BRIEFING

Feed Grain Volatility and Effects on
Feeder Cattle Producers

John M. Marsh

Agricultural Marketing Policy Center
Linfield Hall
P.O. Box 172800
Montana State University
Bozeman, MT 59717-2920
Tel: (406) 994-3511
Fax: (406) 994-4838
email: ampc@montana.edu
website: www.ampc.montana.edu

Contact:

John M. Marsh
(406) 994-5621
jmarsh@montana.edu

Objective

Analysis

for Informed

Decision Making

Prices received by cow-calf producers depend upon many factors including retail beef demand, red meat and poultry supplies, food safety, trade in live cattle and beef, and breeding cattle inventories. In addition, feed grain supplies and prices are important since they impact the cost of gain in cattle finishing. Cost of gain influences feedlot demand for feeder cattle and fed cattle supplies (particularly slaughter weights), and, consequently prices received by cow-calf producers and cattle finishers. The United States Department of Agriculture (USDA) indicates that feed grains (particularly corn) can account for over 70 percent of variable cost of gain in cattle finishing (USDA 2003).

Most commodity analysts view corn, the major feed grain used in livestock finishing , as a key link in determining prices of feeder calves. For example, producers in the summer months often decide whether to forward contract spring-born calves for the fall marketing period. They may have information about feeder cattle supplies, pasture conditions, etc., but expectations about fall corn prices are uncertain. If a larger fall corn harvest occurred than what the USDA projected in early summer, corn price will have declined, resulting in increased demand prices for feeder calves in the fall marketing period. Thus, it would have been premature if producers had

contracted calves at a fixed price in the summer. Other feed grains used in livestock finishing rations are oats, barley, and sorghum.

Commodity futures data on 2004 live cattle and feeder cattle demonstrates the corn price effect. For example, fall contract price spreads between November feeder cattle and December live cattle increased from about $9/cwt to $24/cwt between April and September of 2004. This was commensurate with the December 2004 corn futures declining by about $1.30/bu between April and September. The corn price decline was consistent with USDA updated forecasts indicating expected increases in the fall corn harvest. The effects of changes in corn production and corn price on feeder calf price and calf crop production are examined in this briefing. In particular, variables related to policy constituents of corn demand and supply are analyzed. These include corn exports (trade policies), the marketing assistance loan rate for corn (USDA commodity programs), and fertilizer costs (energy prices).

Livestock producers have a vested interest in these policy provisions because of their important role in determining feed grain prices and ultimately rancher profits.

Model and Corn Market Volatility

To analyze the corn market effects, a statistical model integrating demands and supplies of the corn and feeder cattle markets was developed. Model coefficients were statistically estimated and equilibrium multipliers were derived to calculate economic impacts in these sectors. For example, arbitrary changes in fertilizer prices, loan rates, or corn exports are expected to impact demands, supplies and prices in the corn and feeder calf sectors. In turn, revenue adjustments in the corn and feeder calf markets can be calculated.

The model multipliers can be applied to relative volatility in the corn market. For example, USDA crop data indicate that corn prices and production vary substantially, reflecting changing demand and supply conditions related to food and feed usage, exports, weather, etc. Relative volatility (RV) is defined as the standard deviation of a variable divided by its average or mean value. From 1970-2003, the RV of real corn price (1982-84 constant dollars) was 50.7 percent and the RV of corn production (acreage times yield) was 23.4 percent. The multipliers of the statistical model indicate the corn price and corn
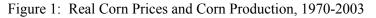
quantity RV's resulted in real feeder calf price changing by 10.55 percent of its average value of $67.70/cwt, or $7.14/cwt. The resulting change in the calf crop was 7.71 percent of its average value of 42.24 million head, or 3.26 million head. These corn market changes implied a gross revenue swing of $3.14 billion, or about 19 percent of average (cow-calf) revenue for the 1970-2003 period. For a weaned 575 pound feeder calf, this amounted to about $74 per head.
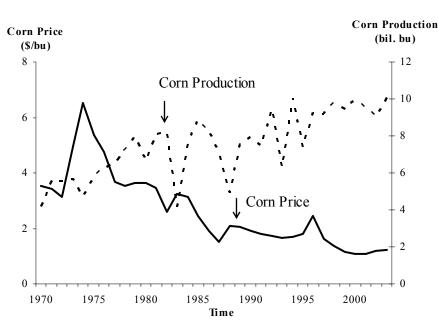
Trend Effects of Corn Market Constituents

With corn as an input in livestock production, revenue trade-offs between cash corn growers and livestock producers occur over time with changes in corn market constituents . For example, increases in U.S. corn exports may increase corn price and corn production, but would decrease feeder calf price as feedlots adjust to tighter cattle feeding margins. Lower expected profits by cow-calf producers would then reduce calf crop production over time. Alternatively, if reduced fertilizer costs increase corn production and

reduce corn price, this would likely increase livestock revenue due to increases in feeder calf price and calf crop production. Revenues to cash corn growers would decrease if the percentage reduction in corn price exceeds the percentage increase in corn production. The 1970-2003 trends in real corn price and corn production are shown (Figure 1).

The real price, quantity, and real total revenue adjustments in the corn and feeder calf sectors given long-term (1970-2003) changes in the real corn loan rate, corn exports, real fertilizer costs, and real slaughter steer price are presented (Table 1). Slaughter steer price represents a livestock demand factor which can affect both the corn and feeder cattle markets. The changes in the variables over the 1970-2003 period were: (1) a decline of 60.4 percent in the corn loan rate; (2) corn exports increased by 207.7 percent; (3) real fertilizer price declined by 27.6 percent; and (4) real slaughter steer price declined by 39.3 percent.

Figure 1: Real Corn Prices and Corn Production, 1970-2003

The equilibrium multipliers of the statistical model were used to derive the impacts of the four variables above on prices, quantities, and revenues in the corn and feeder calf sectors. The multipliers indicate, for example, that a change in corn exports within a time period of one year result in several years adjustment of feeder prices and calf imports until they reach an equilibrium. The coefficients indicated several types of long-run economic relationships between the corn and feeder calf sectors. First, an increase in the corn loan rate increases corn production and reduces corn market price. The result is to increase feeder calf price and calf crop production. Second, an increase in corn exports increases corn market price and corn production, but results in decreasing feeder calf price and calf crop production. Third, an increase in fertilizer costs decreases corn production and increases corn price. The result is to decrease feeder calf price and calf crop production. And fourth, an increase in slaughter steer price increases feeder calf price and

calf crop, subsequently increasing the price and supply of feed corn.

The USDA loan rate used in the statistical model is a nonrecourse marketing assistance loan rate. Nonrecourse marketing assistance loan rates have been a consistent price support feature of wheat and feed grain programs since the mid-1930s, although other commodity program and loan provisions have varied. Essentially, the loan rate serves as a floor price for program commodities such as corn as long as the corn is of loan quality. Results of the statistical model indicate that a 10 percent increase in the corn loan rate increases corn production by 3.2 percent. However, a 10 percent increase in national average market price for corn (usually higher than the corn loan rate) increases corn production by 8.2 percent.

Results

There are substantial differences in the market effects of the loan rate, corn export, fertilizer price, and steer

price variables (Table 1). From 1970 to 2003, U.S. corn exports expanded by 207.7 percent, primarily into the markets of Asia, Mexico, and Canada. This export increase resulted in increasing corn prices and production by $1.17/bu and 2.72 billion bushels, or a corn revenue increase of $19.25 billion. The large revenue increase amounted to 96.2 percent of average 1970-2003 corn revenues. But the effect of expanding corn exports on the feeder calf sector was to decrease feeder calf price and calf crop by $6.19/cwt and 2.81 million head, or a revenue decline of $2.49 billion. This decline amounted to 15.2 percent of average 1970-2003 feeder calf revenues. Moreover the 60.4 percent reduction in the nonrecourse loan rate, which reduced corn production and increased corn price, reduced revenues of cow-calf producers by $0.35 billion, or 2.1 percent of average total revenue.

Table 1: Effects of Changes in Corn Market Factors and Slaughter Steer Price on Revenues in the Feeder Calf and Corn Sectors

Variable (1970-2003 changes)	Loan Rate ↓ 60.4%	Corn Exports ↑ 207.7%	Fertilizer Price ↓ 27.6%	Steer Price ↓ 39.3%
Feeder Cattle Sector: Price Quantity Revenue Percent	$0.86/cwt -0.38 mil hd -$0.35 bil 2.13%	-$6.19/cwt -2.81 mil hd -$2.49 bil 15.15%	$0.92/cwt 0.42 mil hd $0.39 bil 2.37%	-19.23/cwt -8.73 mil hd -$7.1 bil 43.19%
Corn Sector: Price Quantity Revenue Percent	$0.16/bu -1.09 bil bu -$1.85 bil 9.25%	$1.17/bu 2.72 bil bu $19.25 bil 96.20%	-$0.17/bu 1.17 bil bu $1.63 bil 8.15%	$0.21/bu -0.48 bil bu -$2.71 bil 13.54%

Note: "Price" and "Revenue" are in real dollar terms and "Percent" is Revenue divided by average total revenue (AR) for the sectors. The Revenue is expressed as deviations from the average total revenues for 1970-2003. For the feeder sector, the AR was $16.44 billion and for the corn sector, the AT was $20.01 billion.

In the changes described, the more expensive corn reduced the demand price for feeder calves and led to a decrease in calf crop production. However, the real fertilizer price decline of 27.6 percent for the 1970-2003 period boosted corn production by 1.17 billion bushels and decreased corn price by $0.17/bu. The result was to increase feeder calf revenues by $0.39 billion, or 2.4 percent of average total revenue.

Slaughter steer price is a critical factor that affects the expected profitability of cattle finishing. Other factors constant, the 39.3 percent decline in slaughter steer price decreased feedlot operating margins, resulting in decreasing feedlot demand for both feeder calves and feed corn. As might be expected, the distribution of the decline in revenues between the feeder calf and corn sectors is skewed towards feeder calves. Specifically, the 39.3 percent decrease in slaughter steer price reduced feeder calf revenue by $7.1 billion, or 43.2 percent of feeder revenue, but reduced corn producer revenue by $2.7 billion, or 13.5 percent of corn revenue. About 60 percent of the decline in real beef cattle prices from the decade of the 1970s was attributed to the long term (1975 to 1998) decline in consumer demand for beef (Marsh 2003).

The beef cattle industry consumes nearly one-third of the corn used in livestock and poultry feeding. Most livestock-feed grain demand and supply studies focus on the effects of feed grain prices on the livestock markets as opposed to the effects of the livestock markets on the feed grain industry. But it should be recognized that if increases in consumer meat demand result in increasing livestock demand in the beef and pork sectors, then additional livestock units fed would increase the demand price of corn.

There are two-way effects in the markets for feed inputs and livestock production. The statistical model was used to estimate and compare the effects between the corn market affecting the beef market and the beef market affecting the corn market. Statistical results indicate asymmetry occurs, i.e., changes in feeder calf price have about a 35 percent larger impact on corn price and corn production than changes in corn price have on feeder calf price and calf crop production.

Conclusion

Public policies affecting corn prices and production are not trivial to cow-calf producers. Cattle producers continually monitor corn prices since corn dominates price movements of other feed grains. More importantly, corn prices heavily influence costs of gain, thus, bid prices and production of feeder cattle, slaughter cattle weights, and beef production levels. Therefore, beef producers have a vested interest in government legislation that affect support prices, production costs, and exports of feed grains.

References

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