

Factors affecting beef and cattle producer prices movements

In 2003, beef producer price movements demonstrated changes in supply and demand; previous liquidation, Mad Cow Disease, steady demand, feed prices, and slaughter weights all influenced these changes

Marta Norton

Producer prices for beef and veal rose 16.3 percent in October 2003, the largest monthly gain since April 1975. October slaughter cattle prices exhibited the largest monthly gain since January 1974, rising 20.4 percent. The index for beef and veal was the primary accelerator for the 2.0-percent gain in the finished consumer foods index, which, in turn, was a major force in the 0.5-percent jump in overall prices for finished goods. The increase in prices for slaughter cattle heavily influenced the index for crude foodstuffs and feedstuffs to climb 7.8 percent and push crude good prices up 2.6 percent.¹

The October gains, while more substantial than earlier movements throughout the year, were not complete anomalies in 2003. Prices for beef and veal generally advanced in prior months, moving up as much as 7.3 percent in June. (See chart 1.) Likewise, 2003 prices for slaughter cattle posted several noticeable gains, increasing 9.1 percent in January, 5.7 percent in August, and 11.4 percent in September. In addition, the U.S. case of Mad Cow Disease discovered in early December 2003 promised more price movement. This article investigates the influences behind 2003 price movements for beef and veal and slaughter cattle indexes by reviewing the trends and recent developments in the industry.

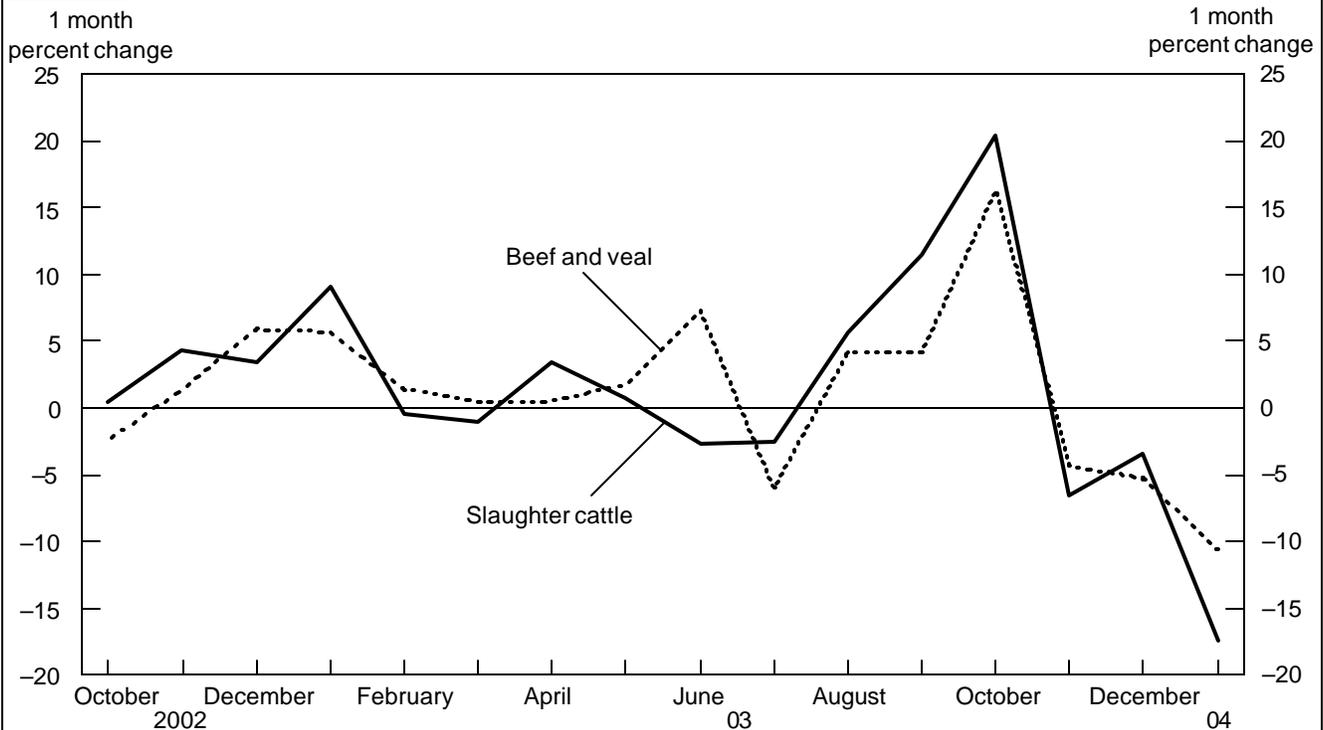
The cattle industry structure

The United States is the world's dominant producer of beef, and maintains a large fed-cattle industry that produces high-quality, grain-fed beef.² While the industry has evolved over the years, growing more specialized, production can still be considered in two general divisions: cow-calf and cattle feeding.

The cow-calf sector of the beef industry spans across the country on land that is not valued for crop production. At the cow-calf stage, cattle are calved and maintained on pasture until they weigh about 400 pounds, the weight at which a calf is typically weaned.³ Ranchers retain very few male calves for breeding purposes; most are castrated and sent to the feedlots when they weigh roughly 500 pounds. However, once a female calf is weaned, the rancher can either retain the female as a capital good and add her to the breeding stock or send her to slaughter along with her male counterparts as a consumption good.⁴ Occasionally, when additional forage is available after a male or female calf has been weaned, the calf will be retained by the rancher for grazing until the following spring.⁵ Cow-calf operations need, on average, 5 tons of forage on a dry matter basis per cow per year.⁶ An average beef-cow herd is 40 head, but the head size distribution is

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Chart 1. Slaughter cattle/beef and veal prices, October 2002 to January 2004



SOURCE: U.S. Bureau of Labor Statistics, Producer Price Indexes.

skewed;⁷ more than half of the U.S. beef-cow inventory is dominated by a small number of large producers.

Cattle feeding is the second sector of cattle production and occurs on feedlots located mostly, although not exclusively, in the Great Plains. The aforementioned weaned calves generally do not go directly to slaughter but instead become feeder cattle and are moved to a feedlot when they weigh between 500 and 750 pounds.⁸ Depending on conditions and desired results, the feeding period lasts approximately 90 to 300 days.⁹ During this time, an animal is fed grain and protein concentrates and gains, on average, 2.5 to 4 pounds a day. Cattle are generally sold from the feedlot to the slaughter plant when they weigh between 950 and 1,250 pounds.¹⁰ According to the Economic Research Service of the U.S. Department of Agriculture (USDA), the cattle feeding industry is dominated by a small number of specialized feedlots, and is becoming increasingly vertically integrated with the cow-calf farms and slaughter plants.¹¹

Historical cattle trends

The cattle industry is cyclical. Herd size expands and contracts during an 8- to 12-year period due to cattle's biological cycle and market changes.¹² The biological cycle, for

example, forces a 3-year time lag between the time the producer receives a market signal to expand and the time when the calves produced by additional retained heifers are slaughtered as added beef.¹³ Each cattle cycle is composed of a period of herd expansion followed by a period of herd liquidation. USDA cites research that shows expansion generally lasts for about 6 to 7 years, and liquidation lasts for roughly 3 to 4 years, with a 1- to 2-year period of consolidating cattle numbers between the two stages.¹⁴ In order to drive production upward, producers must retain heifers for breeding purposes prior to and throughout the expansion period.¹⁵ Expansion signals include large supplies of forage from pasture and range, favorable grain prices, and favorable cattle prices.¹⁶

The cattle cycle is vulnerable to weather, changes in industry structure, cropping/commodity programs, inflation, demand, grain prices, and imports/exports.¹⁷ Droughts often extend liquidation phases by reducing available pasture for cattle. During droughts, cattle producers can either sell cattle to reduce the number of animals grazing, or they can feed animals supplemental harvested forages, which increase operating costs. Producers choosing to sell cattle often force more cattle to market than normal by selling younger cattle at lighter weights, thus pushing down the prices they receive.

The effects of droughts are often, though not always, seen in late spring/early summer.

Aside from weather-related influences, the cattle industry is often affected by several other variables. First, alterations in industry structure and technological innovations have changed recent cycles. For example, improved slaughter plants allow for larger animals with higher weights. Cropping/commodity programs also affect the industry by providing incentives to use land either as cropland or as improved pasture. USDA cites research that shows cattle numbers are inversely related to changes in the number of harvested crop acres. In addition, inflation and changes in demand can increase incentives to move from expansion to liquidation or vice versa, while grain prices influence cattle production costs and decisions. Lastly, changes in imports/exports of beef and grain can have substantial effects on the cattle cycle by encouraging either herd expansion or herd liquidation.

The cattle cycles since the 1970s demonstrate the effects of many of these forces. The 1970s cattle cycle was affected by President Nixon's beef price freezes, oil price shocks, drought, and unusually high grain prices.¹⁸ A number of researchers note that demand has steadily decreased since the 1970s, demonstrating consumers' growing health awareness

and changing preferences.¹⁹ The 1980s were affected by drought and increased slaughter weights, and the 1980-90 cycle had an extremely short expansion period of 3 years.²⁰ Average cattle weights increased and total inventory decreased with the introduction of new packing plants that allowed for larger animals. Also, since 1986, more fat has been trimmed off primal cuts of beef than before, pushing quantity measures lower.²¹

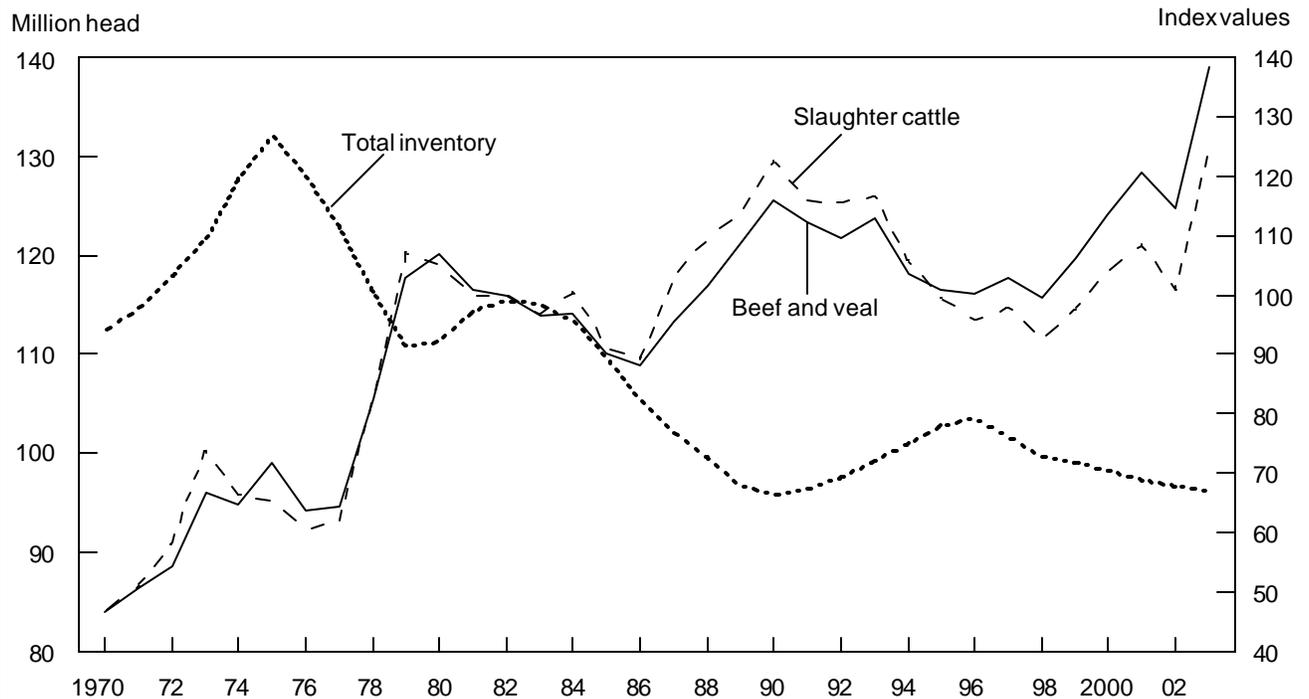
Liquidation began in 1996 after a severe drought and high grain prices.²² Drought continued to plague the cattle industry, and producers reduced herds into 2002.²³ (See chart 2.)

2003 price movements

Beef price movements in 2003 have demonstrated changes in both supply and demand. Previous liquidation and Canada's Mad Cow Disease, steady demand, feed prices, and slaughter weights appear to have influenced such changes.

Previous liquidation and Canada's Mad Cow Disease. On May 20, 2003, Canadian beef imports were banned by several countries, including the United States, because of the discovery of an animal afflicted with Mad Cow Disease. Mad Cow Disease, or Bovine Spongiform Encephalopathy (BSE),

Chart 2. Cattle on feed annual inventory and annual index values for slaughter cattle and beef and veal, 1970-2003



SOURCE: USDA's National Agricultural Statistics Service and the Producer Price Index.

is a degenerative neurological disease caused by an abnormal protein.²⁴ Cattle become infected with the disease by eating food contaminated with the infectious agent. Humans cannot contract BSE, but eating the neural tissue (such as the brain and spinal chord) of a BSE-infected animal can cause a fatal disease described as variant Creutzfeldt-Jakob Disease. While USDA efforts are designed to prevent domestic consumers from being exposed to Creutzfeldt-Jakob Disease, the global cattle industry can be affected by a discovery of BSE because countries may impose a ban on imported cattle. The discovery may result in a reduced cattle supply and unpredictable public opinions toward the consumption of beef.

The ban on Canadian beef imports exacerbated an already tight U.S. domestic supply for two reasons. First, the United States has typically relied on Canada for many of its beef products. In 2002, the United States imported a total of 2.5 million cattle from all sources, and 68 percent (1.7 million) came from Canada alone.²⁵ Canadian beef imports accounted for 3.9 percent of U.S. beef consumption. Once Canadian imports were restricted and domestic supplies tightened, the market at most stages of production experienced price increases.

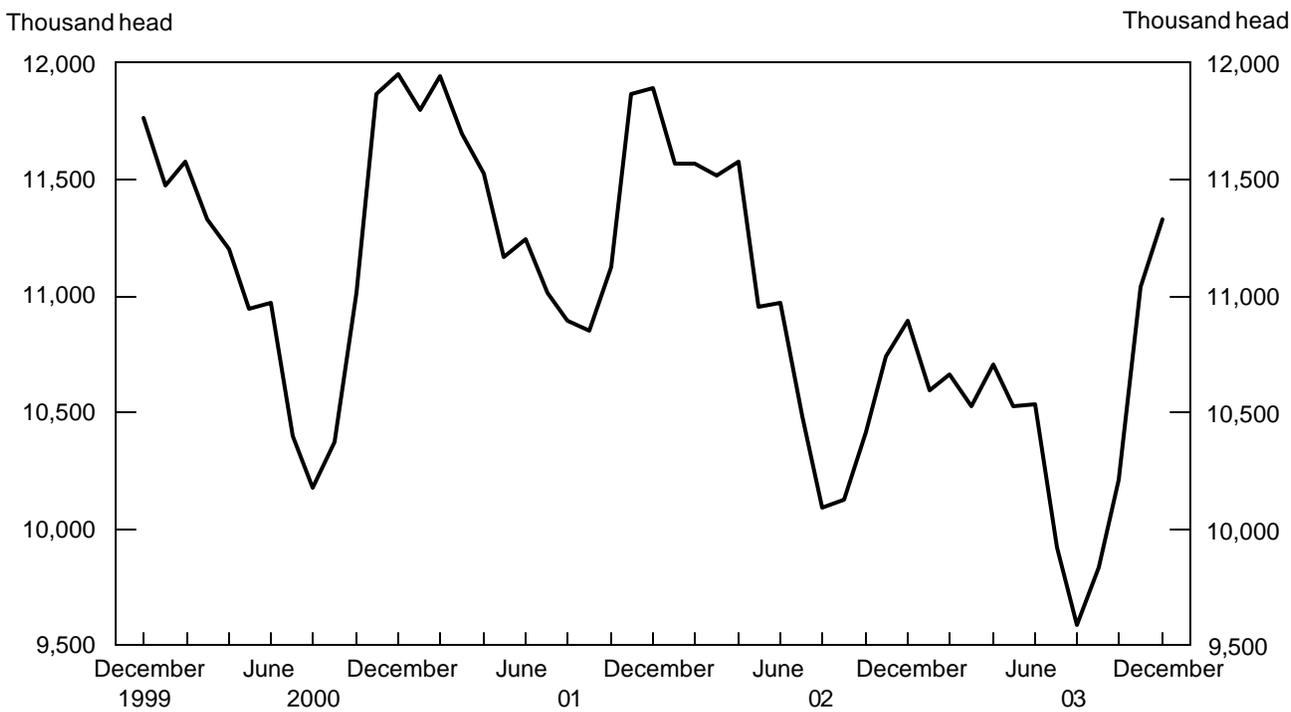
Secondly, imports were restricted at a time when the U.S. cattle inventory was already low due to years of liquidation.

In 2002, droughts had affected the cattle market for 4 consecutive years, worsening grazing conditions and depleting forage supplies.²⁶ Feeder cattle supplies in 2002 were high partially as a result of low heifer retention for herd expansion, and slaughter weights remained low prior to May 2003.²⁷ The ban on Canadian imports occurred at a time when domestic supplies could not recover quickly enough to lessen the impact on the market. (See chart 3.)

Consumer demand. Although some early articles expressed concern that demand for beef would falter after the discovery of Mad Cow Disease in Canada, U.S. per capita beef consumption remained relatively steady throughout most of 2003. In November 2003, USDA forecasted per capita 2003 beef consumption at 65 pounds, while the 2000, 2001, and 2002 final figures were 68, 66, and 68 pounds respectively.²⁸ Many speculate that the improving economy and popular diets encouraging the consumption of foods high in protein helped to maintain strong demand during a period of tightened supply.²⁹ (See table 1.)

International demand for U.S. cattle products remained strong for the greater part of 2003, and total beef and veal exports continued their general trend by rising to 2,523,013 (1,000 pounds carcass weight).³⁰ When taken together, the

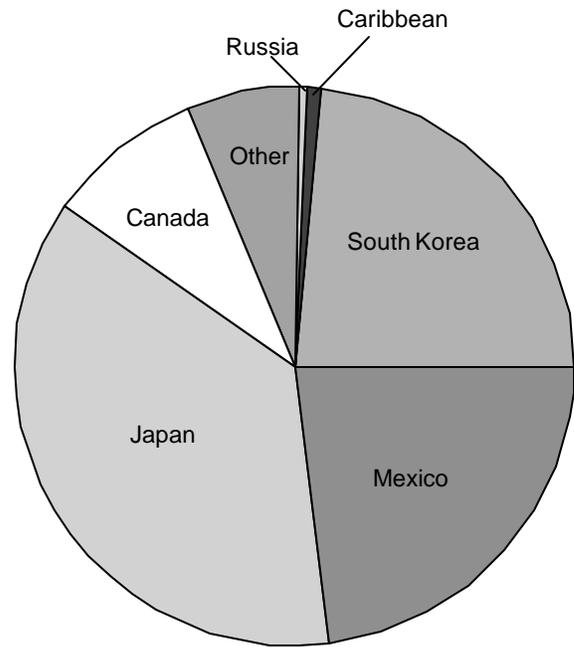
Chart 3. Cattle on feed monthly inventory



SOURCE: USDA's National Agricultural Statistics Service.

United States and Canada form the largest meat-exporting region and share the same abundant resources.³¹ The two countries also share similar international markets, as Mexico, Japan, and South Korea are among the largest importers for cattle products from both countries.³² (See chart 4.) After May 20, 2003, U.S. beef exports rose significantly. For example, beef exports to Japan rose from 79,108 in May 2003 to 90,389 in October 2003 (1,000 pounds carcass weight).³³ Exports to South Korea reached 65,542 in August 2003 after a May value of 42,020, and then fell to 49,374 by October. (See chart 5.)

Chart 4. Import countries of U.S. beef, 2003



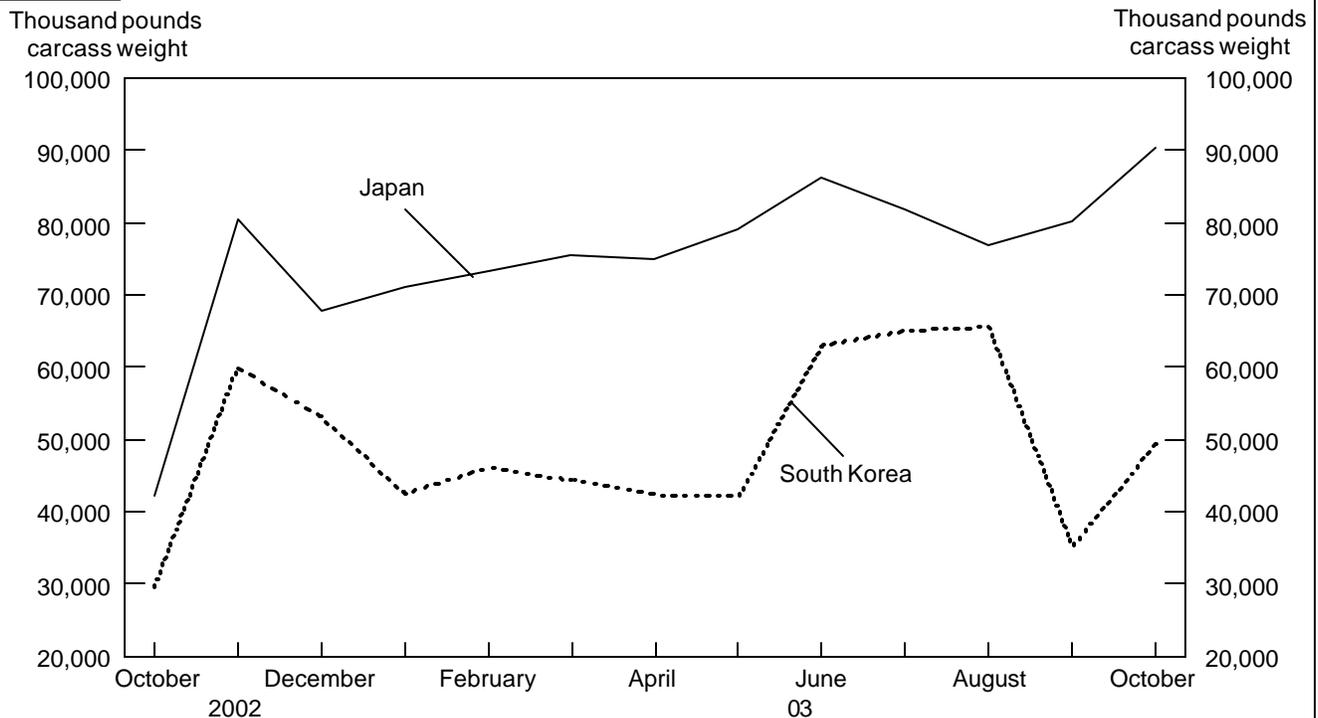
SOURCE: USDA's Economic Research Service.

Table 1. U.S. beef consumption, 2000-04

Year	Consumption			Primary market price per carcass weight
	Total, million pounds	Pounds per capita	Conversion factor	
2000	27,338	68	0.700	\$69.65
2001	27,026	66	.700	72.71
2002	27,878	68	.700	67.04
2003	27,291	65	.700	85.10
2004	26,225	62	.700	85.00

SOURCE: USDA's Economic Research Service.

Chart 5. U.S. beef and veal exports to Japan and South Korea, October 2002-October 2003



SOURCE: USDA's Economic Research Service.

Feed prices. Favorable feed prices helped to keep operating costs down. While the poor weather conditions in late 2002/early 2003³⁴ reduced the 2003 crop supply, the price ratio of steer/heifer prices to corn prices remained high for most of 2003. Corn prices do not represent all of the operating costs in the cattle industry, but they are the most significant input. According to a study conducted by the Kansas State University Agricultural Economics Department for the years 1997–2001, State averages show feed as the most substantial input at all stages of production.³⁵ For instance, at the beef finishing stage, feed costs averaged roughly 85.9 percent of total variable costs. (See chart 6.) A high price ratio of steer/heifer prices to corn prices (a comparison between revenue received and the greatest variable cost) is a strong incentive to produce fed beef. (See chart 7.)

Slaughter weights. Reduced cattle weights also contributed to 2003's tight processed beef supply. In an effort to maintain beef production levels, producers pushed animals through production more quickly than usual, slaughtering cattle at lower-than-normal weights.³⁶ One consequence of the reduced weights can be seen in the limited proportion of high quality, grain-fed cattle. Retail prices of round steak (USDA choice) sold at \$2.45 in October 2002, and at \$3.37 in October 2003.³⁷ Boneless sirloin steak (USDA choice) rose from \$4.36 in October 2002 to \$5.02 in October 2003. In November 2003, USDA assessed the current market situation and predicted that beef prices in the hotel/restaurant sector would continue to be high due to the tight fed-cattle supply. (See chart 8.)³⁸

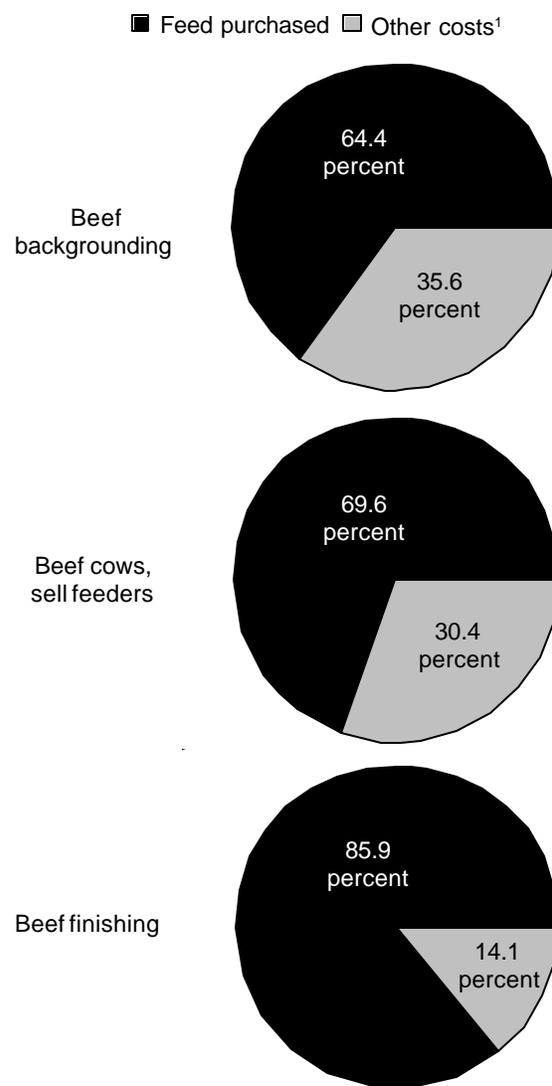
U.S. Mad Cow Disease

On December 9, 2003, a nonambulatory dairy cow showing signs of BSE was found in the State of Washington.³⁹ U.S. authorities identified it as a case of BSE, and the BSE world research lab in Weybridge, England, confirmed the diagnosis on December 25th. While this situation was yet to completely unfold, the effects of previous BSE episodes in Canada and the European Union (EU) provided insights into potential implications of this discovery in the United States.

After analyzing the effects from outbreaks of BSE in the European Union, USDA research suggests that BSE effects on EU beef consumption and trade volume were transitory.⁴⁰ EU total export volume has not remained strongly affected after immediate shocks, and while domestic consumption first sharply declined, it then increased to resume long-term trends. While such research is encouraging, EU beef prices failed to recover after the three cases of BSE, which implies beef demand shifted downward and trade values were strongly affected.

After the May 2003 discovery of BSE in Canada, that

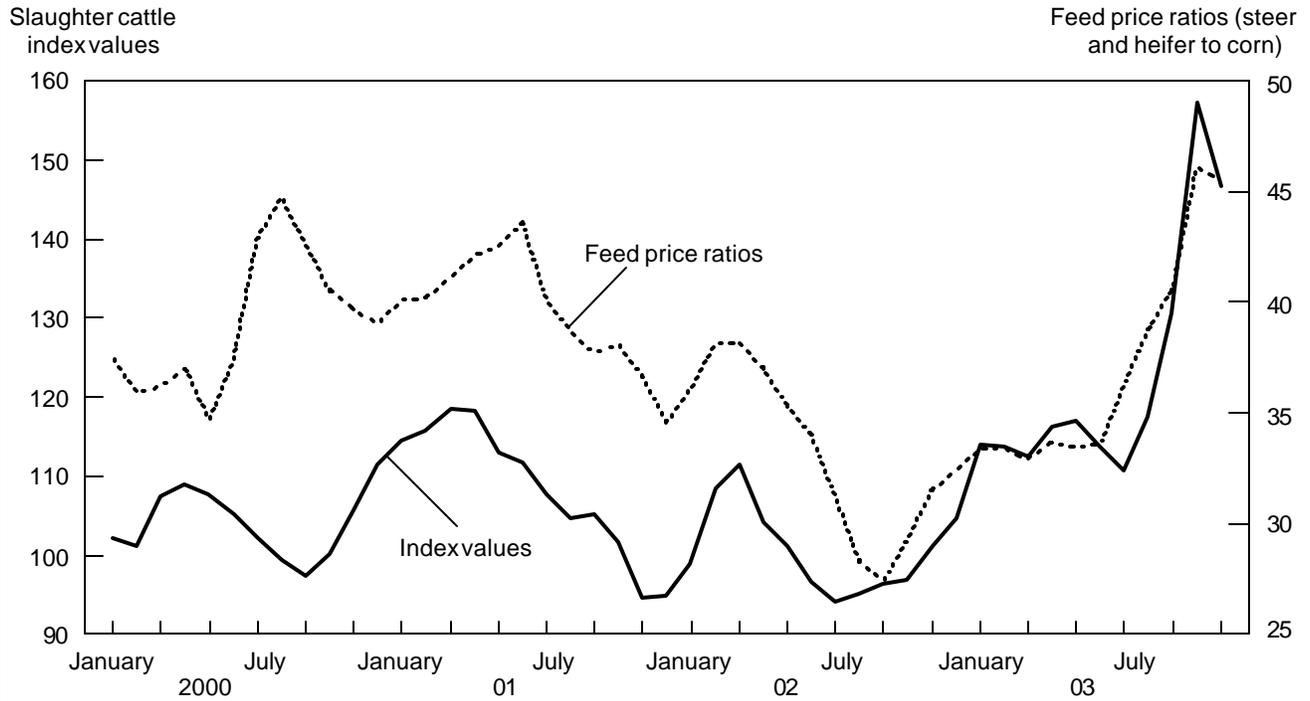
Chart 6. Total variable costs at three stages of processing



¹ Other costs include: labor hired; machine hire - lease; farm organization fees/travel/publication; livestock marketing/breeding; gas/fuel/oil; personal property tax; general farm insurance; utilities; auto expenses; livestock futures; interest paid; veterinary medicine/drugs; and general machinery repairs.

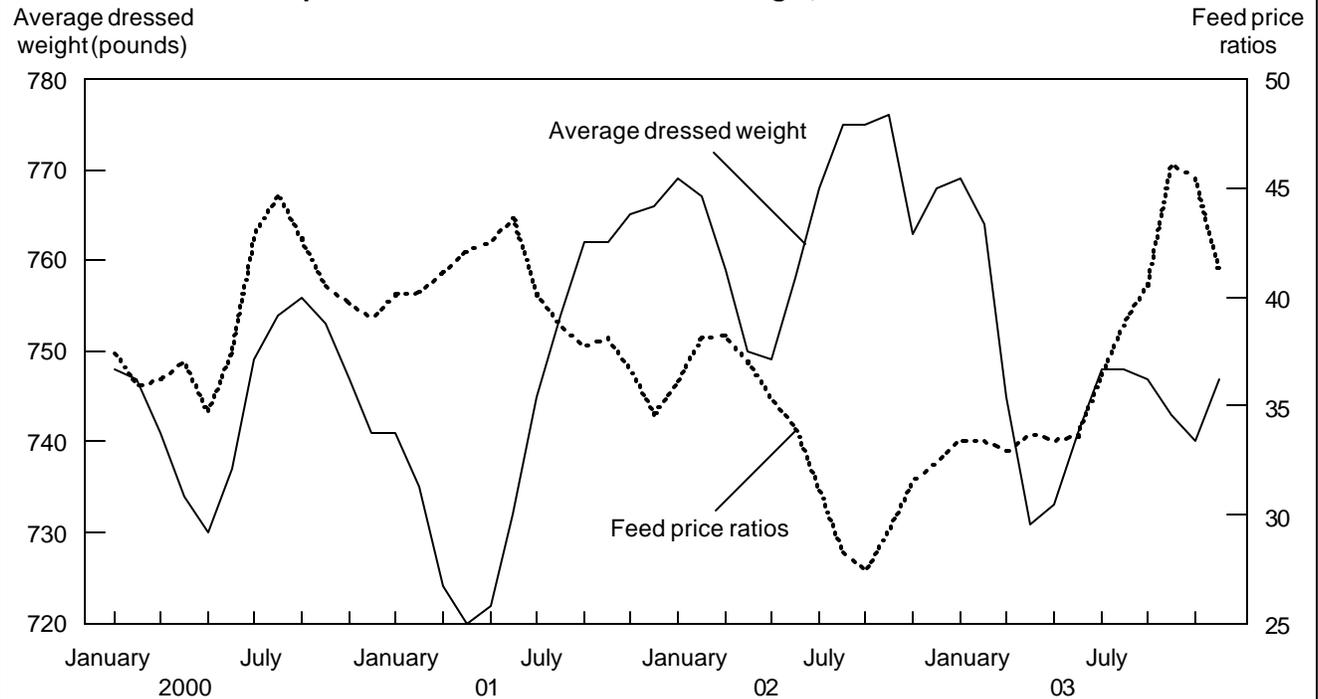
SOURCE: *Livestock: Historical Budgets* (Kansas State University, Department of Agricultural Economics) on the Internet at <http://www.agmanager.info/farmmgmt/income/enterprise/2002/KS%20beef%20finishing%2002.PDF>; <http://www.agmanager.info/farmmgmt/income/enterprise/2002/KS%20cows%20feeders%2002.PDF>; and <http://www.agmanager.info/farmmgmt/income/enterprise/2002/KS%20backgr%2002.PDF>

Chart 7. Feed price ratios: bushels of corn equal in value to 100 pounds of steers and heifers, live weight, and Producer Price Index values for slaughter cattle



SOURCE: USDA's National Agricultural Statistics Service and the Producer Price Index.

Chart 8. Federally inspected average dressed weight and feed price ratios (bushels of corn equal in value to 100 pounds of steers and heifers, live weight)



SOURCE: USDA's National Agricultural Statistics Service.

country's beef industry experienced significant difficulties. The closure of international borders to beef exports crippled the Canadian cattle and beef industry, as Canada had previously exported roughly 63 percent of total output on a beef equivalent basis.⁴¹ Bans forced Canada to cope with an additional 750,000 to 1,000,000 head of live cattle that, prior to the BSE discovery, was forecast to be exported to the United States during the remainder of 2003. Although demand for Canadian cattle and beef exports was virtually non-existent, beef imported into Canada fell only moderately in 2003 and helped to contribute to increased supply. The case of BSE in May apparently did not weaken Canada's domestic consumer confidence. A September report from the Foreign Agriculture Service suggested that Canadian consumption increased after the discovery of BSE, and major fast food restaurants announced that they would acquire 100 percent of their beef requirements from Canada-source beef for the Canadian operations.⁴²

International bans against U.S. cattle and beef products were quickly instituted after the discovery of BSE in the State

of Washington, leading to a notable drop in international demand. Moreover, while officials reacted quickly and the USDA attempted to encourage consumer demand, it was yet unclear whether demand would continue to remain strong in the United States as it did in Canada.

The December 2003 Producer Price Index (PPI) values for beef and veal and for slaughter cattle did not fully reflect the discovery of BSE in mid-December, because the initial discovery occurred on the PPI pricing date for the month.⁴³ However, in light of the Canadian and European Union experiences with BSE, many analysts believed beef and cattle prices would decline in 2004. Confirming these beliefs, the PPI values for beef and veal dropped 17.7 percent and slaughter cattle dropped 20.6 percent, from November 2003 to February 2004. However, prices for beef and cattle soon began to recover from those losses, rising 11.3 percent and 11.7 percent from February to April. The causes behind this relatively quick reversal in prices warrants further investigation. □

Notes

¹ All indexes mentioned are seasonally adjusted except slaughter cattle (WPU0131) and beef and veal (WPU022101), neither of which have been seasonally adjusted since 1993 and 1996 respectively.

² Briefing Room, *Cattle: Background* (U.S. Department of Agriculture, Economic Research Service), on the Internet at <http://www.ers.usda.gov/Briefing/Cattle/Background.htm>

³ James M. MacDonald, Michael E. Ollinger, Kenneth E. Nelson, and Charles R. Handy, *Consolidation in U.S. Meatpacking*, Agricultural Economics Report No. 785 (U.S. Department of Agriculture, Economic Research Service, March 1999), p. 4, on the Internet at <http://www.ers.usda.gov/publications/aer785/>

⁴ David Aadland, "The Economics of Cattle Supply," *Computing in Economics and Finance 2000*, Reference number 57 (IDEAS, Research Papers in Economics, July 2000) on the Internet at <http://ideas.repec.org/p/sce/scecf0/57.html>

⁵ *Ibid.*

⁶ *Beef Cow-Calf Enterprise*, MF-266 (Kansas State University, Department of Agricultural Economics, Farm Management Guide, October 2002), p. 1, on the Internet at <http://www.oznet.ksu.edu/library/agec2/mf266.pdf>

⁷ Briefing Room, *Cattle*.

⁸ MacDonald and others, *U.S. Meatpacking*, p. 5.

⁹ Briefing Room, *Cattle*.

¹⁰ MacDonald and others, *U.S. Meatpacking*, p. 4.

¹¹ *Ibid.*, p. 4.

¹² Briefing Room, *Cattle*.

¹³ Steve Swigert, "Drought, Economy Have Affected Cattle Cycle," *Ag News and Views* (Noble Foundation, October 2002), on the Internet at <http://www.noble.org/Ag/Economics/DroughtEconomyCattleCycle/index.htm>

¹⁴ Kenneth H. Mathews, Jr., William F. Hahn, Kenneth E. Nelson, Lawrence A. Duewer, and Ronald A. Gustafson, *U.S. Beef Industry: Cattle Cycles, Price Spreads, and Packer Concentration*, Technical Bulletin No. 1874 (U.S. Department of Agriculture, Economic Research Service, April

1999), p. 3, on the Internet at <http://www.ers.usda.gov/publications/tb1874/>

¹⁵ *Ibid.*

¹⁶ *Livestock, Dairy, and Poultry Outlook*, LDP-M-113 (U.S. Department of Agriculture, Economic Research Service, November 25, 2003), p. 5, on the Internet at <http://usda.mannlib.cornell.edu/reports/erssor/livestock/ldp-mbb/2003/ldpm113f.pdf>

¹⁷ Mathews and others, *U.S. Beef Industry*, pp. 5-6.

¹⁸ *Ibid.*, p. 14.

¹⁹ Judith Jones Putnam and Jane E. Allshouse, *Food Consumption, Prices, and Expenditures, 1970-97*, Statistical Bulletin No. 965 (U.S. Department of Agriculture, Economic Research Service, April 1999), p. 17, on the Internet at <http://www.ers.usda.gov/publications/sb965/>

²⁰ Mathews and others, *U.S. Beef Industry*, p. 3.

²¹ Putnam and others, *Food Consumption*, p. 17.

²² *Livestock and Poultry: World Markets and Trade* (U.S. Department of Agriculture, Foreign Agricultural Service, March 1997), on the Internet at <http://ffas.usda.gov/dlp2/circular/1997/97-03/cattle.htm>

²³ *Ibid.*

²⁴ *Bovine Spongiform Encephalopathy (BSE) Q & A's* (U.S. Department of Agriculture, Animal and Plant Health Inspection Website, December 24, 2003), on the Internet at http://www.aphis.usda.gov/lpa/issues/bse/bse_q&a.html

²⁵ *Background Statistics on U.S. Beef and Cattle Industry* (U.S. Department of Agriculture, Economic Research Service), on the Internet at <http://www.ers.usda.gov/News/BSECoverage.htm>

²⁶ *Livestock, Dairy, and Poultry Outlook*, LDP-M-106 (U.S. Department of Agriculture, Economic Research Service, April 22, 2003), p. 6, on the Internet at <http://www.ers.usda.gov/publications/ldp/Apr03/LDPM106f.pdf>

²⁷ *Ibid.*, pp. 5-6.

²⁸ "Statistical Indicators," *Agricultural Outlook* (U.S. Department of Agriculture, Economic Research Service), table 10, on the Internet at <http://www.ers.usda.gov/publications/Agoutlook/AOTables/>

²⁹ Articles from the Wall Street Journal, the Washington Post, and USA Today suggest that fad diets have boosted the demand for beef. Examples: Scott Kilman, "U.S. Beef Enjoys a Bull Market, Enriching Ranches and Packers," *The Wall Street Journal*, September 26, 2003; Blaine Harden, "Protein Diet Craze, Thin Supply of Cattle Fatten Ranchers' Wallets," *The Washington Post*, December 22, 2003; Barbara Hagenbaugh, "Beef Prices May Have Hit Bottom," *USA Today*, December 30, 2003.

³⁰ *Total U.S. Beef and Veal Red Meat Yearbook* (U.S. Department of Agriculture, Economic Research Service, Red Meat Yearbook), on the Internet at <http://usda.mannlib.cornell.edu/data-sets/livestock/94006/osexports.xls>

³¹ John H. Dyck and Kenneth E. Nelson, *Structure of the Global Markets for Meat*, Agriculture Information Bulletin No. (AB 785) (U.S. Department of Agriculture, Economic Research Service, September 2003), p. 4, on the Internet at <http://www.ers.usda.gov/publications/aib785/>

³² *Background Data on U.S. Beef Industry*; and *Cattle: Trade* (U.S. Department of Agriculture, Economic Research Service), on the Internet at <http://www.ers.usda.gov/News/BSECoverage.htm>

³³ *Livestock, Dairy, and Poultry Outlook*, LDP-M-115 (U.S. Department of Agriculture, Economic Research Service, January 27, 2004), p. 21, on the Internet at <http://www.ers.usda.gov/publications/ldp/Jan04/LDPM115f.pdf>

³⁴ *Ibid.*

³⁵ *Livestock: Historical Budgets* (Kansas State University, Department of Agricultural Economics), on the Internet at <http://www.agmanager.info/farrrmgt/income/enterprise/2002/KS%20backgr%20finish%2002.PDF>

³⁶ *Livestock, Dairy, and Poultry Outlook*, LDP-M-111 (U.S. Department of Agriculture, Economic Research Service, September 23, 2003),

p. 8, on the Internet at <http://usda.mannlib.cornell.edu/reports/erssor/livestock/ldp-mbb/2003/ldpm111f.pdf>

³⁷ *Data: Retail Scanner Prices for Meat* (U.S. Department of Agriculture, Economic Research Service), on the Internet at <http://www.lmic.info/meatscanner/meatscanner.shtml>

³⁸ Feed price ratios and the average dressed weight for cattle appear graphically to maintain an inverse relationship over recent years, suggesting that the price of feed influences, to some degree, cattle weight.

³⁹ *Newsroom: BSE Chronology* (U.S. Department of Agriculture, December 2003), on the Internet at http://www.usda.gov/wps/portal/!ut/p/s.7_0_A/7_0_1OB/.cmd/ad/.ar/sa.retrievecontent/.c6_2_1UH/.ce/7_2_5JM/.p/5_2_4TQ/_th/J_2_9D/_s.7_0_A/7_0_1OB?PC_7_2_5JM_contentid=bse_chrono.xml

The PPI pricing date each month is the Tuesday of the week with the 13th in it. The pricing date for December 2003, therefore, was December 9, 2003, the same day the dairy cow was discovered. As a result, December prices reflect very little of the U.S. discovery of Mad Cow Disease.

⁴⁰ Jean C. Buzby, ed., *International Trade and Food Safety: Economic Theory and Case Studies*, Agricultural Economic Report No. (AER 828) (U.S. Department of Agriculture, Economic Research Service, November 2003), p. 58, on the Internet at <http://www.ers.usda.gov/publications/aer828/>

⁴¹ *Canada Livestock and Products Annual 2003* (electronic edition) (U.S. Department of Agriculture, Foreign Agricultural Service, September 3, 2003), pp. 3-4 on the Internet at <http://www.fas.usda.gov/gainfiles/200309/145985931.doc>

⁴² *Ibid.*, p.6

⁴³ Each month, the Producer Price Index collects prices for the Tuesday of the week containing the 13th.