b>Farm-level margin</b>
Fed Cattle (\$/cwt)	90.99	97.09	86.44
Feeders (\$/cwt)	101.84	113.43	117.21
Corn (\$/bu)	1.84	1.92	1.80
(\$/head)	267.78	252.50	97.93

Sources: USDA and LMIC

South Dakota, because the fed cattle price is from Agricultural Marketing Service for Sioux Falls in October, the feeder cattle price is the average of feeder cattle sales in South Dakota during May, and the corn price is the National Agricultural Statistics Service price for August.

The basis on fed cattle is particularly difficult to reconcile with conventional wisdom in South Dakota. Using the Sioux Falls fed cattle market as a benchmark, the basis vs. the nearby futures contract (October) is -\$3.05/cwt and the 5-year average basis is -\$1.71/cwt. Thus, the fed basis used for LGM-Cattle grossly overstates the margin.

This should not be a deciding factor in choosing LGM-Cattle over other products. The issue is whether the premium cost is tied to the margin level in addition to the margin risk.

### Cost of LGM vs. puts

When comparing the cost of LGM coverage to other risk management tools—put options, LRP, etc—a producer should evaluate which margin components present risk. A producer who already owns yearlings and/or corn will not face the same margin risk as a producer who seeks to purchase yearlings and/or corn. Similarly, while it is possible to purchase LGM coverage before owning yearlings and/or corn, the standard practice is to consider managing risk once the yearlings (at least) are purchased.

In other words, producers should determine what aspects of margin risk they are exposed to and how long a coverage duration they need.

Another consideration when evaluating LGM coverage is its cost relative to put options on live cattle

futures. Put options are a standard tool producers use to cover against downside price risk when feeding cattle. The cost of option coverage is set in the open market so the cost of risk protection changes continuously. The cost of LGM coverage is based on actuarial costs of insuring against margin risk.

Hence, the cost of LGM-Cattle and put options may be quite different and producers should be alert to pick the most cost-effective alternative.

To demonstrate how costs differ, consider the LGM-Cattle quotes from January 31, 2006 (Table 6). Several quotes are listed as costs for put option coverage (adjusted as described below) from the close of trading at the Chicago Mercantile Exchange on the same date. LGM-Cattle quotes are listed for cattle to be marketed in March, July, and October of 2006 for \$0 deductible and \$50 deductible levels. LGM coverage ends at the end of the calendar month; for example, the March coverage ended on March 31, 2006. Note also that the cost of LGM coverage declines as the deductible increases.

Put option coverage needs to match the ending date and deductible level to compare its cost to LGM-Cattle coverage.<sup>2</sup> The April Live Cattle option contracts expired on April 7, 2006. Back on January 31, 2006, the put option closest to at-the-money had the strike price of \$91.00/cwt and settled at \$2.10/cwt.

Volatility is a measure of the returns risk of holding the underlying futures contract until the option's maturity date. The larger the volatility, the higher the option's premium cost. The implied volatility was 15% on January 31, 2006.

If the maturity of the April option is adjusted to March 31, that effectively lowers the cost of coverage. Similarly, the strike price, adjusted to match the futures

Table 6. Cost comparison between LGM and put options on live cattle futures from January 2006 (\$/head).

Deductible	March		July		October	
	LGM	Put	LGM	Put	LGM	Put
\$0	23	28	32	43	42	50
\$50	6	10	11	22	20	28
\$100	1	2	3	10	8	14
\$150	1	1	1	3	3	6

Source: LGM premiums are from RMA.

Note: Put premiums are adjusted CME quotes.



price, effectively increases the cost of coverage. The calculated premium was \$2.24/cwt.

LGM-Cattle policies on yearlings assume a 1,250-lb finish weight, giving a put-equivalent cost for coverage of \$28 per head (Table 6). At 1,250 pounds the \$50 deductible is equivalent to a strike price that is \$4 out-of-the-money. The calculated premium was \$0.75/cwt, or about \$10 per head.

Regardless of the deductible, in January LGM-Cattle coverage for March was less expensive than put option coverage for March. The July and October put options closest to at-the-money had implied volatility levels of 13.5%. Adjusting the maturity dates and strike prices showed a similar cost advantage for LGM-Cattle.

Recall, however, that the cost of option coverage is set in the open market. The volatility level is subject to change and fluctuates widely across time and throughout the life of a contract.<sup>3</sup> Thus, waiting to purchase the coverage would imply a lower cost because of reduced time value (assuming volatility remains constant).

## References

- Fields, D., and J. Gillespie. 2003. Beef producer preferences and purchase decisions for livestock revenue insurance products. Southern Agricultural Economics Association paper.
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- Moore Research Center, Inc. 2006. *Historical live cattle/feeder cattle report*. Eugene, Ore.

## Endnotes

- <sup>1</sup> The product was first proposed by Hart et al (2001); the paper contains some background ideas.
- <sup>2</sup> The premiums are adjusted and compared using option pricing theory, see Hull (2000).
- <sup>3</sup> Moore Research Center, Inc. (2006) contains historic volatility charts and charts of the “cattle crush,” which combines live cattle, feeder cattle, and corn futures position to speculate on the finishing margin.

Similarly, a change in the volatility would change the premium cost. A volatility level of 10.5% (16.5%) implies the October premium would be \$39 per head (\$61 per head). Thus, during periods of low volatility, options may be more cost-effective than LGM coverage.

## Summary

LGM-Cattle may be a viable risk management tool for feedlots in South Dakota. Producers are advised to assess the type of feeding margin risk they may have before purchasing LGM-Cattle. Obtaining the proper type of coverage is important. Knowing the basis assumptions up front should help mitigate any misunderstanding if actual farm margin differs from the insurance levels. Finally, given the growing number of available risk management tools for livestock producers, a prudent manager will want the most cost-effective choice, which can be LGM-Cattle.

Available on the web at: <http://agbiopubs.sdstate.edu/articles/FS937.pdf>

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