Managing for Today's Cattle Market and Beyond

March 2002

Price Determination versus Price Discovery

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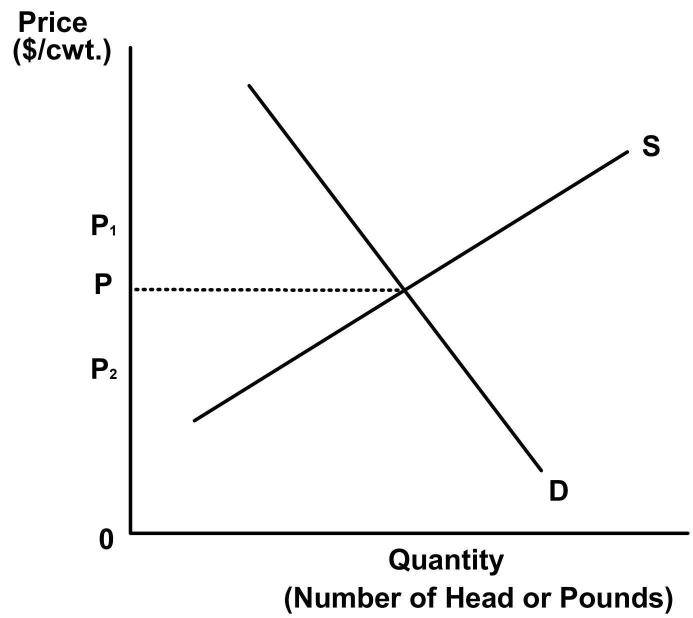
Low cattle prices are related to price determination factors, more so than price discovery factors. Low prices result from supplies that are large relative to current beef demand conditions. Variation in week-to-week or daily prices across pens of cattle, both above and below the market price level, result from many factors directly affecting price discovery, of which captive supplies, market information, and meatpacking concentration could be contributing causes.

Price discovery is frequently confused with price determination. These are two *related* but *different* concepts that need to be understood when discussing pricing issues. This fact sheet distinguishes between both concepts, identifies how they are interrelated, and provides an indication when price discovery concerns may increase.

Price Determination

Price determination is the interaction of the broad forces of supply and demand that determine the market price *level*. Figure 1 depicts a typical textbook diagram for price determination. It shows the interaction of a supply curve and a demand curve to determine the general price level (P). For fed cattle, supply determinants or factors affecting the quantity of beef produced include input prices (feeder cattle and grain), technology (growth promotants, etc.), and expected price of outputs produced from those inputs (fed cattle).

Figure 1. Price Determination

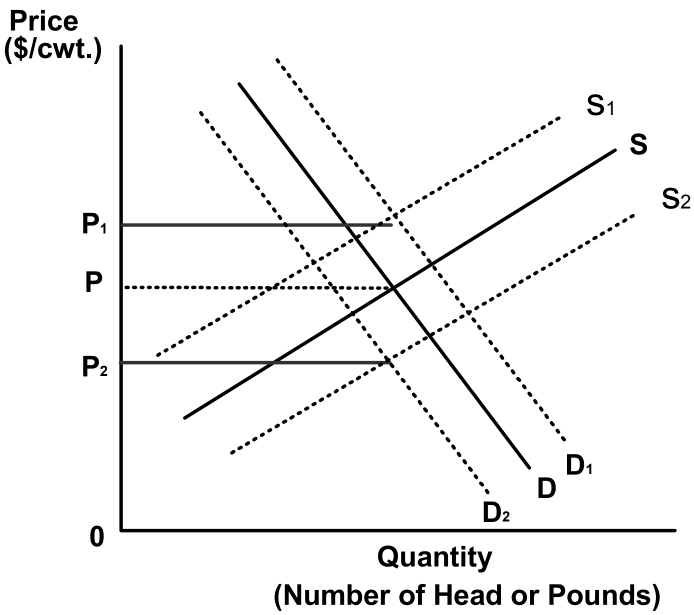


Broad demand forces or factors affecting the amount of beef consumed include the price of products produced from fed cattle (beef), price of competing products (pork and poultry), consumer income, and consumer tastes and preferences.

Price Discovery

Price discovery is the process of buyers and sellers arriving at a transaction price for a given quality and quantity of a product at a given time and place. Price discovery involves several interrelated concepts, among them market structure (number, size, location, and competitiveness of buyers and sellers); market behavior (buyer procurement and pricing methods); market information and price reporting (amount, timeliness, and reliability of information); and futures markets and risk management alternatives.

Figure 2. Price Discovery



Price discovery begins with the market price level. Because buyers and sellers discover prices on the basis of uncertain expectations, transaction prices fluctuate around that market price level. Price discovery is more difficult to show graphically, but Figure 2 is an attempt. We begin with the same diagram as in Figure 1. However, because of information uncertainty, buyers and sellers never know exactly the shape and location of the demand and supply curves. Therefore, buyers are willing to bid and sellers are willing to offer different prices on any given day. This is illustrated in Figure 2 by the dotted lines parallel to and on either side of the "true" demand curves. Those estimated supply and demand curves intersect at a range of quantities and prices. Thus, discovered prices fluctuate above and below the general or market price level (P). This fluctuation is attributable to the quantity and quality of the commodity brought to market, the time and place of the transaction, and the number of potential buyers and sellers present. Other factors might include the amount and type of public market information available, captive supplies, and packer concentration in the case of fed cattle prices.

One type of price discovery research attempts to determine factors that explain variation in transaction prices. In the 1970s, most fed cattle were priced on a live weight, cash market basis. Factors affecting fed cattle prices included: (1) carcass beef prices; (2) live cattle futures market prices; (3) cattle quality (including sex, weight, quality grade, and yield grade); (4) sale lot size; (5) number of days between purchase and delivery of cattle; (6) number of packers bidding on cattle; (7) individual packing plants or firms; (8) time of year; and (9) region of the country (Ward 1981).

Many things have changed since the 1970s. Transaction prices for the same kind of price discovery research in the 1990s (Ward, Koontz, and Schroeder 1996) included some modified and some additional factors: (1) boxed beef cutout values (instead of carcass beef prices); (2) live cattle futures market prices; (3) cattle quality (including sex, weight, quality grade, and yield grade); (4) sale lot size; (5) number of days between purchase and delivery of cattle; (6) individual packing plants or firms; (7) packing plant utilization; (8) day of the week; (9) time of year; and (10) extent and type of captive supplies. Since the mid-1990s, carcass weight and merit pricing systems, commonly referred to as grid pricing, have increased in importance. Thus, the base price used in grid pricing and the carcass premiums and discounts have become increasingly important in the price discovery process for fed cattle.

Price Discovery Interactions with Price Determination

Price determination and price discovery are interrelated. Price determination finds the market price level. The general level of prices may be high or low. However, when market prices are low or are falling, questions and concerns about price discovery increase. Figure 3 is a matrix showing potential price discovery problems or concerns under given supply and demand scenarios. When demand is strong or expanding and when supplies relative to processing capacity are small or declining, price discovery problems are generally not a major concern. Under these conditions, competition is generally keen, thus ensuring efficient price discovery.

Figure 3. Price Discovery Concerns Under Alternative Price Determination Conditions.

	Demand for Beef	
Supply of Beef	Strong or Expanding	Weak or Declining
Large or Expanding	Potential Concerns	Probable Concerns
Small or Declining	Unlikely Concerns	Potential Concerns

In contrast, the opposite conditions have occurred. Beef demand studies indicate consumer beef demand has been weak or declining for much of the past two decades. During the part of the cattle cycle when inventory numbers increase, beef supplies are large or expanding. Under these conditions, large supplies of cattle (beef) combine with weak or declining consumer (processor) demand. This causes low fed cattle prices and may heighten producers' price discovery concerns.

Compounding the problem at times has been large supplies of pork and poultry. The combined result is increased producer concerns about price discovery and accusations about captive supplies and packer concentration. Captive supplies and packer concentration (i.e., number of packers actively bidding) affect price discovery, i.e. transaction prices resulting from given market conditions. However, the market price level is not significantly affected by packer concentration or captive supplies. (see another fact sheet in this series, *Packer Concentration and Captive Supplies*.)

Conclusion

The general level of prices reflects supply and demand factors. Individual transaction prices fluctuate around the general market price, whether it is high or low. The variation in transaction prices is related to many factors, including quantity and quality of cattle, and the timing and location of cattle sales/purchases.

Thus, low prices are related to price determination factors, and less so to price discovery factors. Low prices result from beef supplies which are large relative to the current beef demand conditions. Widely varying prices, both above and below the market price level, result from many factors directly affecting price discovery, of which captive supplies, market information, and meatpacking concentration could be contributing causes.

References

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Managing for Today's Cattle Market and Beyond

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The Impact of Corn and Fed Cattle Prices on Feeder Cattle Price Slides

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Introduction

Feeder cattle price determination and discovery are complex because many factors impact feeder cattle markets. Feeder cattle are an input into a production process; therefore, feeder cattle demand is influenced by all factors that affect future anticipated demand for fed cattle as well as expected feeder cattle backgrounding and/or feeding costs. In addition, as feeder cattle weight varies, the relative importance of expected fed cattle market price and expected input costs changes. Thus, feeder cattle demand determinants vary in importance over time as the cattle grow. A formidable task facing potential cattle buyers and sellers is how feeder cattle market prices are likely to change as the form of the product (i.e., feeder cattle weight) and expected market prices (input and output) change.

Typically, buyers pay a higher price per pound for lightweight feeder cattle relative to heavier feeder cattle because the cost of adding weight (i.e., cost of gain) is generally less than the value of additional weight. This implies that the negative relationship between weight and price, referred to as the price slide, reflecting a buyer's expected cost of gain relative to expected value of gain.[1] Thus, feeder cattle price slides will vary as both feed and fed cattle selling prices vary.

This fact sheet reports and discusses results from a study that examined how feeder cattle price changes as cattle weight, expected input costs, and expected selling prices change. Further discussion will focus on how these factors change in relative importance as feeder cattle weight varies. This information is useful to cattle producers when making management decisions concerning alternative production strategies (e.g., creep feeding calves, rate of gain to pursue in backgrounding programs, length of grazing season) and timing of buy/sell decisions. Understanding how varying market conditions affect price-weight relationships will allow producers to incorporate weight adjustments into price forecasts and thus make more informed production and marketing decisions.

Information in this fact sheet also can help buyers and sellers who forward contract cattle to establish a price slide for weight deviations that is consistent with market conditions. With forward contracted and electronic auction-marketed feeder cattle, price slides are commonly used to adjust price when the delivered weight deviates from the contracted weight. If premiums and discounts associated with weight vary with market conditions, a price slide that is held constant over time increases risk to buyers and sellers of contract cattle. Results from this study suggest that a dynamic price slide (i.e., a slide that varies with market conditions) is more appropriate than a fixed price slide.

Study Methods

To estimate the feeder cattle price-weight relationship, and how it is affected by feed and fed cattle prices, weekly feeder cattle sales data were collected. Sale price, weight, number of head in sale lot, sex, and breed information were collected on individual lots of feeder cattle from Winter Livestock Auction in Dodge City, Kansas from January 1987 through December 1996. The data over this ten-year time period included 46,081 individual lots of cattle with an average weight of 300 to 900 pounds representing three breed categories (the categories used were: English, mixed, and Continental/European). Slightly over half (55.4%) of the lots were steers with the rest being heifers.

In addition to the information on each individual lot of feeder cattle, weekly average futures prices for fed cattle and corn were collected to be used as proxies for expected fed cattle price and expected corn price.

Summary statistics of the price and weight variables used for the analysis are given in Table 1. The average weight of feeder cattle was 660 pounds. Feeder cattle price averaged \$80.65/cwt. over the ten-year period and ranged from a low of \$40.10 to a high of \$142.50 across weights and time. Average corn and live cattle futures prices were \$2.60/bu. (ranging from \$1.52 to \$4.38) and \$69.79/cwt. (from \$54.25 to \$78.00), respectively.

Table 1. Summary Statistics of Feeder Cattle Sale Data and Futures Prices, January 1987 - December 1996

Variable	N	Mean	Std Dev	Minimum	Maximum
Price (\$/cwt.)	46,081	80.65	12.83	40.10	142.50
Weight (lbs.)	46,081	660	141	300	900
Corn futures price[a] (\$/bu.)	46,081	2.60	0.46	1.52	4.38
Live cattle futures price[a]	46,081	69.79	4.79	54.25	78.00

[a] Average of third, fourth, and fifth contracts out where the nearby contract is the first contract out.

To quantify the feeder cattle price-weight relationship while accounting for major price determinants, feeder cattle price was regressed on weight, sex, live cattle futures price, and corn futures price.[2] Weight squared was also included to allow for nonlinear impacts of weight. Interaction terms between weight and each other variable were included. Estimating this regression model allows the price-weight relationship (i.e., price slide) to be quantified as well as to determine how it is impacted with varying feed and fed cattle prices.

Results and Discussion

Regression results are reported in Table 2. The model explained 88.8% of the variability in feeder cattle market prices. Every coefficient is statistically different from zero at the 0.05 level, which is expected given the large number of observations. Because of the interaction and squared terms, the effects of each variable are difficult to decipher simply by examining the coefficients. Therefore, to enhance interpretation, graphical analysis is used to demonstrate the impacts of various price determinants. Additionally, a specific example is included in a following section to show how the information in Table 2 can be used.

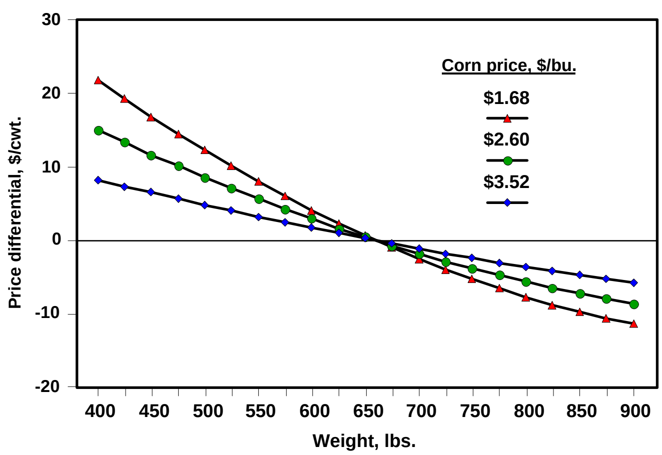
Holding fed cattle futures price at its mean value, Figure 1 shows the feeder steer price-weight relationship for three levels of corn price. As corn price varies from the mean of \$2.60/bushel plus and minus two standard deviations, the price slide (i.e., price-weight relationship) responds differently. For lower corn prices, feeder steer price per cwt. decreases more rapidly as feeder cattle weight increases. This is as expected; when corn price is lower, lightweight feeder cattle are worth more relative to heavyweight cattle because the cost of gain is lower.

Table 2. Regression Results (dependent variable is feeder cattle price, \$/cwt.)

Variable	Parameter Estimate[a]	Standard Error	p-value
Intercept	-45.64718	5.8844	0.0001
Live cattle futures (LC)	3.91611	0.0793	0.0001
Corn futures (CN)	-36.55697	0.8974	0.0001
Weight	0.06633	0.0198	0.0008
Weight squared	-3.765×10^{-5}	1.6×10^{-5}	0.0197
Heifer x weight	-0.04101	0.0004	0.0001
Heifer x weight squared	4.661×10^{-5}	5.6×10^{-7}	0.0001
LC x weight	-0.00477	0.0003	0.0001
LC x weight squared	2.360×10^{-6}	2.1×10^{-7}	0.0001
CN x weight	0.06202	0.0029	0.0001
CN x weight squared	-3.171×10^{-5}	2.3×10^{-6}	0.0001
R^2	88.8		

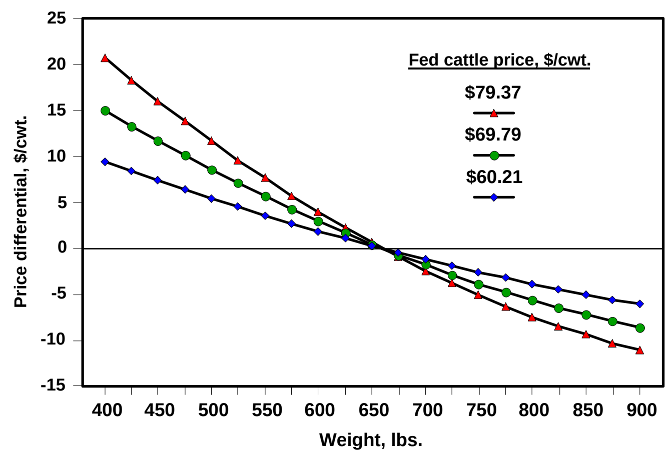
[a] Parameter estimates should not be rounded as predicted values are sensitive to values used.

Figure 1. Impact of corn price on feeder steer price-weight relationship.



For example, the price spread between 500 and 800 lb. steers is almost \$20/cwt. when corn price is \$1.68/bu. and declines to just slightly over \$8/cwt. with a \$3.52/bu. corn price. The size of the price slide also varies with weight. For example, the price deviation for a 10-pound interval around 500 pounds (i.e., 490 or 510 pounds) is \$0.89, \$0.61, and \$0.33/cwt. with corn prices of \$1.68, \$2.60, and \$3.52/bu., respectively. However, the price deviation for a 10-pound interval around 800 pounds (i.e., 790 or 810 pounds) is \$0.44, \$0.34, and \$0.24/cwt. with corn prices of \$1.68, \$2.60, and \$3.52/bu., respectively. An important implication is that price slides should be adjusted for different corn prices and this adjustment varies depending on feeder cattle weight.

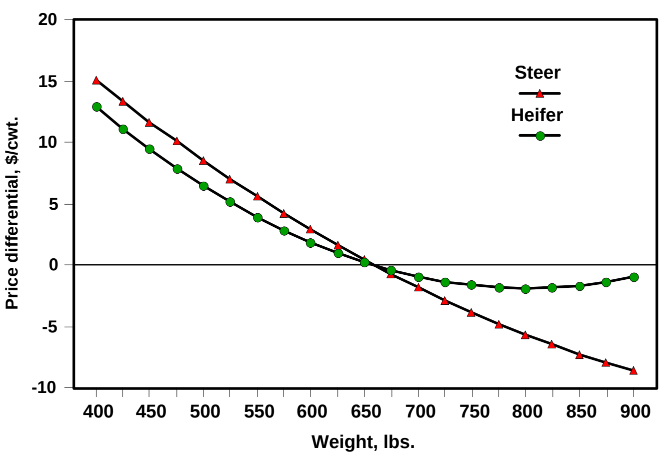
Figure 2. Impact of fed cattle price on feeder steer price-weight relationship.



Expected fed cattle price also has a sizeable impact on the price-weight relationship (Figure 2). Holding corn futures price at its mean, with a \$79.37/cwt. fed cattle futures price (mean price plus two standard deviations), the price spread between 500 and 800 lb steers is about \$19/cwt., whereas with a fed cattle futures price of \$60.21/cwt (mean less two standard deviations), the spread is approximately \$9/cwt. In addition to fed cattle prices, the size of the price deviation also varies with weight. For example, the price deviation for a 10-pound interval around 500 pounds (i.e., 490 or 510 pounds) is $0.84, $0.61, and $0.38/cwt. with fed cattle prices of $79.37, $69.79, and $60.21/cwt., respectively. However, the price deviation for a 10-pound interval around 800 pounds (i.e., 790 or 810 pounds) is $0.43, $0.34, and $0.24/cwt. with fed cattle prices of $79.37, $69.79, and $60.21/cwt., respectively. Thus, price slides clearly depend on expected fed cattle prices as well as corn prices and in both cases the price slides also depend on feeder cattle weight.

Figure 3 shows the relationship between feeder steer and feeder heifer prices as weight varies with corn and fed cattle prices evaluated at their average prices. As expected, the price-weight relationship (i.e., price slide) is negative for both steers and heifers, however, the relationship differs between steers and heifers. Steer prices decrease essentially linearly over the weight range examined (i.e., 400 to 900 pounds), whereas, the relationship between heifer prices and weight is nonlinear.

Figure 3. Impact of sex on feeder cattle price-weight relationship.



In this analysis, heifer prices decrease as weight increases up until heifers reach approximately 750 pounds after which there is little further decline in price as weight increases. For example, the price change for a 10-pound deviation from 500 pounds (i.e., 490 or 510 pounds) is $0.61/cwt. for steers compared to $0.55/cwt. for heifers (corn and fed cattle prices evaluated at their means). However, the price change for a 10-pound deviation from 800 pounds (i.e., 790 or 810 pounds) is $0.34/cwt. for steers compared to $0.00/cwt. for heifers. A couple possible explanations exist for this result. First, an 800-pound heifer is not equivalent to an 800-pound steer because they have different end weights and thus the price-weight relationship is not expected to be exactly the same. Although this may be partially what is occurring, it is likely not the only factor. Some of the heavyweight heifers in this data may have actually sold as replacement heifers. These heifers are in a completely different market than steers (e.g., breeding stock versus feeder cattle) and differences between price slides would be expected. Regardless of the reason, these results suggest that the price slide (i.e., weight discount) is similar for lightweight steers and heifers but it is considerably less for heavyweight heifers than for heavy steers on average.

The relationship between feeder cattle prices and weights (i.e., price slides) vary as feed and fed cattle prices vary. Thus, it is important to account for current market conditions when estimating the impact of weight on feeder cattle price. Additionally, while price slides are comparable for feeder steers and heifers at lighter weights (e.g., less than 600 pounds), price slides diverge at heavier weights.

Price Slide Example

The information in Table 2 may appear complicated and hard to interpret, however, it is fairly easy to use this information to predict price slides using a computer spreadsheet.[3] The following hypothetical example is given to demonstrate how the information in Table 2 can be used to assist producers in making management decisions.

Consider the following, a cattle feeder is backgrounding steers and is considering alternative rations with varying rates of gain. If the cattle are fed a more energy intensive ration they will end up weighing approximately 775 pounds after the feeding program. However, if a more roughage-based ration is fed the cattle will only weigh around 700 pounds. The producer is trying to determine which of these feeding programs will be the most profitable. The producer has a forecast of $78.50/cwt. for 750 pounds steers at the time the cattle will come off feed. While this forecast may have come from any number of sources (e.g., futures + basis, university outlook, industry newsletter) it is most likely quoted for "700-800" pound steers. However, because the producer does not believe it is appropriate to assume the same price (i.e., $78.50) for both feeding programs, he needs to "adjust" this price for that of both a 700 and a 775 pound steer. Using the information in Table 2 along with his expectations of corn and fed cattle prices the producer can estimate the prices for 700, 750, and 775 pounds steers. Based on expected prices of $2.50/bu. and $70/cwt. for corn and fed cattle, respectively, the producer estimates the prices as shown in Table 3.

Table 3. Predicted price for steers of varying weights assuming a corn price of $2.50/bu. and a fed cattle price of $70/cwt. using parameter estimates reported in Table 2.

	750 lb steer	**700 pound steer**	**775 pound steer**
	- 45.64718	- 45.64718	- 45.64718
	+ 3.91611 x ($70)	+ 3.91611 x ($70)	+ 3.91611 x ($70)
	- 36.55697 x ($2.50)	- 36.55697 x ($2.50)	- 36.55697 x ($2.50)
	+ 0.06633 x (750)	+ 0.06633 x (700)	+ 0.06633 x (775)
	- 3.765 x 10^{-5} x $(750)^2$	- 3.765 x 10^{-5} x $(700)^2$	- 3.765 x 10^{-5} x $(775)^2$
	- 0.04101 x (750) x (0)[a]	- 0.04101 x (700) x (0)[a]	- 0.04101 x (775) x (0)[a]
	+ 4.661 x 10^{-5} x $(750)^2$ x (0)[a]	+ 4.661 x 10^{-5} x $(700)^2$ x (0)[a]	+ 4.661 x 10^{-5} x $(775)^2$ x (0)[a]
	- 0.00477 x ($70) x (750)	- 0.00477 x ($70) x (700)	- 0.00477 x ($70) x (775)
	+ 2.36 x 10^{-6} x ($70) x $(750)^2$	+ 2.36 x 10^{-6} x ($70) x $(700)^2$	+ 2.36 x 10^{-6} x ($70) x $(775)^2$
	+ 0.06202 x ($2.50) x (750)	+ 0.06202 x ($2.50) x (700)	+ 0.06202 x ($2.50) x (775)
	- 3.171 x 10^{-5} x ($2.50) x $(750)^2$	- 3.171 x 10^{-5} x ($2.50) x $(700)^2$	- 3.171 x 10^{-5} x ($2.50) x $(775)^2$
	= $79.85/cwt	= $81.98/cwt	= $78.88/cwt
Difference from 750 lb price, $/cwt.		$2.13/cwt.	$0.97/cwt.
Difference from 750 lb price, %		2.67%.	-1.21%

[a] If predicted prices were for heifers this value would be equal to one (for steers it is zero).

After calculating the information in Table 3, the producer can estimate what the price of a 700 and 775 pound steer will be either using the $/cwt. or the percent difference from the base price (i.e., $78.50 for a 750 pound steer). For example, using the $/cwt. difference implies a price of $80.63/cwt. ($78.50 + $2.13) for the 700 pound steers and a price of $77.53/cwt. ($78.50 - $0.97) for the 775 pound steers. Given these prices for 700 and 775 pounds steers along with projected costs of gain, the producer can make a more informed decision about the relative profitability of the alternative feeding programs.

Using the percent difference approach would suggest prices of $80.59/cwt. (78.50 x 1.0267) and $77.50/cwt. (78.50 x 0.9879) for the 700 and 775-pound steers, respectively. In this case, both methods (fixed dollar amount and percent) resulted in similar prices because the model-predicted price for the 750 pound steer (i.e., the "base weight") was close to the producer's price expectation.[4] While the percent adjustment method requires several additional calculations, it is probably the more appropriate method. This is especially true if the predicted price for the base weight is considerably higher or lower than the producer's price forecast (i.e., the difference between the $78.50 and the $80.04 in this example).

This example has shown how a price slide can be estimated based on expected prices for corn and fed cattle as well as feeder cattle weight. It should be noted that actual price slides might vary from model-predicted slides seasonally and if feed conversion varies from what would be expected in Kansas (remember the parameter coefficients in Table 2 were estimated with price data from Dodge City, Kansas). For example, the price slide for heavier weight feeder cattle tends to be a "flatter" in the summer months (June-September) compared to the rest of the year. In other words, it may be that discounts for additional weight on 700-900 pound feeder cattle will be slightly less than the model-predicted slide in the summer months. Thus, while the information in Table 2 is useful for helping producers make management decisions, it is important to remember that actual observed price slides may vary from model-predicted slides.

Summary

Several important determinants need to be considered when analyzing feeder cattle price-weight relationships. The two most economically important price-weight slide determinants are expected fed cattle price and corn price. Price-weight slides increase notably when corn prices decline (i.e., the premium for lightweight calves increases as feed prices decrease). Likewise, when expected fed cattle prices increase, price-weight slides increase. In addition to varying with corn and fed cattle prices, price slides vary with feeder cattle weight and also differ between steers and heifers, at least at heavier weights. Knowing this information can help producers who forward contract feeder cattle, backgrounders making decisions regarding feeding calves to varying weights, and producers making feeder cattle purchase decisions.

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[1] In this fact sheet, the term price slide is used in a generic fashion to represent how price of feeder cattle changes as weight varies. When the exact weight of feeder cattle is unknown at the time of sale, buyers and sellers often use a predetermined price slide to adjust their price for deviations in weight from some agreed upon base weight.

[2] Models including variables for breed, seasonality, profitability, and price variability were also estimated. Results with regards to the variables of interest here (fed cattle and corn prices) were similar, so the simpler model is presented to save space.

[3] An Excel® spreadsheet (Price slides.xls) can be found at www.agecon.ksu.edu/kdhuyvetter to estimate the feeder cattle price-weight relationship for various corn and fed cattle prices and feeder cattle weights.

[4] The model-predicted price for a 750 lb. steer of $80.04 can vary from the producer’s forecast of $78.50 for several reasons. First, the model was estimated using prices from Dodge City, Kansas and thus prices may differ geographically (i.e., regional differences in basis). Also, forecasted prices may differ due to varying price expectations for feed costs and fed cattle prices (i.e., the corn and fed cattle price expectations of the different people or firms providing a price forecast may differ from the futures market).

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Focus on Beef Demand

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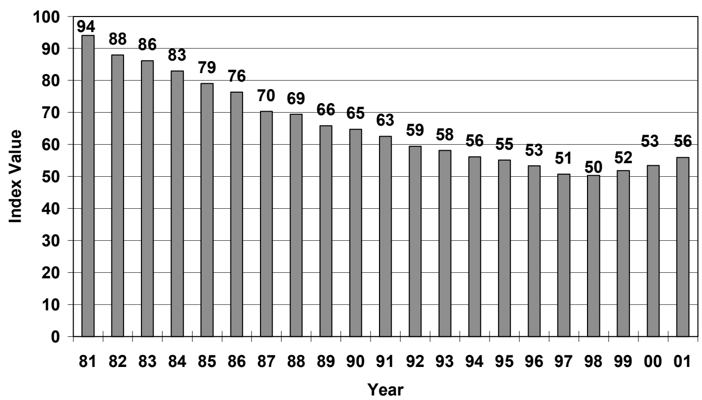
Consumer demand for beef increased modestly during 1999, 2000, and 2001, which generated considerable interest in the cattle industry. The recent demand rebound came on the heels of essentially 20 years of declining beef demand. The decline in demand was apparent as inflation-adjusted retail beef prices and per capita consumption fell. Despite the recent demand recovery, beef demand today is still substantially lower than it was in 1980. For example, the beef demand index indicates 2001 Choice retail beef prices were approximately 44 percent lower than if beef demand was at its 1980 level (Figure 1). To sustain the recent recovery, the beef industry needs to examine in detail what undermined beef demand during the 1980s and 1990s and address the problems identified. This fact sheet discusses results of a comprehensive meat demand study designed to determine major factors that caused beef demand to shift down during much of the last two decades.

Defining Beef Demand

One challenge facing the beef industry is a poor understanding of beef demand and its determinants. Part of the problem is confusion over terminology. Economists differentiate between two related, but distinctly different, terms; 1) quantity demanded and 2) demand. A meaningful discussion of beef demand requires a clear distinction between these two terms. Quantity demanded refers specifically to the quantity of beef consumers will purchase at a given beef price, holding all other factors constant. On the other hand, demand, also referred to as a demand curve, is a schedule of beef quantities consumers will purchase over a range of beef prices.

Figure 1. Retail Choice Beef Demand Index



Source: USDA, Dept. of Commerce & K-State Research & Extension
Price Deflated By CPI, 1980 =100 for Beef Demand Index

A shift in beef demand occurs when the entire beef demand curve shifts up (demand increase) or down (demand decrease). Changes in beef price or the quantity of beef consumed do not cause the beef demand curve to shift. Rather, changes in other factors, such as prices of competing meats (e.g., pork or poultry), demographics (e.g., income, age distribution, etc.), or health or food safety concerns cause the beef demand curve to shift. When beef demand increases (i.e., shifts up), say as a result of an increase in the price of poultry that causes consumers to substitute beef for poultry, the result is higher beef prices at any level of beef consumption than prior to the demand shift. Conversely, when beef demand decreases (i.e., shifts down) beef prices are lower at any beef consumption level than prior to the demand shift.

Because there is considerable confusion surrounding demand, it is useful to stipulate what beef demand is not. Beef demand is not per capita beef consumption. Per capita consumption is beef production (net of changes in cold storage, imports, and exports) divided by population. Observing per capita consumption over time without consideration of price provides little information regarding beef demand. Beef demand is not beef's relative share of total meat consumption. This share concept simply reflects production of beef relative to production of competing meats and does not include information regarding prices. Finally, beef demand is not the share of consumer income spent on beef. Consumer income level affects beef demand, but changes in the share of consumer income spent on beef do not provide a measure of whether beef demand is increasing or decreasing since changes in income alone can cause changes in the share of consumer income spent on beef, even if beef demand remains unchanged.

Since many beef demand determinants, as well as beef production, change at the same time, it is impossible to accurately assign relative demand shifts to individual demand determinants through casual observation of trends and beef demand shifts. As a result, a meat demand system was estimated using quarterly time series data over the 1982 to 1998 period. The system included factors accounting for prices of competing meats and total consumer expenditures, changing consumer demographics, food safety problems, health information, and seasonality. The impacts of individual demand determinants on beef demand were calculated each year from 1992 through 1998.

Beef Demand Model Results

Model results indicate beef demand is inelastic with respect to beef price and that pork and poultry are weak substitutes for beef. Over 1982 to 1998, on average, beef quantity demanded declined 0.61 percent given a 1 percent increase in beef price. Responses to competing meat price changes were much smaller as beef quantity demanded increased 0.04 percent and 0.02 percent, given a 1 percent increase in retail pork and poultry prices, respectively. These elasticity estimates indicate relative prices matter, however, per capita beef consumption was not highly responsive to changes in pork and poultry prices. Moreover, beef expenditures represent a progressively smaller proportion of total consumer expenditures. This implies beef demand will become even more inelastic (i.e., quantity demanded will be less responsive to price changes) in the future. This result, taken together with findings from other consumer research indicates many consumers are willing to pay for a high quality product (i.e., price is less of an issue if quality is high). As a result, consideration should be given to devoting resources to research focusing on quality (especially tenderness) measurement. Making it easier for consumers to select the quality product they desire will encourage consumers to buy beef.

Expenditures Impact On Beef Demand

Beef demand was highly responsive to changes in total per capita expenditures on all goods. Changes in total per capita expenditures occur when personal disposable income increases, consumer willingness to spend income increases, or a combination of the two. Consumer willingness to spend a larger proportion of total income has been an important source of economic growth for the U.S. economy in recent years. For example, consumer expenditures rose from less than 90 percent of disposable income in the early 1980s to near 98 percent by 1999. Demand model results indicate beef demand increases 0.90 percent for a 1 percent increase in total per capita expenditures. This means beef demand was a major beneficiary of increasing consumer expenditures, but if consumers choose to increase savings in the future (in lieu of consumption), or if disposable income declines, it will have a negative impact on beef demand.

Food Safety Recalls Impact On Beef Demand

Beef demand declined when beef food safety recalls occurred. Beef recalls averaged 2.1 per quarter from 1982 to 1998, but the number of recalls varied across quarters and years. For example, beef recalls ranged from 4 to 8 per quarter during 1998. Over the 1982-1998 period the number of Food Safety

Inspection Service (FSIS) recalls were relatively few in number and their impact on beef demand was generally small. But the demand model results indicate a large increase in beef recalls leads to a significant downward beef demand shift. The beef industry cannot afford to be passive and simply react to food safety problems after they occur. Rather, the industry needs a proactive food safety program to minimize the negative impact on beef demand associated with FSIS recalls.

Health Information Impact

Health information linking cholesterol and heart disease weakened beef demand, from 1982 through 1998, by an average of about 0.60 percent annually. As more articles are published supporting the linkage between cholesterol and heart disease, beef demand declined modestly, whereas pork and poultry demand actually increase. Importantly, the negative impact of health information on beef demand increased over the study period.

There are several implications to be derived from the linkage between articles that publicize heart disease risk and cholesterol and their subsequent negative impact on beef demand. First, dietary guidelines for consumers on cholesterol restricted diets that include beef need to be broadly disseminated. This type of program has already been developed with beef checkoff funding and these results suggest it should continue. Second, additional research that clarifies the heart disease - cholesterol relationship by cholesterol type, and dissemination of these research results within the medical community and among consumers, could also prove helpful. Finally, the industry must produce healthy, nutritious beef products to keep consumers satisfied

Changing Consumer Demographics

Changing demographics suggested consumers placed more emphasis on how quickly meat items can be prepared for consumption. The percentage of females in the labor force rose from 52 percent in 1982 to 60 percent in 1998. As a greater proportion of females enter the labor force, less time is available for at home food preparation. Declining time available for food preparation had a negative effect on beef demand, but a positive effect on poultry demand. Beef demand declined an average of 1.3 percent annually over the 1992-98 period as a result of increasing female labor force participation. Assuming consumer demand for convenience is related to female labor force participation, these results indicate the poultry sector benefited over time by offering more convenient products to consumers. At the same time, beef demand suffered as time allocated for food preparation declined and the beef industry failed to offer consumers high quality, convenient, easy-to-prepare beef products.

The lessons for the beef industry are two-fold. First, it confirms the need for the beef industry to commit resources to research and development of innovative, consumer friendly, easy to prepare beef items suitable for sale in supermarkets. Recent new product development successes reinforce the value of devoting beef checkoff funds to product development research. Second, the industry must recognize that as consumers place higher and higher values on their time, demand for food consumed away from home will increase. This means new product development should also target products consumers purchase in a wide variety of dining establishments, ranging from low-priced fast food restaurants to high-priced white table cloth establishments.

What's Behind The Recent Beef Demand Recovery

Beef demand showed signs of strengthening in late 1998 1999, 2000, and 2001. The beef demand index, which is a ratio of the actual inflation-adjusted Choice retail beef price and the price that would have occurred if beef demand held constant at its 1980 level (multiplied by 100), helps illustrate the magnitude of demand changes over time. During 1998, the beef demand index bottomed out at 50, indicating inflation adjusted prices were 50 percent lower than they would have been if demand held constant at its 1980 level. During 1999, 2000, and 2001 the index value increased 3, 3.2 and 4.6%, respectively. Cumulatively, these modest increases brought beef demand in 2001 back to the level observed in 1995, still 44 percent below the 1980 level.

Although it is not clear exactly what drove the recent improvement in beef demand, some inferences can be drawn. First, changes in competing meat prices since 1998 do not explain the demand shift. If all else is held constant, an increase in inflation-adjusted competing meat prices would lead to an increase in beef demand as consumers would shift their consumption away from relatively higher priced competing meats towards relatively lower priced beef. But from 1998 to 2001 inflation-adjusted broiler prices declined 5.5 percent. Retail pork and turkey prices increased just 2.2 and 1.5 percent, respectively, so most of the beef demand increase was not attributable to changes in competing meat prices.

Second, growth in the U.S. economy contributed to the improvement in beef demand. Inflation-adjusted per capita disposable personal income grew by about 3.7 percent from 1998 to 2001. Demand model results indicate that consumer income is an important determinant of beef demand. So, the rise in income contributed to the beef demand increase.

Third, consumer acceptance of new beef products in the marketplace might explain some of the recent beef demand turnaround. To date, the gain from new product development is likely small, but increasing. Many of the new beef products are derived from round, chuck, and shoulder clod cuts. So, one way to assess whether new product offerings have had a significant impact on beef demand is to examine these wholesale cut prices relative to USDA's light Choice cutout value. Examining these ratios provides some information regarding demand for individual cuts relative to a composite beef price.

Round prices weakened, relative to the cutout, during most of the 1990's. The ratio of top round prices to the light Choice cutout value declined from an average of 1.39 in 1990 to 1.19 in 1997 (Figure 2). Similarly, the ratio of bottom round prices to the cutout value averaged 1.21 in 1990, but was only 1.02 by 1997. However, the declines in both the top and bottom round ratios apparently came to a halt during 1998-2001 (Figure 3). One possible explanation for the apparent turnaround in these wholesale cut values is the addition of new product offerings that utilize these cuts. So, it appears that offering new, consumer friendly beef products has had a positive impact on beef demand, but it has been modest so far and likely explains only a portion of the observed beef demand increase.

Another factor that likely contributed to the beef demand recovery during recent years was an apparent stabilization in the percentage of women employed outside the home. During the 1980's and most of the 1990's, an increasing percentage of women joined the U.S. labor force. This long-term change in consumer demographics likely increased consumer demand for convenience, which benefited poultry demand and contributed to beef's long-term demand decline. However, the rate of growth in female employment outside the home slowed during 1999-2000.

Finally, it's worth noting that many of the other factors that had a negative impact on beef demand during the 1980s and 1990s, such as consumer concerns about food safety and health information, continued to have a negative effect on beef demand during 1999-2001. The fact that beef demand was able to strengthen despite the presence of these negatives suggests some consumers' preferences may have shifted away from other food products toward beef.

Figure 2. Top Round #168 to Light Choice Cutout Price Ratio, Weekly 1990-1998

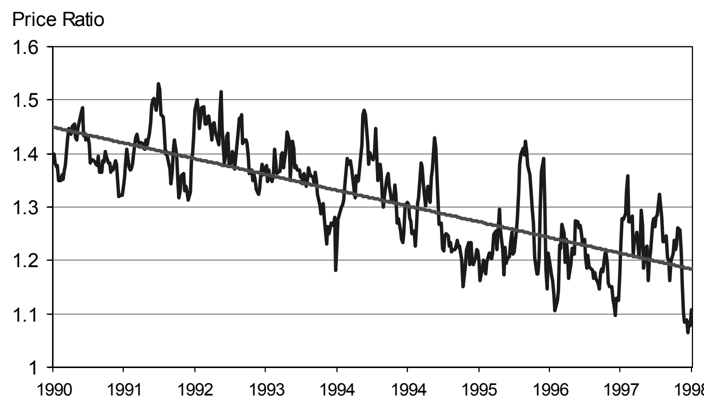
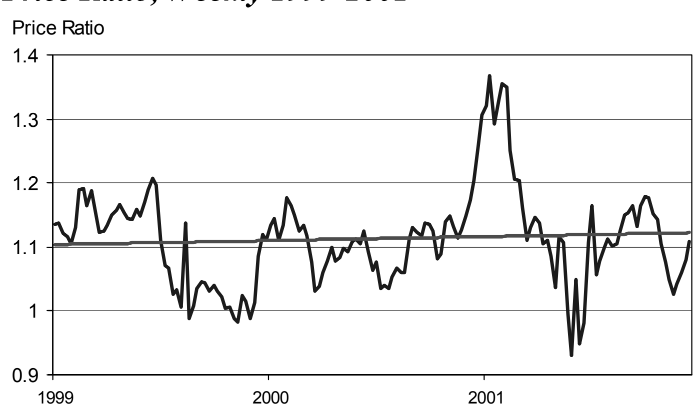


Figure 3. Top Round #168 to Light Choice Cutout Price Ratio, Weekly 1999-2001



THE CATTLE CYCLE

By
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Cycles are a well known and often discussed feature of the cattle business. Improved knowledge of the cattle inventory cycle can be helpful for long-run planning as you evaluate the direction your business should take in the future. This fact sheet discusses the cyclical aspects of the cattle business, some of the causes of cyclical behavior, and several indicators which can be used to monitor the cycle and provide some guidance when making long range plans.

Seasonality, Trends and Cycles

Three time dimensions are usually used when discussing the beef cattle industry; seasonal patterns, trends, and cycles. A seasonal pattern is a regularly repeating pattern that is completed once every twelve months. Examples include seasonal highs and lows in fed cattle or feeder cattle prices which tend to occur near the same time each year. Trends may be thought of as long term direction and an analysis of trends usually covers several years. A long term increase in the U.S. population is an example of a trend. Finally, a cycle is a pattern that repeats itself regularly over a period of years.

The history of the cattle business has been one of cycles as cow-calf producers expand inventories in response to profits and, ultimately, contract their herd size in response to losses. While no two cattle inventory cycles have been exactly the same, there are a number of repetitive patterns that occur across cycles which can be used to judge where we are and where we are headed within a given cattle cycle.

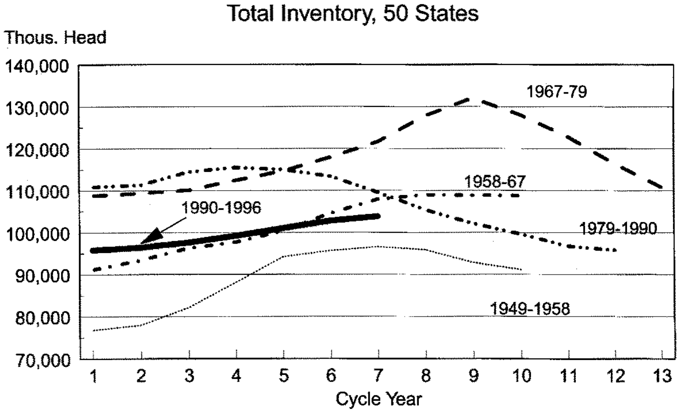
Inventory Cycles: What and Why

Cycles are measured from one trough to the next trough. The average length of the six full cycles in cattle inventories since 1928 has been about 10 years (Figure 1). On average, inventories increased about 6 years during each cycle, but during the last full cycle (1979-1990) cattle inventories increased just 3 years before producers began to liquidate their herds. Historically, periods of declining cattle inventories have averaged about 4 years. However, liquidation during the 1980s lasted 8 years, the longest liquidation phase on record. The cattle herd liquidation of the 1980s was apparently caused by an extended period of low prices attributable not only to cattle and beef supplies, but also to large year-to-year declines in beef demand. Relatively low prices of competing meats, and other factors related to changing consumer tastes and preferences for beef, led to the beef demand decline.

Prior to 1979, the long-term trend in the U.S. cattle sector was for inventories to increase. At each cycle's trough the all cattle and calves inventory was larger than the lowest inventory during the previous cycle and each successive inventory peak was greater than the previous cycle's peak. The cattle inventory peak during the 1979-1990 cycle was the first time the cycle's peak failed to establish a record high. In addi-

FIGURE 1. CATTLE ON FARMS BY CYCLES

Total Inventory, 50 States



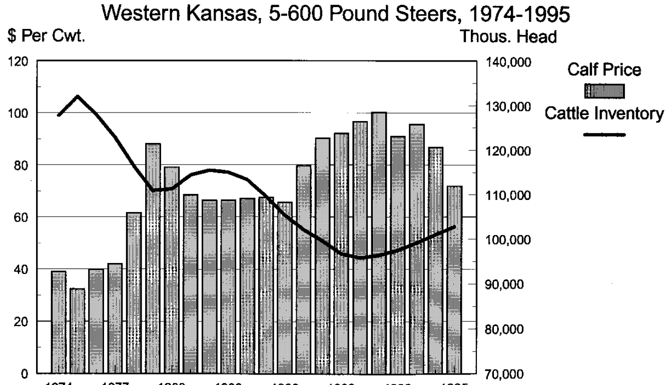
tion, the 1990 cattle inventory estimate marked the first time a cycle's inventory trough fell below the previous cycle's trough.

Cattle cycles occur in large part because of the biological nature of production. Cow-calf producers respond to profitable calf prices by holding back more replacement heifers and not culling as many cows. The increase in cow numbers leads to more calves the next year. But additional heifers held back for entry in the cow herd don't increase beef production for at least 3 years. Eventually, the increase in the cattle inventory and, subsequently, beef supplies leads to lower prices. Ultimately, prices decline below many cow-calf producers break-even level which leads higher cost firms to start liquidating their herds. Herd liquidation continues until prices return to profitable levels.

The time it takes production to respond to higher or lower prices creates a lag between price peaks (troughs) and subsequent inventory peaks (troughs). For example, annual average prices for 500-600 pound steers in western Kansas reached a cycle high of $87.97 per cwt. in 1979, but the all cattle and calves inventory didn't peak until three years later in 1982 (Figure 2). Similarly, in the current cycle, the same weight steers averaged $100.19 per cwt. in 1991 and it appears the all cattle and calves inventory peaked about 5 years later.

FIGURE 2. CALF PRICES AND CATTLE INVENTORY

Western Kansas, 5-600 Pound Steers, 1974-1995



The biological response time for a cattle cycle would be shorter than the average cycle's 10 year length. But cow-calf operators tend to keep increasing the size of their herds as long as calf prices remain profitable and tend to liquidate a portion of their herds as long as calf prices are unprofitable. Moreover, behavioral factors also influence the build-up and liquidation phases of cattle cycles. Some producers respond to early warning signs while others do not, leading to lags in producer response and thereby lengthening the cycle. Finally, the financial condition of producers can influence the speed with which they respond to either profitable or unprofitable calf prices.

Beef demand has also played a role in the cattle cycle. Population growth and growing consumer incomes led to long term growth in beef demand until the 1970s and 1980s. In turn, long term growth in beef demand helped produce an upward trend in cattle inventories and beef supplies. But in the 1980s, declines in beef demand helped cut short the expansion phase of the 1979-1990 cattle cycle as calf prices fell to unprofitable levels more quickly than during previous cattle cycles and producers began to liquidate a portion of their herds. Declining beef demand during the 1980s contributed to the unusually long liquidation phase of the last cattle cycle.

Cycle Indicators and The Current Cycle

Several indicators can be used to monitor the stage of the cattle cycle. Although no single indicator is perfect, using several indicators together can provide insight into the current cattle cycle.

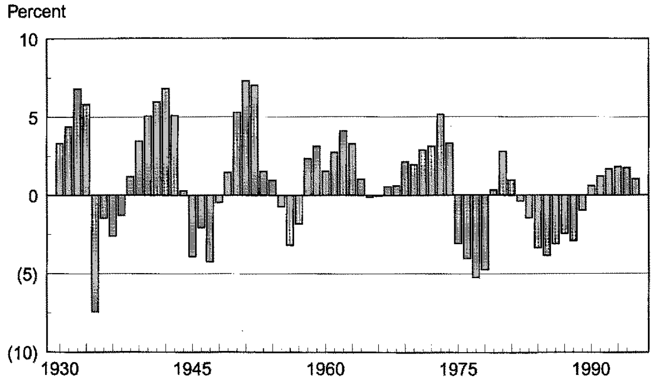
The current cattle cycle began in 1990 when the U.S. cattle and calf inventory was 95.8 million head. That was the smallest total inventory since 1959 when the U.S. inventory was just 93.3 million head. The current cycle entered its seventh year in 1996.

Calf prices peaked during the current cycle in 1991, averaging $100.19 per cwt. for 500 to 600 pound steers in western Kansas. But declining prices in 1992 were followed by an increase in calf prices during 1993 due to higher fed cattle prices caused by the harsh winter of 1992-1993. That "false signal" of increasing calf prices in 1993 probably extended the expansion phase of this cattle cycle and helped exacerbate the industry's price problems in 1996.

Inventory Growth Rate

A growth rate is simply the year-to-year percentage increase in the inventory. Growth rates vary widely from one cycle to the next. The growth rate of the all cattle and calves inventory during this cycle has been modest compared to previous cycles. For example, since 1990 the rate of growth in the all cattle and calves inventory was never greater than 1.8 percent whereas previous cycles often recorded year-to-year increases in the cattle inventory of more than 5 percent (Figure 3).

FIGURE 3. PERCENT CHANGE IN CATTLE INVENTORY
1930-1996



The rate at which cattle inventories can expand before the resulting increase in supplies leads to lower prices is largely dependent on how rapidly aggregate beef demand grows. It appears that rapid growth rates were sustainable for longer time periods in previous cattle cycles because the combination of a growing domestic population and increasing consumer incomes were producing larger aggregate increases in beef demand than has been the case in recent years. Addtionally, growing productivity in the beef sector represented by the trend of increasing beef production per cow also means that any given herd growth rate today will lead to a larger beef supply increase than was the case during previous cattle cycles. Recent evidence suggests that total herd growth rates in excess of one percent for several years are sufficient to push fed and feeder cattle prices lower. However, in the future, continued growth in beef exports could once again put beef in a position where faster herd growth rates are sustainable.

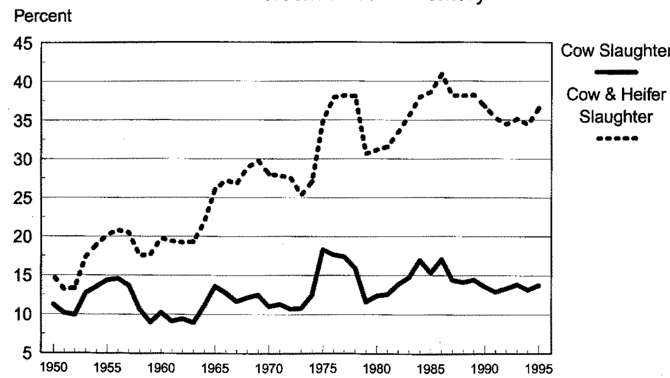
Cow and Heifer Slaughter

Historically, cow slaughter less than about 13 percent of the January 1 cow inventory indicated herd buildup. Cow slaughter rates greater than 14 to 15 percent have generally been a sign of herd liquidation. During the current cycle, cow slaughter as a percent of the January 1 cow inventory has ranged between 12.9 and 13.8 percent (Figure 4).

Cow and heifer (total female) slaughter as a percent of the cow inventory can also be used to indicate herd growth and liquidation. The addition of heifer slaughter provides some information regarding heifer retention rates which can be viewed as another leading indicator of the cow herd's future size.

Annual total female slaughter greater than about

FIGURE 4. COW AND HEIFER SLAUGHTER
As a Percent of Cow Inventory



38 percent of the cow herd inventory has been indicative of herd liquidation while female slaughter totalling less than approximately 37 percent of the cow herd has been associated with herd growth. Since 1990, total female slaughter ranged from 34.4 to 36.5 percent of the January 1 cow herd. Consequently, female slaughter data during this cycle has been consistent with the relatively slow herd growth rates that have been observed, but the 1995 data indicated that the industry was poised to switch from the expansion phase of the cattle cycle to the liquidation phase.

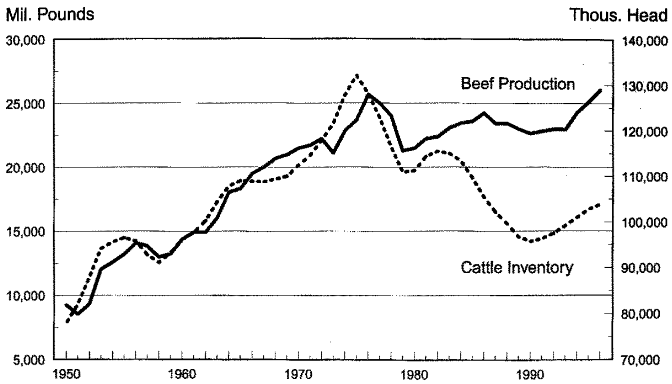
The Cattle Cycle and Beef Production

When examining the cattle cycle, producers should remember that many things have changed over the last 20 years. In addition to changes in beef demand, important changes have occurred in cattle production, especially in cattle weights. These factors have impacted the cattle cycle and will continue to do so.

Estimated commercial cattle dressed weights increased from a 1975 average of 575 pounds to 705 pounds during 1995, an increase of 130 pounds. Heavier dressed weights are attributable to changing herd genetics and management systems. Over the same time period, the increase in dressed weights and a long term decline in calf slaughter helped push estimated beef production per cow up 35 percent to 563 pounds per cow in 1995.

The implications for the current cycle are clear. Beef production today is about the same as that of the 1970s, but with 12 million fewer cows (Figure 5). Although the cattle inventory grew by less than 2 percent annually in the 1990s, beef production increased by almost 6 percent in 1994 and 3 percent in 1995. During the expansion phase of this cycle, small increases in cattle inventories had much larger impacts on U.S. beef production than in previous cycles. Now that the liquidation phase of the current cattle cycle has emerged, the reverse is true as well. Fewer cows need to be liquidated than in past cycles to a have a large impact on beef production.

FIGURE 5. BEEF PRODUCTION AND CATTLE INVENTORY
1950-1996

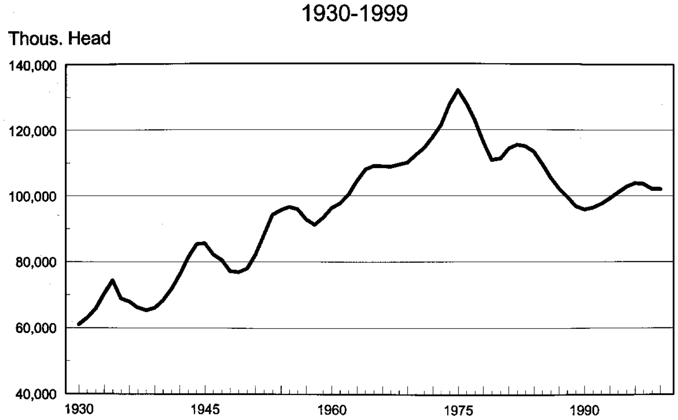


Projections

Cow-calf producers absorbed large losses in 1995 and are expected to lose money again in 1996. Consequently, the U.S. cow herd is expected to reach its cyclical peak in 1996. If cow slaughter continues at the pace established during the first half of 1996, the January 1, 1997 cow inventory and the total U.S. cattle inventory are both likely to fall below their 1996 levels.

Long-term, calf prices are expect to remain at unprofitable levels through 1997 and the lack of profitability will probably lead to even smaller cattle herd inventories by January 1998 (Figure 6). The length and severity of this liquidation phase depends heavily on the weather and feed markets. Prolonged severe drought may force liquidation in some parts of the country. Continued high feed costs will pressure calf and feeder cattle prices, leading to even larger losses in the cow-calf sector and more rapid liquidation. Alternatively, larger corn acreage and a return to long term trend yield levels combined with improving moisture and pasture conditions in the Southern Plains could slow the rate of liquidation and lead to a longer liquidation phase.

FIGURE 6. U.S. CATTLE INVENTORY
1930-1999



Two other factors, besides weather and feed grain prices, could be important in the liquidation phase of the current cattle cycle. Cow-calf producers had a long string of profitable years in this cycle and their balance sheet strength may result in some delays in breeding stock liquidation, particularly in regions where drought and poor pasture conditions are not limiting factors. Second, U.S. beef exports have grown dramatically in recent years. If that trend continues, foreign demand for U.S. beef will absorb an increasing share of U.S. production and provide more support to domestic cattle prices. However, despite the optimistic outlook for U.S. beef exports, it appears unlikely that increasing export demand will be sufficient to absorb enough of the expected increase in beef production to enable the U.S. cow-calf sector to return to profitability prior to 1998.

Managing for Today's Cattle Market and Beyond

March 2002

Profiting from the Cattle Cycle: Alternative Cow Herd Investment Strategies

By

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Beef cowherds are capital-intensive enterprises and should be viewed as other capital investments. Like other assets there is an initial investment followed by a stream of future earnings that provides a return on the original investment. Heifers are retained and developed or purchased and raise calves over the coming years to generate income. And like many other businesses, the cattle industry is cyclical. When you invest impacts your return because the cycle impacts the investment cost and future earnings.

Can producers use knowledge of the cattle cycle to make more profitable investment decisions? Yes, if two basic principles of economics are applied. First, "buy low and sell high," and second, "find out what everyone else is doing and do the opposite." While easier said than done, this paper will evaluate alternative heifer retention strategies to put these principles into practice to profit from the cattle cycle.

Where do cycles come from?

The cattle cycle is largely driven by the economics of the beef cow enterprise. One explanation is that cash flow needs drive heifer retention decisions. When calves are cheap, ranchers sell more calves (steers and more of the heifers) to meet cash flow obligations. As prices increase, they do not have to sell as many to meet their needs and can thus retain more heifers to rebuild and expand their herd.

This analysis evaluates four alternative heifer retention strategies over the 30-year period between 1970 and 1999, using annual returns and wealth produced over the period. Four alternative heifer retention strategies are modeled for a representative beef cow-calf producer. The starting point for all strategies is a January 1, 1970 inventory of 82 bred cows, 18 bred first calf heifers, 21 virgin heifers being developed and 5 bulls. University extension budgets for each year were used to determine non-feed variable costs, the amount of inputs used, hay prices and bull purchase price (Iowa State University Extension). Table 1 summarizes the budgeted weights and nominal prices and costs for 1999 as a point of reference.

Selling prices were based on USDA reported prices for 1970-1999 (USDA, AMS). Prices and expenses were deflated using in the GDP deflator with 1996=100. Steer and heifer calves, cull cows, heifers and bulls were assumed sold in November at the monthly average price. January herd inventory value is based on November prices but with expected weight gains. Bred cows and heifers were valued 50 percent over the cull value.

Performance assumptions in the model were as follows: Conception rates for cows and heifers 85 percent, death loss for calves 4 percent and 2 percent for cows, and the culling rate for cows was 16 percent annually inclusive of the open cows. The number of breeding females per bull did not exceed 25:1. Market weight of calves and cull heifers and cows were based on university budgets, but were averaged from year to year to reflect the trend in weights rather than periodic increases as budgets were updated. Retained heifers were expensed into the herd at their cost of production rather than their market value opportunity cost.

Table 1. Beef Cow Budget Values, 1999 Values

Revenue	**Amounts**	**($/cwt)**
Cull cows (average weight)	1150	37.88
Steer calves (average weight)	551	90.98
Heifer calves (average weight)	511	80.41
Open Cull Heifers (average weight)	907	74.76
Percent calf crop	90%	
Operating cost per cow		
Pasture (acres)	2.5	$26.50
Corn (Bu)	4	$1.80
Supplement (lbs.)	50	$0.16
Hay (tons)	2.1	$67.00
Vet & health		$15.00
Mach & equip, fuel		$15.00
Marketing/misc		$20.00
Interest		9.0%
Labor	7.0	$6.00
Fixed cost per cow		
Mach, equip, fences		$27.00
Interest, insurance		$87.00
Bull deprec/repl		$10.00

Because the focus of the analysis is to compare heifer retention strategies, some simplifying assumptions were made. First, the model ignores weather variability that can impact forage availability. Second, initially it is assumed that the rancher has a flexible land base that can be increased or decreased at the going rental rate. This assumption is relaxed later to determine if the results hold for producers with a fixed land base.

Four alternative strategies

***Steady size (SS)*:** The producer retains the *same number* of heifers each fall to maintain the same size of cowherd. This strategy is common among cattle producers who manage the cowherd to match a fixed land base. The SS strategy serves as the baseline for comparison to the other strategies.

***Cash flow (CF)*:** This producer's objective is to maintain the *same cash flow* each year. All steer calves, cull cows and bulls are sold. Next, enough heifers are sold to reach the cash flow objective and the remaining heifers are retained for the breeding herd. If there are not enough heifers to achieve the cash flow objective additional cows are sold to achieve the needed income. The annual cash flow is equal to the average annual cash flow of the SS strategy. When calf prices are high (low) more (fewer) heifers are retained for the breeding herd.

Dollar cost averaging (DCA): This strategy follows the time-tested method for stock market investments in pension plans. The producer retains the *same dollar value* of heifers each fall. When calf prices are low (high) the producer retains a higher (lower) number of heifers. The annual amount of investment in heifers is equal to the average SS investment in heifers, but the timing of the investment is different. Because of the cyclical nature of cattle prices and the biological lag in production, the lower priced heifers tend to sell higher priced calves and vice versa.

Rolling average value (RAV): The producer retains the *10-year average value* of heifers each fall. The annual investment is equal to the 10-year average value of 21 head of heifers; the same numbers as the SS strategy. Like the DCA strategy, RAV uses the value of heifers based on prices to determine how many heifers to retain each year for the breeding herd.

Results

Table 2 summarizes the animal inventories by strategy. The SS strategy retained 21 heifers each fall as designed, and calved the same number of cows each spring. Notice that the animal units (AUs) increased over time reflecting the move to genetically larger cattle over the 1970-1999 time frame. The DCA and RAV strategies kept an average of one more heifer than SS, but there was much greater variation from year to year. The range was from 15 to 43 a year for DCA and 13 to 33 for RAV. The CF strategy had the greatest variation in the number of heifers retained, 0 to 55 head a year and on average it kept fewer heifers.

RAV calved the same number of cows as SS, but had a range of 91 to 120 head. The DCA strategy averaged more cows calved, had a wider range in number calving, 86 to 138, and ended the 30 year period with 4 more cows than the SS herd. The CF herd averaged fewer cows calving and ended with the smallest herd.

There is much greater variation in AUs in the DCA, RAV, and CF strategies compared to the SS because of the variable investment decisions. It is assumed that the producer rents pasture by the AU rather than by the acre which may be an important restriction. The analysis will address this issue later in the paper.

Table 2. Heifers Retained, Cows Calving, and Animal Units by Strategy, 1970-1999

	Average	Minimum	Maximum	Ending
	Heifers Retained per Year			
SS	21	21	21	21
CF	15	0	55	0
DCA	22	15	43	21
RAV	22	13	33	23
	Number of Cows Calving per Year			
SS	100	100	100	100
CF	85	32	144	32
DCA	106	86	138	104
RAV	100	91	120	120
	Annual Animal Units			
SS	159	152	170	170
CF	132	47	229	47
DCA	169	142	215	179
RAV	160	139	206	206

Table 3 shows the gross revenue and returns over economic and cash costs by strategy. DCA had the largest average revenue and the largest range in revenue. Most of the variation came on the upside with revenues as high as $96,218. CF had the lowest average revenue.

All of the strategies had a long run average return over total economic costs near zero. While disappointing, this result should not be surprising given the declining demand the beef industry suffered from 1980 through the late 1990s. Also, economic cost includes a payment to all resources used in the enterprise, including depreciation and interest on owners' equity. SS had the lowest average return and a range of more than $35,000. DCA had the highest average return and largest range of variation in returns. CF had the smallest range in returns, but the lowest maximum return. CF's lower returns came in part from selling off the cowherd as the ending inventory in Table 2 was only 47 cows.

Return over cash costs (excluding debt service) more closely reflects the rancher's checking account and potentially his/her decision framework. DCA had the highest average cash return (33% over SS) and the widest range. RAV had the second highest average (15% over SS). SS was next in the average and did have a higher minimum. CF had the lowest average return over cash cost (15% under SS). It was the most stable given its objective to produce a target cash flow each year.

A less risky cash flow is an admirable objective for producers and particularly for their lenders. However, the variability or range in returns alone is not a good measure of risk. A more meaningful measure is the downside variation. How large are the losses and how long do they last? The DCA and RAV strategies' minimum was $7,000 and $4,500 less than the worse SS return, making them more risky. At least a portion of this lower cash return is due to retaining more heifers at low calf prices meaning there is less income and more expense from developing additional heifers. Producers using one of these strategies must be financially prepared to weather periods of larger losses in order to be in position for higher returns in the good years.

Table 3. Annual Revenue, Return Over Economic Cost and Return Over Cash Cost, by Strategy, 1970-1999

	Average	Minimum	Maximum	Ending
	Total Revenue			
SS	$43,676	$26,877	$64,707	$39,564
CF	36,417	14,002	65,081	14,002
DCA	47,374	24,710	96,218	41,773
RAV	43,853	22,504	75,119	49,221
	Return Over Total Economic Cost			
SS	-$1,817	-$16,332	$19,406	$545
CF	-924	-11,172	2,872	2,666
DCA	108	-21,146	37,465	1,740
RAV	-449	-17,577	27,792	3,097
	Return Over Cash Cost			
SS	$4,869	-$7,861	$27,178	$5,900
CF	4,152	2,873	6,387	4,757
DCA	6,474	-14,900	48,054	7,135
RAV	5,581	-12,399	35,934	8,356

Table 4 reports the accumulated cash over 1970-1999 period and the value of the cattle inventory at the end of 1999 to measure the change in net worth resulting from the strategy. The accumulated cash results from returns over cash costs compounded annually at the annual real interest rate. As expected, the strategies with the largest returns over cash cost also had the largest increase in accumulated cash and herd net worth. Compared to SS, DCA had 34 percent higher accumulated cash and 30 percent higher herd net worth. RAV produced 21 percent higher accumulated cash and ended with 23 percent higher inventory value. CF ended with the least amount of cash and inventory value.

Table 4. Accumulated Cash and Herd Net Worth, 1970-1999, by Strategy

	Accumulated Cash	Value of Inventory	Herd Net Worth
	Values at the end of 1999		
SS	$492,110	$70,846	$562,955
CF	383,853	15,576	399,429
DCA	659,843	74,308	734,150
RAV	596,510	86,974	683,484
	Compared to Steady Size		
CF	-22%	-78%	-29%
DCA	+34%	+5%	+30%
RAV	+21%	+23%	+21%

Table 5. Total Animals Sold and Average Value per Head, by Strategy, 1970-1999

	Steers	Heifers	Cows
	Total Number Sold		
SS	1440	810	480
CF	1221	762	399
DCA	1532	858	503
RAV	1443	788	473
	Average Value per Head		
SS	468	370	534
CF	459	329	541
DCA	471	391	542
RAV	469	383	531

Given that the performance variables are the same for all strategies, where does the difference in returns come from? As is shown in Table 5, the DCA and RAV strategies sold more total cattle and at higher average prices than the SS and CF strategies because of the timing of investment in heifers. Cattle sold in the DCA strategy received a higher average price suggesting that it sold more cattle during the high price period of the cycle and fewer during the low price period than did the other strategies. This was particularly true of heifer prices. The RAV strategy was second highest on steer and heifer values.

Fixed Land Base

Most cow-herds have a fixed land base rather than a flexible one as modeled above. The producer owns or rents a specific area of pasture (acres). Often this land base is difficult to increase or decrease, and if additional land is available it is often in "lumpy" proportions rather than one AU at a time. The SS strategy matches a fixed land base because it keeps the herd the same size each year. The DCA and RAV strategies have higher average returns and net worth growth, but vary the herd size and the required land base over the cattle cycle. If the land base is fixed are the returns to DCA and RAV still as high?

The analysis assumes that a stocker operation is used to add flexibility to a fixed land base because the number of stockers purchased each spring can be adjusted to match available forage. If the cow inventory declines (increases), more (fewer) stockers are purchased. The stockers were purchased in April and sold in September at the monthly average price, respectively, and gained 200 pounds. The returns for this analysis were based on the change in gross value less $25 per head. The land base was fixed at 215 animal units because it is the maximum herd size for the DCA strategy if it buys no stockers. SS maintains the same cowherd size and buys the same number of stocker cattle each year.

As with the earlier analysis, the DCA enterprise produced higher average revenue, returns over total economic and cash costs, accumulated cash and herd net worth (Table 6). However, the advantage was not as large as before, +22% versus +33%.

This analysis suggests that the DCA and possibly the RAV strategies that factor cattle market prices into the heifer retention decision outperform the SS strategy even with a fixed land base if stocker cattle are purchased to utilize forage not needed by the cowherd. While this analysis focused on the cowherd investment and used stockers as a residual, operations with a larger stocker enterprise could use the same strategy to shift investment between cows and stockers over the cattle cycle.

Table 6. Economic Returns to the DCA and SS Strategies with a Stocker Enterprise

	Average	Min	Max	Last
		Total Revenue		
DCA	49,393	22,860	96,461	44,005
SS	46,112	24,710	66,062	42,378
		Return over total cost		
DCA	1,585	-19,486	37,468	3,924
SS	-151	-15,455	19,669	3,334
		Return over cash cost		
DCA	7,931	-13,248	48,059	9,316
SS	6,511	-7,217	27,450	8,687
		Accumulated Cash		
DCA	261,260	3,151	750,012	750,012
SS	218,248	5,099	615,598	615,598
		Herd Net Worth		
DCA	363,794	88,738	824,320	824,320
SS	314,588	88,383	686,443	686,443

Purchased cows or heifers

The analysis described above was developed for producers retaining heifers rather than buying bred cows or heifers. Although the timing between the investment and the birth, production and sale of offspring is a year quicker with the purchase of bred females, the price sensitivity may be greater. This analysis valued retained heifer investment at cost of production plus heifer development expenses. Although there is not a good data series for bred female prices, there are clearly times when these animals can be bought for less than what it cost to produce them. Likewise, there are times when the selling price has a substantial premium built into it. The DCA concept should guide a producer's investment decision for purchased females as well as it does for raised heifers.

The DCA and RAV concepts should also work for purchased open heifers. The decision of how many to retain was based on the market value, but the actual investment was based on the cost of producing the heifer. Actually buying the heifer at the market value would reduce investment cost during low calf prices and increase investment cost during high calf prices and should result in at least as large, if not a greater advantage to the DCA and RAV strategies.

Summary

Beef cowherd owners can benefit from incorporating price signals into their heifer retention decisions. While a perfect forecast of calf prices over the productive life of the heifer added to the herd would be ideal, such information is not available. However, simple decision rules that incorporate current or recent prices and the knowledge that the cattle cycle likely will repeat itself can help producers improve their investment decisions. A dollar cost averaging strategy that retains the same dollar value of heifers each year and a rolling average value strategy that retains a 10-year average value of heifers out performed strategies that sought to maintain a constant herd size or a constant cash flow.

The dollar cost averaging and rolling average strategies produced higher average annual revenue, returns over economic and cash costs and larger accumulated cash and herd net worth than the other strategies. These results hold for producers who have a fixed land base if a stocker enterprise can be used as a shock absorber for excess forages as the size of the cowherd fluctuates based on investment decisions. However, producers who retain and develop more heifers when calf prices are low and produce more calves and retain fewer heifers when calf prices are high, also have greater variation in returns. Producers who implement these strategies must be prepared financially to weather wider swings in cash flow.

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[1] Special thanks to Zhi Wang, Graduate Research Assistant, and Bridget Rockow, Undergraduate Research Assistant, Iowa State University, Ames Iowa

Managing for Today's Cattle Market and Beyond

March 2002

Should Producers Attempt to Behave Counter-Cyclically During Cattle Cycles?

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Introduction

Cattle cycles refer to the relatively predictable rise and fall in US cattle inventories over a period of years (normally 9-13 years) that have characterized the US cattle market since at least the mid-19th century. Cycles are a well-known phenomenon in cattle markets and are attributed to the lengthy biological lag which exists between when price signals are experienced and when an appropriate increase or decrease in beef production occurs.

Prices tend to vary inversely (though not perfectly) with cattle numbers, meaning that as inventories decline (increase) in cattle cycles, prices are expected to increase (decline). This raises the question of whether producers can take advantage of the cattle cycle by behaving counter cyclically. Counter cyclical behavior basically means that producers would retain more heifers and/or cows than usual when cattle inventories are at or near the high point of the current cycle under the assumption that prices will soon rise and would sell more heifers and/or cows than usual when cattle inventories are at or near troughs in the cycle assuming that prices will soon decline.

Economists sometimes encourage cattle producers to try to behave counter cyclically. Beale et al. (1983), for instance, strongly advocated that producers develop management strategies over the cattle cycle and offered explicit instructions on how to do so. In trade publications, such as the *Western Livestock Journal* (*WLJ*), the message to ranchers is frequently one to try and "time" the market[1] (e.g., the April 3, 2000 Market Advisor column in the *WLJ*). Trapp (1986) suggested that the best strategy for ranchers to follow was to build up herds on the upside of the cycle and to reduce herd sizes on the downside of the cycle.

However, recent research completed by Rosen et al. (1994) suggests that cattle cycles are the direct result of the behavior or forward-looking, profit-maximizing ranchers. However, Rosen et al. made the assumption that all cattle producers have similar costs and that all react the same to market signals.[2] Obviously cattle producers have different costs and may react differently to market price signals, but the work by Rosen et al. and others raises questions about whether producers can behave counter cyclically and improve profits.

Hamilton and Kastens (2000) suggest that cattle cycles can be influenced by market timing. They believe that cattle inventories are influenced by producers attempting to act counter cyclically as well as by prices and biological lags. If so, at least some producers are trying to time the market because they believe they can increase profits by doing so. Is it possible for producers to make more money by timing the market and what conditions need exist for them to do so? In this article, we attempt to describe some of the market conditions and producer situations that might make a market-timing strategy more profitable than simply making decisions based on current market prices. We also describe some of the barriers producers might face in attempting to behave counter cyclically.

Possible Factors Providing Incentives to Act Counter Cyclically

Since economic models using representative producers (e.g. Rosen et al.) suggest that ranchers cannot behave counter cyclically and increase their profits. They also indicate that any rancher who can be more profitable using a counter-cyclical strategy must not be "representative." This may be obvious but it points out that producers must have different costs or behave differently than most producers when faced with similar market conditions if market timing is to be a valid strategy. This must be true since if all producers were willing and able to behave counter cyclically, the cattle cycle would disappear.

Some factors that might provide incentives for some cattle producers to behave differently than other producers include 1) having a significantly lower cost to produce calves than others, 2) holding an opinion that prices for female cattle near the top (bottom) of cattle cycles are undervalued (overvalued), or 3) having a different attitude toward risk than other producers. Each of these possible incentives will be discussed below.

Producers with Low Costs of Production

The per-unit (per-cow) costs of production for cattle producers in different parts of the United States is quite different. For example, Figure 1 shows production costs during 1996-97 on a per bred beef cow basis for four regions defined by USDA, ERS. The four regions were defined as the Plains (KS, NE, ND, OK, SD, TX), the West (CA, CO, ID, MT, OR, WY), North Central (IL, IA, MO), and Southeast (KY, FL). The Plains Region had the lowest production cost while the West had the highest production costs per bred beef cow. If one assumes that producers with low production costs can take advantages of cattle cycles and if the relative relationships between costs in the four regions have held for some time, then one would expect the number of beef cows in the Plains region to be increasing relative to beef cow numbers in the other regions. Figure 2 reports relative beef cow numbers in the four regions between 1970 and 2000. Using the number of beef cows in the Plains region as a base, beef cow numbers in the other three regions are divided by the number of beef cows in the Plains region. Figure 2 shows that little has changed in the relationships between beef cow numbers in these four regions during the past 30 years. Relative beef cow numbers in the North Central region (one of the high cost regions) have declined somewhat compared to the Plains region, but relative beef cow numbers in the West (the highest cost region) have actually increased slightly between 1970 and 2000. This suggests that the relative level of investment in cattle inventories in the four regions has remained relatively constant over time in spite of difference in production costs. While further work is needed to examine these relationships during cattle cycles, the results suggest that in general, producers in low cost regions have either been unwilling or unable to capture more market share by using their cost advantage to behave counter cyclically.

Figure 1. Average Economic Costs Per Bred Beef Cow in Selected ERS Regions, 1996-97.

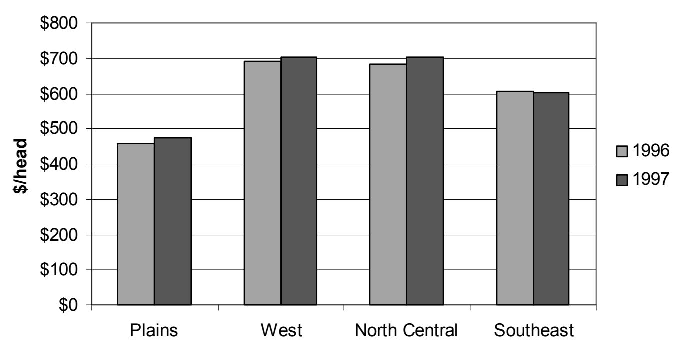
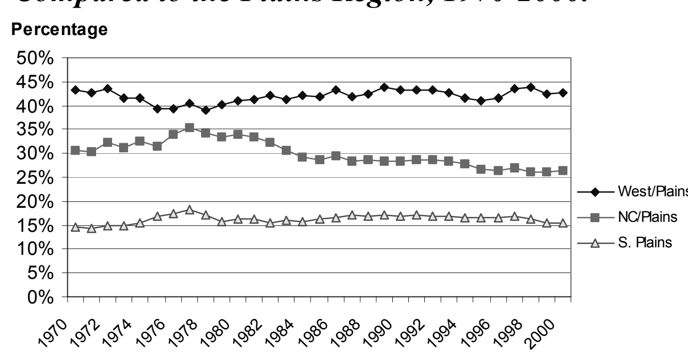


Figure 2. Beef Cow Numbers in Three Regions Compared to the Plains Region, 1970-2000.



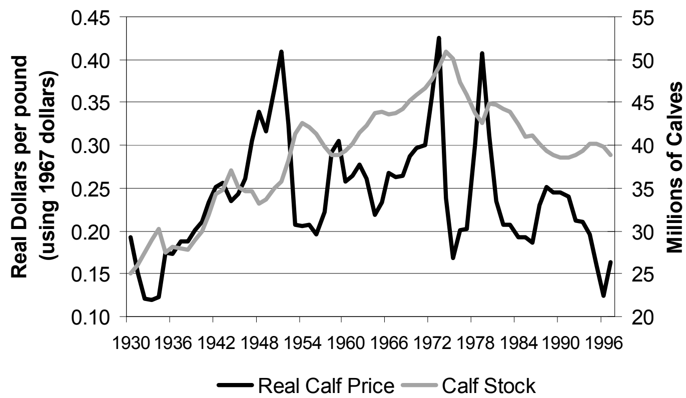
Are Female Cattle Valued Incorrectly During the Cattle Cycle?

Counter cyclical behavior indicates that some market inefficiencies may exist since it implies, in general, that female cattle can be purchased or retained for less than their true value near the top of cattle cycles and/or sold for more than their true value near the bottom of cattle cycles. This is a general statement since different buyers have different values they place on females at each stage of the cycle since their marginal value products for females are not equal. This is because buyers have different costs and price outlooks. However, economic theory states that the value of a female cow is equal the net present value of calves she will produce during her lifetime plus her discounted cull (salvage) value less her discounted carrying (production) costs (Aadland and Bailey). If market inefficiencies do exist which reward counter cyclical behavior it implies that a consistent downward (upward) bias exists in buyers price expectations for calves and/or cull cows near the top (bottom) of cattle cycles that sellers can take advantage of this bias. The authors are aware of no economic research confirming that such a bias exists or not. Consequently, this is an area where further research is needed to determine if counter cyclical behavior could be profitable.

Producers with Differing Attitudes toward Risk

Economic research indicates that cattle prices follow cycles just like cattle numbers follow cycles (Mundlak and Huang). However, price cycles are not mirror images of inventory cycles (i.e., do not rise at precisely the same time inventories fall or vice versa). This is illustrated in Figure 3 where the US calf inventory (stock) is graphed against real US calf prices between 1930 and 1997. Real prices are calculated using 1967 as the base year. From Figure 3 we see clearly that calf inventories have followed a regular cyclical pattern which is repeated approximately every 10 years. Calf prices also appear to display a cyclical pattern, although a much less regular one than calf inventories. Although there were periods such as in 1954, 1959, and 1979 when peaks (troughs) in calf numbers corresponded approximately to troughs (peaks) in calf numbers, there are also other times such as in 1943, 1973, and 1986 where the opposite was true. The reason for these inconsistencies is that the demand and supply for beef (and, consequently, cattle) is not always stable and shocks (shifts) to supply and demand affect the inventory and price relationship.

Figure 3. Calf Stock vs. Real Calf Prices.



What does this imply about the possibility of a producer adopting a counter-cyclical strategy? We suggest that it may be rational for a risk-averse producer to not attempt to time the market. To be successful in a counter cyclical strategy, producers need to be able to forecast with a reasonable degree of certainty, the future path of prices during a cattle cycle. This is difficult for a couple of reasons. First, every inventory cycle is different. Although inventory cycles are fairly regular lasting approximately 10 years, some cycles have been as long as 15 years and some as short as six years. Second, supply and demand shocks are continuously hitting the market making it difficult to judge price movements purely by changes in cattle inventory.

Conclusions

Although different economists have suggested that cattle producers should behave counter cyclically, it is a strategy that has never been a widely followed by producers. This article reports recent economic research which implies that profit-maximizing behavior of producers generates cattle cycles. This suggests that counter cyclical behavior is not expected to generate greater profits than cyclical behavior. We describe some conditions that might lead producers to follow and profit from a counter cyclical strategy. These conditions include having lower production costs than most other producers, the existence of a bias in price expectations for female cattle, or producers who are more willing to accept risks than others.

The fact is that counter cyclical behavior does not appear to be a general practice and has not been successful in dampening cattle cycles. More research is needed to determine conclusively whether some producers can profit from counter cyclical behavior or not.

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[1] "Timing." is defined by Hamilton and Kastens in a February *American Journal of Agricultural Economics* article as the "incentive . . . to deviate from the aggregate movement of the cycle by behaving 'counter cyclically.'"

[2] This means Rosen et al. used a "representative" rancher in their model and assumed all other ranchers had basically the same costs and reacted the same way to market conditions.

Managing for Today's Cattle Market and Beyond

March 2002

Cattle Price Seasonality

By
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Introduction

Seasonal price patterns are normal price movements or fluctuations that occur within a year. Recognizing the presence and magnitude of seasonal price patterns can improve many cattle producer marketing and production management decisions. But producers must also be aware that other factors such as market price trends (general long-term price direction) and price cycles[1] (pattern of prices over several years) also are important.

Agricultural production is driven by climatic seasons and biological factors that result in supplies changing over the year. The timing of calf weaning and stocker animal production are greatly influenced by climatic season, which in turn creates seasonality in animal sales and animal movements. Additionally, demand for many agricultural products is seasonal. When combined, seasonal supply and demand factors (direct and derived from subsequent stages along the marketing chain) create seasonal price patterns. When opposite of "normal" seasonal conditions emerge, market participants often refer to the situation as being counter-seasonal.

Seasonal price patterns tend to differ depending on cattle class (cow, calf, yearling, fed cattle). There also can be differences in seasonal price patterns within cattle classes based on geographic location.

Price Seasonality Defined

Cattle price seasonality is defined as regular or average cattle price patterns occurring within a year. Typically, seasonal patterns for livestock are developed on a calendar year basis and crops are developed based on crop-years.

Seasonal price patterns are usually calculated as an index whose values represent average price levels at a particular point in time relative to the annual average price. Usually, seasonal indices are calculated from monthly average prices. The result is an index where the annual average price is given an index value of 1 or 100 and each time period (monthly) index value represents the percentage deviation from the annual average price level. For example, for 400-500 pound steers sold in Alabama (table 1), a March price index value of 1.05 or 105 means that March prices tend to be 5 percent above the average annual price (1.05 x annual average price). An October index value of 0.951 or 95.1 means that October prices tend to average about 5 percent below the annual average price (0.951 x annual average price).

Seasonal price patterns are calculated from historically observed prices[2]. Data should be collected for a period of time covering one complete cycle. Indices reported here are based on data collected from USDA's Agricultural Marketing Service and cover a period of ten years (1991-2000).

With several years of data, the variability of seasonal prices can also be calculated as a standard deviation at each point in time during the year.

Some times during the year may inherently be more price volatile and the difference between the maximum and minimum index for that month over the entire period examined will grow increasingly wide. There is also a larger standard deviation around the seasonal price index for those months. Thus the confidence or range of variation that one would expect for prices in a given month will vary according to the standard deviation of prices in that month. Tables 1-6 contain 10 year average seasonal price indices and standard deviations for feeder cattle and slaughter cows for six regions of the country. Table 7 contains fed cattle seasonal price indices for Amarillo and Western Kansas.

Price Seasonality by Cattle Class

Cattle price seasonality is generally most pronounced for lighter weight animals (calves) and generally dampens in magnitude for larger animals (feeder and fed cattle). Cull cows, however, have the largest seasonal price swings of all cattle classes. Figure 1 shows a comparison of seasonal price patterns for Texas markets.

Moreover, the general seasonal pattern of price varies across different classes of animals. For calves, prices tend to be higher in the first half of the year and lower in the second half of the year (figures 2 and 3). This reflects a combination of supply -- the majority of calves are spring born and marketed as weanling calves in the fall -- and demand conditions --demand for stocker cattle and cows is generally greater nationwide in the spring as forage production begins to accelerate.

Prices for cows exhibit a pronounced seasonal low in the fall (figure 4). This pattern is the result of dominant production patterns. The majority of beef cows calve in the spring and therefore are culled in the fall after weaning and the producer is confident that the animal was not able to breed back. But, the seasonal pattern can be overwhelmed during periods in the cattle cycle when liquidation or expansion is taking place[3].

Feeder cattle (700-800 lb steers) have complicated and diverse seasonal price patterns (figures 5 through 10). Generally, feeder cattle price exhibit two low periods in the spring and fall with summer and winter price peaks. Fed cattle have seasonal price lows in the summer (figure 11).

Regional Differences in Price Seasonality

Cow-calf production differs widely in different parts of the country. Seasonal availability of calves differs due to forage growing seasons and cattle production practices, such as fall calving in southern regions. Although generally similar, seasonal price patterns for different classes of cattle will vary in magnitude and exact timing of highs and lows in different parts of the country.

Using Seasonal Price Indices to Project Prices

In a stable cattle market environment, seasonal price patterns are baseline market indicators and thus are useful starting points for price projections. Combining seasonal price patterns with current market information provides a simple tool to project current market conditions into the future. A simple procedure to project future prices from current prices is given by:

$$(1) \qquad P_{future} = P_{current} (Index_{future} / Index_{current})$$

For example, if we observe that the November price of 400-500 pound steers in Oklahoma is $100/cwt., we can project the March price of 400-500 pound steers as:

$$P_{March} = \$100\ (1.056/0.973) = \$108.53$$

In this example, we used the March index value of 1.056 and the current (November) index value of 0.973 from Table 4.

We might be interested in determining the most likely range within which the March price will fall. The standard deviation is a measure of the likely variation in the future index value. By adding or subtracting one standard deviation from the future index we can calculate the range within which the future price will most likely fall. In the example above, the March price of 400-500 pound steers in Oklahoma is most likely to fall in the range of $106.27 [$100((1.056-0.022)/0.973)] to $110.79 [$100((1.056+0.022)/0.973)][4].

The above procedure for projecting future prices should be viewed as only the first step in evaluating market conditions. The projection made above assumes that current prices accurately reflect supply and demand conditions and that markets are stable, i.e. not trending up or down. Seasonal price projections calculated according to this procedure may need to be adjusted up or down given one's perception of other (nonseasonal) factors that may be influencing market prices over time.

Table 1. Alabama Cattle Price Seasonal Indices, 1991-2000 Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
400-500 LB STEERS	1.030	1.050	1.079	1.051	1.000	0.991	0.983	0.965	0.958	0.951	0.959	0.982
	(0.037)	(0.045)	(0.023)	(0.050)	(0.041)	(0.024)	(0.048)	(0.048)	(0.044)	(0.016)	(0.026)	(0.038)
500-600 LB STEERS	1.020	1.039	1.070	1.051	1.007	0.999	0.999	0.978	0.957	0.946	0.954	0.979
	(0.032)	(0.040)	(0.023)	(0.039)	(0.038)	(0.027)	(0.041)	(0.039)	(0.035)	(0.017)	(0.024)	(0.029)
700-800 LB STEERS	1.012	1.018	1.016	0.998	0.999	1.013	1.011	1.006	0.984	0.974	0.973	0.996
	(0.026)	(0.020)	(0.026)	(0.041)	(0.036)	(0.026)	(0.031)	(0.037)	(0.029)	(0.019)	(0.017)	(0.036)
UTLITY COWS	0.996	1.054	1.061	1.056	1.068	1.056	1.012	1.000	0.940	0.910	0.908	0.940
	(0.032)	(0.023)	(0.031)	(0.031)	(0.032)	(0.031)	(0.027)	(0.024)	(0.030)	(0.031)	(0.031)	(0.023)

Standard Deviations in ( ).

Table 2. Colorado Cattle Price Seasonal Indices, 1991-2000 Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
400-500 LB STEERS	1.037	1.059	1.072	1.046	1.038	1.016	0.972	0.923	0.942	0.951	0.970	0.976
	(0.048)	(0.049)	(0.037)	(0.043)	(0.032)	(0.053)	(0.062)	(0.153)	(0.070)	(0.026)	(0.037)	(0.049)
500-600 LB STEERS	1.006	1.029	1.059	1.057	1.046	1.025	0.998	0.966	0.952	0.949	0.950	0.964
	(0.029)	(0.023)	(0.018)	(0.030)	(0.033)	(0.045)	(0.029)	(0.035)	(0.041)	(0.017)	(0.023)	(0.034)
700-800 LB STEERS	1.023	1.006	0.992	0.986	0.979	0.986	1.006	1.009	0.999	1.001	1.005	1.008
	(0.022)	(0.018)	(0.026)	(0.045)	(0.033)	(0.032)	(0.037)	(0.031)	(0.031)	(0.021)	(0.023)	(0.035)
UTLITY COWS	0.981	1.028	1.043	1.032	1.037	1.042	1.043	1.035	0.984	0.936	0.899	0.940
	(0.043)	(0.028)	(0.029)	(0.047)	(0.031)	(0.021)	(0.022)	(0.023)	(0.027)	(0.023)	(0.021)	(0.027)

Standard Deviations in ( ).

Table 3. Montana Cattle Price Seasonal Indices, 1991-2000 Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
400-500 LB STEERS	1.027	1.053	1.054	1.029	1.016	0.989	0.969	0.970	0.966	0.962	0.974	0.991
	(0.036)	(0.027)	(0.022)	(0.029)	(0.027)	(0.036)	(0.041)	(0.053)	(0.042)	(0.021)	(0.017)	(0.029)
500-600 LB STEERS	1.016	1.050	1.061	1.045	1.023	1.027	0.980	0.946	0.965	0.959	0.956	0.973
	(0.028)	(0.023)	(0.024)	(0.032)	(0.032)	(0.034)	(0.045)	(0.051)	(0.032)	(0.014)	(0.014)	(0.019)
700-800 LB STEERS	1.012	1.002	0.995	0.992	0.989	1.011	1.010	0.999	1.001	1.003	0.992	0.994
	(0.026)	(0.015)	(0.027)	(0.042)	(0.038)	(0.037)	(0.026)	(0.038)	(0.023)	(0.019)	(0.021)	(0.029)
UTLITY COWS	0.961	1.011	1.040	1.029	1.043	1.048	1.058	1.051	0.996	0.945	0.898	0.921
	(0.031)	(0.030)	(0.029)	(0.052)	(0.043)	(0.022)	(0.022)	(0.036)	(0.034)	(0.040)	(0.040)	(0.020)

Standard Deviations in ( ).

Table 4. Oklahoma Cattle Price Seasonal Indices, 1991-2000 Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
400-500 LB STEERS	1.002	1.037	1.056	1.048	1.012	0.998	0.989	0.986	0.961	0.947	0.973	0.991
	(0.036)	(0.019)	(0.022)	(0.035)	(0.057)	(0.027)	(0.042)	(0.044)	(0.040)	(0.020)	(0.023)	(0.037)
500-600 LB STEERS	0.992	1.024	1.053	1.048	1.016	1.013	1.006	0.995	0.961	0.946	0.965	0.982
	(0.030)	(0.021)	(0.023)	(0.037)	(0.036)	(0.026)	(0.039)	(0.036)	(0.037)	(0.021)	(0.018)	(0.032)
700-800 LB STEERS	1.008	0.997	0.980	0.977	0.977	1.007	1.016	1.006	0.993	0.998	1.014	1.027
	(0.023)	(0.019)	(0.024)	(0.035)	(0.034)	(0.025)	(0.030)	(0.028)	(0.026)	(0.020)	(0.021)	(0.031)
UTLITY COWS	0.984	1.035	1.052	1.039	1.031	1.037	1.034	1.025	0.977	0.930	0.908	0.949
	(0.035)	(0.031)	(0.024)	(0.042)	(0.031)	(0.022)	(0.037)	(0.026)	(0.024)	(0.028)	(0.025)	(0.018)

Standard Deviations in ( ).

Table 5. Texas Cattle Price Seasonal Indices, 1991-2000 Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
400-500 LB STEERS	1.008	1.044	1.059	1.060	0.995	1.000	1.006	0.995	0.961	0.946	0.953	0.973
	(0.035)	(0.024)	(0.019)	(0.039)	(0.047)	(0.026)	(0.033)	(0.036)	(0.041)	(0.035)	(0.033)	(0.042)
500-600 LB STEERS	0.994	1.036	1.061	1.058	1.019	1.016	1.013	0.998	0.960	0.942	0.946	0.956
	(0.025)	(0.015)	(0.019)	(0.042)	(0.036)	(0.024)	(0.028)	(0.031)	(0.043)	(0.020)	(0.032)	(0.036)
700-800 LB STEERS	1.009	1.018	1.019	1.015	0.986	1.001	1.025	1.012	0.986	0.976	0.971	0.982
	(0.024)	(0.022)	(0.029)	(0.046)	(0.042)	(0.035)	(0.030)	(0.032)	(0.040)	(0.015)	(0.043)	(0.036)
UTLITY COWS	0.998	1.054	1.060	1.045	1.009	1.042	1.021	1.022	0.971	0.922	0.912	0.945
	(0.042)	(0.043)	(0.029)	(0.048)	(0.048)	(0.028)	(0.040)	(0.028)	(0.035)	(0.029)	(0.035)	(0.020)

Standard Deviations in ( ).

Table 6. Pacific Northwest Cattle Price Seasonal Indices, 1991-2000 Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
400-500 LB STEERS	1.004	1.020	1.046	1.063	1.045	1.026	1.021	0.977	0.941	0.942	0.950	0.965
	(0.035)	(0.030)	(0.036)	(0.034)	(0.036)	(0.027)	(0.037)	(0.052)	(0.039)	(0.025)	(0.024)	(0.029)
500-600 LB STEERS	0.999	1.017	1.048	1.062	1.048	1.025	1.001	0.977	0.960	0.949	0.949	0.964
	(0.027)	(0.033)	(0.040)	(0.030)	(0.042)	(0.012)	(0.037)	(0.035)	(0.037)	(0.022)	(0.021)	(0.022)
700-800 LB STEERS	1.007	1.005	1.002	1.011	1.011	1.017	1.017	1.000	0.979	0.982	0.974	0.994
	(0.027)	(0.021)	(0.028)	(0.043)	(0.026)	(0.032)	(0.032)	(0.044)	(0.027)	(0.019)	(0.013)	(0.028)
UTLITY COWS	0.972	1.020	1.048	1.034	1.059	1.054	1.054	1.025	0.979	0.935	0.891	0.929
	(0.034)	(0.037)	(0.046)	(0.055)	(0.031)	(0.031)	(0.026)	(0.029)	(0.036)	(0.034)	(0.039)	(0.037)

Standard Deviations in ( ).

Table 7. 1100-1300 Pound Slaughter Steer Price Seasonal Indices, 1991-2000 Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Amarillo	1.011	1.014	1.031	1.029	1.003	0.980	0.967	0.967	0.977	0.998	1.017	1.006
	(0.026)	(0.035)	(0.032)	(0.045)	(0.042)	(0.037)	(0.020)	(0.034)	(0.045)	(0.038)	(0.030)	(0.027)
Western Kansas	1.010	1.012	1.031	1.031	1.004	0.980	0.965	0.968	0.979	0.999	1.017	1.005
	(0.025)	(0.035)	(0.032)	(0.047)	(0.043)	(0.037)	(0.020)	(0.034)	(0.046)	(0.039)	(0.030)	(0.029)

Standard Deviations in ( ).

FIGURE 1. SEASONAL PRICE INDEXES -- TEXAS
By Cattle Class, 1991-2000

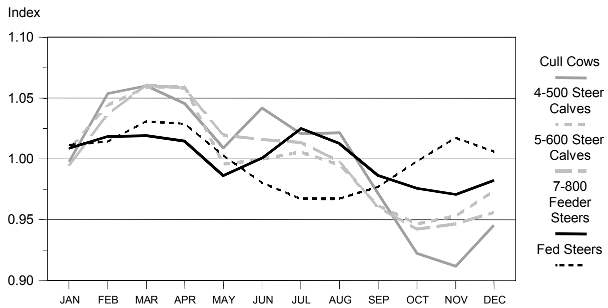


FIGURE 2. SEASONAL PRICE INDEXES -- STEER CALVES
Various Markets, 400-500 Pounds, 1991-2000

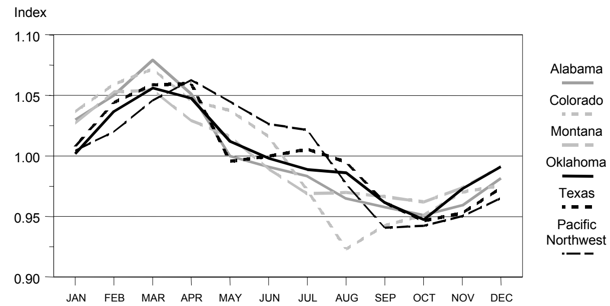


FIGURE 3. SEASONAL PRICE INDEXES -- STEER CALVES
Various Markets, 500-600 Pounds, 1991-2000

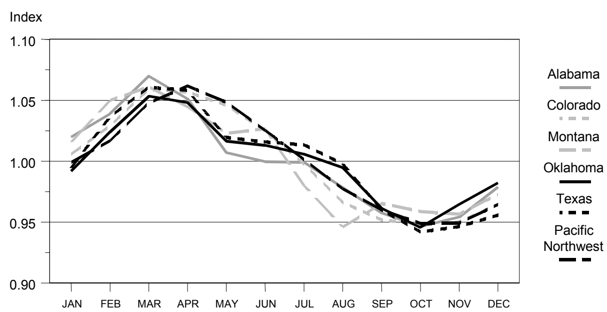


FIGURE 4. SEASONAL PRICE INDEXES -- UTILITY COWS
Various Markets, 1991-2000

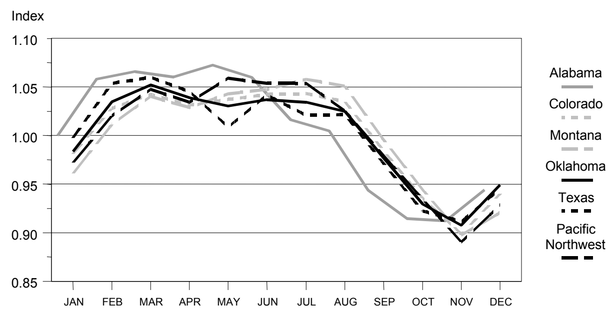


FIGURE 5. SEASONAL PRICE INDEX -- FEEDER STEERS
Alabama, 700-800 Pounds, 1991-2000

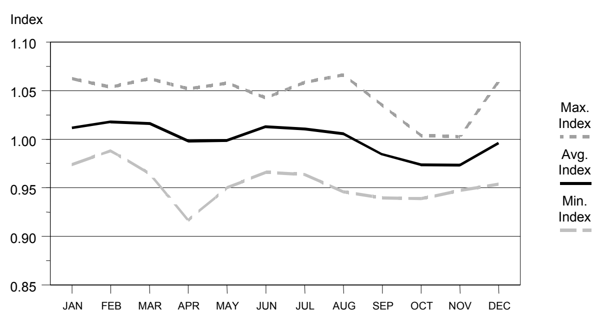


FIGURE 6. SEASONAL PRICE INDEX -- FEEDER STEERS
Colorado, 700-800 Pounds, 1991-2000

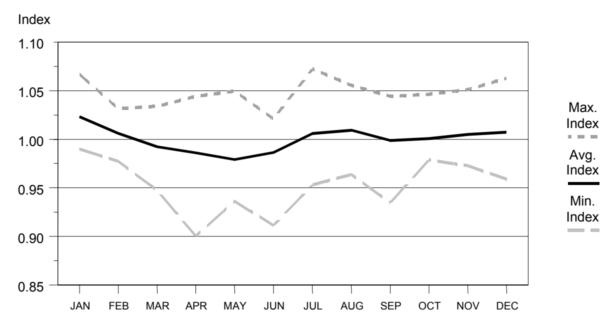


FIGURE 7. SEASONAL PRICE INDEX -- FEEDER STEERS
Montana, 700-800 Pounds, 1991-2000

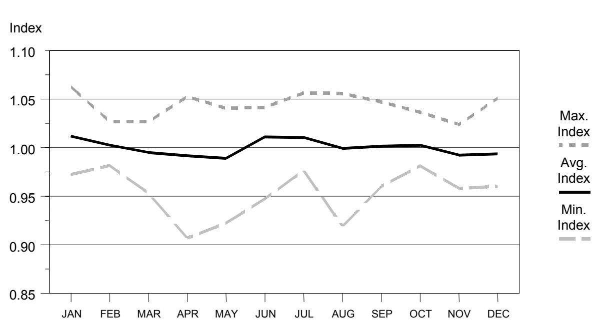


FIGURE 8. SEASONAL PRICE INDEX -- FEEDER STEERS
Oklahoma, 700-800 Pounds, 1991-2000

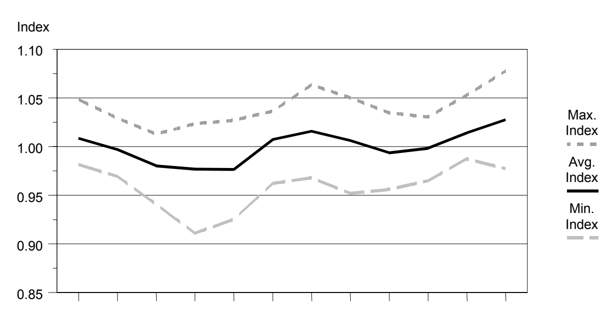


FIGURE 9. SEASONAL PRICE INDEX -- FEEDER STEERS
Texas, 700-800 Pounds, 1991-2000

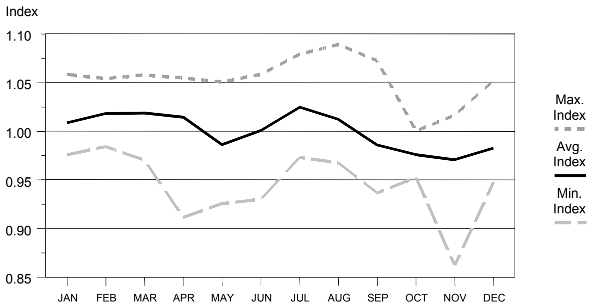


FIGURE 10. SEASONAL PRICE INDEX -- FEEDER STEERS
Pacific Northwest, 700-800 Pounds, 1991-2000

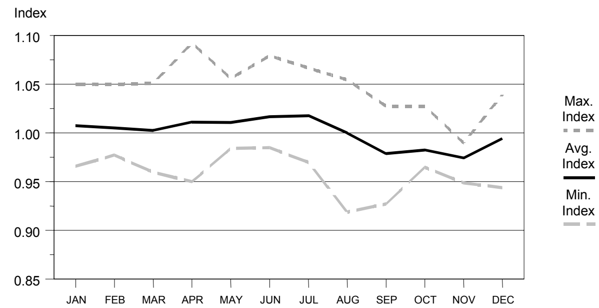
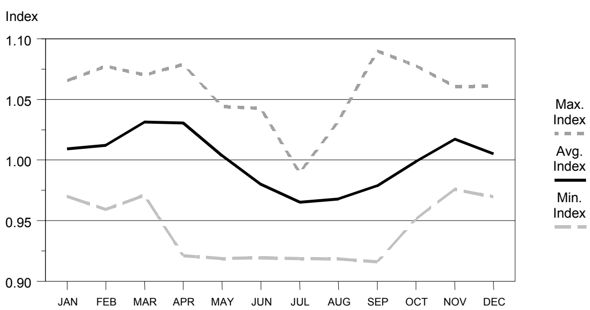


FIGURE 11. SEASONAL PRICE INDEX -- FED STEERS
Western Kansas, 1100-1300 Pounds, 1991-2000



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[1] For a more detailed discussion of cattle cycles, see “The Cattle Cycle” by David P. Anderson, James G. Robb and James Mintert in the “Cattle Market Environment” section of Managing for Today’s Cattle Market and Beyond.

[2] There are several methods to calculate seasonal indices. Many approaches attempt to remove the bulk of the trend and cyclical influences of the data. Index values that are reported are usually an average over a period of years. A centered moving average approach to calculating seasonal price indices on a monthly basis was used for this paper. Market analysts, including the staff of the Livestock Marketing Information Center, have used this method extensively. More details about the method can be obtained from the authors.

[3] For a detailed discussion of marketing cull cows, see “Feeding and Marketing Cull Cows” by Dillon M. Feuz in the “Marketing” section of the Managing for Today’s Cattle Market and Beyond.

[4] Statistically this calculation means that there is a 66 2/3% probability of price being within the calculated range, a 16 2/3 % probability of the price being higher than the upper end of the range and a 16 2/3% probability of being lower than the lower end of the price range.

Packer Concentration and Captive Supplies

By
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Concentration in meatpacking is high, especially for fed cattle slaughtering and fabricating. Use of captive supply methods remained reasonably stable from 1988 to 1994 on an annual average basis. However, captive supply procurement is seasonal and can vary widely from plant to plant and week to week.

Concentration in meatpacking and use of "captive supplies" in cattle procurement have been major concerns to many in the cattle industry in recent years. This fact sheet defines both concepts, provides information on the level and trends in both, and reports on research attempting to determine their impacts.

Concentration

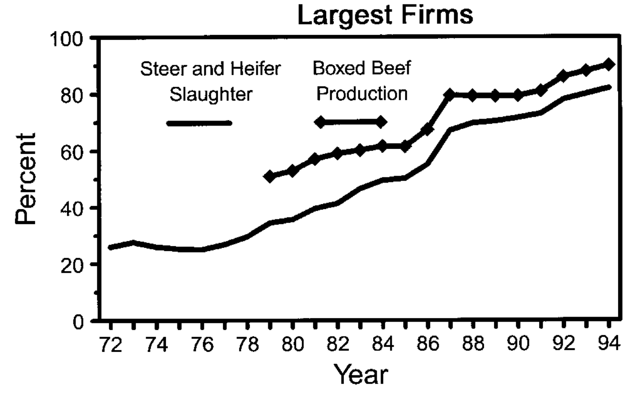
Concentration is defined as a measure of the market dominance of a few large firms. Cumulative market shares by the four, eight, or twenty largest firms are frequently reported measures of market concentration.

High levels of concentration are believed by some to be associated with lower prices paid for inputs (such as fed cattle) or higher prices charged for outputs (such as beef and byproducts). However, concentration does not necessarily indicate noncompetitive behavior (market power) or poor economic performance (low prices paid for inputs or higher prices charged for outputs). Other factors must be considered.

There is little argument that concentration in fed cattle slaughter and boxed beef production is high. In 1994, the four largest firms combined had an estimated 87 percent of U.S. steer and heifer slaughter and over 90 percent of boxed beef production (Kay). Figure 1 shows how concentration has increased since 1972 (Packers and Stockyards Administration). Note, however, that the four largest firms in 1972 were not the same as the four largest firms in 1994. The combined market share of the four largest firms (equivalent to the four-firm concentration ratio) was relatively flat throughout most of the 1970s. Concentration began increasing in the late 1970s and increased sharply through the 1980s and to date in the 1990s.

Consolidation among meatpacking firms has contributed to increased concentration. In 1987 alone, mergers and acquisitions increased the combined market share of the four largest firms by 12 percentage

Figure 1. Combined Market Share of the Four Largest Firms



1991 - 1994 Preliminary

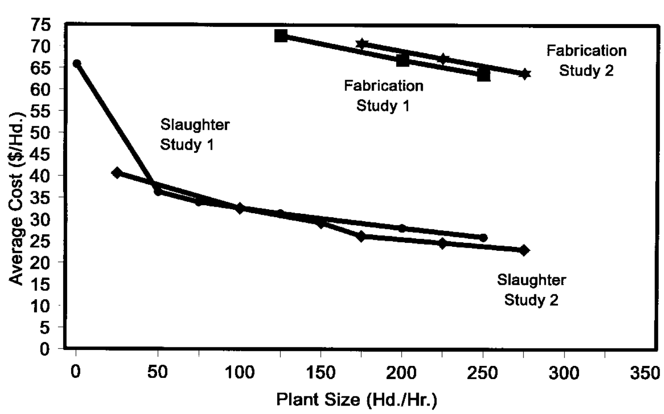
points, from 55.1 to 67.1 percent of total fed cattle slaughter (Figure 1).

The three largest firms, sometimes called the "Big 3" because of their combined market share (an estimated 80.5 percent in 1994), have remained the same since a series of mergers and acquisitions in 1987. Another contributing factor to increased concentration has been internal growth by these largest firms.

Why have meatpacking firms increased in size? Why has concentration increased? To answer these questions we need to understand the nature of the meatpacking business. Meatpacking is a margin business. It has often been called a high-volume, low-margin business. In a margin business, if all meatpackers pay about the same price for cattle, labor, and other inputs, and if they all receive about the same price for the sale of meat and byproducts, then their gross margins will be about the same. So the difference between being more or less profitable (i.e. having higher or lower net margins) is their operating costs. Higher cost firms will be less profitable and lower cost firms will be more profitable. To a limited extent, meatpackers do not care whether cattle and beef prices are high or low, only whether or not their gross margin remains about the same over time. If gross margins remain about the same, they can control net margins by managing their costs.

As a result, one of the driving forces in meatpacking is the need to be a low-cost, cost-competitive firm. One way to achieve lower costs is to operate larger, lower-cost plants at capacity. Several research studies dating back to 1962, have shown there are economies of size in cattle slaughtering and fabricating (Ward 1993). Figure 2 shows results from the two most recent studies. The two lines for slaughtering are downward sloping and the two lines for fabricating are also downward sloping. Both for slaughtering and fabricating, that means as plant size increases, at full plant utilization, average cost per head for slaughtering and fabricating decreases, respectively. Therefore, to be cost-competitive, meatpacking firms operate larger plants.

Figure 2. Average Cost Comparisons from Two Studies, by Plant Size



Another factor affecting operating costs is plant utilization. Having a larger plant pays dividends in terms of achieving lower costs per head when there is a high volume of cattle through the plant (or high plant utilization). Research has shown that larger plants have higher plant utilization (Ward 1990; Barkley and Schroeder 1996). To maintain cost advantages over smaller plants, larger plants must operate their plants more efficiently (i.e. at higher levels of utilization).

As a firm expands a plant, say from 0.5 million cattle per year to 1 million cattle per year. The plant experiences lower operating costs. It also means that 0.5 million cattle which were slaughtered by other plants will now be slaughtered in a single plant. The plants losing slaughter to the larger plant experience higher costs because their plant utilization and volume decrease. The result over time is that smaller plants go out of business and concentration in meatpacking increases. When fed cattle supplies approach slaughter capacity, some smaller plants may reopen as occurred in the early 1990s.

Concentration in meatpacking, then, resulted in part from a need for plants to become more cost competitive. Research has clearly shown significant cost efficiencies associated with larger plants. Lower costs mean meatpackers could pay higher prices for fed cattle. Even a $5 lower average slaughtering-fabricating cost per head potentially could translate into $0.35-0.50/cwt. higher prices paid for fed cattle.

Profits in meatpacking in the mid-1990s have been double the profit rates for the preceding several years. A long-run profit rate in meatpacking has been a 1 percent return on sales. Sales can be estimated by taking the boxed beef cutout value times the average dressed weight for fed cattle plus the average hide and offal value times the average live weight for fed cattle. Then 1 percent times that figure gives an estimate of average profit per head in fed cattle slaughtering and fabricating. Returning all the higher profits (above a 1 percent return on sales) from meatpackers to cattle feeders in the form of higher prices would mean about $0.75-1.00/cwt. higher fed cattle prices the past couple years.

Concentration Impacts

Impacts of high or rising concentration are difficult to measure. Cattlemen express concerns about: (1) market access or having a market for cattle when cattle reach market weight and finish; (2) adequacy of competition among buyers; and (3) receiving lower prices paid for livestock.

Certainly, fewer meatpackers mean fewer potential buyers. As long as meatpacking capacity exceeds the supply of fed cattle, having a market for cattle may not seem to be a big concern in the industry as a whole. However, for some short time periods and in some local areas, market access may be a real issue.

A major question relates to the adequacy of competition among buyers and the effect on fed cattle prices (Ward 1988). There is evidence from several research studies of small negative impacts on slaughter livestock prices from increased consolidation and concentration. Research has addressed several questions; some focusing on transaction price impacts and some on impacts for prices aggregated over time and over the entire U.S. meatpacking industry.

One line of research has attempted to determine the effects which number of buyers has on livestock prices. Generally, fewer buyers mean less demand for slaughter livestock and less buyer competition, both of which lead to lower livestock prices. Conversely, more buyers generally mean more demand for slaughter livestock and more buyer competition, both of which lead to higher prices. The adoption of electronic markets, giving more buyers better access to livestock offered for sale, has typically resulted in higher livestock prices in several studies. Increased numbers of buyers bidding on fed cattle have had a positive effect on fed cattle transaction prices in several studies .

Researchers have examined the relationship between regional fed cattle prices and meatpacking concentration (Marion and Geithman 1995; Azzam and Schroeter 1991; Slaughter Cattle Procurement and Pricing Team 1996). Higher levels of concentration were associated with lower prices paid for fed cattle in those studies.

Studies examining fed cattle transaction prices found that meatpackers often paid significantly higher or lower prices for fed cattle than competitors or groups of competitors (Ward 1993; Schroeder et al. 1993; Ward, Koontz, and Schroeder 1996). A study conducted after the series of mergers and acquisitions in 1987 found the Big 3 meatpackers paid significantly lower prices for fed cattle in the Southern Plains and in subregions of the Southern Plains than did their competitors as a group. However, in the same study, plus in a more recent study, differences were found among the Big 3 firms in how much they paid for fed cattle. Each firm did not pay lower prices than other competing firms.

Several studies have estimated aggregated effects from structural changes (Schroeter 1988; Schroeter and Azzam 1990; Azzam and Pagoulatos 1990). One study found monopoly price distortions for wholesale beef. Monopoly price distortions refer to observing higher-than-competitive prices for wholesale meat sold by meatpackers. The same and similar studies also found monopsony price distortions for livestock prices. Monopsony price distortions refer to observing lower-than-competitive prices for livestock purchased for slaughter by meatpackers. Another study used a different statistical technique and found cooperative price behavior among meatpackers in fed cattle procurement (Koontz, Garcia, and Hudson 1993). Such behavior is indicative of oligopsonistic market power or noncompetitive pricing. However, another study suggested that reducing industry concentration would not increase fed cattle prices (Stiegert, Azzam, and Brorsen 1993).

In summary, fewer and larger meatpackers have resulted in increased plant and industry efficiency. Several studies have also suggested that larger meatpackers have exercised a small degree of market power in livestock procurement. One study indicates the “most plausible” estimate of noncompetitive pricing is less than 1 percent of prices paid for livestock (Azzam and Schroeter 1991).

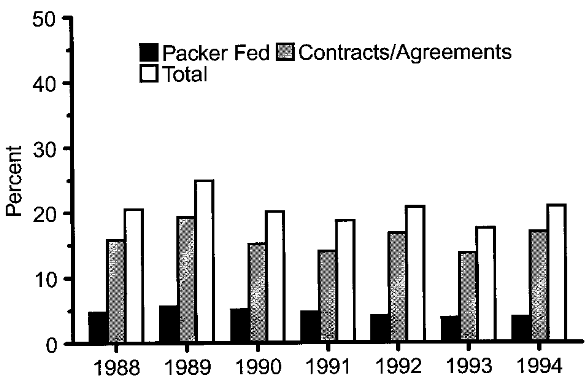
The drive to operate larger, more efficient plants does not explain by itself the increase in firm size and increase in concentration. We noted that internal growth as well as mergers and acquisitions have played a significant role. No research has estimated how large a firm must be (i.e. how many plants are needed) to achieve most cost economies and yet not have excessive, potential market power. Questions are raised about past or current abuses of market power vs. firms positioning themselves in the marketplace so as to apply market power in the future. While research to date generally shows small negative impacts from increased concentration, one recent study showed that the gains from cost efficiencies in meatpacking more than offset any likely market power impacts from concentration (Azzam and Schroeter 1995).

Captive Supplies

Captive supplies refer to livestock which are committed to a specific buyer two weeks or more in advance of slaughter. The three most common types of captive supply methods include forward contracts, packer feeding, and exclusive marketing/purchasing agreements.

Captive supplies represented 21 percent of fed cattle slaughter on an annual basis for the four largest firms in 1994 (Packers and Stockyards Administration). The next largest 10 or so firms had a lower percentage of captive supplies. Captive supplies are typically higher in Texas-Kansas-Colorado than Nebraska-Iowa. For some plants and some weeks the percent of slaughter may be 70 percent or more. But to have the annual average at 21 percent, captive supplies for some plants and some weeks must be 10 percent or less. Figure 3 indicates the extent of captive supplies on an annual average basis has not varied greatly over the past several years.

Figure 3. Captive Supplies for the Four Largest Beef Packers



One point often overlooked in the discussions about captive supplies is why both sides of the market, both buyers and sellers, use them. Both parties to a captive supply agreement, in the case of forward contracts and marketing agreements or formula selling of cattle, must decide that at the time the contracts or agreements begin that positive benefits will accrue to themselves. Below are a list of potential motivations why cattle feeders enter into captive supply arrangements.

***Forward Contracts*:**

Manage risk (basis or price level);
Obtain favorable financing terms;
Guarantee a buyer for cattle

***Marketing Agreements*:**

Manage risk (within-week price risk);
Obtain favorable financing terms;
Guarantee a buyer for cattle;
Access carcass information on cattle;
Move toward value based marketing;
Reduce the adversarial relationship with packers

***Packer Feeding in Custom Feedlots*:**

Increase feedlot utilization;
Develop a positive relationship with a packer for other custom or company cattle.

One motivation for packers is increased plant utilization. That increase in plant efficiency and lower plant operating costs potentially could mean $0.20-0.30/cwt. higher prices paid for fed cattle.

The main point is that there are economic incentives for using captive supply marketing and procurement methods. Those economic incentives apply both to cattle feeders and meatpackers.

Captive Supply Impacts

Cattle producers are most concerned about the potential impacts of captive supplies on cash prices. When buyers purchase fed cattle by captive supply methods, the supply of cattle which can be purchased by other buyers is effectively reduced. That by itself would likely raise prices for the remaining cattle. Other buyers, those without captive supplies, need to bid more aggressively for a smaller supply of fed cattle. That, too, should put upward pressure on prices. However, it also means that those buyers which have captive supply cattle, need not be as aggressive in the cash market because they already have a portion of their supply needs met. That in turn may cause them to be less aggressive in the cash market and cash prices may decline. The end result is not clear. Research to date suggests the presence of captive supplies may reduce cash fed cattle prices by a small amount (Ward, Koontz, and Schroeder 1996). Use of captive supplies also reduces the availability of market price information which can be reported, summarized, disseminated, and used by the industry for subsequent price discovery.

Only a few studies have focused on captive supplies or explicitly included captive supplies in studies examining impacts from structural and behavioral changes in meatpacking. One of the first studies on captive supplies estimated the extent of forward contracting (Ward and Bliss 1989). Survey results indicated that 12.7 percent of fed cattle in the major cattle feeding states in 1988 were procured by forward contract. Ninety percent of forward contracting in 1988 occurred in the Plains states (Nebraska, Colorado, Kansas, Oklahoma, and Texas) and nearly two-thirds of all contracting was found in just two states (Texas and Kansas). Eighty-four percent of forward contracting was by cattle feedlots which marketed 20,000 or more cattle. Nearly all contracting (96 percent) was between cattle feedlots and the Big 3 packers.

Another study examined the effects from forward contracting fed cattle in Texas feedlots (Elam 1992). Results indicated that contract prices were significantly lower than hedge prices for fed cattle. Cattle feeders were giving up a portion of the basis to packers when they forward contracted cattle. This difference was in essence a risk transfer premium from cattle feeders to packers. The same study also estimated the aggregate effect deliveries of captive supply cattle had on fed cattle prices in the U.S. and in four states (i.e. Texas, Kansas, Colorado, and Nebraska). Overall, small negative effects were found. Results differed for individual states, ranging from no significant impacts to significant, negative price impacts in others.

Another study concluded that when transportation costs were waived for cattle feeders, there was no significant difference between contract prices and hedge prices (Eilrich et al. 1990). When transportation costs were not waived, results corresponded with the Elam study, indicating lower prices for forward contracting compared with hedging fed cattle with a live cattle futures market contract. Net basis contract prices and hedged prices both were significantly lower than estimated cash prices for fed cattle. Similar results were found in the Congressionally-mandated Beef Concentration Study (Ward, Koontz, and Schroeder 1996). Forward contract prices were significantly lower than cash market fed cattle prices.

Other research indicated there was a negative relationship between fed cattle prices and packer-controlled supplies over a six-month period (Schroeder et al. 1993). As shipments of captive supply cattle increased, fed cattle prices declined in sampled feedlots. Price impacts differed among packers and subperiods within the six-month period and price impacts were not significant for some packers and time periods.

In the Beef Concentration Study, captive supply impacts were generally negative but small, and potentially so small as to not be economically significant (Ward, Koontz, and Schroeder 1996). Generally, increases in the percentage deliveries of forward contracted cattle were associated with increases in plant utilization, increases in cash market prices, and decreases in basis. Generally, increases in the percentage deliveries of packer fed cattle were associated with increases in cash market prices, decreases in plant utilization, and declines in futures market prices, though not all coefficients were significant. Increases in percentage deliveries of marketing agreement cattle were consistently associated with increases in cash market prices, decreases in plant utilization, and decreases in futures market prices.

Increasing deliveries of cattle from each of the captive supply inventories were associated with lower transaction prices for fed cattle in two-thirds of the equations estimated. There was generally a small negative effect on cash market transaction prices from meatpackers having an inventory of captive supply cattle from which to deliver cattle for slaughter. The type of captive supply had a differential impact on fed cattle prices.

Negative, significant price differences were found between forward contract prices and cash market prices. No significant price differences were found between packer-fed cattle and cash market cattle. Prices paid for marketing agreement cattle were significantly higher than cash market cattle. If marketing agreements result in better communication between feeders and packers, along with additional information regarding how purchased cattle dressed, then one could expect a positive price difference between fed cattle purchased by marketing agreement compared with those purchased in the cash market. Over time, cattle feeders should use the additional information and improved communications in purchasing feeder cattle and better feeding and marketing fed cattle, which should be reflected in higher prices. Additionally, the incremental information may allow feeders to alter the type of feeder cattle purchased so as to better match the demands of packers when cattle reach market weight and finish. The higher price may represent a quality difference between marketing agreement and cash purchased cattle and may reflect lower transactions costs associated with procuring cattle via marketing agreement.

In summary, the captive supply study conducted as part of the Beef Concentration Study for the Packers and Stockyards Administration was the most comprehensive of any study to date. In that study, a relatively weak negative relationship was found between transaction prices for cash market cattle and either delivering cattle from an inventory of captive supplies or having an inventory of captive supplies from which to deliver cattle at a later time. Prices paid for forward contracted cattle were significantly lower than for cash purchased cattle and were relatively large ($3/cwt. on a dressed weight basis). Prices paid for marketing agreement cattle were significantly higher than cash purchased cattle but price differences were not large. Prices for packer fed cattle were not significantly different than cash market cattle.

Over a year-long period, captive supplies may account for about 25 percent of fed cattle slaughter. In some weeks, the percentage is much larger and the percentage is much higher for some plants. One limitation of the most recent captive supply study was not being able to estimate the very short-run effects often described by cattle feeders. When one or more of the largest three-to-five packers have a substantial portion of their slaughter needs for a week or short-term period coming to a specific plant in the form of captive supplies, a series of short-run events may be observed. First, meatpacker-buyers may become much less aggressive in the cash market. Second, buyers may say, in an effort to negotiate lower market prices, that they do not need cattle. Third, the psychological effect on the market may be negative in the short run, until buyers again bid on cash market cattle.

Conclusions

Concentration in meatpacking is high, especially for fed cattle slaughtering and fabricating. We must not lose sight of the fact that concentration has increased in part as meatpacking firms increased industry efficiency.

Use of captive supply methods remained reasonably stable from 1988 to 1994, but are seasonal and can vary widely from plant to plant and week to week. We must also recognize and accept that captive supplies are thought to be beneficial to the buyer and seller or they would not be used.

Research to date suggests price impacts both from packer concentration and captive supplies have been negative in general, but small. A much larger impact on fed cattle price level results from the large meat supplies and sluggish beef demand in recent years. However, given sluggish beef demand and large supplies of beef, concerns about packer concentration and captive supplies will not likely subside (see Price Determination versus Price Discovery).

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Managing for Today's Cattle Market and Beyond

March 2002

Structural Changes in Cattle Feeding and Meat Packing

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Cattle feedlots and meatpacking plants have both declined in number and increased in size. However, in comparison, concentration has increased at a much more rapid pace in meatpacking than in cattle feeding. As a result, concentration in meatpacking has been a major concern to many cattlemen and others in recent years. To some, it has been a concern for more than 25 years.

Market structure typically refers to the number, size, and location of firms in an industry. Major changes in the structure of cattle feeding and beefpacking have occurred the past couple decades. This fact sheet reviews many of these changes and discusses implications for marketing and pricing feeder and fed cattle.

Changes in Cattle Feeding

Cattle feeding has become more highly concentrated in larger feedlots, fewer firms, and in a few states. As a result of these changes, data are no longer collected by the U.S. Department of Agriculture (USDA) on a regular basis from feedlots with less than a 1,000 head one-time capacity.

In 1972, 104,340 feedlots in 13 states marketed 23.9 million cattle (National Agricultural Statistics Service). By 1995 for the same 13 states, 41,365 feedlots marketed 23.4 million cattle. Fed cattle marketings were at about the same level but number of feedlots declined over the period by 60.4%. Average marketings per feedlot were 2,287 head in 1972, but increased sharply to 5,648 head by 1995.

The above suggests that feedlots today are larger on average than feedlots 25 years ago. Most of the feedlots that exited the industry over the past 25 years were smaller feedlots. In 1972, 98.2% of the feedlots had a one-time capacity of 1,000 head or less, while the comparable percentage for 1995 was 95.3%. That alone suggests average marketings per feedlot increased.

Remaining feedlots also increased in size. In 1972, 1.8% of the feedlots (with a one-time capacity greater than 1,000 head) marketed 65.2% of the cattle. Those larger feedlots in 1995 marketed 90.2% of the cattle. Average marketings for the 1,936 larger feedlots in 1995 were 10,897 cattle per feedlot; while for the 39,429 smaller feedlots, average marketings were 58 cattle per feedlot.

Cattle feeding is more geographically concentrated today than 25 years ago. In 1972, Texas was the leading cattle feeding state, followed by (in order) Iowa, Nebraska, Kansas, and Colorado. In 1998, the largest cattle feeding states were Texas, Kansas, Nebraska, Colorado, and Oklahoma (Figure 1). The five states combined in 1998 combined for 86.5% of fed cattle marketings in the 12 leading states. Since 1972, there has been a sharp decline in cattle feeding among some of the leading states (for example, Iowa and California) and a rapid increase in other states (such as Kansas and Texas).

Average marketings per feedlot for each state illustrate where the larger cattle feedlots are located and the differences in feedlot size from state to state (Figure 2). Arizona had only 10 cattle feedlots in 1995, but each was quite large, marketing an average of 38,000 cattle per feedlot. Iowa was on the opposite end of the spectrum. Iowa had the most feedlots of any state in 1995, 14,500, but each was relatively small, marketing only 102 cattle per feedlot on average.

While cattle feeding has become more concentrated in larger feedlots and in a smaller geographic region, it also has become more concentrated in larger cattle feeding firms. Table 1 lists the 10 largest cattle feeding firms according to industry sources (Kay 1999). These firms own 53 feedlots with a total one-time capacity of 2.9 million cattle, or an average capacity of 54,075 per feedlot. Marketings by these 10 firms approach 6 million cattle annually.

The importance of the largest feedlots has increased over time. Total number of feedlots with a one-time capacity of 1,000 head or more has increased slightly over the past 15 years, going from about 1,600 in 1985 to about 1,800 in 1999. However, there have been significant changes within this group. Figure 3 shows the growth in marketings from feedlots with a one-time capacity of 16,000 head or more, and a slight decline in marketings from feedlots with capacity of 1,000 to 15,999 head.

Cattle feeding firms have increased in size to capitalize on economies of size. However, no research is available to estimate the extent or limit of those cost economies. Economies may be present in terms of purchasing feeder cattle and grain, utilizing labor, feed processing, and marketing fed cattle. Larger firms have also increased in size to place themselves in a better bargaining position in price negotiations with fed cattle buyers.

Concentration is an often-mentioned concept regarding beefpacking. Concentration is defined as a measure of the market dominance by a few large firms and is intended to be an indicator of when an industry might experience poor economic performance (such as artificially low input prices or artificially high output prices or excessive profits). While concentration in cattle feeding has not been much of an issue because it is small in comparison with beefpacking, some in the cattle industry question the desirability of the trend towards large cattle feeding firms and exodus of smaller cattle feeding operations.

Changes in Meatpacking

Meatpacking plants and firms have also become fewer in number but larger in size. In addition, steer and heifer slaughtering has become more geographically concentrated, nearer to where cattle are fed.

In 1972, 807 steer and heifer slaughtering plants (called fed cattle slaughtering plants here) slaughtered 26.1 million cattle (Packers and Stockyards Administration). In 1998, 168 plants slaughtered 27.4 million fed cattle (Grain Inspection, Packers and Stockyards Administration). Average slaughter per plant increased from 32,383 head in 1972 to 163,071 head in 1998.

Smaller plants have exited the industry, while remaining plants have increased in size. Plants that slaughtered less than 50,000 fed cattle represented 82.5% of total plants for 1972. Plants that slaughtered less than 250,000 fed cattle in 1998 represented nearly the same percentage of total plants, 83.3%. However, the market share of smaller plants decreased sharply. In 1972, the smaller plants (less than 50,000 head annual slaughter) accounted for 20.7% of total fed cattle slaughter. By 1998, even all the plants in a larger size group (less than 250,000 head annual slaughter) represented a smaller percentage of total fed cattle slaughter (7.4%).

The same trend can be shown in another manner, by focusing on the largest plants. In 1976, five plants each slaughtered more than 500,000 fed cattle per year. In 1998, 20 plants slaughtered more than 500,000 cattle apiece and 14 of those slaughtered more than one million head. Combined, the 20 plants accounted for 80.6% of fed cattle slaughter. Average slaughter in those 20 largest plants in 1998 was 1,105,350 cattle. The driving force for the trend toward larger plants is cost efficiency, capitalizing on economies of large size.

Fed cattle slaughtering has become more concentrated in a few states. The leading fed cattle slaughtering states in 1972 were (in order) Nebraska, Iowa, Texas, California, and Kansas. In 1994, the leading states were (in order) Kansas, Nebraska, Texas, Colorado, and Iowa (Figure 4). In some states, there is essentially only one large plant (Figure 5). Therefore, the "state" market share of slaughter by one or a small number of plants in some states is very high. However, the state market share can be misleading. Fed cattle are purchased from surrounding states as well. Research indicated 64 percent of fed cattle purchases were from within 75 miles of the plant; 82 percent from within 150 miles; and 92 percent from within 250 miles (Grain Inspection, Packers and Stockyards Administration 1996). Research also found that procurement prices among plants were closely interrelated. Therefore, competition among plants generally keeps prices from deviating far from the cost differential to transport cattle longer distances.

Fed cattle slaughter in some states (for example, Iowa and California) has declined sharply since 1972, and increased rapidly in others (such as Kansas and Texas). Note the states with the largest changes (decreases and increases) are the same for fed cattle slaughtering as for cattle feeding.

Fed cattle slaughter has become more concentrated in just a few firms. Table 2 shows the ten largest beefpacking firms according to industry sources (Kay 1999). These firms account for over 90% of all steer and heifer slaughter in the U.S. They operate all of the 20 largest slaughtering plants that were discussed earlier. Together, they operate 38 plants that slaughter steers and heifers with a combined daily capacity of 110,000 head.

Implications for Feeder and Fed Cattle Pricing and Competition

The trend toward fewer and larger feedlots and beefpacking plants, fewer and larger cattle feeding and meatpacking firms, and concentration in a smaller geographic region is clear. The implications are not as clear.

Fewer and larger cattle feedlot firms and meatpacking firms means fewer potential buyers bidding on feeder and fed cattle. On the surface, this gives the appearance of reduced competition. However, these larger firms are more efficient. Thus, there exists a tradeoff between being cost-efficient and being able to pay higher prices; versus having fewer competitors and not needing to pay higher prices. This tradeoff represents a key issue for many cattlemen. Which is better, fewer and more cost-efficient plants or more but less cost-efficient plants?

Two closely related issues regarding fed cattle pricing are meatpacking concentration and captive supplies. Research has addressed both of these issues for fed cattle (see a companion fact sheet in this series Packer Concentration and Captive Supplies). However, little or no research is available to measure the impacts on feeder cattle prices from the trend toward larger cattle feedlots.

Figure 1. Leading Cattle Feeding States, 1998.

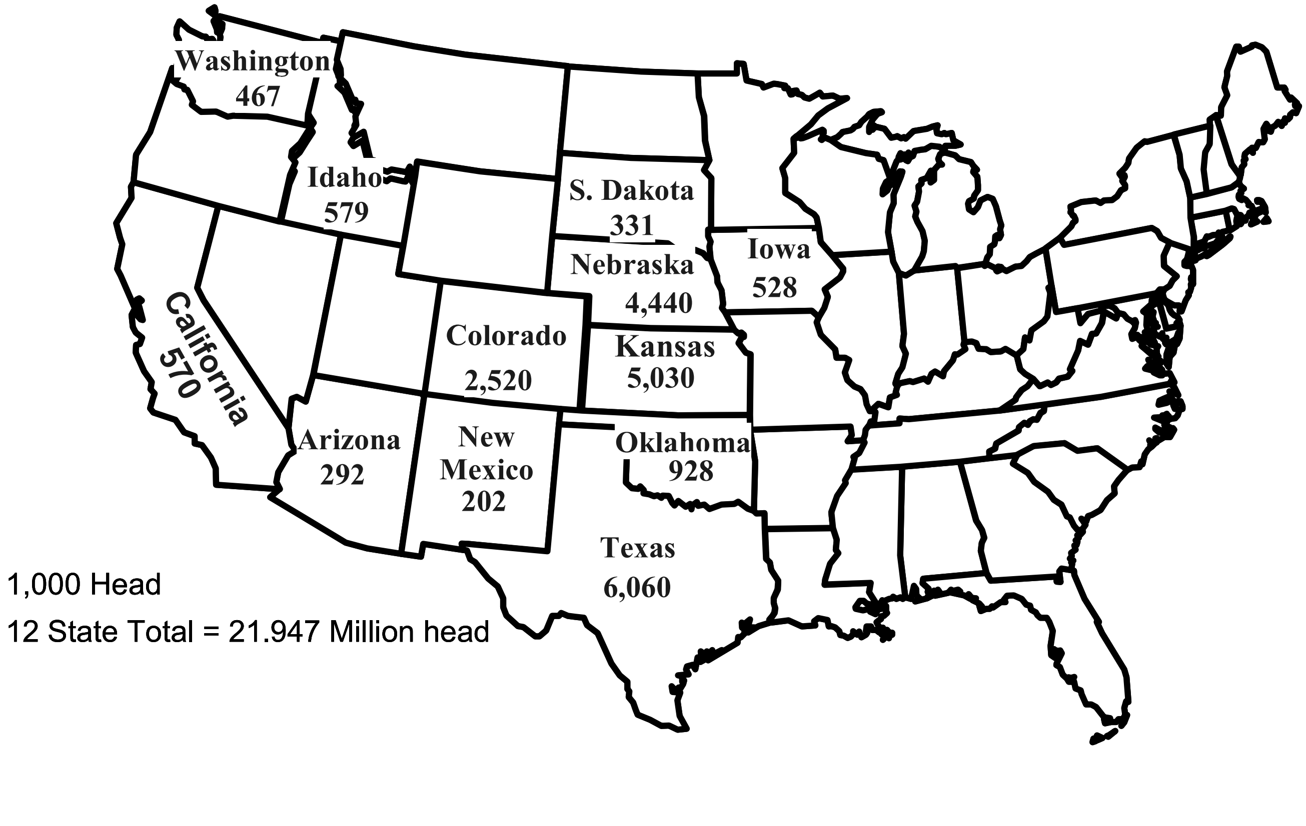

Figure 2. Average Number of Cattle Marketed per Feedlot, 1995.

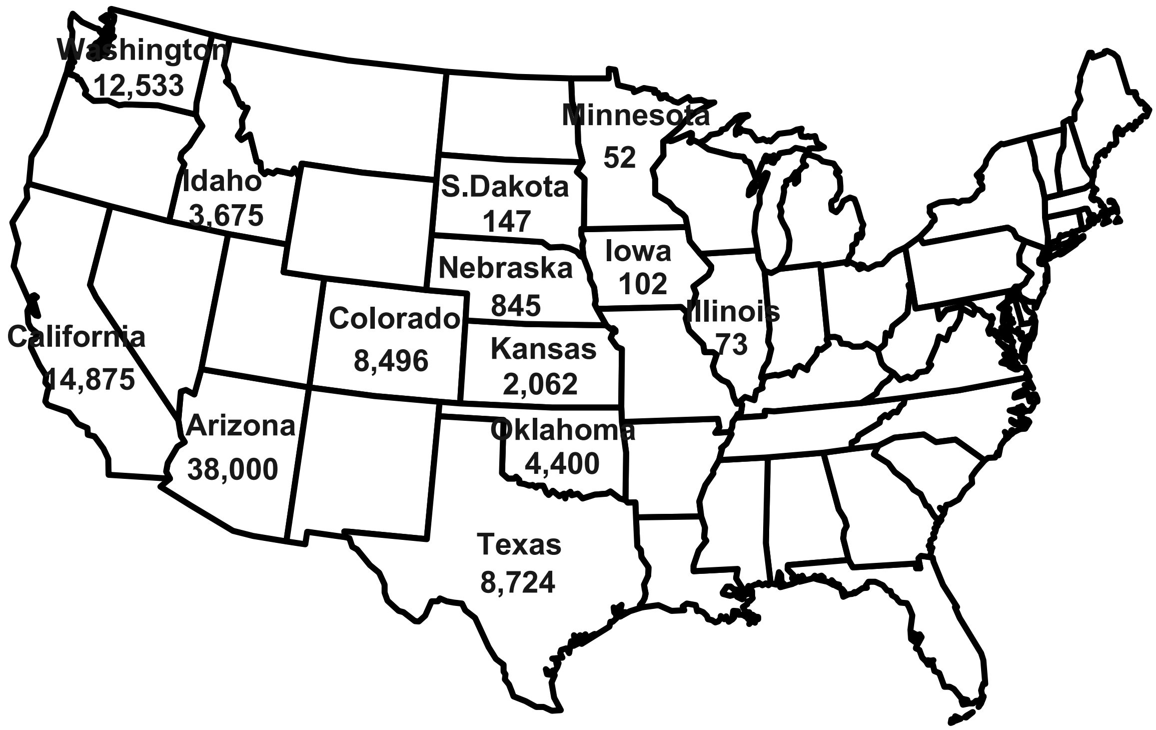

Figure 3. Marketings from Larger Feedlots by Size Group.

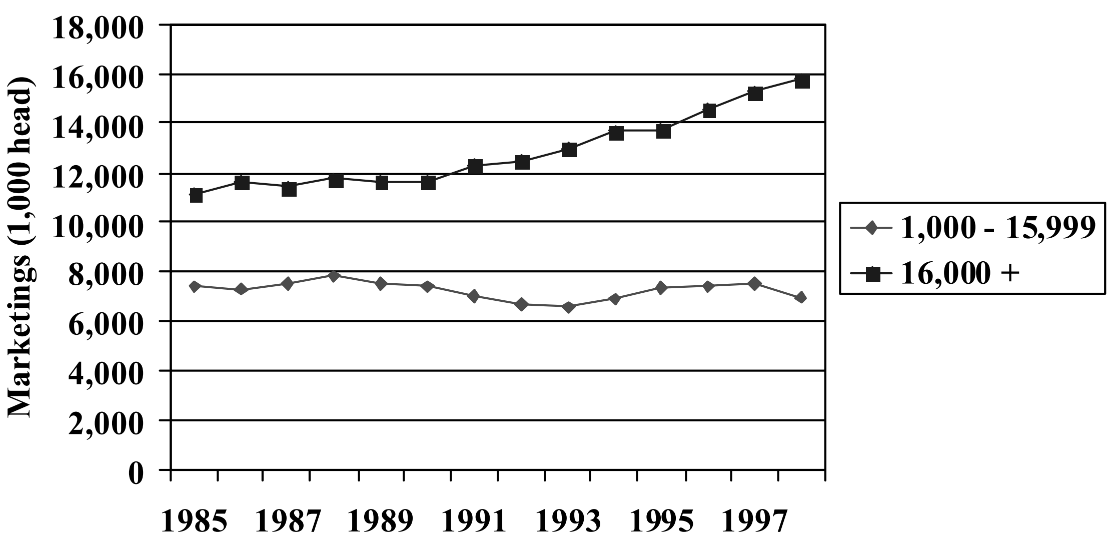

Figure 4. Leading Fed Cattle Slaughtering States, 1994.

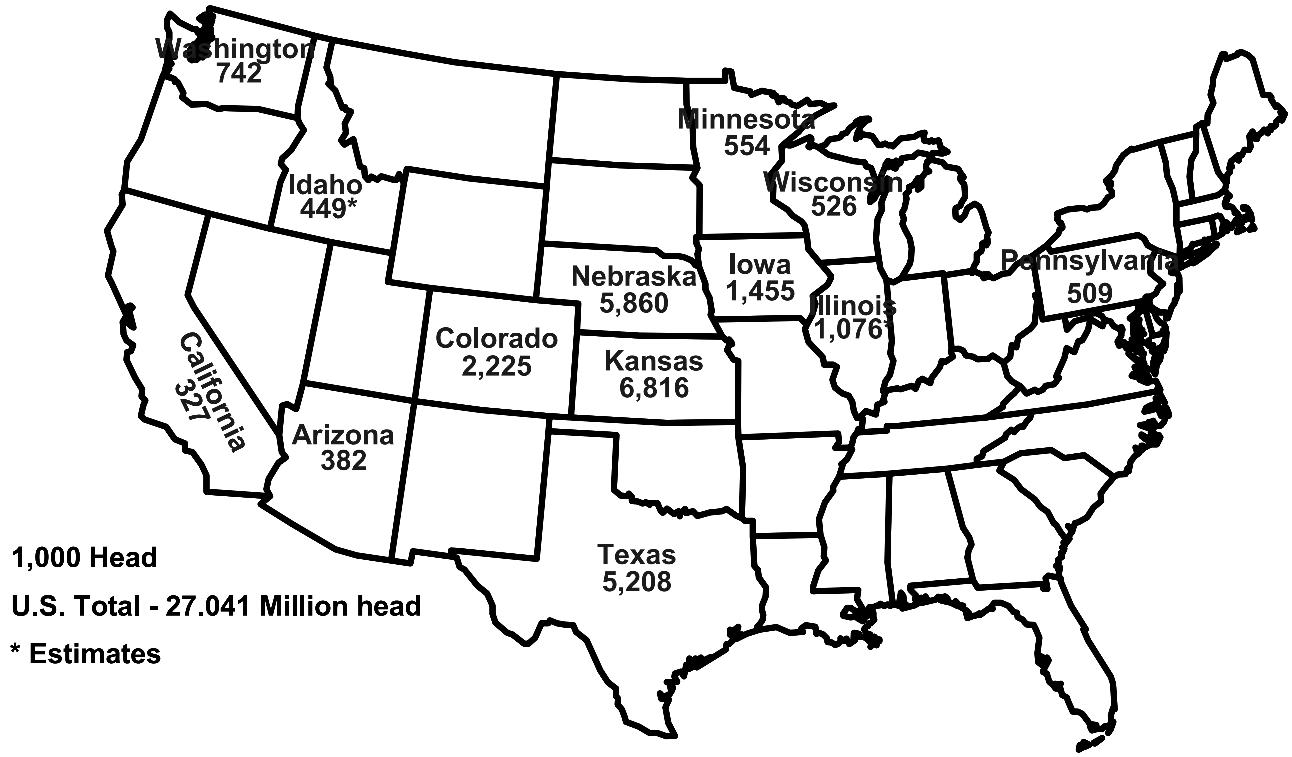

Figure 5. Fed Cattle Slaughtering Plants, Four Largest Firms, 1999.

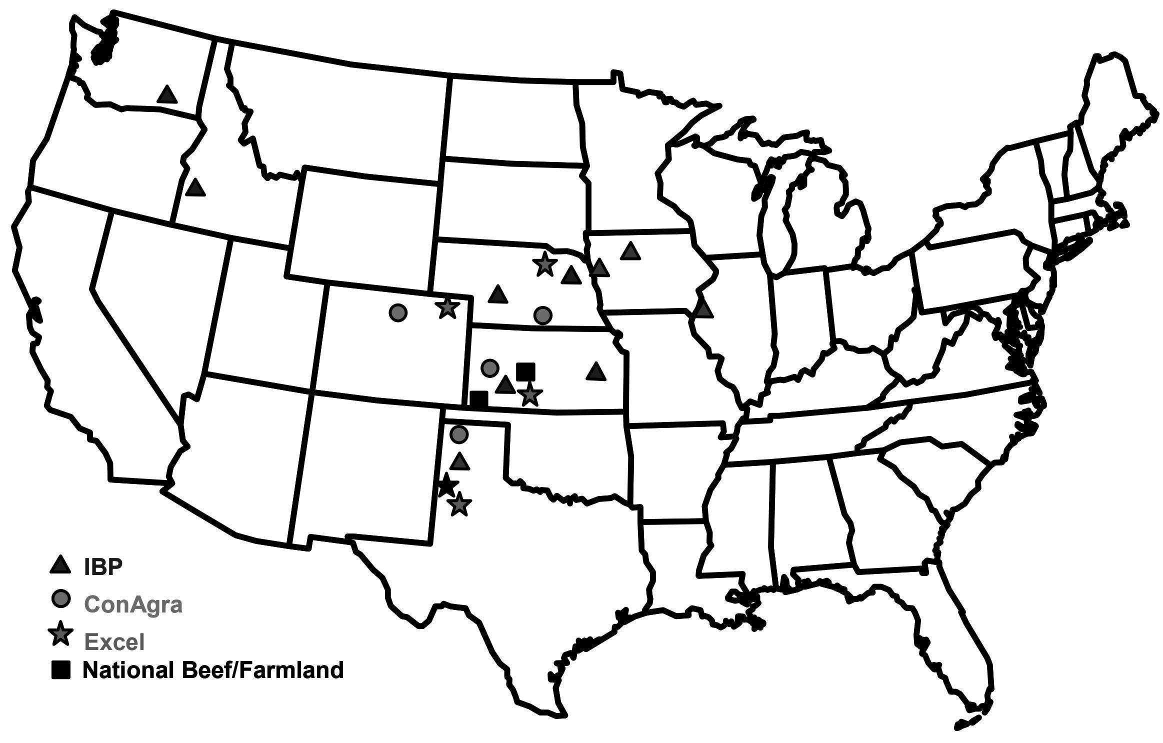

Table 1. Largest Cattle Feeding Firms, 1999.

Rank	Firm	Number of Lots	One-Time Capacity (1,000 hd)
1	Cactus Feeders, Inc.	9	460,000
2	ContiGroup Cattle Feeding Div.	6	425,000
3	ConAgra Cattle Feeding Co.	4	345,000
4	Caprock Industries	4	285,000
5	National Farms, Inc.	7	274,000
6	J.R. Simplot Co.	3	260,000
7	Cattlco/Liberal Feeders	5	235,000
8	Friona Industries, L.P.	5	230,000
9	Agri-Beef Co.	6	180,000
10	AzTx Cattle Co.	4	172,000

Table 2. Largest Beefpacking Firms, 1999.

Rank	Firm	Number of Plants	Capacity (head/day)
1	IBP, Inc.	13	38,800
2	ConAgra Beef Company	7	23,000
3	Excel Corporation	5	22,500
4	Farmland National Beef Packing Co.	2	9,000
5	Packerland Packing Company	4	6,100
6	Nebraska Beef Inc.	1	2,500
7	Rosen's Diversified, Inc.	3	1,950
8	Greater Omaha Packing Co., Inc.	1	1,925
9	Moyer Packing Company	1	1,900
10	Taylor Packing Co., Inc.	1	1,900

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Managing for
Today's Cattle Market
and Beyond

March 2002

U.S. Beef Trade Issues

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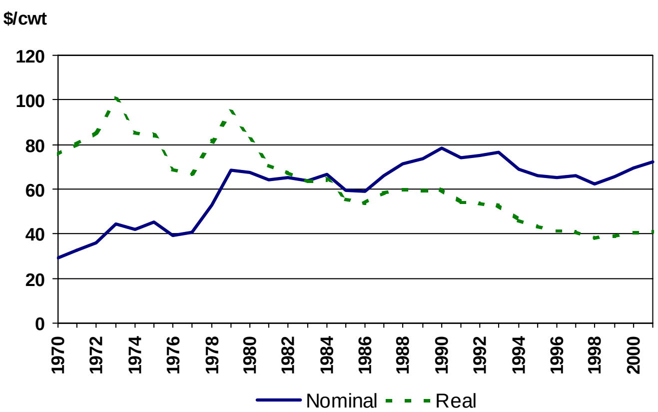
Introduction

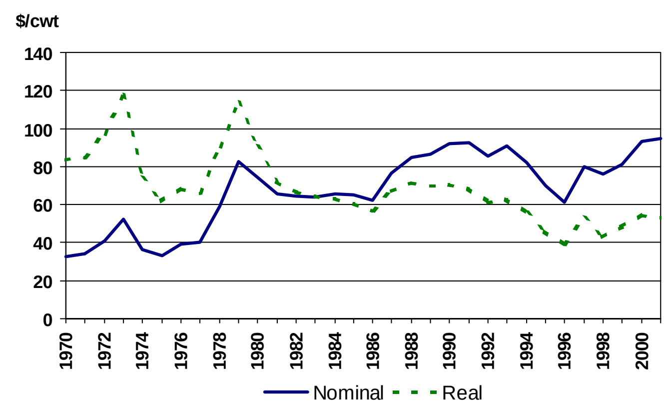
Nominal U.S. cattle prices generally increased throughout the 1970s and 1980s but declined steadily throughout the 1990s. However, real fed and feeder cattle prices have declined steadily since 1979 (Figures 1 and 2). These price declines have generated renewed interest in the role that beef and live cattle imports play in price determination.

Figure 1. Nominal and Real Fed Cattle Prices (Nebraska Direct, 1100-1300 lb Choice Steers).



Since implementation of the Canada–U.S. Free Trade Agreement (CUSTA) in 1989 and the North American Free Trade Agreement (NAFTA) in 1994, the Canadian beef industry has gained additional market share in the United States while Mexico's share has remained relatively constant. The visible increase in U.S. imports of Canadian cattle raised concerns, especially in Northern-tier States, regarding the contribution of cattle and beef imports to declining cattle prices. This paper examines a variety of trade developments in the beef industry and analyzes the impact of imports and exports on U.S. cattle prices.

Figure 2. Nominal and Real Feeder Cattle Prices (Oklahoma 600-700 lb Steers).



U.S. Beef and Cattle Imports

Total U.S. beef imports (beef imports plus beef obtained from live cattle imports) have increased about 1.54 billion pounds since 1988 -- from 3.05 billion pounds to 4.59 billion pounds in 2001 (Figure 3). Although record beef imports occurred in 2001, imports were only 850 million pounds more than the 1993 levels (Figure 3). Total U.S. beef (including live cattle) imports in 2001 accounted for just over

15 percent of total U.S. beef supplies -- which is similar to that occurring in 1993 (Figure 4).

Figure 3. U.S. Beef, Veal and Live Animal Imports (Annual, Billion Lbs., Carcass Weight Basis).

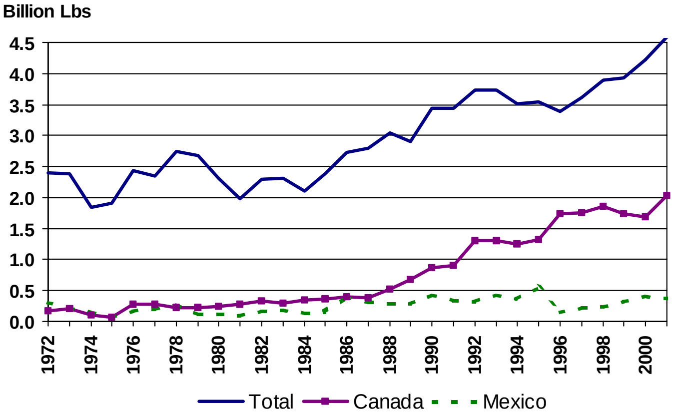


Figure 4. Beef and Beef From Live Cattle Imports as a Percentage of U.S. Supply.

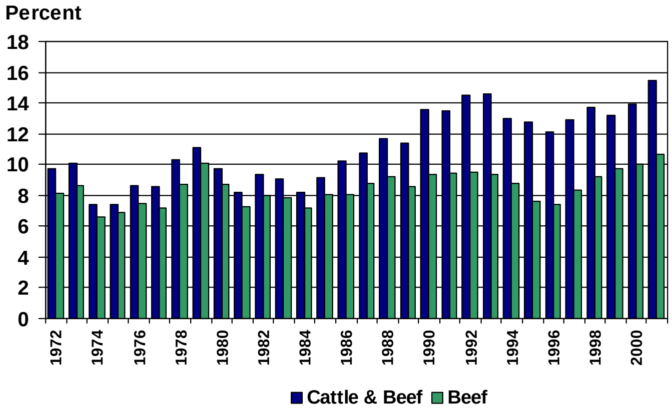


Figure 3 illustrates that cattle and beef imports from Canada have increased steadily since the early 1990s. A sequence of events caused these increases. The watershed event occurred in the 1990s when the Canadian government eliminated transportation subsidies for grain exports (Hayes and Clemens). Subsequently, less grain was exported from central Canada, and lower regional feed grain prices stimulated expansion of cattle (and hog) feeding in Alberta and Saskatchewan. Because Canadian slaughtering capacity has not kept pace, fed cattle exports to the United States have increased. Other factors have also played a role in this increase -- such as excess U.S. slaughtering capacity, CUSTA reductions in trade barriers, and USDA grading of Canadian cattle and beef carcasses. In 2001, beef and cattle imports from Canada represented 4.2 percent of the total U.S. beef supply (29.7 billion pounds).

Cattle imports from Mexico are almost exclusively lightweight feeder calves, which are subsequently finished in U.S. feedlots. Although variable from year to year, Mexican feeder cattle imports decreased by about 13 percent from 1993 to 2001 (Figure 3). The decline probably reflects significant cattle inventory reductions in Mexico. Imports from Mexico currently represent approximately 1 percent of total U.S. beef supplies.

Data Issues Related to U.S. Imports of Canadian Fed Cattle

U.S. cattle producers have expressed concerns regarding the manner in which the U.S. Department of Agriculture (USDA) reports U.S. beef production and import quantities. Specifically, the USDA collects data on quantities of beef produced by U.S. meat packing plants and reports these data as "U.S. beef production." To the extent that fed cattle are imported and then slaughtered in U.S. packing plants, the USDA's approach overstates the amount of beef actually "produced" in the United States. Similarly, the USDA's measure of beef imports understates actual beef imports because only quantities of beef that have been slaughtered in other countries and subsequently imported by the United States are categorized as beef imports.

Figure 5. "US Beef Production" vs. Cattle Inventory as a Percentage of U.S. Supply, January 1, United States

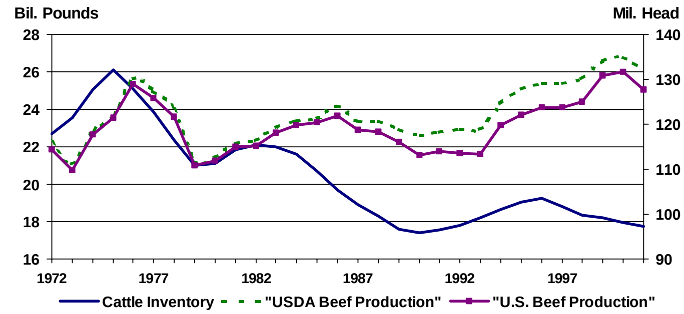
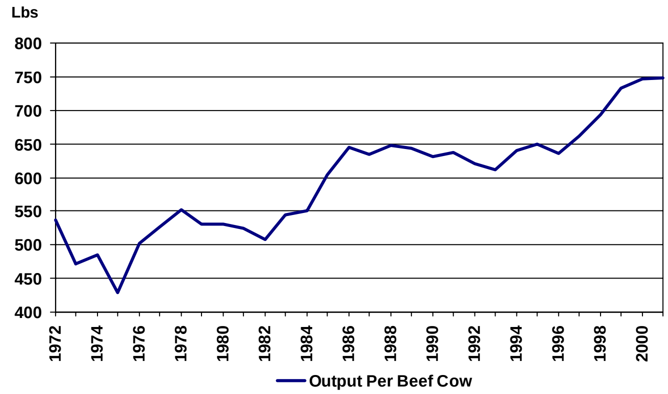


Figure 5 illustrates the relationship between U.S. cattle inventories and two different measures of U.S. beef production since 1972. The first measure, labeled "USDA Beef Production," represents the USDA's definition of domestic beef production (i.e., all beef produced by U.S. slaughter plants). Using this measure, it appears that 2001 beef production in the United States is slightly larger than quantities produced in 1975 -- but with almost 35 million fewer cattle and calves (based on January 1 inventories). However, a debate has formed over whether these production levels are the result of increased productivity of the U.S. beef breeding herd or the result of increased imports in the form of live cattle that are subsequently slaughtered in the United States (and, hence, counted as part of U.S. beef production).

The line in Figure 5 labeled "U.S. Beef Production" represents a more accurate measure of beef actually produced in the United States. It has been constructed by subtracting the carcass weight equivalent of live cattle imports from "USDA Beef Production." Live cattle imports originate from both Canada and Mexico. Upon adjusting the USDA's measure of U.S. beef production for meat that is imported in live animal form, Figure 5 shows that in 2001 the USDA's estimate of U.S. beef production overstates the true value by about 4 percent (26.107 versus 25.067 billion pounds). A visual representation of this issue is provided by figure 4. The lightly-shaded bars in Figure 4 erroneously represent the market share of imports in terms of a percentage of U.S. beef supplies (10.7 percent in 2001) because it uses the USDA's definition of imports (which excludes meat obtained from live cattle imports). The darkly-shaded bars more accurately represent actual U.S. beef imports by including the USDA's measure of beef imports and the beef that is obtained from live cattle imports (15.5 percent in 2001). Note that since 1990, the discrepancy between the two measures averages about 5 percentage points annually. However, year-to-year changes in the percentage that imports add to the U.S. beef supply are similar between the two measures.

Clearly, the USDA's definition of U.S. beef production does not explain production levels occurring in recent years. Some of the increase can be traced to increased feedlot finishing of dairy steers and heifers in the 1980s and concurrent reductions in calf slaughter (Brester, Schroeder, and Mintert). However, most of the increase is explained by increased beef cow productivity. Figure 6 illustrates that beef output per U.S. beef breeding cow (exclusive of dairy cows) on a carcass weight basis has increased 40 percent over the past 28 years. Increased production per beef cow represents a measure of technological change through improved genetics, management, and feeding programs. Consequently, U.S. beef production remains relatively large even as cattle and calf inventories have declined.

Figure 6. Productivity of U.S. Beef Cow Breeding Herd (Carcass Weight Pounds Per Beef Cow, Annual)



U.S. Beef Exports

U.S. beef exports have increased since the mid-1970s, but the rate of increase accelerated dramatically in the mid-1980s, continued throughout the 1990s, and has only recently declined slightly (Figure 7). Relative to U.S. production, exports have become increasingly important for beef producers. In 1990, beef exports totaled 4.4 percent of total U.S. beef supplies. By 2001, exports increased to 8.9 percent (Figure 8). Approximately 55 percent of all U.S. beef exports are sold to Japan -- by far the largest U.S. beef export customer. Approximately 30 percent of U.S. beef exports are marketed to Canada and Mexico, and 7 percent to South Korea. Brester and Marsh (1998) describe the long-run potential impacts of increasing exports on U.S. beef and cattle prices as a result of GATT.

Figure 7. U.S. Beef, Veal and Live Animal Exports (Annual, Billion Lbs, Carcass Weight Basis).

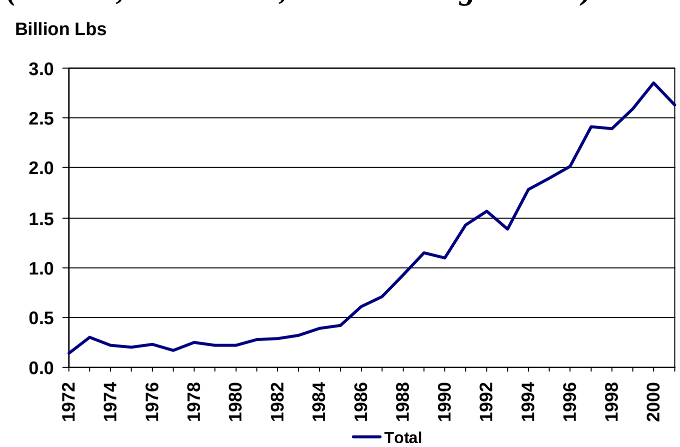
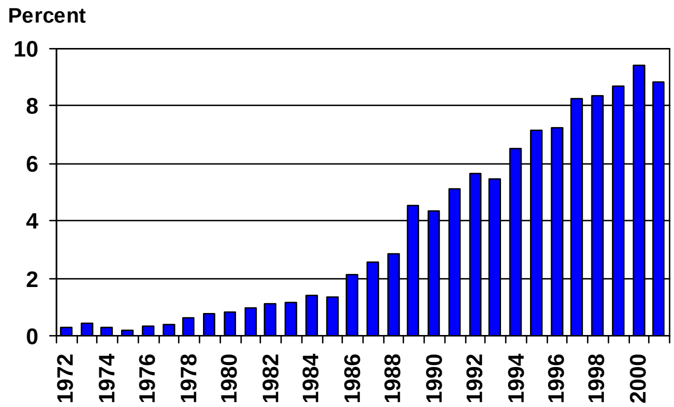


Figure 8. U.S. Beef and Veal Exports As A Percentage of U.S. Beef Supply.



U.S. meat exports have accelerated since the mid-1980s for several reasons (Brester, Mintert, and Hayes):

1. Depreciation of the U.S. dollar relative to other currencies prior to 1997;
2. Adoption of technologies to transport chilled rather than frozen meat;
3. Relaxation of trade (tariff and quota) restrictions;
4. Increased per capita incomes and changes in dietary preferences in developing countries.

Figure 9 shows that, on a value basis, the United States had been exporting almost as much as it has been importing from 1997 to 2000 (including both beef and cattle). In 2001, however, world economic conditions caused the value of imports to exceed the value of exports by almost $1 billion. On a quantity basis, the United States is a net importer of beef (live cattle included). However, import quantities have increased slightly while export quantities have expanded rapidly. Thus, the difference between the two narrowed markedly until 2001. In 1990, U.S. net imports were approximately 2.6 billion pounds. By 2000, U.S. net imports declined to 1.37 billion pounds (Figure 10). However, net imports increased to 1.99 billion pounds in 2001. Many analysts expect that U.S. net quantity imports will approach zero within the next few years. However, this projection depends critically upon continued income growth in developing countries and continued increases in market access.

Figure 9. Value of U.S. Beef, Veal and Live Animal Net Imports/Exports

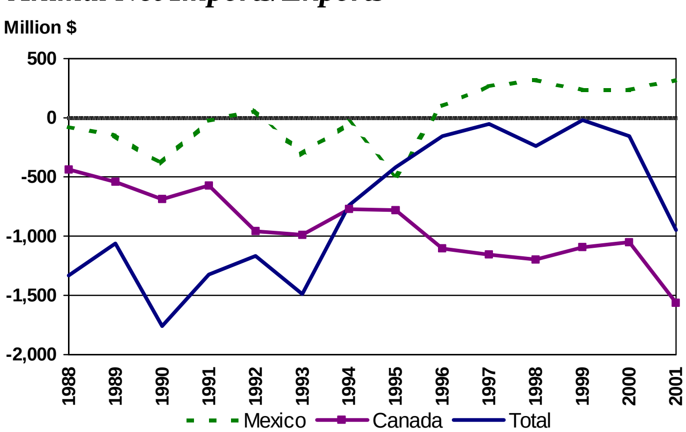


Figure 10. U.S. Beef, Veal and Live Animal Net Imports (Annual, Carcass Weight Equivalents)

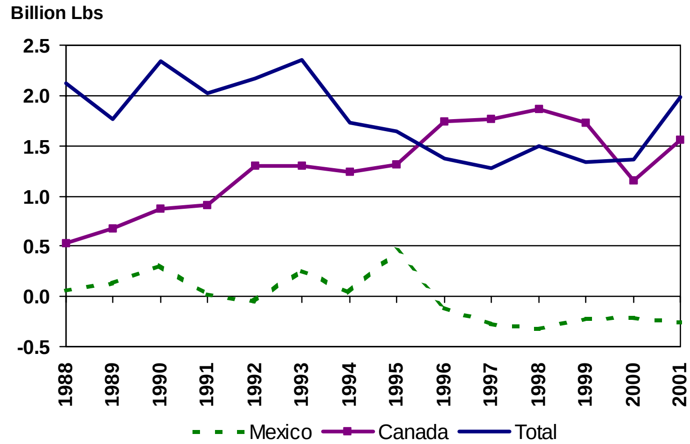
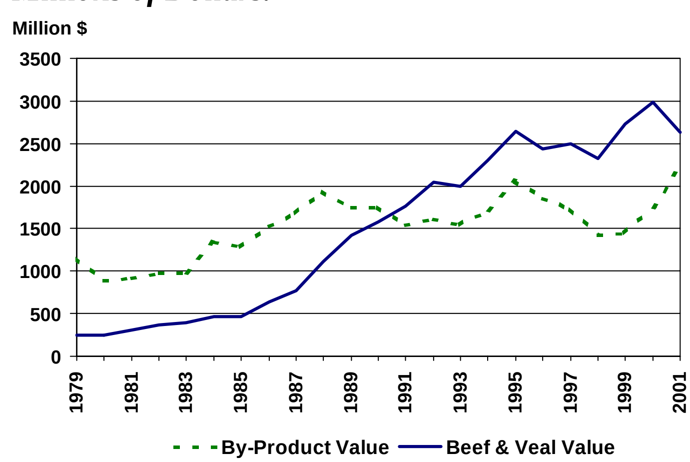


Figure 11 illustrates that beef by-product exports (variety meats, hides, and leather) have also trended upward during the 1990s (because of data limitations, the values of edible and inedible beef tallow are not included). Surprisingly, exports of beef by-products exceeded beef export values until 1991. In 2001, the value of beef by-product exports represented approximately 46% of total beef and beef by-product export value.

Figure 11. U.S. Beef & Veal and By-Product Export Value (Variety Meats and Hides), Annual, Millions of Dollars.



Impacts of Trade on Cattle Prices

The United States exports high-quality beef muscle cuts and both edible and inedible by-products; it imports feeder cattle from Mexico, lower-valued ground beef from Australia and New Zealand, and a mix of high-value muscle cuts, manufacturing–trimming beef, and fed cattle and carcasses from Canada. In general, increased beef imports from Canada have replaced imports from other sources as Canada's proximity to the United States makes it a natural trading partner. Because of excess capacity resulting from plant expansion during years of higher cattle inventories, U.S. beef packing and processing plants rely upon imported fed cattle and beef carcasses to reduce average slaughtering costs and produce additional value-added products.

Considerable controversy has surrounded the cattle price effects of CUSTA and NAFTA on the U.S. cattle market. Throughout the 1990s, total Canadian and Mexican cattle imports have been relatively steady -- averaging 2.16 million head annually. However, a notable difference throughout the 1990s was the declining U.S. net trade position (including both beef and live cattle) with Canada. U.S. net beef and cattle imports from Canada as a percentage of total U.S. beef supplies increased from 2.0 percent in 1988 to 5.8 percent in 1999.

Marsh (1997) considered the impact of CUSTA on U.S. cattle prices using an econometric model. The model was applied to the 1989 to 1997 period to assess the contribution of net imports from Canada on the decline in U.S. slaughter steer prices. Results indicated that domestic factors were primarily responsible for the price decline. The cattle market, however, received support from increasing beef exports and relatively strong by-product values. Canada's share of U.S. beef supplies increased by slightly over 3 percentage points during this period. As a consequence, of the $8/cwt *decline* in slaughter price, about $0.35/cwt was attributable to Canadian imports or about 4.4 percent of the price reduction. For a 1,200-pound fed steer, this amounts to about $4.20 per head. On the other side of the trade picture, U.S. beef exports to Canada (as a percentage of U.S. beef supplies) increased by less than one-half percent, which translated into only a $0.05/cwt support of slaughter price over this period.

It must be noted that the Canadian cattle industry expanded significantly throughout the 1990s in response to the loss of grain transportation subsidies from the Canadian prairie provinces to west coast port facilities. After the subsidies were eliminated, feedgrain prices in the prairie provinces declined which, in turn, stimulated feedlot expansion. Because both the U.S. and Canada produces high-quality, grain-finished beef cattle, increased Canadian cattle production would have had negative effects on U.S. cattle prices even without increased exports to the U.S. Hence, perhaps it is more accurate to say that increased Canadian cattle production reduced U.S. price by $0.35/cwt during the 1989-1997 period, rather than implying that the reductions were the sole result of increased Canadian cattle exports to the U.S.

Some producers would like to know what would happen if U.S. participation in international trade in live cattle, beef, and by-products were unilaterally eliminated. Abstracting from political fallout and beef's substitute relationships with other meats, Marsh's model predicts the following:

1. an increase in slaughter price of $5.15/cwt caused by eliminating live cattle and meat imports from Canada and feeder cattle imports from Mexico;
2. an increase in slaughter price of $1.00/cwt caused by eliminating all other beef imports;
3. a reduction in slaughter price of $4.90/cwt caused by eliminating beef exports;
4. a reduction of $6.30/cwt caused by eliminating by-product exports.

These estimates use average market shares for the 1989–1997 period and the October 1998 fed cattle market price of $60/cwt.

In summary, eliminating U.S. participation in international beef trade would entail a net reduction in slaughter price of about $5.00/cwt. This reflects the consequences of closing off foreign demand for high-value products and by-products in exchange for eliminating cattle and lower-value imports. Other costs such as time involved in trade negotiations, transportation, changes in feedlot and packer capacity utilization, and effects on supporting industries, are not considered in this analysis.

Restricted Feeder Cattle Program

The Restricted Feeder Cattle Program (formerly titled the Northwest Pilot Project) has increased U.S. feeder cattle exports to Canada.

Previously, transactions costs for exporting feeder cattle were relatively large because of sanitary restrictions intended to protect the Canadian beef herd from disease. Hence, only a few feeder cattle were exported to Canada. However, many of these diseases have been eradicated in Northern-tier States. The removal of unnecessary quarantines and veterinary expenses and the expansion of the Western Province's cattle feeding sector stimulated feeder cattle exports from Montana and Washington under the Northwest Pilot Project. The Project has been expanded to include feeder cattle exports from Alaska, Hawaii, Idaho, North Dakota, and New York. During the October 1999-March 2000 marketing window, 180,314 head of feeder cattle were exported to Canada. Most of these cattle (over 75%) originated in Montana. Recently, the Canadian Food Inspection Agency published a final regulatory amendment that would allow low-risk health areas to export feeder cattle to Canada on a year-around basis.

Marsh (2000) has estimated that the Restricted Feeder Cattle Program has positively influenced the U.S. cattle market, albeit by a small amount. He estimates that the Program has increased U.S. fed cattle price by $0.33/cwt, and increased U.S. feeder cattle price by $0.51/cwt. Of course, these improvements are quite small because of the relatively small number of cattle exported. Nonetheless, the primary benefit to U.S. feeder cattle producers is manifest in transportation savings. Because Canadian fed cattle are trucked across Northern-tier States to Washington, Utah, and Colorado packing plants, truckers are willing to backhaul feeder cattle to Canada for relatively small amounts. For example, anecdotal evidence indicates that the backhaul opportunities may reduce transportation costs to Lethbridge, Alberta by $3/cwt compared to transportation costs to Western Kansas.

Trade Tensions

In 1998, declining nominal and real fed and feeder cattle prices stimulated legal actions against Canada by the Ranchers-Cattlemen Action Legal Fund (R-CALF). On June 30, 1999, the U.S. Department of Commerce's Import Administration of the International Trade Administration issued a preliminary ruling instructing the U.S. Customs Service to require cash deposits or bonds totaling 4.73 percent (later increased to 5.57 percent) of the value of imported live Canadian cattle. The ruling was based on a preliminary conclusion that Canadian feedlot managers had sold live cattle to U.S. purchasers below the "normal value" of those cattle in Canada. In November 1999, the International Trade Commission (ITC) issued its final ruling in which five of the six commissioners voted to rescind the preliminary tariff. Initially, R-CALF had appealed the ITC's negative decision under the Chapter 19 provisions of NAFTA. However, the appeal was later retracted.

Brester, Marsh and Smith (2002) note that this particular rent-seeking activity would not have had a significant impact on U.S. cattle prices even if it had been permanently imposed. However, the tariff would have had significant negative effects on Canadian cattle prices. In addition, the legal and bureaucratic costs associated with the trade dispute were relatively large for U.S. and Canadian livestock producers (some have estimated the combined costs at $6 million) and their respective governments. These costs would have likely increased substantially over time as the proposed anti-dumping tariff would probably have been challenged under NAFTA and WTO provisions. In addition, the imposition of an import tariff would likely have hampered efforts to expand access and reduce tariff-rate quotas in U.S. beef export markets during the upcoming WTO negotiations (Brester, Hayes, and Clemens). Furthermore, such trade actions could encourage retaliatory trade actions that may limit U.S. beef exports. Neither the Canadian government nor a marketing board is involved in the Canadian cattle feeding industry. Therefore, it is difficult to envision Canadian feedlot operators intent on maximizing feedlot profitability selling fed cattle to U.S. packers at exchange rate-adjusted prices below those that could be obtained from Canadian packers.

At least two other beef trade tensions have surfaced in the past year. First, the U.S. government (responding to U.S. beef producers) is likely to institute a country-of-origin labeling requirement on beef and beef products. Brester and Smith (2000) note that the results of such an effort could be either positive or negative for the U.S. beef industry depending upon whether U.S. consumers have a country-of-origin preference, the quality of imported beef products resulting from the labeling program, and the costs imposed on the processing sector. Second, U.S. beef producers are also requesting that USDA grade stamps be used only on meat produced by U.S. beef cattle. Again, the benefits and costs of such an action are unclear at this point.

Summary

U.S. participation in trade liberalization agreements with Canada and Mexico through CUSTA and NAFTA has generated intense debates in agricultural sectors about the benefits and costs of those agreements. CUSTA and NAFTA mandate that live cattle and beef trade among Canada, Mexico, and the United States be based upon competitive factors and include legal safeguards to deal with arbitrary trade restrictions.

Nominal and real U.S. fed and feeder cattle prices declined throughout the 1990s. Over the same period, the total U.S. beef supply increased from 25.4 billion pounds to 29.7 billion pounds. Imports (both beef and beef obtained from live cattle) accounted for 1.5 billion pounds, or 35 percent, of this increase. Thus, most of the supply increase has resulted from increased domestic production.

U.S. cattle and beef imports from Canada have increased substantially since 1988. Expansion of Canadian slaughtering capacity has not kept pace with the expansion of the Canadian cattle finishing industry. Given that the United States has excess slaughtering capacity and a larger consumer demand for high-quality and ground beef compared to Canada, fed cattle imports from Canada have increased.

Although beef and cattle imports from Canada have expanded throughout the 1990s, total beef imports from all sources have increased only slightly. Canada's share of U.S. beef supplies increased by slightly over 3 percentage points during the 1990s. As a consequence, of the \$8/cwt *decline* in slaughter price during this period, about \$0.35/cwt was attributable to increased Canadian imports or about 4.4 percent of the price reduction. For a 1,200-pound fed steer, this amounts to about \$4.20 per head. Although Canadian beef and cattle exports to the United States certainly put downward pressure on cattle prices, these exports were responsible for only a small portion of the 1990s decline in U.S. cattle prices. Rather, the combination of low feed prices which encouraged unusually heavy average dressed weights, large supplies of competing meats, a flat market for high-quality U.S. beef exports, and a significant reduction in by-product values in Asian countries contributed to 1998 price woes. Cattle prices recovered during the 1999 to 2000 period.

Producers have expressed concerns regarding the method in which the USDA reports U.S. beef production levels. Prior to the mid-1980s almost all U.S. live cattle imports were feeder cattle. The USDA's definition of U.S. beef production was reasonable given that most of the meat being added to imported feeder cattle was actually being produced in U.S. feedlots. However, because of increased fed cattle imports from Canada, it is important that analysts continue to recognize and account for USDA's definitions of beef production and imports.

The R-CALF anti-dumping challenge to U.S. imports of Canadian fed cattle, had it been permanently implemented, would not have had a significant positive effect on U.S. cattle prices. Although the challenge was rejected, this rent-seeking activity was expensive for Canadian and U.S. cattle producers and added to trade tensions. Issues regarding country-of-origin labeling and the potential restriction of USDA grade stamps to only meat produced by U.S. beef cattle will continue to impact trade relations.

U.S. (and Canadian) cattle producers operate in a commodity marketing system that is highly competitive. Increased prices cause increased production from both domestic and foreign sources -- which, in turn, eventually depresses prices. Because of such supply responses, a competitive industry will not experience sustained price levels in excess of long-term average costs (which include a normal rate of return). Therefore, industry participants must continually work at expanding both domestic and foreign markets, developing new products, improving product quality and safety, and lowering production and marketing costs.

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