ELSEVIER
SAUNDERS

VETERINARY
CLINICS
Food Animal Practice

Vet Clin Food Anim 22 (2006) 271–296

Economics of Stocker Production

Derrell S. Peel, PhD

Department of Agricultural Economics, Division of Agricultural Sciences and Natural Resources, 519 Ag Hall, Oklahoma State University, Stillwater, OK 74078, USA

General considerations

Stocker production is defined as any of several postweaning cattle-growing systems that produce commercial feeder cattle ready for finishing [1]. Stocker production occurs in many places and in a wide variety of production systems. Stocker production activities generally share a number of production characteristics, however, as shown in Table 1.

Table 1 demonstrates that various combinations of beginning weight, rate of gain, total gain, ending weight, and length of time result in many different possible stocker production programs. An even wider range of programs is possible when one considers production alternatives using different qualities and genders of animals. For any particular time and place, specific production environments (forage type and quality), time of year, management considerations, and other factors often limit the feasible set of alternative stocker programs to a subset of the total possible programs. Producers in a specific production and market situation usually have several possible stocker programs from which to choose, however. The profitability of stocker production often depends critically on which program is chosen at a particular point in time. This purpose of this article is to describe those factors that affect the economics of stocker production.

Price-weight relation

Stocker production is a margin business, that is to say, the profit potential is largely determined by the gross margin between the initial cost of the purchased stocker animal and the final sale value of the feeder animal. This margin is determined by the relation between feeder cattle price and weight. The various weights and classes of feeder cattle represent a complex set of markets that are related but not in a fixed pattern. Generally, this relation

E-mail address: dpeel@okstate.edu

doi:10.1016/j.cvfa.2006.03.007

Table 1
Stocker production characteristics

Stocker production characteristic	Typical	Range
Beginning weight (lb)	400–550	300–650
Rate of gain (lb/d)	1.5–2.5	1.0–3.5
Total gain (lb)	200–300	100–400
Ending weight (lb)	650–850	600–950
Length of time (days)	100–200	75–300

is negative and nonlinear (Fig. 1). In all but the most rare market situations, the price per unit of weight for feeder cattle is higher at lighter weights and decreases nonlinearly as animal weight increases. Fig. 1 shows the average price for steers of various weights over the period from 1992 through 2005[a].

The price-weight relation for feeder cattle varies considerably over time according to cyclic and seasonal factors and other cattle and feed market conditions. Fig. 1 shows the variability of the price-weight relation as illustrated by the range of plus and minus 1 standard deviation and the maximum and minimum values over the period from 1992 through 2005. The price-weight relation varies in terms of height, or intercept (ie, average price level by weight), and slope (ie, different price relation across weights). Both of these factors are important with regard to the economic returns to stocker production.

Cattle cycle impact on price-weight relation

The largest impact over time on feeder cattle prices is attributable to the cycles of prices and production that have characterized the cattle industry for many years. Prices for all classes of cattle rise and fall over the course of cycles of production, which span roughly 10 years (Fig. 2). These cycles change the level of prices and the differences between weight classes of animals, thereby changing the height and slope of the price-weight relation. Fig. 3 shows the average price-weight relation at the high (1991 and 2005)

[a] A note on feeder cattle price data. All feeder cattle prices, gross margins, and values of gain in this article are based on US Department of Agriculture (UCDA) reposts for medium- and large-frame no. 1 steers and heifers at Oklahoma City (USDA Agricultural Marketing Service [AMS] report KO_LS795). The USDA-AMS began the current price reporting system in January 1992 with reports for many locations that include weighted average prices and weighted average weights in 50-lb weight categories. These reports provide detailed information about feeder cattle price relations and the economic implications for stocker production. Oklahoma City is the largest feeder cattle market and has the most complete set of feeder cattle prices, with most weight classed reported nearly every week of the year. Form this data set, value of gain for 155 stocker programs were calculated for all weeks in which the appropriate buy and sell prices were available. The stocker programs represent combinations of beginning weights (375–625 lb), total gains (100–300 ld), and lengths of time (6–32 weeks). More than 65,500 individual calculations are represented in the summary tables and averages reported in this article.

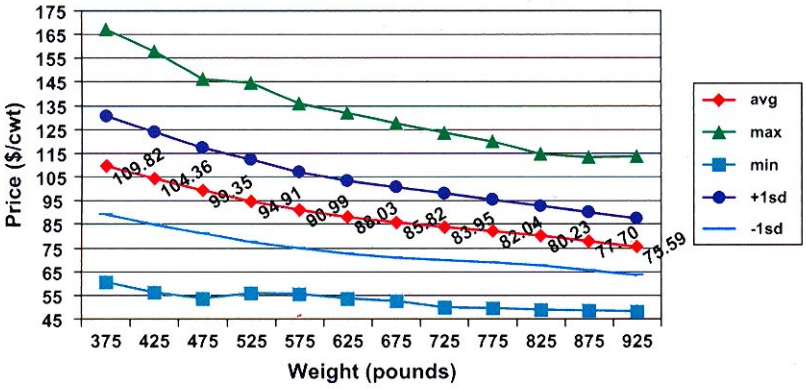

Fig. 1. Price-weight relation in medium- and large-framed number 1 steers, Oklahoma City, from January 1992 through September 2005. Avg, average; max, maximum; min, minimum; SD, standard deviation.

and low (1986 and 1996) points of the last two cattle cycles. It is apparent that prices for lightweight animals tend to rise and fall relatively more than prices for heavier weight feeder cattle over the course of each cattle cycle. Thus, not only does the height of the price-weight relation change to reflect higher and lower average price levels over a cattle cycle, but the line is flatter at low prices and steeper when prices are high.

Seasonal impact on price-weight relation

Different classes of feeder cattle have distinct patterns of price variation within each year (Fig. 4) [2]. These seasonal price patterns have important implications for the gross profit margin for stocker enterprises depending on the size of cattle bought and sold and the time of year of those purchases

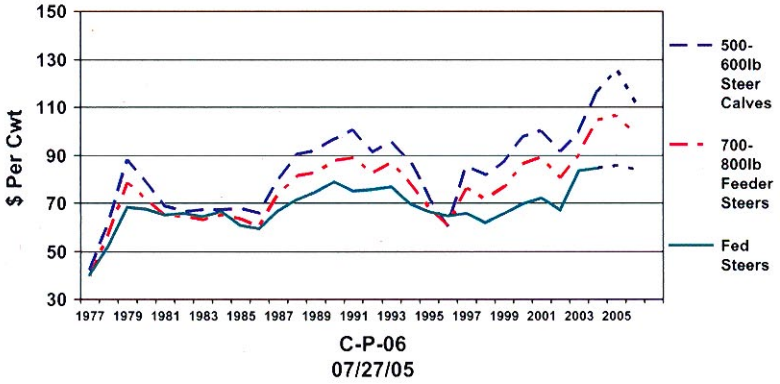

Fig. 2. Annual average cattle prices.

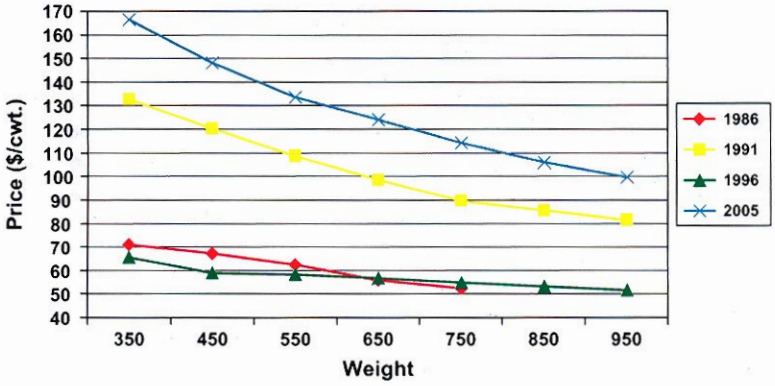

Fig. 3. Impact of cattle cycle on feeder cattle price-weight relation.

and sales. Seasonal price patterns for feeder cattle are quite regular and persistent but are modified by short-term market trends and may be muted or exaggerated by the longer term cattle cycle.

Other market impacts on price-weight relation

Other market conditions, especially feed market conditions, also have an impact on the price-weight relation for feeder cattle. Anything that changes the relative value of concentrate feeds and forage values has an impact on the feeder cattle price-weight relation.

High corn prices reduce the price that feedlots can pay for feeder cattle and may change the demand for different weights of feeder cattle [3]. For example, in 1996, extremely high corn prices (aggravated by cyclically large cattle numbers) caused the normal price-weight relation to "invert," wherein prices for heavyweight feeder cattle were higher than for lighter feeder cattle. Thus, although cattle prices were generally low at that time, the unusual

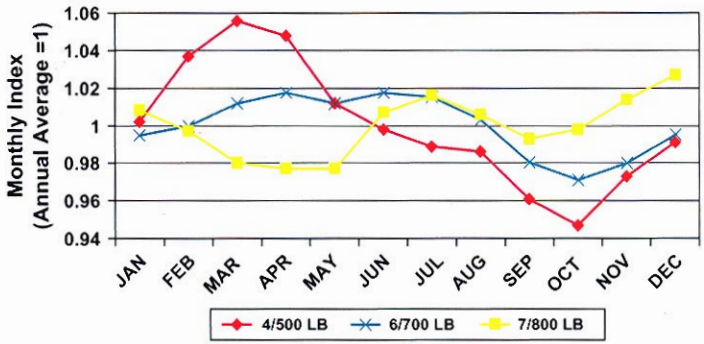

Fig. 4. Feeder cattle seasonal price pattern.

feeder price-weight relation resulted in strong incentives to keep cattle on pasture to heavier than usual weights (thus fulfilling the market incentive of reducing feedlot use of expensive corn).

Drought conditions cause changes in the price-weight relation for feeder cattle as well. In 1998, a pronounced drought in the Southern Plains caused feeder cattle prices to drop and the price-weight relation to flatten out dramatically by midsummer. The reduced availability of forage made forage relatively expensive compared with feed grains (which were unusually abundant at that time) and reduced the demand for lightweight stockers, which are normally used for grazing programs. By the end of 1998, the price-weight relation had recovered to more typical levels, with lightweight feeder prices increasing relatively more than heavier feeder prices.

Gross margin and value of gain

As noted previously, stocker profitability is primarily determined by the margin between beginning animal value and ending animal value. It is useful to compare this gross margin and the value per pound of gain across different stocker enterprises.

The gross margin, GM, for stocker production (gross margin per head) is the final value of the animal (value at sales) minus the beginning value (purchase value) and is written as follows:

$$GM = P_f W_f - P_b W_b \tag{1}$$

where P_f is the final price (selling price) in dollars per hundredweight, W_f is the final weight (selling weight) per hundredweight, P_b is the beginning price (purchase price) in dollars per hundredweight, and W_b is the beginning weight (purchase weight) per hundredweight.

Equation 1 may be expressed with price in dollars per hundredweight and weight in hundredweight or with price in dollars per pound and weight in pounds.

In Example 1, a 450-lb steer is bought for \$106/cwt and sold at 650 lb for \$90/cwt:

$$GM = 90(6.5) - 106(4.5) = 585.00 - 477.00 = \$108.00 \text{ per head}$$

or

$$GM = 0.90(650) - 1.06(450) = 585.00 - 477.00 = \$108.00 \text{ per head}$$

The total gain is:

$$G = W_f - W_b \tag{2}$$

The value of gain, VG, per pound is given by the following equation:

$$VG = GM/Gain \tag{3}$$

Substituting Equations 1 and 2 into Equation 3:

$$VG = (P_f W_f - P_b W_b)/(W_f - W_b) \tag{4}$$

From Example 1:

$$VG = 108/(650 - 450) = 108/200 = \$0.54/\text{lb of gain}$$

More correctly, the value of gain in Equation 4 is the average marginal value of gain. Marginal value of gain of feeder cattle is the value of the last pound of gain, a value that changes constantly because of the nonlinear price-weight relation that is typical for feeder cattle. Equation 4 represents the average value of an additional increment of gain. As the amount of additional gain considered is smaller, the average marginal value of gain from Equation 4 approaches the marginal value of gain.

The difference between average marginal value of gain and marginal value of gain is illustrated by Example 2, which is a variation of Example 1.

In Example 2, the price of 450-lb steers is \$106/cwt; at 500 lb, the price is \$101.50/cwt; and at 650 lb, the price is \$90/cwt.

Compare the value of gain for the first 50 lb of gain (from 450 to 500 lb) to the next 150 pounds of gain (from 500 to 600 lb):

$$VG \text{ (from 450 to 500 lb)} = 507.50 - 477 = 30.50/50 = \$0.61/\text{lb of gain}$$

$$VG \text{ (from 500 to 650 lb)} = 585 - 507.50 = 77.50/150$$
$$= \$0.517/\text{lb of gain}$$

This example illustrates that the marginal value of gain is higher at the beginning of the 200-lb increment and lower for the last 200 lb of gain. Thus, the value of gain in Example 1 of \$0.54/lb of gain is the average marginal value of 200 lb of gain.

Equation 4 can be rewritten as follows:

$$VG = P_f + [(P_f - P_b)W_b/(W_f - W_b)] \tag{5}$$

Equation 5 illustrates that the value of gain consists of two terms. The first term is the final selling price, which demonstrates, as expected, that the value of gain is higher when the selling price is higher. The second term is an adjustment for the change in the initial value of the animal.

Because the beginning price is almost always higher than the final price, the second term is usually negative. Thus, the value of gain is the final selling price minus an adjustment for loss in value of the initial pounds of the animal.

The second term also illustrates that all else being equal, this negative adjustment is less for a smaller beginning weight and smaller for a larger increment of gain. Of course, a smaller beginning weight is usually associated with a higher beginning price, and, similarly, a larger gain is usually associated with a higher ending weight, and thus a lower selling price; the value of gain at any point in time depends on the animal's rate of gain compared with the rate of price decrease for heavier weights. This is shown by the fact that a positive value of gain occurs when

$$P_f/P_b > W_b/W_f \tag{6}$$

The more that the price ratio in Equation 6 exceeds the weight ratio, the greater is the value of gain.

Equation 6 illustrates that the profit potential depends uniquely on beginning weight and total gain (ie, ending weight) and not on either factor individually. For example, the ratio of 200 lb of gain with a beginning weight of 425 lb is 425/625 or 0.68. The ratio of 525 lb of beginning weight to a 772-lb ending weight is also equal to 0.68 and results in 247 lb of gain. Therefore, the stocker program with the greater value of gain depends on whether the ratio of the price of 625-lb animals to 425-lb animals is greater than the ratio of the price of 772-lb animals to 525-lb animals. This also depends on the absolute level of prices as well as on the relation between prices at different weights. This illustrates the final factor affecting the value of gain, which is the rate of gain that determines the amount of time needed to reach the final weight in each program, and thus has an impact on the timing of the selling price to the purchase price in each program.

Average value of gain

Table 2 shows the average weekly value of gain for a variety of different stocker enterprises over the period from 1992 through 2004. The stocker programs vary by beginning weight, rate of gain (time), and total amount of gain (ending weight). The value of gain is calculated using weekly buy and sell prices for the appropriate animal weight and time lag. Table 2 shows that overall average values of gain do not vary much across different programs. In the most common stocker programs, with beginning weights between 425 and 525 lb and total gains of 200 to 300 lb, the average value of gain varies from \$0.54 to \$0.58/lb of gain across programs, with an overall average of approximately \$0.57/lb of gain. From this average value of gain, all production expenses must be paid before any profit can be realized.

Table 2
Average value of gain, medium-to large-frame number 1 steers, Oklahoma City, 1992 through 2004

	Total gain											
	100 lb			200 lb			250 lb			300 lb		
	ADG (lb)											
Beginning weight (lb)	1.43	1.79	2.38	1.43	1.79	2.38	1.43	1.79	2.38	1.43	1.79	2.38
	Value of gain ($/lb)											
375	0.66	0.65	0.63	0.61	0.60	0.58	0.60	0.59	0.58	0.60	0.59	0.58
425	0.57	0.56	0.56	0.57	0.56	0.55	0.57	0.57	0.56	0.58	0.57	0.57
475	0.52	0.52	0.54	0.56	0.55	0.54	0.57	0.57	0.56	0.57	0.57	0.56
525	0.54	0.54	0.56	0.58	0.57	0.56	0.58	0.58	0.57	0.58	0.57	0.57
575	0.57	0.60	0.59	0.61	0.60	0.59	0.58	0.58	0.57	NA	NA	NA
Weeks	10	8	6	20	16	12	25	20	15	30	24	18

Abbreviations: ADG, average daily gain; NA, not applicable.

The average values of gain in Table 2 suggest that there is not much difference in the economic potential of various stocker programs when averaged over a long period. The values in Table 2 mask a great deal of variation in stocker value of gain over time, however. For example, Table 3 shows summary statistics for stocker programs with 250 lb of gain and various beginning weights and rates of gain. Table 3 contains the standard deviations and maximum and minimum values of gain for programs beginning each week over the period from 1992 through 2004. These values confirm that stocker values of gain vary widely. In a specific example from Table 3, 250 lb of stocker production, beginning with a 475-lb steer and a rate of gain of 1.79 lb/d, results in an average value of gain of $0.57/lb and a standard deviation across weeks of $0.22/lb of gain. This means that 67% of the time, the value of gain is between $0.35 and $0.79/lb of gain. The extremes are even more dramatic, ranging from a high of $1.30/lb

Table 3
Variability of value of gain, medium-to large-frame number 1 steers, 1992 through 2004

Total gain 250 lb															
Beginning weight (lb)	375			425			475			525			575		
ADG	1.43	1.79	2.38	1.43	1.79	2.38	1.43	1.79	2.38	1.43	1.79	2.38	1.43	1.79	2.38
Avg	0.60	0.59	0.58	0.57	0.57	0.56	0.57	0.57	0.56	0.58	0.58	0.57	0.58	0.58	0.57
SD	0.24	0.21	0.18	0.23	0.21	0.19	0.24	0.22	0.20	0.24	0.22	0.20	0.24	0.22	0.20
Max	1.38	1.35	1.25	1.46	1.29	1.28	1.48	1.30	1.23	1.50	1.31	1.29	1.55	1.51	1.27
Min	0.02	0.06	0.03	0.04	0.06	0.04	0.01	−0.04	−0.05	0.0	−0.01	0.02	0.01	−0.04	−0.04

Abbreviations: ADG, average daily gain; Avg, average; Max, maximum; Min, minimum; SD, standard deviation.

of gain to a low of −$0.04/lb of gain. There can be little doubt about the inherent risk associated with stocker production.

Average values of gain vary by time of year for different stocker programs. Combinations of beginning weight, rates of gain, and total amount of gain result in seasonal variation in values of gain as a result of the different seasonal price patterns for different sizes of animals (see Fig. 4). Table 4 shows average values of gain for a variety of stocker programs producing 250 lb of gain beginning each month of the year.

The influence of the cattle cycle on stocker value of gain is illustrated in Table 5. The table confirms that average values of gain vary dramatically over time as cattle prices fluctuate cyclically. It is apparent that there is not necessarily a direct correlation between average price levels and stocker values of gain, however. For example, the average values of gain in 1998 are lower than for 1996 despite the fact that feeder cattle price levels averaged higher in 1998. It is also apparent that although the values of gain for different stocker programs tend to vary higher and lower together over time, there is considerable variation across various programs, demonstrating that there are opportunities to improve average returns by selecting different programs under different market conditions. Table 5 only represents stocker programs for 250 lb of gain, and thus is only a sample of the variation apparent across a wider range of possible stocker programs.

The tremendous variability of stocker value of gain over time and across programs raises the question of how much increased economic potential exists in choosing different stocker programs under different conditions. Over the period from 1992 through 2004, choosing the highest value of gain across stocker programs for each week, with beginning weights from 425 to 575 lb, with total gains of 200 to 300 lb, and from 6 to 32 weeks in length, results in an overall average value of gain of $0.81/lb of gain. This potential is roughly 40% higher than the averages for individual stocker programs, which generally range between $0.52 and $0.58/lb of gain. The maximum potential value of gain is calculated ex post facto and represents outcomes that could not have been anticipated or foreseen in some instances. Nevertheless, a considerable increase in stocker returns is possible, even if only a portion of the maximum potential can realistically be captured.

The variability of stocker programs over time and across programs at a point in time illustrates the underlying economic role of the stocker industry, which is to provide a high degree of flexibility for the cattle industry to adjust the timing and level of beef production according to changing market conditions. The diverse set of possible stocker programs encompasses a wide range of production environments and requirements, and not all possible programs are feasible for all producers in all locations. The essential economic function of the stocker industry lies not in having a single good production program, however, but in having several good programs among which a producer may choose the most appropriate at a particular point in time.

Table 4
Monthly average value of gain for stocker programs, medium-to large-frame number 1 Steers, 1992 through 2004

Total gain 250 lb															
Beginning weight (lb)	375			425			475			525			575		
ADG	1.43	1.79	2.38	1.43	1.79	2.38	1.43	1.79	2.38	1.43	1.79	2.38	1.43	1.79	2.38
Jan[a]	0.67	0.63	0.67	0.67	0.64	0.62	0.64	0.60	0.53	0.67	0.62	0.54	0.72	0.65	0.55
Feb[a]	0.62	0.64	0.61	0.61	0.60	0.55	0.60	0.58	0.51	0.61	0.59	0.51	0.64	0.62	0.53
Mar[a]	0.57	0.60	0.58	0.58	0.55	0.55	0.53	0.53	0.51	0.55	0.54	0.52	0.56	0.56	0.54
Apr[a]	0.49	0.53	0.56	0.56	0.51	0.53	0.51	0.50	0.52	0.52	0.52	0.53	0.52	0.54	0.54
May[a]	0.52	0.53	0.55	0.55	0.55	0.56	0.58	0.60	0.59	0.59	0.58	0.57	0.57	0.56	0.56
Jun[a]	0.58	0.54	0.56	0.56	0.59	0.62	0.65	0.61	0.61	0.67	0.62	0.61	0.64	0.61	0.58
Jul[a]	0.52	0.58	0.54	0.54	0.58	0.57	0.55	0.62	0.60	0.57	0.64	0.60	0.58	0.62	0.59
Aug[a]	0.58	0.56	0.59	0.59	0.57	0.58	0.54	0.59	0.64	0.55	0.61	0.67	0.55	0.63	0.65
Sep[a]	0.63	0.55	0.55	0.55	0.55	0.60	0.57	0.60	0.65	0.56	0.60	0.68	0.53	0.60	0.69
Oct[a]	0.71	0.65	0.58	0.58	0.58	0.57	0.62	0.58	0.61	0.62	0.59	0.64	0.59	0.58	0.65
Nov[a]	0.70	0.69	0.60	0.60	0.62	0.55	0.59	0.57	0.53	0.58	0.57	0.54	0.59	0.57	0.56
Dec[a]	0.59	0.62	0.62	0.62	0.55	0.53	0.58	0.52	0.51	0.56	0.49	0.49	0.59	0.51	0.51

Abbreviation: ADG, average daily gain.

[a] Average of weekly stocker programs that begin in the month.

Table 5
Annual average value of gain for stocker programs, medium-to large-frame number 1 steers, 1992 through 2004

Total gain 250 lb															
Beginning weight (lb)	375			425			475			525			575		
ADG	1.43	1.79	2.38	1.43	1.79	2.38	1.43	1.79	2.38	1.43	1.79	2.38	1.43	1.79	2.38
1992	0.63	0.60	0.56	0.63	0.60	0.58	0.64	0.62	0.59	0.67	0.65	0.63	0.69	0.67	0.64
1993	0.53	0.57	0.58	0.51	0.55	0.57	0.50	0.53	0.55	0.50	0.54	0.56	0.49	0.54	0.56
1994	0.36	0.42	0.45	0.34	0.38	0.42	0.34	0.37	0.41	0.34	0.37	0.41	0.34	0.38	0.42
1995	0.32	0.34	0.37	0.29	0.31	0.35	0.32	0.34	0.38	0.34	0.36	0.39	0.36	0.38	0.41
1996	0.78	0.71	0.64	0.74	0.69	0.63	0.76	0.71	0.65	0.78	0.73	0.67	0.80	0.75	0.68
1997	0.58	0.60	0.59	0.54	0.56	0.55	0.52	0.53	0.54	0.55	0.56	0.56	0.56	0.57	0.56
1998	0.45	0.45	0.46	0.41	0.40	0.41	0.41	0.41	0.42	0.42	0.42	0.43	0.42	0.42	0.43
1999	0.66	0.65	0.62	0.65	0.62	0.58	0.67	0.64	0.60	0.69	0.65	0.61	0.68	0.65	0.60
2000	0.64	0.63	0.61	0.61	0.60	0.60	0.59	0.58	0.57	0.61	0.60	0.57	0.61	0.60	0.58
2001	0.48	0.52	0.54	0.48	0.50	0.54	0.46	0.49	0.53	0.45	0.49	0.53	0.43	0.47	0.51
2002	0.54	0.52	0.50	0.52	0.50	0.49	0.52	0.49	0.48	0.53	0.51	0.49	0.56	0.54	0.53
2003	0.83	0.75	0.71	0.82	0.75	0.71	0.84	0.77	0.72	0.83	0.76	0.71	0.84	0.76	0.71
2004	0.92	0.91	0.83	0.88	0.87	0.82	0.89	0.88	0.83	0.86	0.85	0.81	0.85	0.86	0.83

Abbreviation: ADG, average daily gain.

Thus, although expecting to achieve the maximum possible value of gain every time is not realistic, it is clear that a variety of market conditions influence stocker value of gain and suggest more and less appropriate production programs for a given set of market conditions. Stocker producers must consider the implications of many factors, including the following:

- Cattle cycle
- Time of year
- Feed grain market situation
- Forage availability and value
- Long-run market trends
- Short-run market trends.

Using these factors, the producer must select the most appropriate feasible stocker program based on the following considerations:

- Beginning animal weight
- Rate of gain (length of time)
- Target ending weight (total gain)
- Animal gender
- Animal quality

Stocker costs of production

In a traditional enterprise budget framework, the principal costs of stocker production include purchase price, feed and forage cost, interest cost, veterinary and medical cost, labor and equipment, death loss, and marketing cost. A typical stocker breakeven cost of production has roughly the following budget composition:

Purchase price: 75% to 85%
Feed and forage cost: 8% to 15%
Interest cost: 2% to 3%
Marketing cost: 2% to 3%
Veterinary and medical cost: 2% to 3%
Death loss: 1% to 3%
Labor and equipment: 1% to 2%

Purchase price

The initial purchase cost of the stocker animal represents the most significant component of the animal's final breakeven cost. Total purchase cost is purchase price multiplied by pay weight. Pay weight is the actual or negotiated weight on which payment is based but may not represent the actual beginning weight of the stocker production program. For example, the buyer may agree to pay on weight adjusted for pencil shrink at the seller's location, whereas the actual program beginning weight would be the actual weight at

the seller's location adjusted for actual shrink to the buyer's location. *Pencil shrink* is the term used to describe a negotiated adjustment to actual cattle weight to adjust for animal fill (feed and water) at the time of weighing. The effective initial cost of the stocker animals may also include shipping cost to the production location if animals are purchased at auction or free on board (FOB) at the seller's location. Purchase price has previously been discussed extensively in the context of the gross margin and value of gain associated with various stocker production programs. The initial value represents a fixed or sunk cost once the animal is purchased; thus, the impact of purchase price decreases with additional time, that is to say, with additional gain.

Feed cost

Stocker programs typically rely primarily on forage, usually in some type of grazing program and sometimes using harvested forages. Protein or energy concentrate feeds may be used to supplement grazing programs depending on nutritional requirements and forage quantity or quality. Supplements are often needed in initial receiving programs for newly arrived stocker cattle. On rare occasions, it is economically prudent to use predominantly concentrate feed rations for stocker production. Feed costs are usually true variable costs and depend on the level of production. As such, feed costs typically represent an increasing component of the breakeven cost with additional time (weight gain). The exact impact of forage costs on breakeven cost dynamics depends on the manner in which the forage is priced, however. Various methods of forage pricing are discussed later in this article. Feed cost also includes the costs of salt and mineral supplementation and the cost of ionophores, if used.

Interest cost

Interest costs for stocker production depend mostly on the initial animal cost and feed cost as well as on the interest rate and tend to increase with additional time. The appropriate interest rate used in the budget may be an actual rate on borrowed capital or may be an opportunity cost, such as a savings or investment return rate, when owner capital is used.

Marketing cost

Stocker cattle marketing costs may include any of a variety of marketing-related costs, including auction or broker commission fees, check-off fees, actual or negotiated (pencil) shrink, and cost of shipping cattle to market.

Labor and equipment cost

Labor cost for stocker production includes labor for initial processing of cattle, daily monitoring and feeding, and sick animal treatment. Equipment

cost primarily consists of a charge for cattle-handling facilities and variable costs for cattle monitoring, feeding, and treatment (eg, fuel, tires for pickup truck and trailer). Labor and equipment costs are highly variable to specific situations and difficult to generalize. There is often a temptation by producers to ignore equipment costs, because a pickup truck, trailer, and corrals are viewed as overhead that they would already have. In a similar fashion, owner-supplied labor may not be identified as a specific cost item. Although there is nothing inherently wrong with treating these costs in this manner, because overall stocker profits can be viewed as returns to these factors, the result can be to overvalue animals and inadvertently bid the profit out of animals at the time of purchase. One convenient way to capture at least a portion of labor and equipment cost explicitly in the budget is to charge each animal a daily yardage fee in much the same way that feedlots do. Thus, charging, for example, $0.10 per head each day ensures at least some coverage of variable and overhead costs of labor and equipment.

Veterinary and medical costs and death loss

Veterinary and medical costs and death loss costs vary by cattle size, source, type, and quality as well as by time of year and other conditions. In general, the health risks for stocker cattle vary widely, ranging from raised and retained stockers with the least health risk to high-risk and highly stressed cattle. Stocker production often involves hauling cattle long distances and commingling smaller lots of cattle from different sources into larger grazing groups. Long-haul "put-together" cattle typically experience significantly higher morbidity and mortality than raised or locally purchased single-source cattle. Veterinary and medical costs typically include costs of vaccinations, implants, ear tags, and treatment for internal and external parasites as needed for all animals plus treatment costs for sick animals.

Time of year generally affects weather conditions and health-related costs. Animal morbidity and mortality may be increased by cold and wet conditions or by hot and dusty conditions. Although veterinary and medical cost and death loss cost averages are included in the ranges indicated previously, actual values are likely to vary considerably across different sets of animals. Thus, health-related costs may well be less than average on some occasions and greater than average for other sets of animals when the inevitable health "wreck" occurs. This may be caused by unexpected adverse weather conditions or by specific animals that arrive sick or otherwise compromised in health.

It is generally true that older and larger feeder cattle have lower veterinary and medical costs and lower death loss. For example, yearling cattle placed in a feedlot would certainly be expected to have lower health costs and lower death loss than weaned calves. Size alone is not highly correlated with health costs for stocker cattle in the range of typical beginning weights, however. One exception may be for extremely light weight stockers (ie, those

cattle with beginning weights less than 400 lb). Table 2 shows that the average value of gain for 375-lb steers is generally higher than for most other beginning weights. It is likely that this is simply a market reflection of the generally higher health-related costs for these extremely small animals. In other words, the value of gain for these extremely lightweight animals is probably not higher on average than other stocker programs when adjusted for increased costs of production for the lightweight animals. Animals this small, especially those that are at high risk by virtue of being long-haul commingled cattle, often require a fundamentally different health receiving program than larger cattle. It is much more likely for these cattle to require mass medication of the entire group on arrival rather than provision of health care on a "pull and treat" basis. It is also likely for the average death loss for lightweight cattle to be higher than for larger cattle.

Most veterinary and medical costs and death loss typically occur in the initial receiving phase of a stocker program. This has the effect of initially increasing the breakeven cost of the cattle, with the expense recovered over time as the animal gains weight. Although one wants to minimize death loss, it is better from a cost perspective for an animal to die shortly after arrival than to survive as a chronically sick animal incurring additional medical, treatment, and feed costs only to die shortly before marketing.

Stocker breakeven time dynamics

Breakeven costs for stocker cattle typically start high and decrease over time (Fig. 5). In the first few days after purchase, the breakeven is usually higher than purchase costs because most veterinary and medical costs and death loss occur immediately after purchase. With more time and weight gain, these initial costs are spread over more pounds of animal, thus

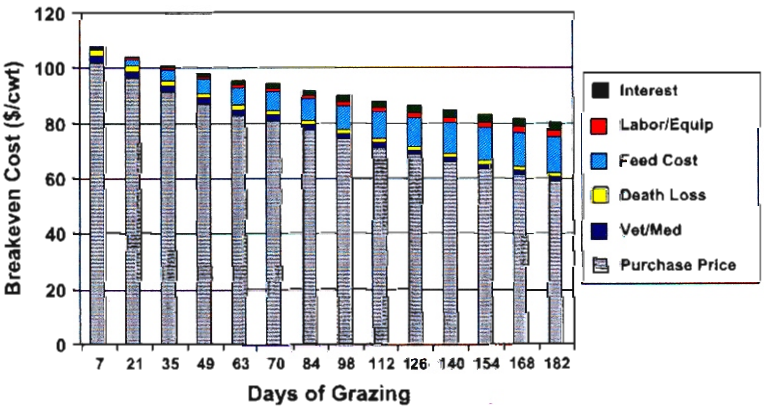

Fig. 5. Change in stocker breakeven cost over time.

resulting in a decrease in breakeven costs over time. This is true despite the fact that some costs, such as feed costs and interest costs, are usually increasing with additional time, although the impact of feed costs on breakeven dynamics depends on the manner in which forage is priced (forage pricing is discussed elsewhere in this article). The impact of feed costs in Fig. 5 assumes that feed cost is truly a variable cost and depends on the amount of gain.

The breakeven selling price for an animal varies at different points in time, and in each time period, the breakeven consists of a different composition of costs. Changes in various cost components have different impacts on the breakeven price of the animal. Reducing the purchase price shifts the breakeven down, lowering breakeven costs immediately and for all weights, whereas improved rate of gain increases the rate of decay, thus lowering breakeven cost over time (Fig. 6).

Stocker breakeven days of grazing

The profitability of stocker production at the time of sale depends on the rate of decrease of breakeven cost of production (see Fig. 5) compared with the rate at which animal price decreases at heavier weights (the price-weight relation; see Fig. 1). Because breakeven costs begin high with purchase costs plus veterinary and medical costs and death loss occurred at the beginning of the stocker enterprise, it is usually true that selling the animals in the first weeks of stocker production would result in a loss. With additional time, the breakeven costs, which usually decline at a faster rate than the price-weight relation, decrease enough that the animal can be sold at a profit. This point of breakeven length of time, or days of grazing, varies widely depending on market and cost factors but often occurs at roughly 90 to 100 days of grazing. In many instances, stocker enterprises shorter than 90

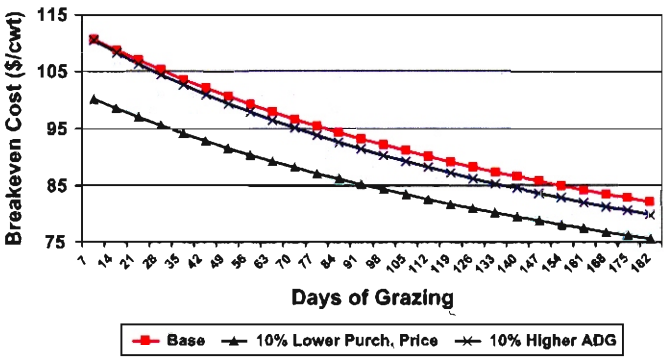

Fig. 6. Impact of purchase price and rate of gain on stocker breakeven cost over time. ADG, average daily gain.

days are not profitable; in general, the longer an animal is owned, the greater is the likelihood that the animal can be sold profitably. Particular circumstances may reduce or extend the breakeven time required, however. The breakeven days of grazing are a function of costs of production, especially purchase price, and animal performance. Animals with a higher rate of gain reach the breakeven days of grazing sooner than animals with a lower rate of gain.

Forage pricing

Forage costs usually make up most of stocker feed costs as an actual cost for leased pasture or as an opportunity cost for grazing owned forage. Although the value of forage is implicitly the same whether pasture is leased or owned, pasture ownership significantly affects the accounting profit or loss of stocker programs. Leased pasture is an explicit cost that must be paid whether or not the cattle return a profit. Conversely, a producer grazing owned pasture can think of smaller than expected stocker returns as simply generating a smaller return to the forage resource. A poor return to an owned forage resource is an economic loss, but it does not have the same financial implications as an out-of-pocket accounting loss to pay for leased pasture.

Stocker programs use a diverse set of forage resources, and a wide variety of forage pricing methods are utilized when pasture is leased. Common forage pricing methods include the following:

Cost per acre per season
Cost per acre per month
Cost per head per season
Cost per head per month
Cost per beginning hundredweight per month
Cost per pound of gain

In many cases, these pricing methods also include an agreement as to stocking rate and beginning and ending dates for grazing. Often, the different pricing methods result in approximately the same total forage costs on average, but different forage pricing methods reflect various considerations of the cattle owner and the pasture owner. Different forage pricing methods have different cost implications in specific circumstances. Consequently, the preferred pricing method depends on such factors as type of forage, risk, and agreements about other services that might be provided by the pasture owner.

Risk considerations are important for the cattle owner and the pasture owner. The cattle owner necessarily has the risks associated with the animals, but animal performance is obviously a function of forage quality and quantity. Thus, pricing methods that are fixed as to the cost per head or per acre mean that the animal owner is accepting all climate risk that

affects the quantity and quality of forage available. When forage is priced per acre, the cattle owner has an incentive to use the forage as completely as possible so as to reduce forage cost per unit of gain. For this reason, the pasture owner may set the expected stocking rate and retain the right to terminate grazing if forage is short so as to prevent overgrazing. This is particularly important for perennial forages, where the pasture owner's perspective is to maintain long-term productivity of the forage. Pricing on a per head basis removes some of the cattle owner's incentive to overstock forage on an average basis but does not remove the incentive to overgraze in the event that forage growth is limited by drought conditions. Pricing on a monthly basis rather than a season-long basis allows for more flexibility to terminate grazing early if forage growth is limited.

Pricing forage on a per head or per acre basis does not account for the fact that different sizes of animals have different forage requirements. For this reason, the forage price is sometimes based on animal size, usually at a given rate per hundredweight of the beginning weight of the animals. This serves to adjust the per head rate for different sizes of animals automatically. In some cases, the pasture owner may be interested in trying to generate higher returns to the pasture by accepting some of the animal performance risk. Especially in the case of high-quality forages, such as wheat pasture, pricing is often on a price per pound of gain basis. In this case, returns to forage are uncertain but are higher on average as compensation for accepting more risk.

The preferred forage pricing method may also be influenced by different conditions of the lease, especially with respect to other services that may be provided by the pasture owner. In some cases, the pasture owner provides no additional services. In other cases, the pasture owner may provide some services, such as temporary fencing and water facilities, and perhaps some care, such as monitoring cattle. Finally, the pasture owner may provide full care, including providing and maintaining fencing and water, animal monitoring and feeding, and health care as needed. In the latter situation, the pasture owner has considerable influence on animal performance, and forage pricing is more likely to be based on animal performance, such as cost per pound of gain.

As has been noted, stocking rate plays an important role in the cattle owner's and pasture owner's preferences for forage pricing methods. This is because they have different perspectives on the economics of grazing. The forage owner is interested in returns per acre, whereas the cattle owner is interested in returns per head. It is well documented that there is often a tradeoff between animal rate of gain and stocking rate [4]. Thus, the type of forage pricing arrangement determines whether there are conflicting incentives between the pasture owner and the cattle owner. With per acre pricing, the pasture owner may have an incentive to understock to protect the forage resource, whereas the cattle owner has an incentive to overstock to minimize forage cost per head. With per head pricing, the pasture owner

may have an incentive to overstock to increase returns per acre, whereas the cattle owner would want to stock conservatively to maximize animal performance. Incentives are most compatible with cost per pound of gain pricing, because the pasture owner and the cattle owner usually have an incentive to maximize total pounds of gain.

In some instances, the intent of the pasture owner and the cattle owner is to use all available forage completely. This is often the case for annual forages, such as grazeout wheat, annual rye, and crop aftermath (eg, corn or grain sorghum stubble). In such cases, the pasture owner and the cattle owner may prefer per acre pricing, because the cattle owner is effectively buying the entire crop. In such cases, there is little concern over the stocking rate and the cattle owner may change the stocking rate and the stocking density to change the timing and extent of forage use. Dual-purpose winter wheat, where wheat is grazed during the winter vegetative stage and removed before the first hollow stem so that a grain crop can be harvested, is a unique situation in which the pasture owner is not particularly concerned with the stocking rate during the winter grazing period but is quite concerned with the grazing termination date so as not to have a negative impact on grain yield.

Receiving programs

Most stocker programs involve some sort of receiving program, although these vary widely in magnitude and formality[b]. In general, the need for specifically designed receiving programs is a function of animal quality, source, degree of commingling, distance shipped, and weather conditions at arrival. Obviously, raised calves typically have the fewest health problems, and it is arbitrary whether the weaning and/or preconditioning program is considered to be part of the cow-calf enterprise or is considered to be the stocker receiving program. For purchased calves, the receiving program may be minimal or quite comprehensive. For example, high-quality preconditioned calves from a single local source may require little or nothing in the way of a receiving program and may be turned out for grazing within a matter of hours after arrival. At the other extreme, a set of long-haul calves commingled from several auctions and arriving highly stressed and shrunk may require an intensive 14- to 28-day receiving program to prepare the calves for grazing. Cost of receiving programs is typically included in the

[b] There are producers who specialize in providing receiving program services for stocker producers who do not have the time, equipment, or skills to receive cattle. These custom receiving programs typically receive the cattle for 14 to 28 days and provide specialized health care and nutritional programs to "straighten out" stockers before they are moved to pasture. Custom cattle receiving programs typically do not take ownership of the cattle and provide receiving services on a fixed rate per head each day or similar basis.

feed costs, veterinary and medical costs, and death loss costs identified previously but may be treated as a separate cost item if desired.

Other stocker economic considerations

Animal quality

The economic motivation for stocker production is usually based on the value of gain, and thus is related to the quality and growth potential of cattle. Stocker production developed historically from a more basic motivation, however: that of taking lower quality or mismanaged cattle and upgrading them in value. There is often a tradeoff between the growth potential of high-quality stocker cattle and the upgrading potential of "bargain" cattle. The choice between top-quality cattle and upgradable cattle depends on the relative value of gain and the price relations between cattle of various qualities.

Stocker producers, especially those with the inclination and skills to provide more care for cattle, may recognize greater opportunities at times in purchasing lower quality animals that are lighter muscled and smaller framed, are thin, or are animals that have not been properly weaned or preconditioned. Animals of this type are often sold singly or in small or mixed groups at auction. Several studies have documented the discounts applied to feeder cattle sold as intact male animals, with horns, in generally poor condition or poor health, or in small or nonuniform lots [5–7]. Cattle can be upgraded in value by providing health and nutritional care and by assembling cattle into larger and more uniform groups. These services, combined with value of gain, may represent relatively more profit potential for stocker producers at certain times, especially when the value of gain is relatively less because of overall market conditions.

Steers versus heifers

Another consideration for stocker producers is the choice between steers and heifers. The economic considerations discussed in this article generally apply equally to steers and heifers. Of course, there are some production differences between steers and heifers, and these are generally reflected in discounts for heifers relative to steers of the same weight (Fig. 7). Fig. 7 also shows that the heifer discount is less at heavier weights and that the variability of heifer price relative to the price of steers is less for larger heifers. The price relation between steers and heifers varies over the cattle cycle, however, and the heifer discount for lightweight animals is generally greater when cattle prices are low and less when prices are high (Fig. 8). Cyclically high feeder cattle prices generally mean that heifers are more in demand for breeding. Stocker producers may have more flexibility to market heifers as

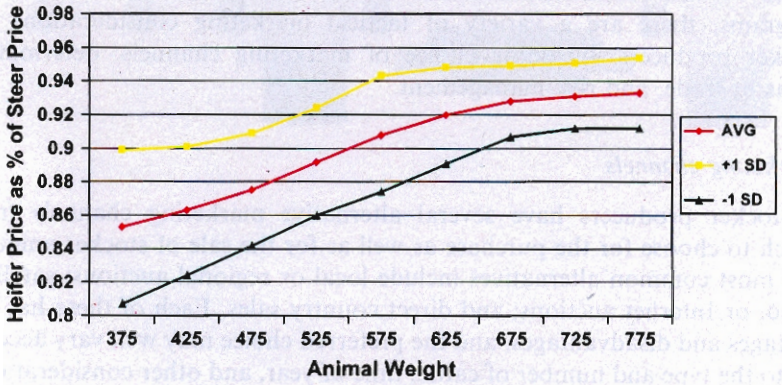

Fig. 7. Steer-heifer price relation, Oklahoma City, from 1992 through 2004. Avg, average; SD, standard deviation.

feeders or as breeding animals at this point in the cattle cycle. Obviously, heifer quality affects their potential for breeding use.

Stocker marketing

Strategic and tactical marketing considerations have a considerable impact on the profitability of stocker enterprises. The most important strategic marketing considerations relate to those decisions made at the time of animal purchase, including beginning weight, rate of gain, and expected ending weight. These decisions determine the overall profit potential of the stocker enterprise and have been the major thrust of the preceding sections. In addition to the strategic positioning resulting from the choice of stocker

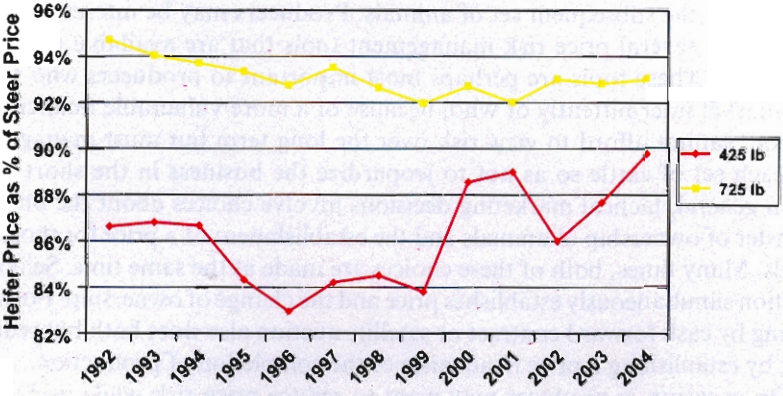

Fig. 8. Cyclic effects of steer-heifer price relation.

programs, there are a variety of tactical marketing considerations for stocker producers, including choice of marketing channels, determining terms of trade, and risk management.

Marketing channels

Stocker producers have several alternative marketing channels from which to choose for the purchase as well as for the sale of stocker animals. The most common alternatives include local or regional auctions; satellite, video, or Internet auctions; and direct country sales. Each of these has advantages and disadvantages, and the preferred choice may well vary according to the type and number of cattle, time of year, and other considerations. Different market alternatives carry different implications and requirements for the producer to determine prices and terms of trade.

Risk management

Price risk for stocker production is inherent in the time lag between when cattle are purchased and when cattle are ready to sell. Cattle prices may rise or fall over this period. Price increases make outcomes pleasantly uncertain, and these speculative returns sometimes contribute significantly to the overall profitability of stocker enterprises. It is the possibility of price declines that creates price risk and represents a concern and possible threat to stocker enterprises. In general, price risk is a function of short-term market trends, the influence of the cattle cycle, and the possibility of economic shocks that might cause prices to decline before selling.

Experienced cattle traders have long recognized that producers who are "always in the market" effectively reduce much of the price risk over time by buying and selling in the same market. Thus, if one happens to be in a situation of having to sell animals at low prices, buying replacement stockers at the same time (ie, less expensively) increases the odds of increasing profitability of the subsequent set of animals. Producers may be interested in using any of several price risk management tools that are available to reduce price risk. These tools are perhaps most important to producers who are in the market intermittently or who, because of a more vulnerable financial situation, cannot afford to view risk over the long term but must manage risk on each set of cattle so as not to jeopardize the business in the short run.

In general, tactical marketing decisions involve choices about the physical transfer of ownership of animals and the establishment of a price for those animals. Many times, both of these choices are made at the same time. Selling at auction simultaneously establishes price and the change of ownership. Forward selling by cash forward contract or satellite auction also does both but reduces risk by establishing a price in advance of the completion of production.

On occasion, a producer may want to reduce price risk while using cash auctions or simply postpone the decision about change of ownership until

later. Hedging the cattle with futures or options or using livestock risk protection (LRP) insurance reduces price risk without also determining the change of ownership[c]. In principle, purchases and sales of stocker cattle could be hedged using Chicago Mercantile Exchange (CME) Feeder Cattle futures and options contracts. Hedging with futures sets an expected fixed price, whereas hedging with options sets an expected minimum (maximum) price for cattle sales (purchases).

The key to using futures and options successfully is to understand the relation between the feeder cattle futures price and the cash price in the market in which the producer is physically buying or selling cattle. The difference between the local cash price and the futures price at the time of the cash market transaction is called basis. Expected basis is determined by using historical price differences between specific cash markets and the futures prices at different locations and times of the year. The CME Feeder Cattle futures price is based on the average price of 650- to 850-lb, medium- and large-frame, number 1 steers across many markets in the central part of the United States. Basis for any particular local market tells the producer how the feeder cattle futures price translates into an expected local price.

Basis is a function of location; size, gender, and quality of animals; and time of year, and it is influenced by the cattle cycle. In other words, basis is another dimension of stocker economics that depends critically on the price-weight relation for feeder cattle. Although actual basis is not perfectly predictable, basis is more predictable than market prices, and this fact is the key to risk management with futures and options. Basis is most predictable for heavier feeder cattle, which are most similar to the specifications of the CME Feeder Cattle futures contract. For lighter weight stocker cattle, basis is less certain, because prices for lightweight cattle are more variable than for heavier feeder cattle, as shown in Fig. 2. This fact effectively limits the potential of hedging for purchases of stocker cattle. Thus, risk management with futures and options is more feasible for sales of feeder cattle and less useful for purchases of stocker cattle.

Shrink and weighing conditions

Shrink and weighing conditions are related to the process by which a pay weight is established for animals [8]. In the best of circumstances, shrink and weighing conditions should not be biased in favor of the buyer or the seller.

[c] It is not possible to provide a complete discussion of the mechanics of hedging with futures and options in this article. Comments here are intended to demonstrate the perspective of how risk managements tools should be considered in the overall context of the economics of stocker production. LRP insurance may be available to producers in certain locations. LRP is revenue insurance, based on the Chicago Mercantile Exchange feeder cattle futures contract, that works much like options on futures contracts. LRP insurance is more flexible than futures and options, especially for small producers, but also has many of the same basis considerations as futures and options.

The buyer clearly should not be expected to pay for excessive gut fill, nor should the seller be penalized for excessive loss of gut fill or, in extreme cases, actual tissue loss. Shrink depends on a variety of factors, including amount of animal handling, type of animal diet, and time of day of weighing.

Shrink, although a physical process, is often negotiated as one of the terms of trade to mean an adjustment to the actual recorded weight of animals. Thus referred to as pencil shrink, the amount of adjustment should logically be closely related to the agreed-on weighing conditions, which clearly affect the actual amount of shrink in the animals. As a general rule, when weighing occurs at the place and time of loading or soon thereafter, a higher rate of pencil shrink is used to account for extra gut fill in the animals. Conversely, fill shrink occurs rapidly, and animals trucked even relatively short distances to scales should require less pencil shrink for a fair deal. Shrink is also greatly influenced by the amount of time animals spend standing in corrals or on trucks and by the amount of handling and sorting to which they are subjected.

Weighing conditions relate specifically to when, where, and how the animals are weighed, thereby establishing the basis by which to determine the pay weight. These can be important relative to the appropriate level of pencil shrink. For example, if animals are to be weighed on the truck (or trailer) rather than in pen scales, the fill loss before weighing may still be in the truck if not in the animals. It is important that buyers and sellers have a clear understanding of the weighing conditions and shrink allowances so as to avoid disputes.

Price slides

When animals are sold before actual delivery, there is some uncertainty over what the animals are going to weigh at delivery. Buyers and sellers often negotiate a price slide that reflects, in varying degree, the price-weight relation characteristic of feeder cattle (see Fig. 1). Price changes on the basis of animal weight are usually higher for lightweight animals compared with heavier feeder cattle and vary according to price level or cyclic conditions. Much of the cyclic impact is eliminated if the price adjustment by weight is expressed as a percentage of the animal price. Table 6 shows the average price change for steers of various weights in absolute terms and as a percentage of price.

The price rollback in Table 6 is calculated from a beginning weight to the next highest weight. For example, the price for a 475-lb steer decreases (in cents per pound) at a rate equal to 8.6% of the price of 475-lb steers as animal weight increases from 475 lb. The average price of 475-lb steers is approximately $100/cwt over the period from 1992 through 2005. Thus, the average price rollback for animals weighing 475 lb is approximately 8.6 cents/lb. The price of 475-lb steers has varied from a maximum of

Table 6
Average price change (rollback) for medium-to large-frame number 1 steers, Oklahoma City, 1992 through 2004

	Price	Rollback
Weight (lb)	Cents/lb	Percentage of price
375	10.41	9.13
425	9.88	9.14
475	8.66	8.60
525	7.77	7.89
575	5.83	6.24
625	4.70	5.13
675	3.69	4.03
725	3.77	4.29
775	3.53	4.14
825	4.59	5.44
875	4.08	5.26

$146/cwt to a low of $54/cwt, however, which means that the price rollback for 475-lb steers would have varied from 12.56 to 4.64 cents/lb.

The following example illustrates how the price slide should be used to reflect price adjustments for different weights. If animals were forward priced at $110/cwt (ie, $1.10/lb) at 475 lb but actually weighed 500 lb at delivery, the appropriate price adjustment would be 9.46 cents/lb (1.10 × 0.086) multiplied by 25 lb, resulting in a price adjustment of $2.37/cwt and an adjusted price of $107.64/cwt. Alternatively, if the animals weighed 450 lb, it would actually be more correct to use the price adjustment from the previous weight group and adjust the price higher by $2.51 (calculated as 1.10 × 0.0914 × 25 lb) to $112.51/cwt.

As with shrink and weighing conditions, a fair price slide should not create bias for the buyer or the seller. Price slides tend to be negotiated or subject to customary practices in various regions, however, and may or may not accurately reflect changing market conditions. Price slides are usually specified in terms of the amount of price adjustment per pound that animals are subject to, often with a weight window around the target weight [9]. The size of the slide and the size of the window are negotiable, and sellers often use these terms to indicate their confidence in meeting the target weight. A producer quite confident of the target weight may agree to a relative large price adjustment for heavier weights and to a small weight window before the slide takes effect.

Although price slides should logically apply to weights lighter and heavier than the target weight, as in the previous example, there is a tendency, especially in some regions, to only slide the price down (lower for heavier than expected animals), with little or no adjustment for lighter than expected weights. This tendency clearly favors the buyers and puts more risk on the sellers. Sometimes, this practice is more negotiable in times of limited cattle supplies.

Most important is that the terms of trade, such as details of how a price slide is to be applied, are clearly understood by buyers and sellers.

Summary

The beef cattle industry, like any industry, is subject to economic signals to increase or decrease production according to short-run and long-run market conditions. Much of the flexibility that the industry needs to adjust the level and timing of beef production comes from the stocker industry's ability to adjust the flow of animals economically through the many complex production and marketing phases of the industry. Profitable stocker production is the result of careful matching of economic conditions to alternative animal production systems combined with sound animal and business management. The economics of stocker production are driven by the feeder cattle price-weight relation that combines broad market signals about how much production is needed with complex and subtle signals about how that production should be accomplished. The result is a dynamic set of values of gain that direct producers to adjust the level, type, and timing of stocker production according to changing market conditions.

References

[1] Peel DS. Beef cattle growing and backgrounding programs. Vet Clin North Am Food Anim Pract 2003;19:365–85.

[2] Peel D, Meyer S. Cattle price seasonality. In: Bailey D, editor. Managing for today's cattle market and beyond, 2002. Available at: http://ag.arizona.edu/arec/wemc/cattlemarket/cattlepriceseasonality2002.pdf. Accessed April 28, 2006.

[3] Anderson JD. Dynamic price adjustment, price discovery and vertical coordination in cattle markets [doctoral dissertation]. Stillwater (OK): Department of Agricultural Economics, Oklahoma State University; 1998.

[4] Redfearn DD, Bidwell TG. Stocking rate: the key to successful livestock production. OSU Extension Facts F-2871. Stillwater (OK): Cooperative Extension Service, Oklahoma State University; 2006.

[5] Mintert JR, Brazle FK, Schroeder TC, et al. Factors affecting auction prices of feeder cattle. Bulletin C-697. Manhattan (KS): Cooperative Extension Service, Kansas State University; 1988.

[6] Sartwelle JD III, Mintert JR, Brazle FK, et al. Improving the value of your calf crop: the impact of selected characteristics on calf prices. MF 2142 (revised). Manhattan (KS): Cooperative Extension Service, Kansas State University; 1996.

[7] Smith SC, Gill DR, Bess C III. Effect of selected characteristics on the sale price of feeder cattle in eastern Oklahoma. Bulletin E-955. Stillwater (OK): Cooperative Extension Service, Oklahoma State University; 1998.

[8] Barnes K, Smith S, Lalman D. Managing shrink and weighing conditions. OSU extension facts F-3257. Stillwater (OK): Cooperative Extension Service, Oklahoma State University; 1999.

[9] Bailey DV, Holmgren LN. Price slides for feeder cattle. BCH-8470. In: Extension Beef Cattle Resource Committee, editor. Beef cattle handbook. Available at: http://www.iowabeefcenter.org/pdf/bch/08470.pdf. Accessed April 28, 2006.