Since 1947 our beef economy has experienced two complete cattle cycles and a series of seasonal price fluctuations. The first cattle cycle reached its post-war peak in 1951. At that time the feeder calf price at Kansas City was over 41 cents and the slaughter steer price at Chicago was over 37 cents. By October 1953, the Kansas City price had dropped to its lowest post-war level. However, the Chicago price did not reach its lowest post-war level until 1956, when it dropped below 19 cents. Then, as the cattle cycle continued its downward course, cattle prices climbed, with characteristic seasonal variations, until 1959. Thus within a period of five years cattle prices dropped more than 50 percent, and over the next three years they recovered to about 80 percent of their former peak levels.

Nature of the Problem

What supply and price repercussions are generated by the cyclical and seasonal fluctuations in the cattle market? As a result of the year-to-year and month-to-month variations, livestock producers suffer substantial losses that are not, in individual cases, offset by later market advances. From the cattle feeder's standpoint, a more rapidly rising feeder market or a more rapidly failing slaughter market results in a narrowing feeding margin that eventually reduces the demand for feeders. However, when the falling feeding margin is unexpected, the feeder incurs losses that, again, are not necessarily recovered in the typical market advances that follow the low point in the cattle cycle. From the rancher's standpoint, a rapidly declining feeder market is always a bad omen.

Excessive market fluctuations also disturb the long-run prosperity of the entire cattle industry. When beef is in short supply, the consumer generally finds some other meat items to replace temporarily the beef that he would consume but that is not available. However, as the beef output cycle climbs upward the price of beef moves downward more rapidly than the increase in consumption. Thus producers' total returns actually fall. Yet, as far as consumers and retailers are concerned, it makes no difference whether or not beef supplies are small or large, falling or rising, for the simple reason that plenty of other goods are available to buy and sell. And certainly a little less competition from beef would mean higher incomes for swine and broiler producers.

When lamenting over the problems generated by excessive fluctuations in the cattle market, it must not be forgotten that in our particular economic system we still look to our agricultural markets as the means of equating supply with demand.

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For the most part, what is produced will be bought at a price that is determined essentially by the interplay of market forces. If the pricing system is to fulfill its highest purpose in directing agricultural resources to their best and most profitable use, then the imperfections that arise because of unexpected cyclical and seasonal market fluctuations must be remedied. In this presentation, the remedies that I refer to are those forthcoming from the more intelligent use of market information.

In my discussion of beef market fluctuations I would like to do two things. First, I would like to examine with you the functioning of the pricing system as it occurs in the cattle industry. Second, I would like to test our knowledge of this system against its actual performance over the past four or five years insofar as it will help us to detect danger signals in the cattle cycle.

Logic of Cattle Market Fluctuations

Seasonal variability. As we study the cattle industry we discover that cyclical market variability is four to five times as large as seasonal or month-to-month variability. Moreover, the seasonal price variability is the consequence of two forces:

1. Consumers maintain or even step up their demand for beef during the summer and fall months.

2. Producers also step up their demand for replacements during the last six months of the year with a resulting substantial increase in feeder market activity.

Since World War II, consumer demand for the three-month period July-September has exceeded the average annual demand level for beef by an amount equivalent to one-half pound per capita. In other words, an additional 150,000 head of cattle could be slaughtered during this period, given all other factors, without any change in wholesale or retail price. This seasonal increase in demand has been attributed to the popularity of hamburgers and hot dogs during the summer months and, more recently, to the growing popularity of steaks and roasts for outdoor cookery.

The seasonality problem in cattle and beef prices is illustrated in Table 1. Though the range in average monthly prices is as much as 8.2 percentage points (Chicago slaughter price, February to September), the use of an average monthly index obscures its year-to-year variability. For example, during the first and last years of the 1950's the Chicago slaughter steer market reached its peak prices during March, April and May and its low prices during the latter part of the calendar year. The Kansas City feeder calf market behaved similarly. From January, 1955, to February, 1956, however, slaughter cattle prices dropped steadily and then shifted direction to a September peak. Thus, excess marketings in early 1956 were followed by relatively few marketings later that year, contrary to the historical pattern. During the 1955 to 1957 period, therefore, both the slaughter and feeder market behaved erratically.
Table 1. Indexes of monthly prices of beef and cattle, 1947-1961.

<table>
<thead>
<tr>
<th>Month</th>
<th>U. S. Choice grade, 700 pound beef carcass, New York</th>
<th>U. S. Choice grade slaughter steer, Chicago</th>
<th>U. S. Good and Choice feeder calves, Kansas City</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>99.6</td>
<td>98.5</td>
<td>98.8</td>
</tr>
<tr>
<td>February</td>
<td>97.3</td>
<td>95.5</td>
<td>100.5</td>
</tr>
<tr>
<td>March</td>
<td>98.0</td>
<td>97.4</td>
<td>103.4</td>
</tr>
<tr>
<td>April</td>
<td>99.2</td>
<td>98.4</td>
<td>103.7</td>
</tr>
<tr>
<td>May</td>
<td>99.3</td>
<td>98.8</td>
<td>104.0</td>
</tr>
<tr>
<td>June</td>
<td>98.9</td>
<td>99.2</td>
<td>100.1</td>
</tr>
<tr>
<td>July</td>
<td>99.6</td>
<td>101.3</td>
<td>98.1</td>
</tr>
<tr>
<td>August</td>
<td>101.2</td>
<td>102.4</td>
<td>99.2</td>
</tr>
<tr>
<td>September</td>
<td>103.7</td>
<td>103.7</td>
<td>98.6</td>
</tr>
<tr>
<td>October</td>
<td>101.9</td>
<td>102.8</td>
<td>97.2</td>
</tr>
<tr>
<td>November</td>
<td>101.1</td>
<td>101.6</td>
<td>98.9</td>
</tr>
<tr>
<td>December</td>
<td>100.3</td>
<td>100.4</td>
<td>97.5</td>
</tr>
<tr>
<td>Annual average</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>
The seasonal pattern of prices in Table 1 is changing gradually to one with less month-to-month variability. Larger-than-average third-quarter marketings are more than enough to balance the above average third-quarter consumer demand. Cattle feeders are changing their operations in accord with the seasonal patterns in consumer demand and in feeder cattle supplies.

**Cyclical variability.** Year-to-year variability in cattle supplies and prices is not as large now as it was five to ten years ago. It is, however, the source of much uncertainty in the cattle industry, particularly when the producer response to price changes must occur over a period of three to four years. In fact, because of this delayed production response, the danger signals in the cattle cycle are revealed several years in advance of an exceptionally low market.

Several factors are frequently cited as determinants of the cattle cycle, namely, the biological make-up of beef herds, the management practices of ranchers and feedlot operators and the method of making future market estimates. It is, however, the producer response to price fluctuations in terms of changing the number of cattle on hand, particularly breeding stock, that actually generates the cattle cycle. For example, an increase in feeder prices leads to increases in beef cattle numbers, not only in heifers and steers, but also -- a year and one-half later on the average -- in calves, as illustrated in Fig. 1. The change in steer inventories leads to an increase in commercial slaughter during the following 12-month period, while the change in heifer inventories contributes to a corresponding increase in beef cow numbers a year later. The change in commercial slaughter immediately results in a drop in slaughter steer prices. Feeder prices are directly associated with slaughter prices. Thus falling steer prices are followed by a lower feeder market.

Meanwhile, the increase in beef cow inventories generates a decline in commercial cattle slaughter two years after the initial increase in the feeder market. Because beef cows and heifers are withheld from slaughter in response to an initial increase in feeder prices, beef production must decline temporarily. Consequently, both slaughter steer and feeder calf prices must increase. Thus, the price changes in the third year tend to counterbalance the price changes in the second year. The beef cycle, however, still maintains its positive relation to the initial change in feeder price. The change in beef cow numbers results, therefore, in an increase in calf inventories. The increase in calf inventories, in turn, results in increase in steer and heifer inventories. Meanwhile, the inventory changes lead to further changes in commercial slaughter. Eventually, the production and price cycles turn around and start moving in opposite directions from whence they started. Thus, the cattle cycle of about six to eight years duration illustrated in Fig. 2 is generated by a complex of factors that influence the long-run make-up of the beef economy.

At this point, let us refer briefly to the output and price cycles illustrated in Fig. 2. Two different assumptions were made regarding the behavior of the beef economy over a 10-year period. Under the first assumption, the beef economy was
FIGURE 1. INTERNAL MECHANISM OF THE BEEF CYCLE
FIGURE 2. BEEF OUTPUT AND PRICE CYCLES IN TWO PRODUCTION SYSTEMS
examined in isolation from the rest of the economy. A 1 billion pound drop in beef production occurred in year "0". The beef economy then was allowed to run its course without interaction between it and hog production and consumer demand. As a result, a rather well-defined output cycle of seven year duration was obtained. A corresponding series of price changes also was obtained. Under the first assumption, therefore, the system fluctuated around a production level that was about one-half billion pounds below the level from which it started before the initial 1 billion pound drop in production. Meanwhile, slaughter steer prices fluctuated around a price level about 1 1/4 cents above its initial level. The feeder calf price, however, tended to fluctuate around a level about 1 cent lower than its original level.

When the beef economy is considered as a part of the entire economic system, the initial 1 billion pound drop in production is superimposed upon a long-run pattern of growth in aggregate demand. The output cycle is now stretched out along an upward sloping output trend line. The feeder calf price cycle also is superimposed upon a corresponding upward moving price trend line. The slaughter steer price, however, shows a tendency to fall gradually to its initial level. In actuality, the interdependent system roughly illustrates the operation of the beef economy since 1958. Because of the growth in aggregate demand since 1958, the full price impact of the increasing beef supplies has been lessened, as suggested by a comparison of the two production systems.

What is the meaning of the falling feeder prices in the isolated system and the falling slaughter prices in the interdependent system? First, it must be emphasized that only changes from an equilibrium level of production and prices are represented in Fig. 2. The absolute starting, or equilibrium, levels in the isolated system would be somewhat less than in the interdependent system. This is because aggregate demand is expanding in the interdependent system but not in the isolated system. Feeding margins, therefore, are not necessarily profitable in the isolated system even though slaughter steer prices are above feeder calf prices. Also, feeding margins are not necessarily unprofitable in the interdependent system even though slaughter steer prices are below feeder calf prices. The results do show, however, that the average cow-calf operation is worse off in the isolated system and better off in the interdependent system after the initial drop in production. Hence, ranchers generally will look more favorably upon a rapidly growing demand for beef while feedlot operators will face a cost-price squeeze that eventually results in unprofitable feeding margins.

Applications of Logical Analysis

How much is it worth to livestock producers and processors to have better predictions of future market prices and supplies? Can we accept the argument that more effective use of improved market predictions would reduce excessive seasonal and cyclical market fluctuations? If we use the economic relationships suggested in Fig. 1 to prepare the market predictions, much more than estimates of future beef production and prices would be available since the series of economic variables that would be estimated yield a picture of the beef economy for each year in
the forecast period. These estimates to some extent are self-checking. Altogether they provide a basis for drawing some general conclusions with reference to the beef cycle and the interrelated system of cattle inventories, commercial slaughter and primary market prices. Because of the wide variety of market forecasts that would be generated, not only producers but also processors and market agencies would find the market estimates relevant in their planning.

To illustrate the economic value of market predictions, one segment of the beef economy -- farm feeders and commercial feedlot operators -- has been selected for close examination with reference to the losses incurred as a result of unexpected and excessive market fluctuations. In addition, some rough inferences will be made regarding the economic value of improved market forecasting practices in the case of the cattle feeding sector. For this logical analysis, we explore two means of increasing the incomes of cattle feeders -- varying the number of cattle on feed and varying the length of the feeding period.

Variable number of cattle on feed. If a cattle feeder were to vary only the number of cattle on feed and if he were to quit placing additional cattle on feed when the expected feeding margin drops below a certain minimum level, then gradually the demand for feeder cattle would fall. To clear the primary markets and feeder calf producers of the supplies of feeder cattle on hand, market prices would be reduced as an incentive for additional placements in feedlots. This process, of course, does occur whenever feeding margins drop below some minimal level, as illustrated in Fig. 3. The trend in feeding margins has been downward since early 1958. Whenever the feeding margin dropped sharply, feeder prices also dropped. Whenever the feeding margin improved, feeder prices also increases.

When the feeding margin is compared with slaughter prices, as shown in Fig. 3, an obvious fact emerges: The feeder market follows the current slaughter market rather than the expected slaughter market four to 12 months in the future. From our knowledge of the slaughter market and the dressed meat market, we realize that the current wholesale demand and current beef slaughter establish the current slaughter market.

One other fact emerges from the comparison of feeding margins and feeder prices: Increasing feeding margins trigger the upward climb of feeder prices, but a sharp drop in slaughter prices triggers the downward plunge of feeder prices. When slaughter prices drop, feeding margins also drop. Thus sharp drops in feeder prices and feeding margins occur simultaneously. If cattle feeders were guided by expected feeding margins, then the ridiculous behavior that we now experience in our feeder market would cease, provided that the expected margins are based on accurate forecasts of the slaughter cattle market. Accordingly, if the expected margin dropped below a profitable level, the cattle feeder would stay out of the market until current feeder prices were in line with expected slaughter prices.
FIGURE 4. INDEXES OF SELECTED CATTLE FEEDING MARGINS SINCE JULY, 1957.
Before leaving this particular subject, I refer briefly to the derived feeder calf price based on a fixed feeding margin shown in Fig. 3. To derive this price, the month-to-month fluctuations in slaughter prices were smoothed out so that the current feeder price would have a correspondingly smooth pattern that we can refer to as a "moving average." Surprisingly, the moving average feeder price corresponds with the reported feeder price, except for its level, which can be moved up or down depending upon the level of the fixed feeding margin. If the feeder market were based on an expected feeding margin, the moving average feeder price would be lagged (shifted to the left) about seven months -- the average length of period on feed.

Variable length of period on feed. Next let us examine the potential gains for the cattle feeder in varying the length of the feeding period. As shown in Fig. 4, the shorter the feeding period, the more violent are the fluctuations in the feeding margin. The 12-month feeding period, which assumes the placement on feed of 400-pound Good to Choice feeder calves and the marketing of 1,050-pound Choice slaughter steers, results in the most stable feeding margin. The 7-month and 4-month periods, which assume the placement on feed of 700-pound and 850-pound Good and Choice feeder steers, respectively, show especially sharp changes in feeding margins when slaughter prices rise or fall sharply. This is simply because the gains or losses on the weight added by feeding are distributed over a relatively small total weight gain. In Fig. 4 is illustrated, therefore, the potential gains that could be realized by year-around placements of feeder cattle of varying weight and quality.

Accurate market forecasts are as essential in selecting the most profitable feeding program as in selecting the cut-off level on staying in or staying out of the feeder market. With accurate market forecasts and the ability to vary the intended weight gain of year-around placements on feed, the feedlot operator has an advantage that would not be enjoyed by the farm feeder with a fixed feeding program. For example, in fall 1958 and again later in spring 1960 and spring 1961, short-term feeding programs were substantially more profitable than long-term feeding programs. During much of the intervening periods, however, the longer feeding programs were more profitable. Astute market analysis, together with flexible feeding programs, would have made the difference between net loss and profit for many feeders during the last two or three years.

Benefits and Costs of Forecasting the Cattle Cycle

When we assess the net benefits and costs of forecasting the cattle cycle we must recognize that for the most part the cattle feeder operates, or would like to operate, on a fixed feeding margin. The meat packer and the meat retailer are very much alike in their tendency to prefer a fixed operating margin. As a result, when excess beef supplies depress cattle prices, the feeder calf producer is left holding the bag for what it's worth. In the economist's jargon, the demand for slaughter cattle is inelastic and the demand for feeder cattle is even more inelastic. Under
these circumstances a smaller total supply of beef yields more total income to the cattle producer than does a larger total supply of beef. This is not true, however, for the feeder, packer and retailer segments of beef economy. In the long-run setting, therefore, the feeder calf producer benefits from improved market forecasting to the extent that it encourages a more conservative attitude on the part of all producers toward expanding their cow-calf operations when the current feeder market is favorable.

In the short-run setting, the fixed margin segment of the beef economy -- and that includes at least part of the cattle feeding sector as well as most of the meat packing and meat retailing sectors -- benefits from more accurate forecasting of both seasonal and cyclical changes in beef supplies and prices. Cattle feeders can vary their feeding programs and meat packers can vary their work gangs and inventories so as to reduce economic losses associated with wrong estimates of future supply and price prospects. Indeed, it is difficult to find a problem facing the beef industry today that offers in its solution more substantial benefits to the average producer and to the entire industry than does improving our methods of forecasting beef markets.

In trying to better forecast the cattle market, however, the influence of the long-run cyclical forces are overlooked in efforts to forecast short-run market changes. Yet, the long-run forces, insofar as they establish the general price level for cattle, are far more important to the livestock producer than the short-run variations in cattle supplies of different weight and quality characteristics.