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Chicago Mercantile Exchange

CME Commodity Products

CME Livestock Futures and Options

Introduction to Underlying Market Fundamentals

Global Leadership in the Financial Marketplace

CME is the largest and most diverse financial exchange in the world for trading futures and options – handling nearly 800 million contracts worth more than $460 trillion in a single year. Founded in 1898, we serve the risk-management needs of customers around the globe by offering the widest range of benchmark financial products available on any exchange, traded via our CME Globex electronic trading platform and on our trading floors. Our innovative products cover major market segments – including commodities, interest rates, equities, foreign exchange and alternative investment products – and improve the way these markets work for customers everywhere. In addition, our clearing house matches and settles all trades and guarantees the creditworthiness of every transaction that takes place in our markets.

CME Commodity Products

CME agricultural commodity products help farmers and agribusinesses manage the constant price risks they face, enabling them to lock in profits, enhance business planning and more effectively serve their markets. Commodity-related businesses that use CME Commodity products to support and strengthen their operations are able to provide products to their customers at better prices.

Futures trading is not suitable for all investors, and involves the risk of loss. Futures are a leveraged investment, and because only a percentage of a contract's value is required to trade, it is possible to lose more than the amount of money initially deposited for a futures position. Therefore, traders should only use funds that they can afford to lose without affecting their lifestyles. And only a portion of those funds should be devoted to any one trade because a trader cannot expect to profit on every trade.

All references to options in this brochure refer to options on futures

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Introduction

Before entering into the futures and options markets, market participants must gain an understanding of the underlying markets in which each opts to trade. *CME Livestock: Introduction to Underlying Market Fundamentals* will provide basic information regarding the cattle and hog industries as well a fundamental economic framework for analyzing prices.

The information is divided into two main sections. The first section provides general information on the cattle and hog industries and details the life cycle of each species from birth to slaughter. It also describes the different pricing mechanisms in each respective industry, and how prices are realized in the cash markets. The second section provides information on analytical tools used in price forecasts and discusses economic factors affecting the livestock industry. This section also assists the market participant in locating and understanding the various government livestock reports used in price forecasts.

This publication provides a starting point for the potential trader to begin amassing knowledge. Each market participant must learn about other types and sources of pertinent information and how to use the information available. The emphasis here is on fundamental analysis; however, the novice trader may also want to explore technical analysis and discover the benefits it could add to trading. Some market participants prefer one technique over the other, while others utilize both types of analysis to enhance trading skills. The type or combination of techniques used is solely the preference of the individual.

A useful publication to compliment this one is the *Daily Livestock Report*, a free e-mail newsletter that provides market commentary and analysis and historical reference charts. Visit www.dailylivestockreport.com to subscribe. In addition, *The Self Study Guide to Hedging with CME Livestock Futures and Option*s offers detailed information about the contracts and how they are traded.

The Beef Industry

The Cow/Calf Operation

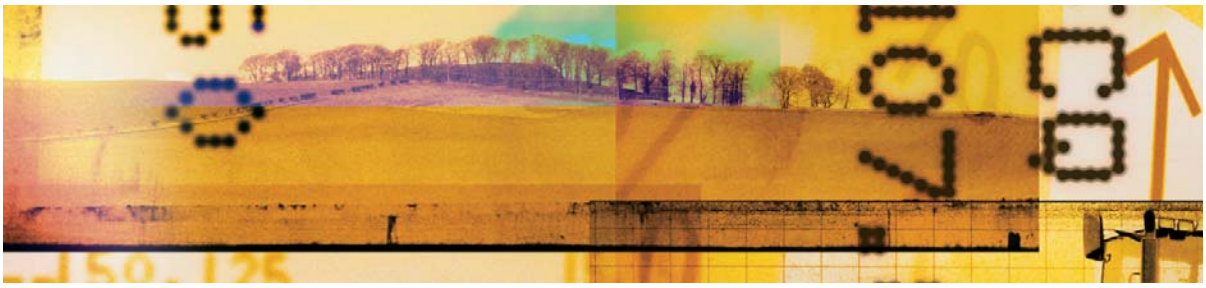
Cattle production begins with a cow-calf producer or rancher who breeds cows to produce calves using natural service with a bull or an artificial insemination program. Although the size of cow-calf operations varies considerably, the average beef breeding herd size consists of 42 cows, according to the United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS) (March 1999). If using a natural service breeding program, each producer commonly runs one mature bull per 23 cows for breeding purposes (USDA, Animal and Plant Health Inspection Service 1998). However, some cow-calf operators choose to breed their herd with an artificial insemination program or a combination of artificial and natural systems. Although the number of cow-calf operators using an artificial insemination program is low, it has increased over the last few years from 5.4 percent in 1992-1993 to 6.3 percent in 1997 (USDA, APHIS 1998) (Population includes cow-calf operations in continental United States). Artificial insemination programs enable producers to introduce new genetics into a herd without actually possessing the bull. Genetics have grown in importance with the movement to produce higher quality beef that will ultimately provide the consumer with a consistently pleasurable eating experience.

A producer, with or without the use of bulls, requires a certain number of acres of pasture or grazing land to support each cow-calf unit. The acres of grazing land required per cow-calf unit is referred to as the stocking rate, and it differs among regions across the U.S. due to weather conditions and management practices. In high rainfall areas of the East and Midwest, for example, the stocking rate can be as low as five acres per cow-calf unit, while in the West and Southwest it can be as many as 150 acres. The ranches themselves vary in size from less than 100 acres to many thousands of acres.

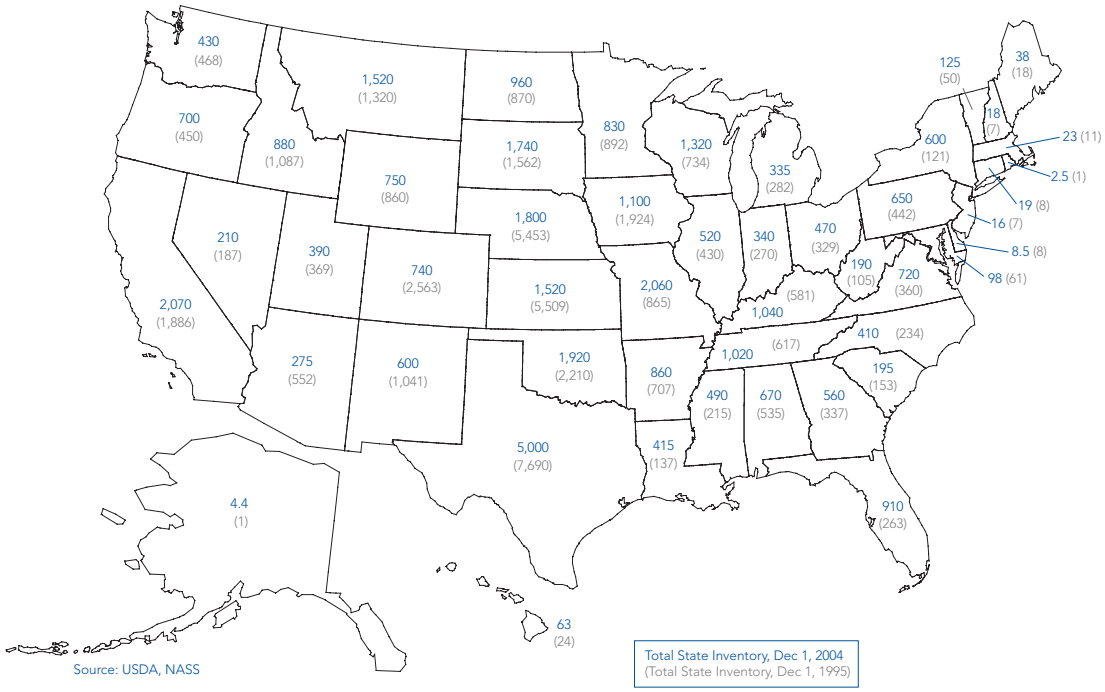
The majority of cow herds are bred in late summer and thus produce a spring calf crop. The actual gestation period for cattle is approximately nine months. Most producers breed their herd to calve in the spring to avoid the harsh weather of winter and to assure abundant forage for the new calves during their first few months. Each cow in a herd generally gives birth to one calf; however, twins are born on rare occasions. Not all cows in a herd will conceive and the conception rate (the percentage of cows bred that actually produce a calf) can be adversely affected by disease, harsh weather, and poor nutrition. A cow that misses its annual pregnancy is referred to as "open" and is usually culled from the herd and sent to slaughter, even if she is still young.

On average, 16 to 18 percent of the cows in a herd are culled each year (Bolze and Corah 1993). Cows can be culled for several reasons: failure to become pregnant, old age or bad teeth, drought, or market conditions such as feed costs (Troxel et al. 2000). The cows that are culled must be replaced in order to maintain herd size. To accomplish this, a certain number of females from the calf crop must be held back to use as replacement heifers. If the calf crop does not contain enough suitable heifer calves to maintain the size of the herd, replacement heifers must be purchased from another source. During the expansion phase of the cattle cycle, when producers are building their herds, the retention rate is higher than average, while during the liquidation phase the rate is lower.

Calves, whether being retained for replacement heifers or being sold for eventual slaughter, remain with the cow for at least the first six months of their lives. At birth, calves receive their nourishment exclusively from nursing. Over time, however, their diet is supplemented with grass and eventually grain. When calves reach six to eight months of age, they are weaned from the cow. Some calves are then put directly into feedlots, but most pass through an intermediate stage called the stocker operation.



Total Calf Crop and Cattle Marketings by State (in thousands)



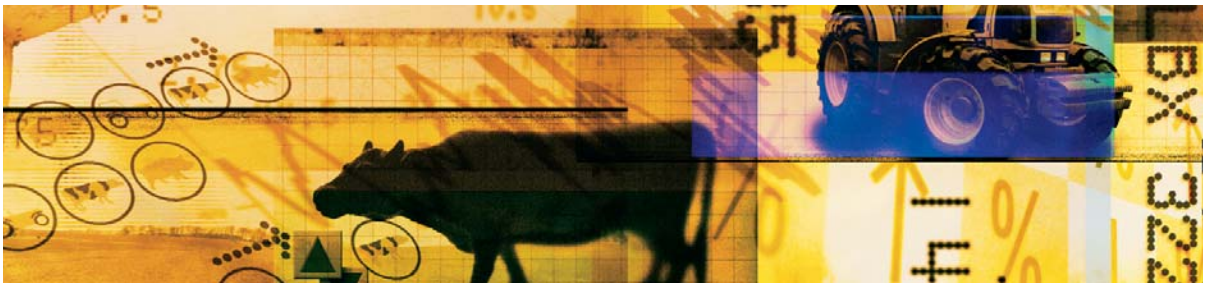
Source: USDA, NASS

The Stocker Operation

Stocker or backgrounding operations place weaned calves on summer grass, winter wheat, or some type of harvest roughage, depending upon the area and the time of year. The cow-calf operator may pay a stocker operator for providing these services or may sell the calves to a stocker operator. Either way, the stocker phase of the calf's life may last from six to ten months, until the animal reaches feedlot weight of about 600 to 800 pounds. When the cattle are ready to be placed in feedlots, they are referred to as feeder cattle. Again, as they pass from the stocker operation to the feedlot, the animals may or may not change ownership. Many of the feedlots that stocker calves are sent to are located in the Great Plains, specifically Colorado, Nebraska, Kansas, Oklahoma, and Texas (MacDonald et al. 2000). Figure 1 provides a distribution of where calves are raised as well as where they are marketed.

The Feedlot

Cattle producers, or backgrounders, have three options when their cattle reach the feeder stage. They can 1) feed the cattle at a home operation, 2) place the cattle in a commercial feedlot to be custom fed while retaining ownership, or 3) sell the cattle to another cattle feeder or feedlot. No matter the option selected, when cattle reach this stage, they are fed a mix of high energy feed to promote rapid weight gain. Most feeder cattle are steers (castrated males) and heifers (females that have not yet calved). However, there are generally more steers than heifers in a feedlot at any given time since cow-calf operators usually retain some heifers for herd maintenance. Cows (females that have had a calf) and bulls (sexually intact males) are not commonly placed in feedlots.



Feedlots vary in capacity from less than 100 head to more than 50,000 head. Generally, the small feedlots, also called farmer feedlots, are owned and run by individuals, as part of a family operation, or with a few partners. Generally, small feedlots are part of a diversified farming operation and they usually do not feed cattle for others outside the business. Small operations are defined in this publication as having a one-time capacity of less than 1,000 head. In 2004, approximately 78 percent of all feedlots had a one-time capacity of less than 1,000 head.

In contrast, large or commercial feedlots, defined here as having a one-time capacity of 1,000 head or more, are primary enterprises of the owners or managers and usually require their full attention. Commercial feedlots, which accounted for 11 percent of the nation's feedlots in 2004, provided about 85 percent of the total fed-cattle marketings for the same year (USDA, NASS). Commercial feedlots often sell their services to outsiders in an arrangement known as custom feeding. Commercial feedlots can offer several services to producers who choose to have their cattle custom fed, particularly in regard to marketing and risk management.

Commercial feedlots usually have a greater ability to market cattle because they have contacts with many packing plants that small farmer feeders may not have. Commercial operations can also sell large lots of cattle by combining cattle from several different owners, and packers prefer this to buying numerous small individual lots. In addition, commercial feedlots can offer different methods of risk management and various types of financing.

Once a feeder calf enters a feedlot, whether it is a farmer feedlot or a commercial lot, there is intense focus on feeding the calf for slaughter. The rations fed promote low feed-to-meat conversion and high daily rate of gain. An average daily gain for steers in feedlots in the Great Plains is 3.2 pounds per day and the average feed conversion is 8.3 pounds of feed for every one pound of gain. The average number of days on feed is 149 days (Jones 2001). Generally, average daily gain for a heifer is lower and feed conversion is higher. However, the averages, for both steers and heifers, can be greatly affected by management practices and weather. Extremely hot weather can depress appetites, resulting in lower daily weight gains and extended feeding periods. Unusually cold weather can cause food energy to be diverted from growth to the maintenance of body heat. This also results in lower daily gains and longer feeding periods, as well as higher feed conversion ratios.

The efficiency and ability of the feed yard also strongly influences feeding statistics. Many lots, especially larger ones, have a full-time nutritionist, equipment to monitor feed intake and an on-site mill to manufacture feed for the animals' dietary requirements. These and other facilities and services create higher efficiencies in feeding and therefore, higher daily gains, lower feed conversions, and fewer days on feed.

Whether the cattle are fed in a farmer or commercial feedlot, they usually receive a ration consisting of grain, protein supplement and roughage. The grain portion is usually corn, milo, or, when the price is low enough, wheat. Generally, the protein supplement is soybean, cottonseed or linseed meal. The roughage portion is alfalfa, silage, prairie hay, or some other agricultural by-product such as sugar beet pulp. The choice of feed depends upon its price relative to the price of other alternatives.

Feeding continues until the animal is "finished" or has reached some optimum combination of weight, muscling and fat and is ready for slaughter. In 2004, the average live, federally inspected slaughter weight was approximately 1,243 pounds and the average federally inspected dressed (carcass) weight was 750 pounds (USDA, NASS). However, these feeding weights will vary with market conditions. If feed prices fall or slaughter cattle prices rise, animals will be kept on feed longer to bring them to a heavier weight. There is a limit to the extension of the feeding period, though, because over-fattened cattle can be discounted substantially when sold. Starting the feeding period earlier with lighter weight feeder calves can also extend the length of time cattle are on feed.

Once the cattle reach slaughter weight and the owner is ready to sell, there are two main marketing routes through which the animals pass: 1) direct sale to a packer, or 2) sale through an auction.

Beef Packing and Processing

A packer buys cattle, slaughters them, and then sell virtually every item that comes from the slaughtered animals. The two major sources of revenue for packers are sales of meat (either in carcass or boxed form, or the most recent trend, case ready) and sales of the hide and offal, or "drop" (hide, trimmed fat, variety meats, bones, blood, glands, and so on). Packers generally sell meat in boxed form, with the carcass divided into major cuts and vacuum-packed. When these boxes reach a retailer they are further fabricated. However, there is a move in the beef industry towards selling case-ready beef which has been cut into wholesale cuts by the packer and sent to the retailer ready to be placed directly in the meat case and sold. There is no further fabrication necessary on the part of the retailer.

Although boxed and case-ready meat are packaged differently, all carcasses, regardless of packaging, are split down the middle and then cut into quarters. The hindquarter is 48 percent of the carcass and includes the round and rump, loin, and flank. The remaining 52 percent of the carcass is the forequarter and is comprised of the rib, chuck, plate, brisket, and fore shank. Most of the meat, about 65 percent, is fabricated into steaks and other cuts and the remainder is used for ground beef and stew meat (USDA, Food Safety and Quality Service).

Salaried employees, known as packer buyers, purchase many of the packers' cattle directly from feedlots. Based upon current meat prices and other economic factors, the buyers bid on desirable cattle. If a bid is accepted, the cattle are generally delivered to the packer within seven to 14 days for slaughter, depending on the pricing method. This delivery schedule allows the packers some flexibility and enables them to schedule their kills several days in advance.

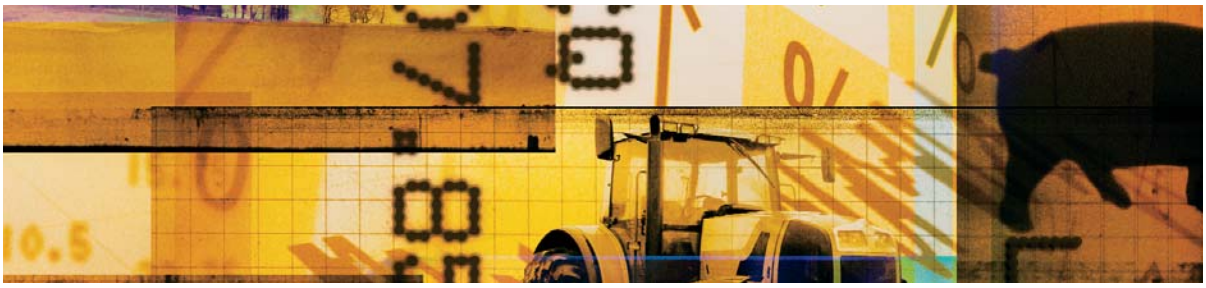
Packers negotiate feedlot cattle prices in several different ways. One approach, called Formula Pricing, involves using a mathematical formula that includes some other price as a reference, such as the average price of the cattle purchased by the plant for the week prior to the week of slaughter (Ward et al. 1999). Formula pricing can be used when cattle are sold on a live- or dressed-weight basis. Live-weight pricing is based on estimated carcass weights and quality (generally Prime, Choice, Select, and Standard) and yield grades (1 through 5, with the higher numbers representing a lower proportion of salable retail cuts from the carcass). The price determined by these estimates is then averaged across the entire pen of cattle. Dressed-weight prices are based on estimated quality and yield grades and known carcass weights. This price is not averaged across the pen as in live-weight pricing, but is calculated for each individual carcass.

A second cattle pricing method is forward contracting. A forward contract can either be a basis forward contract or a flat price forward contract. With a basis forward contract, the packer offers to buy cattle at a futures market basis (basis = cash price - futures price) for the month in which the cattle are expected to be slaughtered. The feeder who accepts the bid then decides when to price the cattle. With a flat price forward contract, price is established at the time the contract is entered into (Eilrich et al. 1992). Like formula pricing, forward contracting can be used when the cattle are sold on a live- or dressed-weight basis.

Grid pricing is another way to price cattle. This method establishes a base price and then specifies premiums and discounts above and below the base for different carcass attributes, such as quality and yield grade and whether the carcasses are light or heavy. The base price is set differently depending on each packer and can be based on several different prices. Some of these prices include the futures price, boxed beef cutout value, or average price of the cattle purchased by the plant the week prior to the week of slaughter. Grid pricing is also known as value-based pricing because prices are based on the known carcass weight, and quality and yield grade of each individual carcass.

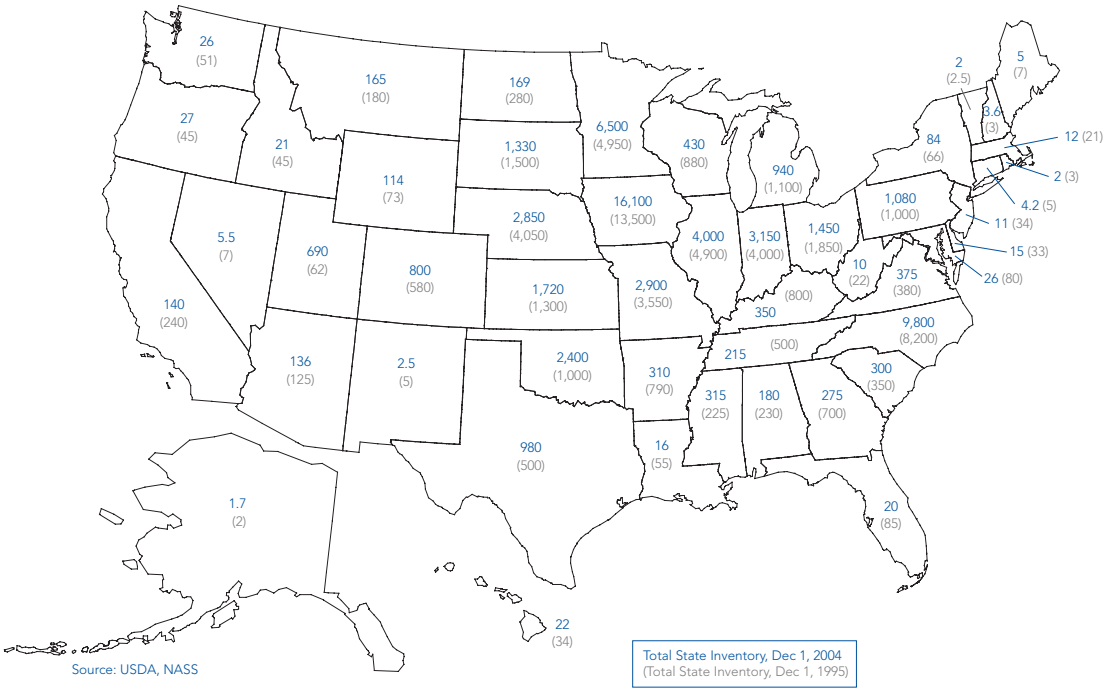
A final method of marketing cattle is selling them on the cash market. The cattle are sold live at the current market price, without any price negotiations, formulas, contracts, or grids. Cash market sales include selling at terminal markets (which are generally located close to slaughter facilities), auction sales, and direct sales to packers at the cash price (spot bid).

In 1998, 13.8 percent of the fed cattle marketed were sold to packers through public markets (this includes terminal and auction markets) while 86.2 percent of the cattle were sold through non-public markets (this includes purchases of livestock from all sources except public markets) (USDA, Grain Inspection Packers and Stockyards Administration). Feedlots choose the pricing method according to which technique will provide the highest return for the specific cattle being sold.



The Pork Industry

Total Hog Inventory by State (in thousands)



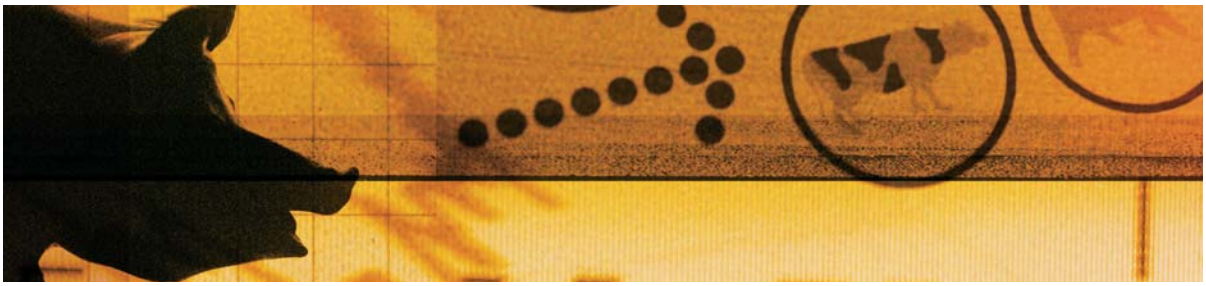
Background

Like the cattle industry, the pork industry can be divided into several basic phases that correspond to the animals' life cycle: 1) the production of young animals (pigs), 2) feeding the pigs to slaughter weight, and 3) slaughter and fabrication. The swine industry has seen dramatic change over the last decade due to a move to contract and vertically coordinate hog production. This move was partially spurred by an effort to maintain control of the growth process from farrow-to-finish and beyond, so as to improve production, efficiency and profitability. As a result, several growing phases are now combined into a single unit in the hog industry. The integrated units are referred to as farrow-to-finish operations, with the hogs staying in the same location from farrowing, or birth, to the finish of their feeding period.

The Hog Production Facility

Hogs originate from three main types of hog farms: farrow-to-finish, farrowing-nursery, and farrow-to-wean. Farrow-to-finish operations handle all stages of a pig's life, from birth to sale of a market-ready hog, while farrowing-nursery operations raise pigs from birth to the feeder pig stage, when they weigh about 40 to 60 pounds, and are ready to be sold to finishing farms. Farrow-to-wean farms raise pigs from birth to only about 10 to 15 pounds, when they are then sold to another operation and fed to market weight (Pork Facts 2001).

At present, most hog operations are farrow-to-finish and are located in the Western Corn Belt and the North Carolina-Virginia region. Newly emerging hog regions are developing, however, in Oklahoma, Utah, and other non-



traditional pork producing states. Figure 2 displays the total inventory numbers in each state from 1995 and 2004 and illustrates the shift in the location of hog production.

It is evident that farrow-to-finish facilities have grown dramatically larger, evolving from small hog farms to large corporate and private operations. In 2000, farms marketing more than 5,000 hogs per year accounted for approximately 79 percent of all hogs marketed during that year (2000 Pork Industry Structure Study in Pork Facts 2001). In contrast, in 1978 just under 67 percent of all marketings came from farms selling less than 1,000 head (MacDonald et al. 2000).

Many producers have expanded to large farrow-to-finish operations because of the benefits from economies of scale. Production costs per hog decline on large farms, in part, because of improved feed efficiency and labor productivity. As annual marketings increase to 1,000 head, production costs drop sharply and continue to decline as the marketings increase above 1,000 head, albeit at a slower rate (MacDonald et al. 2000). Larger operations also are better able to negotiate long-term contracts with packers because the operators can assure them of a constant supply of hogs.

Stages of Hog Production

The life cycle begins with the baby piglet. Each gilt (young female that has not given birth) and sow (mature female that has given birth) is generally bred twice a year, on a schedule to provide a continuous flow of pigs for the operation. To obtain the breeding stock, operators retain gilts that show superior growth, leanness, and reproductive potential as seen in their mothers (Pork Facts 2001). Boars (sexually mature males) used for breeding are generally purchased from breeding farms and have a working life of approximately two years.

There are three main types of hog breeding. The first is pen mating, in which one or more boars are placed with a group of sows or gilts. The second and most common method is hand mating, where one boar is placed with only one sow or gilt at a time and they are monitored to be sure mating occurs. This method is more labor intensive than pen mating but there is more assurance that the female will reproduce. The third method is artificial insemination. This method allows for new genetics to be introduced quickly, but it is the most labor intensive of the three alternatives (Pork Facts 2001).

The gestation period for a bred female is approximately 114 days, at which point the female will give birth to an average of nine to 10 pigs. After these baby pigs are weaned, at around three to four weeks of age (Pork Facts 2001), the sows will either be re-bred or sent to market. Females are generally kept in the breeding herd for two to three years until they are sold for slaughter, but depending on their genetics, health, and weight, they may be sold earlier.

Between farrowing and weaning, the average litter size is reduced to an average of 8.7 pigs due to death loss (Pork Facts 2001). Death can occur from suffocation by the sow laying on the baby pig, disease, weather conditions, and other external factors. Depending on the facilities used for farrowing, death loss due to weather conditions can be higher in severe winters.

As the young pigs grow, they are fed various diets to meet their specific nutritional needs at different predetermined weights. These diets must be high in grains because hogs cannot efficiently convert forages to muscle. Also, many times barrows (castrated males) and gilts are fed separately due to their differing nutritional needs. By separating these two groups, each sex can be fed more efficiently because their nutritional needs are different. The diet generally consists of corn, barley, milo, oats, or sometimes wheat. The protein comes from oilseed meals and vitamin and mineral additives. Sometimes antibiotics are also included to complete the pig's diet. Most of the feed is mixed on the site of the hog operation and some farms grow the feed used. However, sometimes complete rations are purchased from feed manufacturers and can be fed directly without further processing (Pork Facts 2001). On average, a barrow or gilt in the finishing stage will gain approximately 1.64 pounds per day with a feed conversion of 3.10 pounds of feed per one pound of gain (Dhuyvetter and Tokach 2001).

Typically, it takes six months to raise a pig from birth to slaughter. Hogs are generally ready for market when they reach a weight of approximately 250 pounds. In 2000, the average federally inspected slaughter weight was 262 pounds with a carcass weight of 194 pounds (USDA, NASS 2001). The weight at which hogs are marketed is affected by feed and hog prices. High feed prices and low hog prices may cause producers to sell hogs at a lighter weight while low feed prices and high hog prices might induce the producers to feed the hogs to a heavier weight before they are sold.

Generally, market-ready hogs are sold directly to the packer; however, some are sold through buying stations and auctions, and a small number are sold through terminal markets. In a study conducted during the month of January 2001, 82.7 percent of all hogs marketed that month were purchased by packers through non-spot transactions, while 17.3 percent were sold on the spot market (Grimes 2001). Hog producers also often use marketing contracts to sell their hogs to packers. Types of marketing contracts include fixed price, fixed basis, formula price, cost plus, price window, and price floor.

Fixed price agreements are generally short-term contracts that set the actual price at which the hogs will be delivered, usually one to two months out. The price is commonly related to the futures price (Buhr and Kunkel 1999).

Fixed basis contracts are similar to fixed price contracts in that both set a price for future delivery; however, fixed basis contracts set the basis (basis = cash price – futures price) rather than the actual price. Since fixed basis agreements apply to a specific futures contract, they can last for more than a year (Buhr and Kunkel 1999).

Formula pricing may be used when a large number of hogs are forward contracted with a packer or another producer over an extended time period. The formula price is derived from a "price determining market" such as the Iowa-Southern Minnesota weighted average price of 51-52 percent lean hogs. There also may be a price differential subtracted or added based on different factors such as location or overall quality of the hogs (Buhr and Kunkel 1999).

A cost-plus agreement is a formula price generally based on feed costs. These contracts typically set a minimum price level and usually have a balancing clause, commonly referred to as a ledger.

With ledger contracts, payments are made to producers when market prices are below the contracted floor price. However, when the contract base price rises above the floor price, the producer must pay back the money received when prices were low. These contracts typically last from four to seven years (Buhr and Kunkel 1999).

Price window agreements are similar to cost-plus agreements, except for the pricing mechanism. Price window agreements typically establish a price ceiling and floor. If the market price falls between the floor and ceiling, the hogs are exchanged at the market price. However, if the price is above the ceiling or below the floor, the packer and producer split the difference between the market price and ceiling or floor price (Buhr and Kunkel 1999).

Price floor agreements combine features of both ledger and window contracts. A price floor agreement sets a minimum price as well as a ceiling price. When prices are above the ceiling, the producer places a portion of hog prices received into a special account and draws on this account when prices are below the floor price (Buhr and Kunkel 1999).

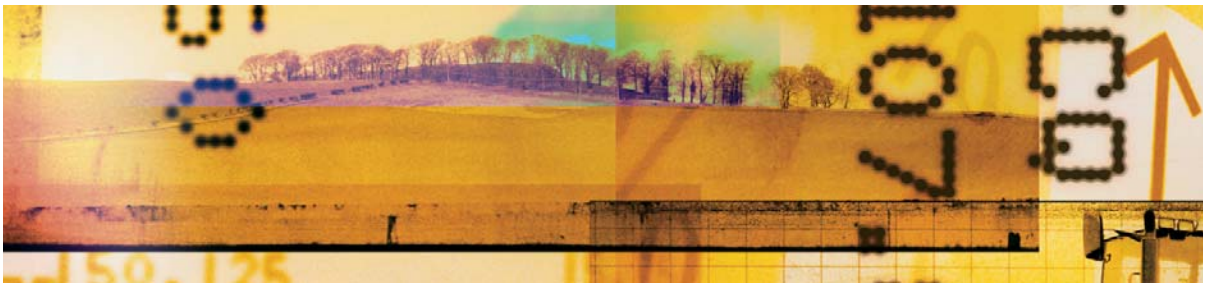
It is important to mention that when hogs are priced, generally, it is with regard to the actual percent lean of their carcasses, since this percentage determines the actual amount of meat the carcass will yield. When live hogs are sold at an auction, however, the price is based on an expected percent lean.

Pork Packing and Processing

After hogs are sold, they are shipped to a packer and slaughtered. The carcasses are cut into wholesale cuts and sold to retailers. A market hog with a live weight of 250 pounds will typically yield 88.6 pounds of lean meat (Pork Facts 2001). This lean meat consists of an average of 21 percent ham, 20.3 percent loin, 13.9 percent belly, 3 percent spareribs, 7.3 percent Boston butt roast and blade steaks, and 10.3 percent picnic. The rest goes into jowl, lean trim, fat and miscellaneous cuts and trimmings (USDA AMS).

A large portion of pork is further processed and becomes storable for considerable periods of time. Hams and picnics (a ham-like cut from the front leg of the hog) can be smoked, canned, or frozen. Pork bellies (the raw cut of meat used for bacon) can be frozen and stored for up to a year prior to processing.

After gaining an understanding of the production cycles of hogs and cattle, it is important to recognize how that knowledge combines with economic factors that affect each industry. The following sections will examine the relationship between economic conditions and livestock prices. These sections will discuss the pipeline approach to the livestock industry, provide information on supply and demand factors, and explain livestock cycle and seasonality issues.



Economic Factors

THE PIPELINE APPROACH

The pipeline approach is a forecasting technique that estimates the quantity of a commodity at a specific point in the future based on observation at various points during the production cycle. At birth, livestock enter into a sort of production pipeline beginning on the farm and terminating at the supermarket. The assumption is that what goes into the pipeline must eventually come out, barring minor "leakage" due to death, loss and exports.

The forecasting technique requires: 1) an estimate of current supplies at various stages in the pipeline; 2) knowledge of the average time it takes for the commodity to move from one stage to the next; and 3) information about any important leakages, infusions (imports), or feedback loops (diversion of animals from slaughter back into the breeding herd). Much of this information is available through United States Department of Agriculture (USDA) publications.

Hog Pipeline

One of the first pieces of information needed to study the hog pipeline is the size of the pig crop. Pig crop data can be obtained from the Hogs and Pigs report published by USDA's National Agricultural Statistics Service (NASS). On a quarterly basis, this report provides information for all fifty U.S. states on the pig crop and total inventory as well as other relevant information regarding hogs and pigs. It also publishes a report on the pig crop, breeding herd size, and the number of sows and gilts bred on a monthly basis.

Quarterly data for total United States commercial pork production, as well as information on the pig crop and total commercial hog slaughter, are provided in Table 1. Notice that the pig crop is the highest in Quarter 2, while hog slaughter and production are highest in Quarter 4. This is because pigs born during March through May are ready for slaughter from October through December, when demand is the highest.

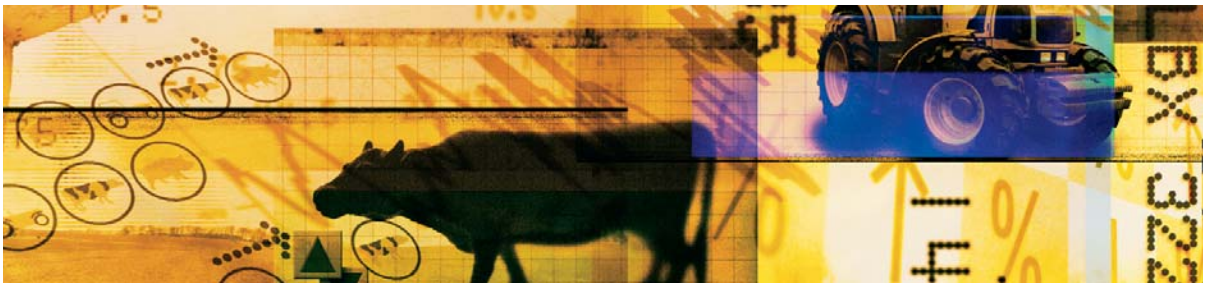
Obtaining Data

Market participants may also need additional information regarding hog slaughter, depending on the stage in the pipeline they are studying. This data can be obtained from the monthly Livestock Slaughter report. Also published by NASS, it presents statistics on total hog slaughter by head, average live and dressed weight in commercial plants by state and in the U.S., information about federally inspected hogs, and additional slaughter data. Finally, hog pipeline analysts need information regarding leakages, infusions, and feedback loops. Several reports published by USDA's Economic Research Service (ERS), including Livestock, Dairy and Poultry Situation and Outlook and Red Meat Yearbook, provide data on imports and exports, offering monthly, quarterly, and yearly statistics separated out by selected countries on a carcass weight and live animal basis.

For feedback data or data regarding retention for breeding purposes, market participants can consult the Hogs and Pigs report, particularly the "Hogs Kept for Breeding" and "Monthly Sows and Gilts Bred" sections. This, however, does vary over time depending on whether the industry is in an expansion or contraction phase. Although gilts may be retained for breeding, they do eventually go back into the pipeline and become part of the slaughter and pork production numbers.

Estimating Production

Using these resources to research the hog pipeline can enable market participants to estimate hog production in a specific time period. For example, a market participant who wished to focus on the third quarter of 2004 could learn that 26,162,000 pigs were born in the U.S. (Table 1) during the first quarter. Since it takes roughly six months, or two quarters, to bring a newborn pig to an average slaughter weight of 250 pounds, the hog pipeline suggests that slaughter in the third quarter of 2004 should be 26,162,000 hogs. In fact, third quarter hog slaughter was actually 25,817,000, which means the pipeline estimate differed from the actual number by 245,000 head, or roughly 1 percent. This estimate was fairly accurate, but other times it can be highly inaccurate.



Total U.S. Pork Production, Hog Slaughter, and Pig Crop by Quarter

		Quarter		
Year	**I**	**II**	**III**	**IV**
Pig Crop[a]		**1,000 Head**		
1999	25,247	26,272	25,862	24,973
2000	24,522	25,565	25,548	25,112
2001	23,963	25,509	25,029	24,972
2002	24,794	25,959	25,700	24,892
2003	24,359	25,583	25,150	25,314
2004	25,105	25,884	26,162	25,881
2005	25,489			
Commercial Hog Slaughter[b]		**1,000 Head**		
1999	25,579	24,288	24,953	26,723
2000	25,019	23,106	24,097	25,732
2001	24,573	23,274	23,631	26,465
2002	24,148	24,279	25,120	26,714
2003	24,653	23,922	24,747	27,607
2004	25,717	24,787	25,817	27,192
2005	25,529	25,027		
Commercial Pork Production[b]		**Million Pounds**		
1999	4,866	4,630	4,672	5,110
2000	4,824	4,470	4,601	5,010
2001	4,805	4,544	4,547	5,239
2002	4,780	4,797	4,832	5,255
2003	4,898	4,741	4,807	5,499
2004	5,130	4,897	5,047	5,435
2005	5,136	5,022		

[a] Begins with a December–February quarter

[b] Calendar quarters

Source: USDA, NASS

Speed of Commodity Flows

A market researcher who does a statistical analysis of the hog pipeline will find that about 73 percent of the variation in hog slaughter, lagged two quarters, can be explained by variation in the pig crop. This relationship is not as high as one might expect because it does not include all the essential factors.

Recall that the pipeline approach requires knowledge of the speed of the commodity flow. While the average time between birth and slaughter is roughly six months, the actual period can vary with economic conditions as well as with the season and unexpected changes in the weather. For example, a decline in the cost of feed makes livestock feeding more profitable, so producers will feed the animals to heavier weights and therefore, increase the time the animals are in the pipeline. A rise in the cost of feed can result in earlier marketing at lighter weights. If livestock prices decline temporarily, producers may delay marketing in hopes of a price increase.

Market participants also need to remember that the number of females withheld from slaughter for breeding purposes will vary over time. When producers are expanding, they increase the number of gilts withheld for breeding. During a contraction phase, however, producers cull females from the breeding herd and increase the number of sows and gilts slaughtered. Although no public data provides exact figures on gilt slaughter in comparison to total hog slaughter, some inferences can be made from data in the Hogs and Pigs report. When producers are putting more hogs into the breeding herd, they are therefore slaughtering fewer females. These estimates can then be considered when forecasting hog slaughter using the pipeline approach.

Effects of Imports and Exports

Market participants also need to account for exports and imports into the hog pipeline to accurately forecast hog slaughter numbers. They can consult USDA data to determine the number of exports and imports that enter and exit the pipeline, apply these numbers to the pipeline forecast, and then estimate the total slaughter. However, when considering import and export data in the pipeline approach, it is important to remember the stage in which the hogs will enter and exit the pipeline. For example, exports of hogs will only affect the slaughter forecast if they are exported as live animals, not pork. Pork exports are subtracted after the U.S. production number is calculated. However, live animals will "disappear" between the pig crop stage and the slaughter stage and this loss must be accounted for to compute an accurate forecast.

Similarly, only imports of live animals will affect U.S. slaughter and production numbers because these animals are slaughtered in the U.S. However, imports of pork are not counted in U.S. slaughter and production numbers because these animals were not slaughtered in this country. One final consideration to account for in the pipeline forecast is death loss. A percentage can be applied to the final total slaughter estimate to account for death loss. According to publications from Kansas State University (Dhuyvetter and Tokach 2001) and Purdue University (Positioning Your Pork Operation 1995), the average death loss from birth to a finished hog is between five and seven percent.

Reviewing the factors that can affect the final number of hogs slaughtered demonstrates why the two quarter prior pig crop is not a perfect predictor of hog slaughter. Other factors not discussed here and not easily quantifiable, such as producer behavior or weather, also influence hog slaughter.

Other Factors Affecting Production

Beyond estimating hog slaughter numbers, there is one further step a market participant can take in forecasting movements along the hog pipeline. This step is to translate the hog slaughter forecast into a pork production forecast. For example the average hog carcass weight in 2000 was 194 pounds (USDA, NASS 2001). Referring back to the forecast of 23,963,000 hogs slaughtered in the third quarter of 2001, and multiplying this number by the average carcass weight of 194 pounds, yields a forecast for the third quarter of 2001 of approximately 4,649 million pounds of pork (23,963,000 head x 194 lbs. per head). The actual third quarter pork production for 2001 was 4,547 million pounds (Table 1), which is two percent less than the forecast. Again, in this pork production forecast, the market participant must take into consideration other factors, similar to those noted previously, that may affect production. Consideration of these factors may provide a more accurate estimate.

Total U.S. Placement of Cattle on Feed (1000+ Capacity Feedlots)

	1999	2000	2001	2002	2003	2004	2005
January	1,933	2,216	2,263	2,169	2,089	1,751	1,834
February	1,808	1,880	1,580	1,820	1,650	1,610	1,885
March	2,031	2,031	1,842	1,963	2,032	1,804	1,523
April	1,688	1,707	1,551	1,463	1,870	1,598	1,750
May	2,049	2,305	2,372	2,267	2,307	2,367	1,660
June	1,794	1,664	1,965	1,644	1,672	1,689	2,223
July	1,812	1,907	1,986	1,840	1,997	1,647	1,769
August	2,428	2,440	2,204	2,228	2,384	1,719	1,678
September	2,759	2,686	2,141	2,194	2,474	2,102	1,993
October	3,114	2,829	2,702	2,396	2,781	2,375	
November	2,170	2,014	1,908	1,982	1,926	2,701	
December	1,646	1,699	1,578	1,610	1,748	1,743	

Source: USDA, NASS

Cattle Pipeline

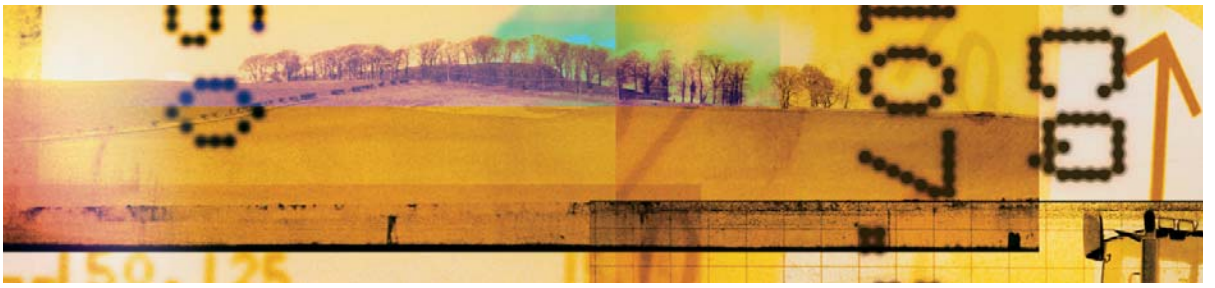
Market participants calculate numbers of animals in the cattle pipeline in much the same manner as the hog pipeline. They consider the same factors and, similarly, study USDA publications. Like hog pipeline analysts, cattle analysts must determine at which stage in the pipeline to initiate their forecasts. There is a difference between the two pipelines, however. The hog pipeline starts with the birth stage, or pig crop estimates. But since there is so much variation in the time it takes to get a calf to the feeder calf stage, a more accurate forecast of cattle slaughter can be made if the estimation begins with cattle placements or marketings.

Estimating Production

Each month, USDA provides estimates of the cattle placed on feed, which are cattle put into a feedlot and fed an intense ration that will get them ready for slaughter. Data on placements can be obtained from the monthly Cattle on Feed report published by NASS of USDA. This report also provides information on the number of cattle already on feed and marketings of fed cattle, or the number of cattle shipped out of feedlots to slaughter, for the month.

Table 2 provides data on placements. Using these data, with appropriate adjustment factors, a market participant can use the information to forecast total commercial slaughter and beef production approximately four to five months later. The forecast is several months in the future because the typical feeding period to bring an animal to an average live weight of 1,222 pounds, as discussed in the previous "Feedlot" section, is between four and five months.

For example, in January 2001, 2.263 million head of cattle were placed on feed in the United States in feedlots with 1,000 head or greater capacity (Table 2). In theory, this same number of cattle would be slaughtered in or around May 2001. However, the market participant must remember that this figure accounts for only 85 percent of the total fed-cattle marketings and cattle that are fed in small feedlots with less than 1,000 head are not included in this number. Total placements for May 2001, including both small and large capacity feedlots, can then be estimated at 2,662,353 head (2,263,000 head ÷ 0.85). This estimate then can be used as the forecast for May slaughter. However, commercial slaughter in May



Commercial Cattle Slaughter

	1999	2000	2001	2002	2003	2004	2005
January	2,961	2,936	3,002	3,057	3,008	2,577	2,528
February	2,723	2,937	2,580	2,616	2,966	2,427	2,341
March	3,050	3,132	2,918	2,738	3,248	2,871	2,724
April	2,971	2,783	2,714	2,949	2,569	2,699	2,560
May	2,997	3,178	3,200	3,147	2,774	2,836	2,792
June	3,207	3,237	3,120	3,062	3,253	2,995	2,987
July	3,083	2,962	2,943	3,188	3,290	2,787	2,718
August	3,150	3,259	3,239	3,213	3,139	2,821	2,990
September	3,099	3,035	2,808	2,867	3,129	2,737	
October	3,094	3,141	3,162	3,267	3,010	2,746	
November	2,940	2,929	2,903	2,861	2,434	2,542	
December	2,875	2,717	2,779	2,772	2,675	2,690	

Commercial Beef Production

	1999	2000	2001	2002	2003	2004	2005
January	2,170	2,178	2,205	2,331	2,292	1,924	1,917
February	1,998	2,175	1,881	1,987	2,151	1,803	1,767
March	2,231	2,300	2,096	2,059	2,360	2,109	2,043
April	2,155	2,027	1,939	2,195	1,942	1,957	1,889
May	2,151	2,303	2,294	2,336	2,048	2,070	2,075
June	2,321	2,369	2,269	2,302	2,391	2,227	2,228
July	2,256	2,202	2,177	2,427	2,439	2,104	2,085
August	2,307	2,437	2,425	2,469	2,328	2,151	2,319
September	2,275	2,275	2,121	2,201	2,314	2,105	
October	2,265	2,345	2,389	2,512	2,212	2,114	
November	2,144	2,169	2,201	2,164	1,783	1,941	
December	2,113	1,997	2,110	2,107	1,978	2,042	

Source: USDA, NASS

2001 was 3,199,000 head or 20 percent more than the forecast (Table 3).

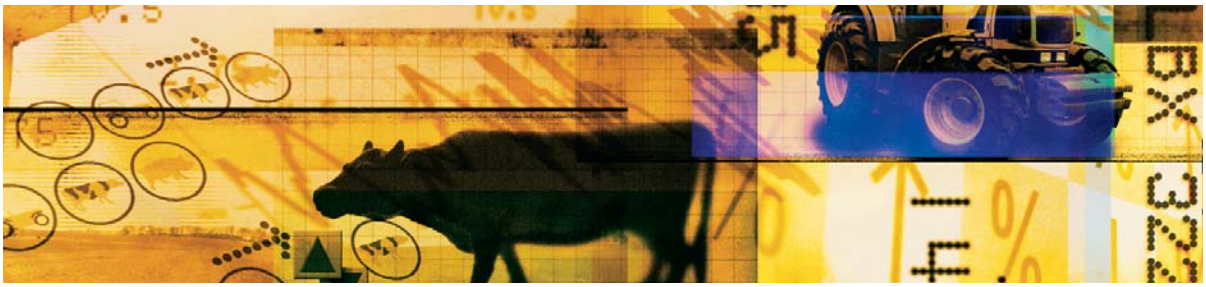
Speed of Commodity Flow

One inherent weakness in this cattle pipeline approach is that cattle slaughter can be under forecast or over forecast depending on the month in which the placements occur. Weather affects cattle performance significantly. If it is cold and wet or hot and dry, cattle do not gain as efficiently and it takes longer for them to reach slaughter weight. The result is a backlog of cattle and eventually, slaughter will be larger than normally expected. Weather does not affect overall hog slaughter as much because many hogs are raised in confinement where they are protected from extreme weather.

Other difficulties in forecasting the cattle slaughter include leakages, infusions, and feedback loops. Information regarding exports (leakages) and imports (infusions) of beef can be gained from Livestock, Dairy and Poultry Situation and Outlook published by the ERS and in the Red Meat Yearbook data set files. The information is provided monthly, quarterly, and yearly, and separated out by select countries on a carcass weight and live animal basis. The export and import numbers gathered from these sources can be applied to the pipeline forecast and then entered into the final calculation of total slaughter estimate.

Imports and Exports

It is important to remember the stage in which cattle imports and exports will enter and exit the pipeline. Exports of beef will not affect total slaughter or production numbers because the reported figure is the total slaughter and production in the United States. Even though the beef is exported, the cattle were slaughtered in the U.S. and therefore counted in the total slaughter and production number. The pounds of beef exported are subtracted from production after the total is calculated and thus affect only the total U.S. beef supply number.



However, if live animals are exported, they will affect the slaughter forecast because they will "leak" out of the pipeline at some stage in the life cycle. The market participant should account for this leakage by utilizing data on exports.

Imports of cattle or beef have the same influence on slaughter and production numbers. Only imports of live animals affect the U.S. slaughter and production numbers because they are slaughtered in the United States. However, imports of beef will influence only the total U.S. supply number and not U.S. production because the cattle were not slaughtered in the United States.

Other Factors Afffecting Production

Besides exports and imports, other weaknesses in the cattle pipeline include death loss and feedback loops. Heifers retained for breeding purposes are not a concern in the cattle pipeline, however, if the market participant begins with placements or other data after this point in the life cycle. This is because heifers retained for breeding are not placed in a feedlot and therefore do not affect the forecast. They do become a concern after the animal is no longer able to reproduce and is culled from the herd, which is where the cattle feedback loop begins. At this point cows, as well as bulls and stags (males castrated after maturity) enter the pipeline and are accounted for in the slaughter number. While these animals are included in the slaughter and production numbers, they are not accounted for in placements, cattle on feed, or marketings. Data regarding this type of animal slaughter is available in Livestock, Dairy and Poultry Situation and Outlook, as well as Livestock Slaughter. An estimate can be made regarding cow, bull, and stag slaughter and applied to the final slaughter and production pipeline forecasts.

Market participants must also consider death loss in a cattle pipeline slaughter forecast. When researching a death loss percentage, the analyst must consider at which stage the cattle are in the life cycle. If using placements, the cattle are in the finishing phase and an average death loss percentage for this stage for both steers and heifers is about 1.2 percent. However, the death loss percentage increases when the cattle are heifers or if they are placed on feed at a lighter weight (Mark 2001).

To forecast beef production, slaughter (in number of head) must be multiplied by an average weight per head. From the previous "Feedlot" section, the average dressed carcass weight in 2000 was 745 pounds. Using this number and multiplying it by the actual May 2001 slaughter number of 3,199,000 head, the May 2001 commercial beef production forecast would be 2,383 million pounds of beef (3,199,000 head x 745 lbs.). The actual production number for this month was 2,293 million pounds (Table 3). A portion of the error originates from using an average carcass weight. Some carcasses weigh more, while others weigh less than this average weight.

Both the slaughter and production forecasts could be improved by using marketing data rather than cattle placement data. In the pipeline, marketings are one stage beyond placements. Using marketings would increase the accuracy of the forecast by decreasing the error due to death loss in the feedlot. Marketing data would also improve the forecast because there would no longer be a question as to how long it took the cattle from when they were placed on feed to the time they were marketed because once cattle are marketed, they go directly to slaughter. One final improvement would be the decreased error from not having the impact of exports and imports. Cattle are generally not exported or imported at the marketing stage but are moved at the feeder cattle stage or before.

The Economics of Supply

Although the forecasting tools provided in the pipeline approach offer an estimation of slaughter and production, the projection will not be accurate if the market participant fails to monitor the basic economic forces affecting supply.

Many factors can influence supply. However, it is important to distinguish between the factors changing the quantity supplied and factors causing a change in supply. These two circumstances have different influences on the supply curve. Theoretically, a supply curve is upward sloping because as price for the output increases (decreases), the quantity supplied increases (decreases). When the price of the specific output changes, this creates a change in the quantity supplied or, more importantly, a movement along the existing

supply curve. A change in the quantity supplied refers only to changes that result from changes in the price of the product itself. Also, a change in the quantity supplied is a short-term or immediate concept.

In contrast, external factors can cause a change in supply, which is a shift in the entire supply curve. These factors include: 1) change in the price of inputs, 2) change in the price of substitutes, 3) change in the price of joint products, 4) change in technology, and 5) institutional factors (Tomek and Robinson 1990). Any of these factors can shift the supply curve either to the right or the left, depending on whether the influence on the product is positive (shift to the right) or negative (shift to the left), all other factors being held constant.

It is important to note that the effect of these factors on the supply curve may not be seen immediately. Generally, the expected effect, either positive or negative, is a long-run effect and is not realized until the next production cycle. For example, if there is an incentive for producers to raise more livestock for slaughter, they will increase their herd size by either buying females to increase the number of young born or they will buy younger animals. If livestock feeders choose the first alternative, more females are held out of slaughter and put into the breeding herd. When these animals reproduce, the young have to be fed to slaughter weight. If the feeders choose to buy younger animals, these animals will have to be fed for a certain time period before they reach slaughter weight. After the feeding period for the animals in both alternatives is complete is when the final increase in supply is noted.

If the incentive is for producers to cut the size of their herds, the full response will not be immediate because animals in the middle of a feeding period will be fed until they reach an appropriate slaughter weight. The change is not felt until after the youngest group of animals has been slaughtered.

Supply Shifters

Input Price

Inputs are products and factors that produce a final output. Two significant inputs in the livestock industry are feed and feeder animals. The costs of these two inputs are highly influential in shifting the supply curve. If the price of feed or the price of feeder animals increases and all other variables are held constant, the supply curve will shift to the left, resulting in a lower quantity supplied at the same output price. However, if the prices of the inputs decrease and all else stays constant, the curve shifts right and a larger quantity is supplied at the same output price.

A change in an input price may not immediately affect supply, but may instead have an effect over the long run that is not evident for a certain amount of time. For example, if the price of feed declines, there may be a short-run, or immediate, reduction in the supply of cattle and hogs, the opposite of what one would expect. The boost in supply usually does not occur until later. Why? Because at the time the price of feed declines, animals almost ready for market have been fed to the point where the cost of the last pound of gain is almost as much as the price per pound of animals sold for slaughter. If feed prices decline, it costs less to feed the hogs or cattle for each additional pound of gain. This lower cost makes it more profitable to continue feeding animals longer and thus creates a short-run reduction in supply. The expected long-run increase in supply will not appear for a time equal to the length of the feeding period for each animal. When feed prices decline, livestock feeders buy more young animals to increase their feeding herd size. Not until these animals are fed to slaughter weight is the increase in supply realized.

Substitute Price

Substitutes, or competing products, are different goods that can be exchanged for a specific product and produced with the same resources. For example, beef may be considered a

substitute for pork and conversely, pork may be a substitute for beef. Substitutes affect supply because if the price of a competing product, product B, changes relative to the price of product A, the product in question, the supply curve will shift. If the price of product B decreases relative to product A, the supply curve for product A will shift to the right and there will be a greater supply of product A. The opposite occurs if the price of product B increases relative to product A. The price of product B can increase (decrease) relative to product A because of an increase (decrease) in the price received for the product or a decrease (increase) in the cost of production for the product (Tomek and Robinson 1990).

Joint Product Price

Joint products are goods derived from a single commodity and produced in proportion to the quantity of this commodity (Tomek and Robinson 1990), such as pork bellies from a pork carcass or spare ribs from a beef carcass. If the price of one of these joint products increases, it can shift the supply curve of the other joint product to the right. However, if price decreases, the opposite occurs.

Technology

Improvements in technology can make it more economical to produce a certain product and thereby also shift the supply curve to the right. This occurs when technology increases the output of a certain product while the level of inputs remains constant (Tomek and Robinson 1990). In livestock production, examples of technological improvements would include new breeds, improvements in reproduction, advances in the understanding of genetics, and a better understanding of what types of feed animals can most efficiently convert into gain. With improvements in technology, hog and cattle producers can increase profitability by increasing the yield of lean meat on a carcass without increasing their costs of production. This in turn shifts the supply curve to the right, if all other factors are held constant.

Institutional Factors

Institutional factors generally relate to government programs or restrictions such as land-use or waste disposal regulations (Tomek and Robinson 1990). These factors can shift the supply curve for the product to the left or right, depending on the industry. For example, stricter waste management regulations may result in decreased livestock production and shift the supply curve to the left, if the guidelines make it less profitable to produce livestock.

Interest rates are another important institutional factor. Significant movements in interest rates can affect production decisions and thus, supply. Capital is an input just like feed and feeder animals. The magnitude of the effect is greater for industries with larger up-front costs than for industries whose costs are spread more evenly throughout the production period. An increase in interest rates may lead producers to not expand herds, improve facilities, or adopt new technology because of the additional cost of financing. However, in times of decreasing interest rates, the livestock industry may expand due in part to more economical borrowing costs.

Short-Run Supply Impacts

Although the factors discussed so far generally impact the supply of a commodity over time, there are other factors that can create an immediate response in an industry. In the livestock industry, for example, severe weather and disease or pest outbreaks can immediately shift the supply curve to the left, assuming all other factors are held constant. In feeding livestock, extremely hot or cold weather slows the rate of gain. When this happens, the supply curve immediately shifts to the left because animals expected to be ready for slaughter at a certain time are not ready. Disease outbreaks affect the supply curve in much the same way. If an outbreak occurs in which animals must be destroyed, the supply curve immediately shifts to the left because supply is drastically reduced. In an outbreak where livestock can be treated but the medication used requires a withdrawal period before slaughter, again the immediate response is for the supply curve to shift to the left.

Sometimes factors may actually have both an immediate and future influence on the available quantity of a commodity, such as the Dairy Termination Program of 1986. Beginning in March, the federal government purchased dairy cattle from 14,000 dairy farmers and agreed to slaughter 1.55 million head over the next 18 months. After selling their herds to the government, the participating dairy farmers agreed to stay out of the business for three years (Ball 1998). This sell-off quickly increased the number of cattle for slaughter, shifting the curve to the right. However, it also had a long-run influence because these cattle were not allowed to produce calves for future slaughter. In this case an institutional policy created both an immediate and long-term influence on supply.

The Economics of Demand

In addition to understanding supply factors, market participants must also have a solid knowledge of factors affecting demand and recognize that these factors are often related to consumer attitudes and decisions. Although many factors can affect demand, it is again important to distinguish between factors that change the quantity demanded and factors that cause a change in demand (demand curve shift). A change in the quantity demanded is a movement along the existing demand curve. Opposite of a supply curve, a demand curve is theoretically downward sloping. As the price of a product increases, the quantity demanded decreases, creating a change in the quantity demanded. A change in the price of the specific product is the only factor adjustment that can create a change in the quantity demanded. However, other demand factors can cause the demand curve to shift either to the right or the left, depending on whether the factor creating the change is viewed as positive (right or outward shift) or negative (left or inward shift), all other factors being held constant. The main factors that may cause a demand curve to shift include: 1) changes in population size and its distribution, 2) change in income, 3) change in the price of substitutes, 4) change in the price of complements, and 5) change in consumer preferences (Tomek and Robinson 1990).

Demand Shifters

Change in Population Size and Distribution

Population growth can increase demand, and population reduction can decrease it. A shift in demand can also result from a change in population distribution, such as a growing number of elderly versus children, because preferences and/or needs of the larger population group dominate. For example, more baby food is sold during a population boom (increased demand for baby food) while other food products are sold after those babies have grown (decreased demand for baby food) (Tomek and Robinson 1990). However, it is also important to remember that changes in population occur over many years and therefore, do not have much of an impact on short-term analysis.

Change in Income

Increasing or decreasing income levels can also shift the demand curve. When income grows, people tend to spend a large proportion of the increase on additional goods and services and put a small proportion into savings. However, the response of the demand curve to an increase or decrease in income depends on the specific product. Generally, the benefits of an increase in income are not usually seen in food items but in other nonessential items such as cars and electronics. However, demand for meat has traditionally responded positively to increased income. This response is limited, however, by the fact that people can only consume a certain amount of meat no matter how much income increases. Although meat demand generally has a positive relationship with income growth, not all meats respond in that manner. For example, if income increases, the demand for more expensive cuts of meat, such as steaks, may increase and the demand for less expensive products, such as ground beef, may decrease. When income decreases, there is usually a decrease in demand, or a leftward shift of the curve, for more expensive cuts and an increased demand, or outward shift, for the less expensive types of meat.

Change in the Price of Substitutes

Substitutes are goods that can be used instead of another good. For example, chicken can be a substitute for either pork or beef. When the price of a substitute good (product B) increases, demand typically increases for another good (product A). When users of product B switch to product A because they consider the price of product B too high, demand for product A increases. Similarly, when the price of a substitute good decreases, users of product A are likely to switch to the substitute, product B. Thus, demand for product A decreases and the demand curve shifts to the left.

Change in the Price of Complements

Complements are items that enhance, but are not a necessity to, a good in question. Barbecue sauce and beef or pork may be considered by some as complementary products. When the price of one of the complementary items increases, in this case, beef or pork, demand for another item, the barbecue sauce, decreases and shifts left. The opposite is true for a price decrease: demand would shift to the right, all other factors being held constant. For example, if the price of pork or beef decreases, demand for barbecue sauce may increase.

Change in Consumer Preferences

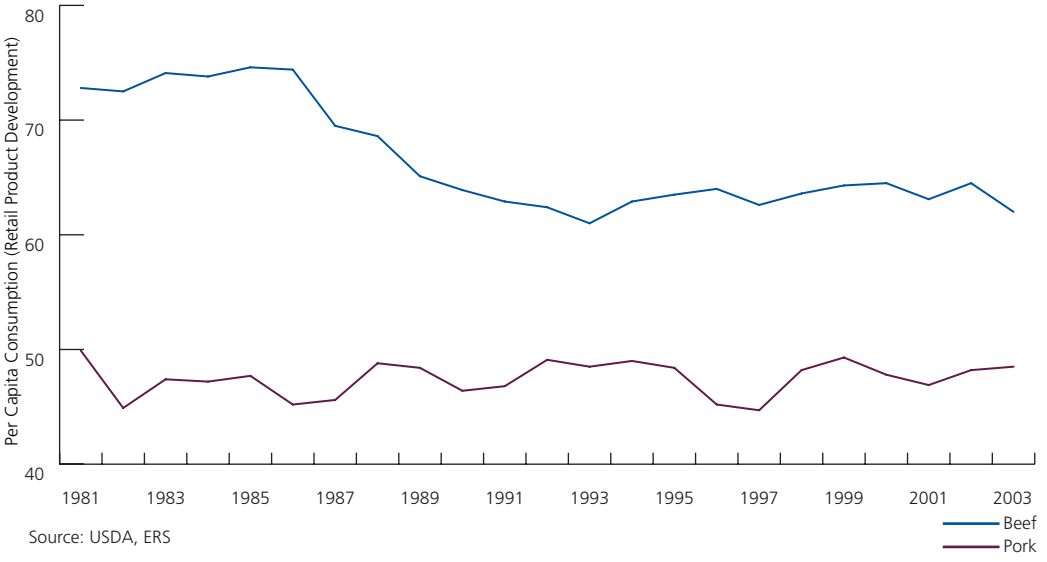
Consumer preferences are constantly changing. There are many different reasons, such as age, increased awareness, or advertising. Increased consumer awareness may be related to increased health consciousness or exposure to new types of foods or preparation methods. Advertising can also sway a consumer's preferences for one item or another. Sometimes, there is a general shift in preferences for a large group of the population, such as a move toward a lower fat diet. It is extremely difficult, however, to measure demand curve shifts in response to changing preferences because they are not directly observable. Many times, preference changes are tied to an additional demand shifter, such as increased consumer income, which makes additional money available to buy different items.

Seasonal periods can clearly and predictably result in changes in tastes and preferences. For example, there is increased demand for certain cuts of meat during the summer because many people enjoy grilling outside. Similarly, at Thanksgiving the demand for turkey increases while the demand for pork and beef decreases. Figure 3 provides a graph of yearly per capita meat consumption for both beef and pork in the United States. It is important to note that per capita consumption alone is not a measure of demand. Market participants must also consider relative prices and income when studying demand for meat.

Lagged Demand Impacts

Changes in the demand curve may not be seen immediately, for several reasons. First, consumers do not have perfect knowledge of what is happening to the price of the goods and services they use. For example, they may not immediately know that the price of pork is falling relative to the price of chicken, which could change their purchasing and eating habits. Consumers are also uncertain about what is going to happen to the price of a good. They may not purchase pork the first time they realize price is decreasing because they might be waiting to see if the price is reduced further. A third reason for the lack of an immediate impact on the demand curve may be a barrier restricting consumers from purchasing a good. For example, a consumer may have purchased several cuts of meat the previous week and even with the price decrease of the current week, the consumer has no room in the refrigerator or freezer for additional purchases. Or, the consumer's food budget may not allow for additional purchases, no matter how attractive the price. A final reason demand changes may be lagged is that consumers tend to be restricted by their habits (Tomek and Robinson 1990). If they have always bought a certain type of meat, they will generally continue with that meat even if its price increases relative to a substitute meat. Although each of these factors may cause a lagged response in demand, it is difficult to predict the exact length of the delay. Figure 4 provides a graph of historical

Per Capita Red Meat Consumption



Source: USDA, ERS

lean hog and live steer cash prices. The live steer data covers a five-area region including Texas-Oklahoma, Kansas, Nebraska, Iowa-Minnesota, and Colorado. The lean hog data were collected from USDA's National Base Lean Hog Carcass Slaughter Cost Report for 51 to 52 percent lean hog carcasses. Hog carcass price data were not published before November 1995.

The combined forces of supply and demand create movement in the prices of each respective commodity. These forces are evident in late 1998 and early 1999when a large supply of hogs, coupled with other factors, caused the price of hogs to decline severely Similarly, a decreased supply of cattle due to restrictions on imported animals combined with an increase in demand for beef products to drive cattle prices higher during 2003. Later in that year, prices declined sharply when a cow in the U.S. tested positive for bovine spongiform encephalopathy (BSE or mad cow disease).

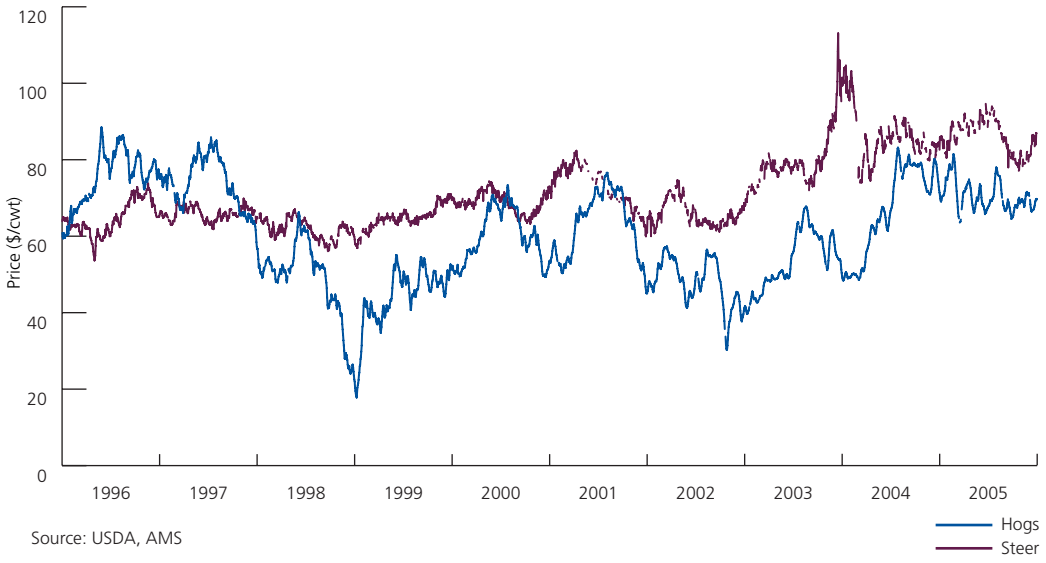
Livestock Cycles and Seasonality

In addition to knowledge of supply and demand factors, as well as pipeline production forecasts, market participants may also want to consider livestock cycles and seasonality when forecasting prices.

Livestock Cycles

Historically, livestock cycles for both cattle and hogs have been a useful tool in predicting expansion and contraction phases and thus, the directional movement of price. In the past, hog cycles have lasted an average of four years (Tomek and Robinson 1990) while cattle cycles generally have lasted 10 to 12 years (Mathews et al. 1999). An actual cycle consists of the time between a trough (low point in inventory) and the next trough or the time between a peak (high point in inventory) and the next peak. The expansion phase of a cycle is constrained by the time it takes to raise female animals to breeding age and to produce offspring (Tomek and Robinson 1990).

Daily Live Steer and Lean Hog Prices

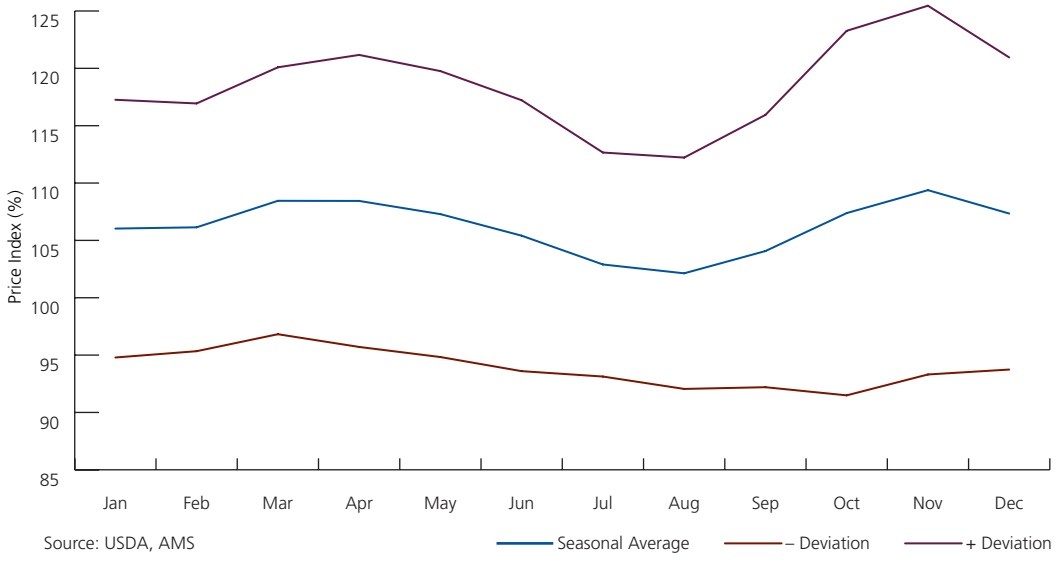


Source: USDA, AMS

Increasing prices spur producers to retain female animals to increase the breeding herd. This initially reduces slaughter numbers and as a result, prices increase even further. However, once these female animals begin producing offspring and the offspring in turn reach slaughter weight, there may be an oversupply of livestock. Prices begin to decline and it eventually becomes unprofitable to raise and feed young animals. Producers begin culling the breeding herd and sending them to slaughter, adding additional numbers to supply and causing prices to decrease even further. This is the contraction or downward phase, which can be long or short in duration depending on the incentives or disincentives provided by the price (Tomek and Robinson 1990). Although hogs and cattle have different average cycle lengths, the dynamics of the cycles are the same. Recently, there have been arguments about the reliability of the hog cycle. One claim is that the hog cycle is becoming more erratic due to changes in hog industry management strategies and structure, making it a less useful guide to understanding producer response to prices (Grimes in Smith 1996). The other side of the argument is that although the variation in hog production is decreasing over time, the large variations in price that accompany hog cycles are still present. Therefore, even though the industry may be going through structural changes, the hog cycle still exists and can be a useful tool in providing indications about the directional movement of price (Kenyon and Purcell 2000).

Currently, there are no similar arguments regarding the cattle cycle. This may be because the cattle industry has not seen the dramatic changes in structure that the hog industry has experienced. Nonetheless, anyone using either the hog or cattle cycles must remember that both need to be considered as long run factors and are most useful when used in longer term price analysis.

Seasonal Index of Monthly Average Live Steer Prices
(1996-2005)



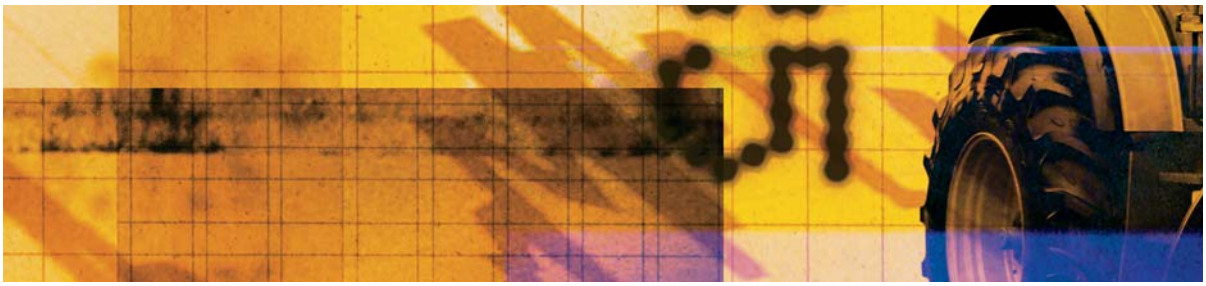
Source: USDA, AMS

Seasonality

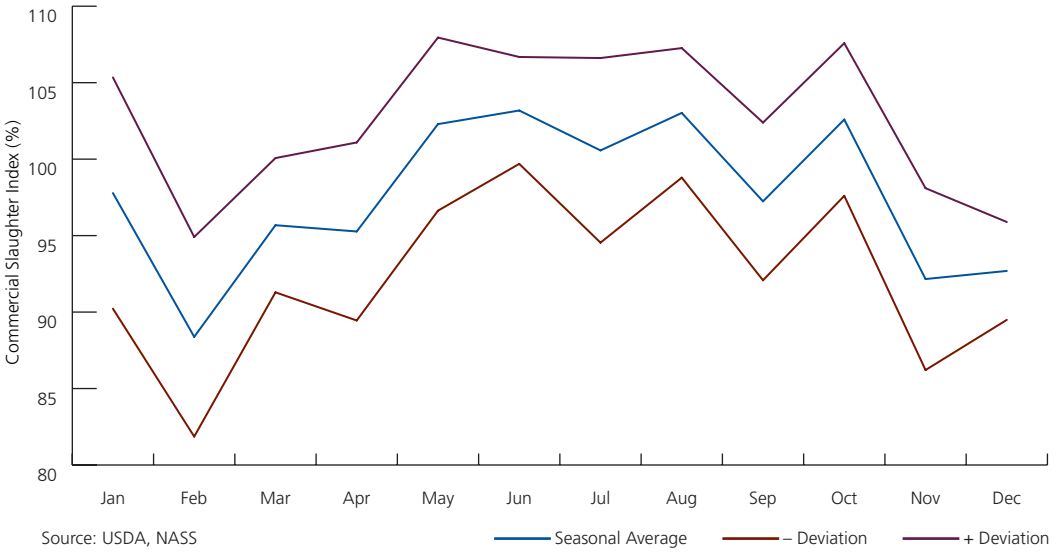
Seasonality trends refer to ways that both the supply and demand for a commodity can be affected by factors that change with reasonable regularity during the year.

Seasonal indexes can also be used to distinguish when price and slaughter numbers have the greatest probability of being near the yearly average. This time period is observed in September for both price, Figure 7, and commercial slaughter, Figure 8. The confidence interval lines show the probability of obtaining the monthly average price or monthly average slaughter level. When the interval is narrow, the probability of obtaining the monthly average is high. Conversely, when the interval is wide, the probability of obtaining the monthly average is low. Although seasonal trends are evident in these figures, it is again important to note that some of the variance

in the movements has been muted due to production and management practices in the hog industry. For example, farrowing seasons are not as dictated by the weather as they once were because many hogs are raised in confinement with climate control. In the past, many producers would avoid farrowing during the winter due to the harsh conditions the baby pigs would have to survive. This is no longer such a strict practice and there is now a flatter, year-round production cycle. Although many production



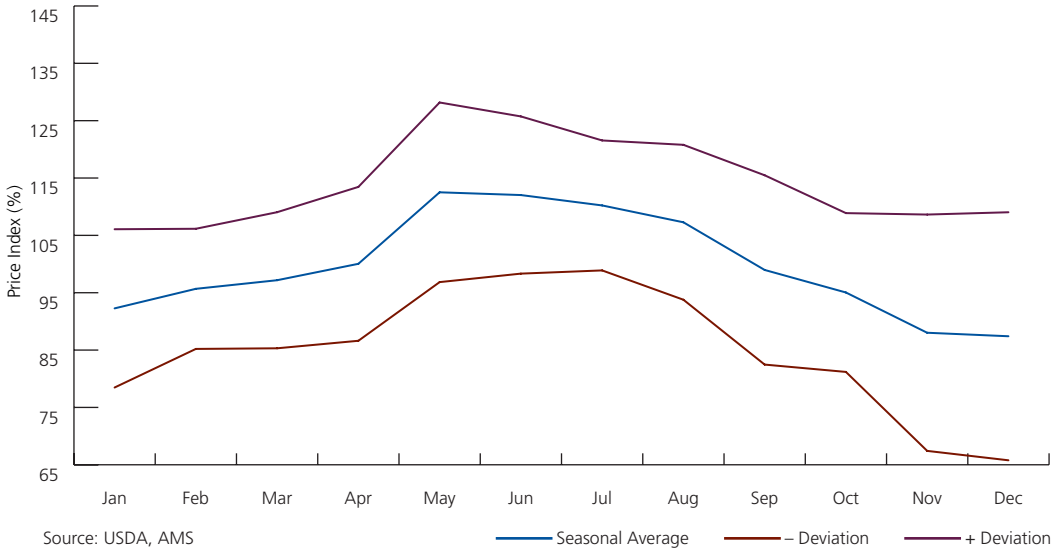
Seasonal Index of Monthly Commercial Cattle Slaughter
(1992-2005)



Source: USDA, NASS

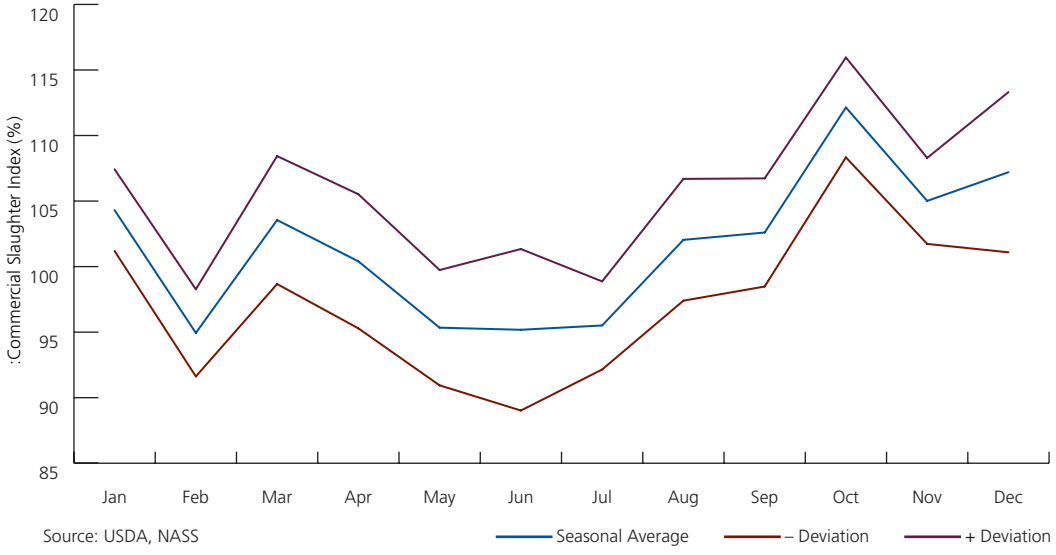
and management methods can help to keep a constant, year-round supply of hogs, demand side factors still play an important role in the hog industry. For example, there is an increased demand for pork around the winter holiday season and no matter what production practices are used, this seasonal demand by consumers will still exist. Sound price forecasting should be based on analyzing all factors that may affect seasonal supply and demand of beef and pork. Market participants must distinguish between one-time occurrences and actual trends, which are movements that occur in the same direction and roughly during the same time each year for several years. Once a trend has been identified, the indexes can then be used to help monitor and analyze the specific commodity in question. One final caveat in the use of seasonal indexes is that although an overall average price or slaughter number for a particular month may be higher or lower than the overall yearly average, the specific monthly price or slaughter number in a specific year may not be higher or lower than that respective year's average number. These figures provide information for prices and slaughter numbers averaged over a period of years and data from each individual year cannot be singled out in the graphs.

Seasonal Index of Monthly Average Lean Hog Prices (1995-2005)



Source: USDA, AMS

Seasonal Index of Monthly Commercial Hog Slaughter (1995-2005)



Source: USDA, NASS

Conclusion

Becoming a successful livestock trader (whether a hedger or speculator) or livestock market analyst requires a basic understanding of the production and life cycles of cattle and hogs. This publication has attempted to provide an overview of those cycles to aid in building the skill set needed to begin trading in these commodities. Although this booklet introduces analytical techniques and information on the economics of each industry, it provides only a portion of what is needed to become successful in trading these commodities. One must also become familiar with the actual procedures of trading, such as the different types of buy and sell orders, margin requirements, position limits, and the over-all rule language for each commodity. It may also be helpful for the trader to study technical factors to assist in proper timing of entry in to and exit out of the market. This additional knowledge, combined with the information provided in this publication, will help to create a successful hog and/or cattle commodity trader.

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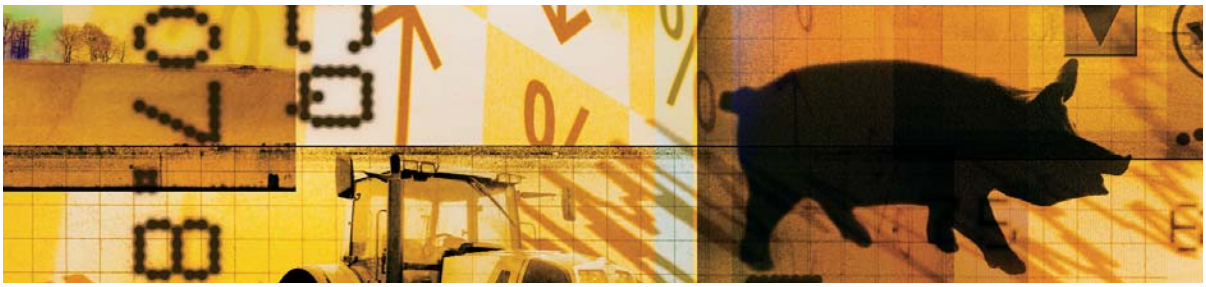

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