

Estimated “Crush” Margins for Hog Producers, 2006-2015

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Buying weaned pigs, corn, and soybean meal and selling hogs at discrete times throughout the year exposes wean to finish producers to both input and output price risk. Weaned pig, corn, and soybean meal prices account for a significant share of total cost and are volatile, adding to a producer’s risk. Managing the crush margin between the hog revenue and the major input costs, weaned pigs corn, and soybean meal 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 hogs, weaned pigs, corn, and soybean meal can be managed to protect a margin for a wean to finish producer.

Procedure

A basic model was created to estimate the margin made on the sale of a hog 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 weaned pigs are placed, corn and soybean meal is purchased, and hogs are sold on the first Wednesday of each month. In this analysis the crush margin (CM) is defined as the value of the hog less the cost of the weaned pig, corn, and soybean meal. Specifically,

$$CM_T = (2 * LHF_{BT}) - WP_{T-5} - (10 * CF_{BT-5}) - (0.075 * SBMF_{BT-5})$$

LHF_{BT} is the lean hog 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 2 for a 200 pound carcass. WP_{T-5} is the weaned pig price at placement, five months prior to slaughter. Prior to purchasing the weaned pig the first Wednesday of the placement month the weaned pig price per head is estimated to be 50 percent of the 5-month-out lean hog futures price not adjusted for basis. Fifty percent is the average ratio of USDA reported national weaned pig price per head and the 5-month-out lean hog futures price. CF_{BT-5} is the corn futures price at placement adjusted by the North Central Iowa basis multiplied by 10 bushels per hog. $SBMF_{BT-5}$ is the soybean meal futures price at placement adjusted by the Iowa basis multiplied by 0.075 tons or 150 pounds per hog. For example, a hog sold in January of 2006, CM was calculated daily based on the price for February 2006 lean hog futures, September 2005 corn futures, and August 2005 soybean meal futures from February 16, 2005 to Wednesday, January 4, 2006. This process was followed for hog sales in each month from 2005 through 2014.

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

$$CM_T = (2 * LHF_{BT}) - WPS - (10 * CS) - (0.075 * SBMS)$$

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

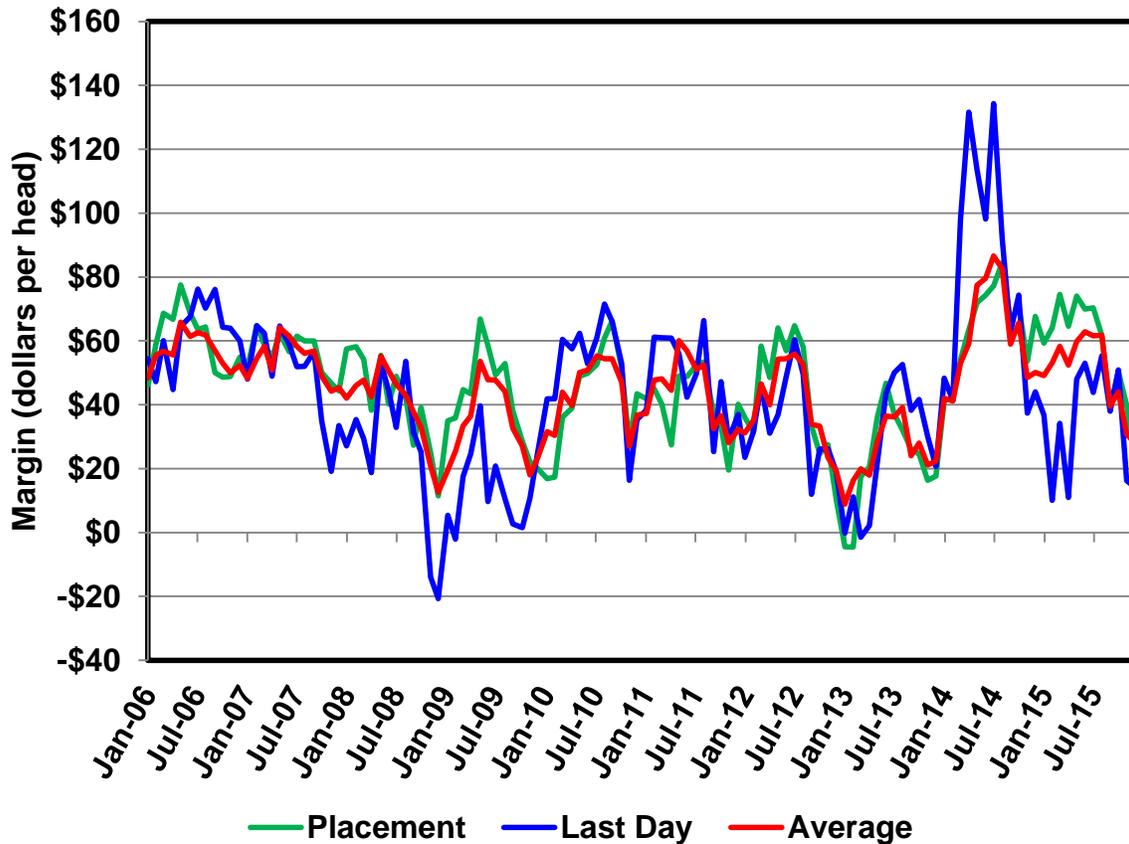
$$CM_T = (2 * LHS) - WPS - (10 * CS) - (0.075 * SBMS)$$

The lean hog selling price is the producer sold Iowa/Southern Minnesota barrows and gilt price. Upon such the final margin is calculated.

Results

A crush margin of approximately \$40 per head is needed to breakeven (see “Using the Crush Margin to Manage Profits Rather than Price: Wean 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 placement day and the day of marketing, respectively. From placement-day to last-day margin uses basis adjusted lean hog futures and the placement date spot market prices for weaned pigs, corn, and soybean meal. Thus, the last-day margin reflects the spot market for all three variables and would be similar to a spot-market strategy.

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



The margins are above the \$40 line in most months and the last-day margin was often higher than the average and placement, but not always. The last-day strategy is also typically the most volatile. Margins reached very low levels in late 2008 as hog prices trended lower from highs in August and last-day margins were negative meaning that feed costs were not covered when the hogs were marketed. In 2013 margins were negative for a short period. Margins reached very high levels in 2014 as feed prices decreased and hog prices were significantly higher. In 2015, margins returned to more “typical levels” with average and placement margins being much higher than last-day margins for the first three quarters of the year.

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 indicate that May-August have the highest crush margins. The months of March-April and September-October are similar to each other and are second level margins. The months of January, February, November, and December are roughly equal over the period and provide the lowest margin on average. While the last-day margin is higher than placement-day and average margin in some months, the high and low indicate the potential range of margin offered by forward pricing. Also note that on average the placement-day margin was higher than last-day in January, February, March, April, May, June, September, October, November, and December.

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

	Overall			At	Last	Before	After
	Average	High	Low	Placement	Day	Placement	Placement
Jan	\$35.82	<u>\$53.52</u>	\$18.90	\$38.11	\$32.35	\$41.59	\$45.89
Feb	\$40.50	\$60.45	\$19.89	\$41.31	\$34.24	\$49.02	\$50.48
Mar	\$46.60	\$67.47	\$26.08	\$50.72	\$46.76	\$52.51	\$57.85
Apr	\$43.90	\$67.08	\$22.02	\$46.64	\$43.12	\$52.10	\$52.38
May	\$56.89	\$77.41	\$36.95	\$60.65	\$56.06	\$63.68	\$66.67
Jun	\$56.24	\$76.83	\$34.99	\$57.07	\$51.94	\$64.72	\$64.47
Jul	\$56.17	\$76.40	\$35.02	\$57.78	\$58.11	\$63.25	\$66.54
Aug	\$54.81	\$71.95	\$34.70	\$56.99	\$57.36	\$60.88	\$64.38
Sep	\$43.12	\$61.78	\$25.39	\$44.31	\$40.93	\$49.64	\$52.82
Oct	\$41.66	\$60.70	\$23.90	\$42.19	\$41.90	\$49.31	\$51.17
Nov	<u>\$31.20</u>	\$48.87	\$12.59	<u>\$32.75</u>	<u>\$23.52</u>	<u>\$38.80</u>	<u>\$39.80</u>
Dec	\$32.20	\$53.65	<u>\$10.87</u>	\$33.36	\$26.78	\$41.49	\$39.90

*Notes: **Bold** text indicates the highest value and underlined 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 lean hogs, corn, and soybean meal. On average, 55 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 January, February, March, April, May, June, July, September, November, and December marketings were above the last-day

margin, but only 39 percent of the trading days leading to August were above the last-day margin. Some years provided better opportunities than others; for example, 2008, 2009, and 2015 had a large percent of trading days with margins above the last-day margin while 2006, 2010, 2011, and 2014 had fewer opportunities. Chronological patterns did also develop reflecting bull and bear periods in the markets. For example, from the July 2006 through the February 2007 marketings, few trading days exceeded the last-day margin, but from March 2007 through December 2009 marketings and November 2014 through December 2015, most days were higher. The challenge is recognizing when the change occurs and adjusting marketing accordingly.

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	29%	83%	39%	87%	62%	24%	4%	7%	0%	10%	5%	20%	31%
2007	49%	9%	32%	68%	44%	75%	99%	95%	40%	99%	99%	89%	67%
2008	100%	90%	100%	98%	67%	72%	98%	9%	84%	92%	98%	90%	83%
2009	85%	98%	90%	94%	92%	100%	96%	100%	91%	85%	61%	45%	86%
2010	10%	11%	0%	0%	8%	31%	35%	2%	30%	35%	98%	54%	26%
2011	44%	1%	10%	1%	60%	98%	64%	0%	85%	0%	40%	27%	36%
2012	93%	71%	48%	90%	98%	74%	40%	62%	97%	72%	37%	56%	70%
2013	56%	49%	99%	91%	75%	17%	0%	0%	0%	4%	12%	59%	39%
2014	33%	44%	1%	0%	17%	26%	1%	42%	38%	28%	99%	68%	33%
2015	85%	100%	89%	94%	68%	69%	89%	70%	63%	21%	100%	90%	78%
Avg	58%	56%	51%	62%	59%	59%	53%	39%	53%	45%	65%	60%	55%

Table 3 indicates the percent of trading days, up to a year prior to marketing, which the crush margin was in one of four categories. As noted earlier, it is estimated that approximately \$40 per head is needed to breakeven.

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

	Dollars per Head			
	<\$30	\$30-40	\$40-50	>\$50
Jan	27%	35%	19%	19%
Feb	19%	24%	30%	26%
Mar	12%	16%	33%	39%
Apr	15%	22%	32%	31%
May	6%	8%	16%	70%
Jun	3%	10%	21%	66%
Jul	3%	9%	23%	64%
Aug	2%	12%	23%	63%
Sep	21%	22%	24%	34%
Oct	20%	25%	28%	26%
Nov	50%	22%	18%	10%
Dec	42%	24%	22%	12%
Avg	18%	19%	24%	38%

Over 85 percent of the days in May, June, July, and August offered over a \$40 crush margin. February, March, April, September, and October had over 50 percent of the trading days above \$40. January and November had the fewest days with margins over \$40. Margins over \$50 are for the most part less common, but do occur and should be viewed as a hedging opportunity.

Summary

The purpose of this analysis was to provide information to hog producers to help them manage profitability and risk. The crush margin is the value of lean hogs less the cost of weaned pigs, corn, and soybean meal. 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 55 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. Lean hog, corn, and soybean meal 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.