

# Estimated “Crush” Margins for Feedlot Operators, 2006-2015

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Buying feeder cattle and corn and selling fed cattle at discrete times throughout the year exposes fed cattle producers to both input and output price risk. Feeder cattle and corn prices account for a significant share of total cost and are volatile, adding to a producer’s risk. Managing the crush margin between the fed cattle revenue and the major input costs, feeder cattle and corn, that change with market conditions is very important. The term “crush” comes from the soybean processing sector where soybeans are crushed to produce oil and meal. Traders use the soybean, soybean oil, and soybean meal futures to find and manage profit opportunities as the three related markets trade months before the beans are physically processed. Similarly, prices for fed cattle, feeder cattle, and corn can be managed to protect a margin for a feedlot operator.

## Procedure

A basic model was created to estimate the margin made on the sale of a fed steer in each month over a ten-year period from January 2006 through December 2015. This historical perspective provides a benchmark with which to compare current conditions as producers evaluate their marketing alternatives. It is assumed that feeder cattle are placed, corn is purchased, and fed cattle are sold on the first Wednesday of each month. In this analysis the crush margin (CM) is defined as the value of the fed steer less the cost of the feeder steer and corn. Specifically,

$$CM_T = (12.5 * LCF_{BT}) - (7.5 * FCF_{BT-5}) - (50 * CF_{BT-5})$$

$LCF_{BT}$  is the live cattle futures that expire in month T (or one month after T in the case of off-contract months) adjusted for the Iowa/Southern Minnesota basis (B) for month T. This price is multiplied by 12.5 for a 1,250 pound steer.  $FCF_{T-5}$  is the feeder cattle futures price adjusted for the combined Iowa feeder cattle basis at placement, five months prior to slaughter. This price is multiplied by 7.5 for a 750 pound feeder steer.  $CF_{BT-5}$  is the corn futures price at placement adjusted by the North Central Iowa basis multiplied by fifty bushels per steer. For example, for a steer sold in January of 2006, the CM was calculated daily based on the price for February 2006 live cattle futures, August 2005 feeder cattle futures, and September 2005 corn futures from February 16, 2005 to Wednesday, January 4, 2006. This process was followed for fed cattle sales in each month for 2005 through 2014.

At placement, the first Wednesday of the month, it is assumed that the feeder steer and corn are purchased in the spot market (S). The CM then becomes:

$$CM_T = (12.5 * LCF_{BT}) - (7.5 * FCS) - (50 * CS)$$

The last day, or the day of marketing, the CM is:

$$CM_T = (12.5 * LCS) - (7.5 * FCS) - (50 * CS)$$

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The fed cattle selling price is the Iowa/Southern Minnesota 65-80% choice steer price. Upon such the final margin is calculated.

### Results

A crush margin of approximately \$150 per head is needed to breakeven (See “Using the Crush Margin to Manage Profits Rather than Price: Yearling to Finish”). Figure 1 shows the crush margin by selling month over the 2006 to 2015 period. The “average” is the average of each trading day crush margin for up to one year prior to marketing. The “placement” and “last” is the crush margin calculated on the placement day and the day of marketing, respectively. From placement-day to last-day margin uses basis adjusted live cattle futures and the placement date spot market prices for corn and feeder cattle. Thus, the last-day margin reflects the spot market for all three variables and would be similar to a spot-market strategy.

The last-day strategy typically has the higher average margins; however, they are also much more volatile than the placement-day strategy. Margins reached very high levels in mid-2011 and mid-2014 as the fed cattle prices trended much higher and feeder cattle and corn prices remained relatively steady. Margins reached very low levels in late-2008, early-2009, and late-2015 reflecting higher feeder cattle and corn prices and declining live cattle prices.

**Figure 1. Crush Margins: Last Day, Average, and Placement**

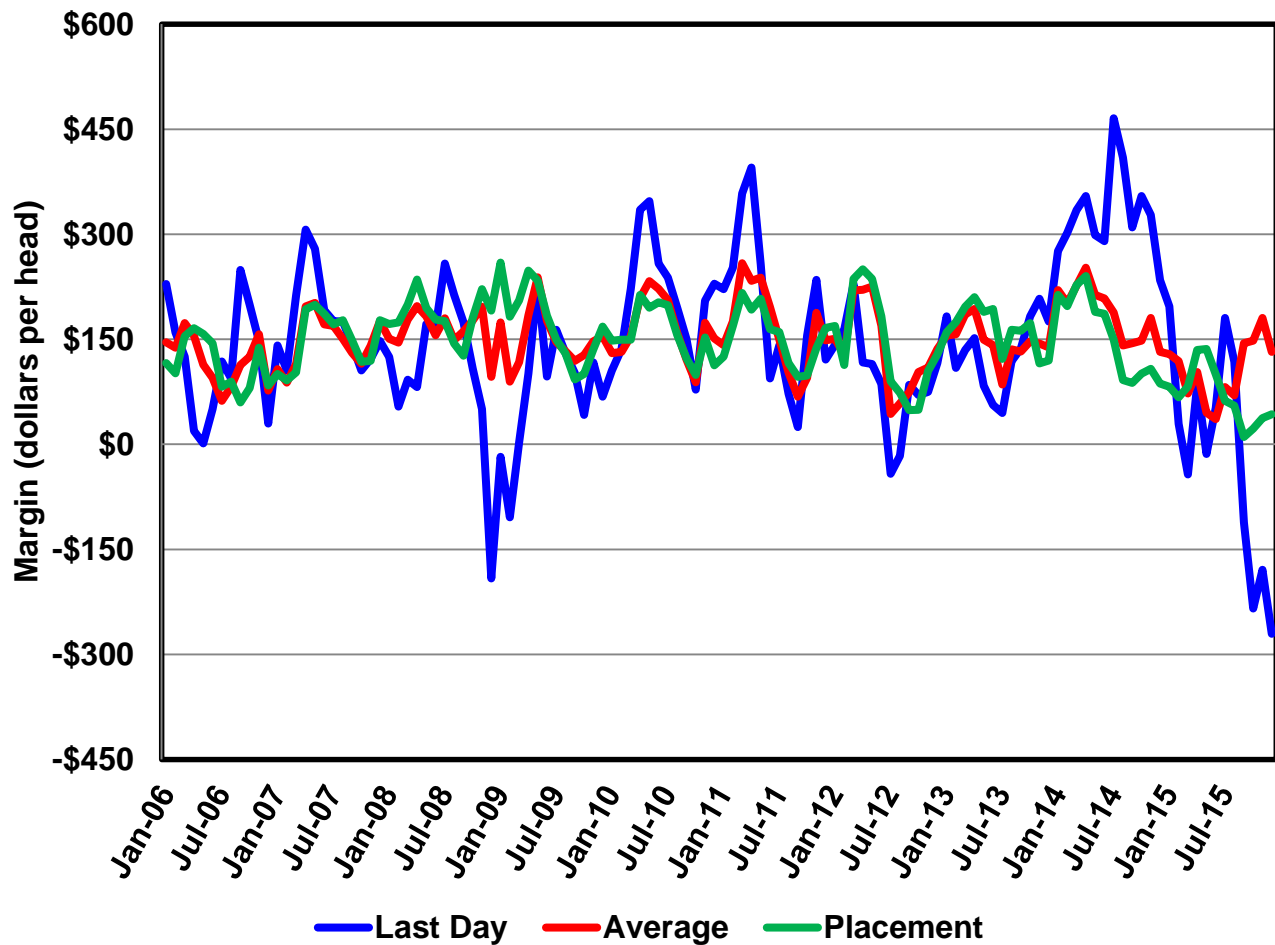


Table 1 shows the ten-year average for each month’s average margin, high margin, low margin, at placement margin, last-day margin, average margin before placement, and average margin after placement. The “high” is the average of the highest daily margin for that selling month averaged across the ten years. The “low” is similarly the average of the lowest daily margin for each selling month. Averaging across selling months indicates that April has the highest crush margins on average, as well as before, at, and after placement. However, May showed the highest average for overall lows. August through December provided the lowest margins on average.

**Table 1. Crush Margin, Average by Selling Month, \$ per head, 2006-2015**

	Overall			At	Last	Before	After
	Average	Highs	Lows	Placement	Day	Placement	Placement
Jan	\$150.47	\$209.56	\$71.04	\$154.57	\$160.19	\$147.03	\$154.02
Feb	\$137.26	\$217.64	\$53.30	\$141.98	\$120.73	\$138.73	\$135.44
Mar	\$170.13	\$254.34	\$108.11	\$177.07	\$166.76	\$164.60	\$177.15
Apr	<b>\$194.52</b>	<b>\$297.11</b>	\$110.53	<b>\$208.30</b>	<b>\$194.64</b>	<b>\$188.69</b>	<b>\$201.97</b>
May	\$184.05	\$287.99	<b>\$116.27</b>	\$193.84	\$177.06	\$178.19	\$191.17
Jun	\$157.20	\$246.18	\$70.08	\$172.21	\$134.15	\$160.98	\$152.17
Jul	\$131.13	\$206.75	\$48.29	\$136.21	\$174.37	\$126.41	\$136.79
Aug	<u>\$118.12</u>	<u>\$187.33</u>	\$46.32	\$119.67	\$150.95	\$117.85	\$118.16
Sep	\$120.94	\$218.20	\$48.41	<u>\$95.64</u>	\$126.36	\$106.56	\$108.69
Oct	\$127.45	\$222.02	\$54.02	\$102.24	\$106.18	<u>\$109.70</u>	\$117.26
Nov	\$161.63	\$257.98	\$83.62	\$127.04	\$130.81	\$138.19	\$148.62
Dec	\$134.20	\$212.45	<u>\$40.06</u>	\$127.74	<u>\$65.93</u>	\$132.50	<u>\$102.59</u>

Notes: **Bold** text indicates the highest value and underline indicates the lowest value.

Table 2 shows the percent of trading days by selling month and year, up to a year prior to marketing, that the margin was higher than the last-day margin. The last-day margin reflects a spot market result using cash prices for live cattle, feeder cattle, and corn.

**Table 2. Average Percent of Trading Days Crush Margin Higher than Last-Day Margin**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
2006	3%	29%	99%	99%	92%	76%	1%	45%	0%	14%	70%	95%	52%
2007	0%	23%	0%	2%	15%	35%	46%	13%	18%	79%	74%	95%	33%
2008	93%	93%	100%	100%	81%	30%	5%	6%	42%	99%	92%	100%	70%
2009	93%	93%	95%	96%	56%	99%	21%	61%	86%	100%	88%	100%	82%
2010	77%	36%	1%	0%	0%	20%	22%	8%	4%	77%	24%	0%	22%
2011	4%	6%	12%	2%	35%	98%	75%	77%	73%	0%	10%	86%	40%
2012	73%	2%	38%	100%	98%	84%	78%	78%	41%	87%	93%	78%	71%
2013	11%	98%	98%	92%	89%	96%	88%	84%	44%	5%	9%	7%	60%
2014	2%	100%	2%	4%	0%	100%	0%	100%	4%	0%	100%	9%	35%
2015	22%	98%	85%	74%	74%	44%	7%	27%	99%	97%	94%	98%	68%
Avg	38%	58%	53%	57%	54%	68%	34%	50%	41%	56%	65%	67%	53%

On average, 53 percent of the trading days prior the last-day had a higher margin than the last-day. Over 50 percent of the trading days leading to February, March, April, May, June, October, November, and December marketings were above the last-day margin, but only 41 percent of the trading days leading to September were above the last-day margin. Some years provided better opportunities than others; for example, 2008, 2009, 2012, and 2015 had a large percent of trading days with margins above the last-day margin while 2010 had fewer opportunities. Chronological patterns did also develop reflecting bull and bear periods in the markets. For example, from the March 2010 through the September 2010 marketings, few trading days exceeded the last-day margin, but from October 2008 through June 2009 marketings, most days were higher. The challenge is recognizing when the change occurs and adjusting marketing accordingly.

Table 3 shows the percent of trading days, up to a year prior to marketing that the margin was in one of five margin categories. As noted earlier, it is estimated that approximately \$150 per head is needed to breakeven. March, April, May, and June had the highest percentage of trading days over \$150 with all three having more than 60 percent. September and October marketings had the lowest percentage of trading days above \$150, with both recording less than 20 percent. Margins over \$300 are rare in any month, but do occur and should be viewed as a hedging opportunity.

**Table 3. Average Percent of Trading Days by Margin Category and Selling Month**

	Dollars per Head				
	<\$75	\$75-150	\$150-225	\$225-300	>\$300
Jan	5%	55%	30%	11%	0%
Feb	9%	52%	35%	4%	0%
Mar	5%	27%	55%	9%	3%
Apr	3%	13%	63%	17%	4%
May	7%	20%	49%	19%	5%
Jun	12%	27%	51%	9%	1%
Jul	17%	40%	38%	5%	1%
Aug	14%	63%	21%	1%	1%
Sep	19%	67%	10%	3%	0%
Oct	17%	64%	16%	3%	0%
Nov	12%	44%	37%	6%	1%
Dec	15%	44%	39%	2%	0%
Avg	11%	43%	37%	7%	1%

### Summary

The purpose of this analysis was to provide information to feedlot operators to help them manage profitability and risk. The crush margin is the value of fed cattle less the cost of feeder cattle and corn. Basis adjusted futures were used until the position was taken in the cash market. The analysis calculated daily crush margins for up to a year prior to marketing by month for 2006 through 2015. Across all months and years 53 percent of the trading days offered a larger margin than was available on the last-day. Often the most profitable pricing opportunity is prior to marketing and may be even prior to placement. Live cattle, feeder cattle, and corn futures trade far enough into the future that is possible to calculate and protect a margin twelve to fifteen months in advance if it appears attractive compared to an individual operation's cost structure and the historic levels presented in this analysis.