Feeder Cattle Price Fundamentals

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Introduction

The cattle industry consists of a complex set of production and marketing activities across unrelated market participants widely dispersed in time, place and form (Peel, 2015). The industry relies on market prices and signals to coordinate these diverse activities. Feeder cattle markets collectively represent the principal point of market contact between all production sectors of the industry (Peel, 2011). Feeder cattle markets provide the market venue for the sale of calves from the cow-calf sector; the source of feeder cattle purchased by feedlots for finishing; and, in between, stocker and backgrounding activities that arbitrage feeder cattle across weights, space and time to provide an efficient set of market prices (Peel, 2011).

Feeder Cattle Market Reporting

Feeder cattle markets are typically reported as a constellation of prices for young cattle differentiated by weight, gender, quality and location. Public availability of feeder cattle market information varies across the country. Some 31 states participate in the voluntary federal market reporting system of the USDA Agricultural Marketing Service (USDA AMS) making feeder market information timely and easily accessible on the internet. Reported prices stem from auction markets in these states, often multiple markets within the states. Prices are negotiated via an English-style auction method and transaction terms are not directly or privately determined. Some variation exists in format and frequency of feeder cattle market reporting across states. Some states do not participate in the USDA-AMS system.

Feeder Cattle Price Relationships

A compact way to present feeder cattle market information is a graph of prices by weight for a specific class of feeder cattle and may be for a specific location and time or an average across locations and time. Figure 1 shows the simple average of weekly prices for different weights of Oklahoma feeder steers.[1]

The most obvious fundamental characteristic of this feeder cattle price-weight relationship is the ten-

1 Oklahoma auction market prices are referenced throughout this paper given the author's background and knowledge of Oklahoma cattle markets. Oklahoma has a more complete data set of prices across cattle weights for all times of the year compared to many regions. Other states and regions exhibit similar general patterns and price-weight relationships to those shown in Oklahoma.

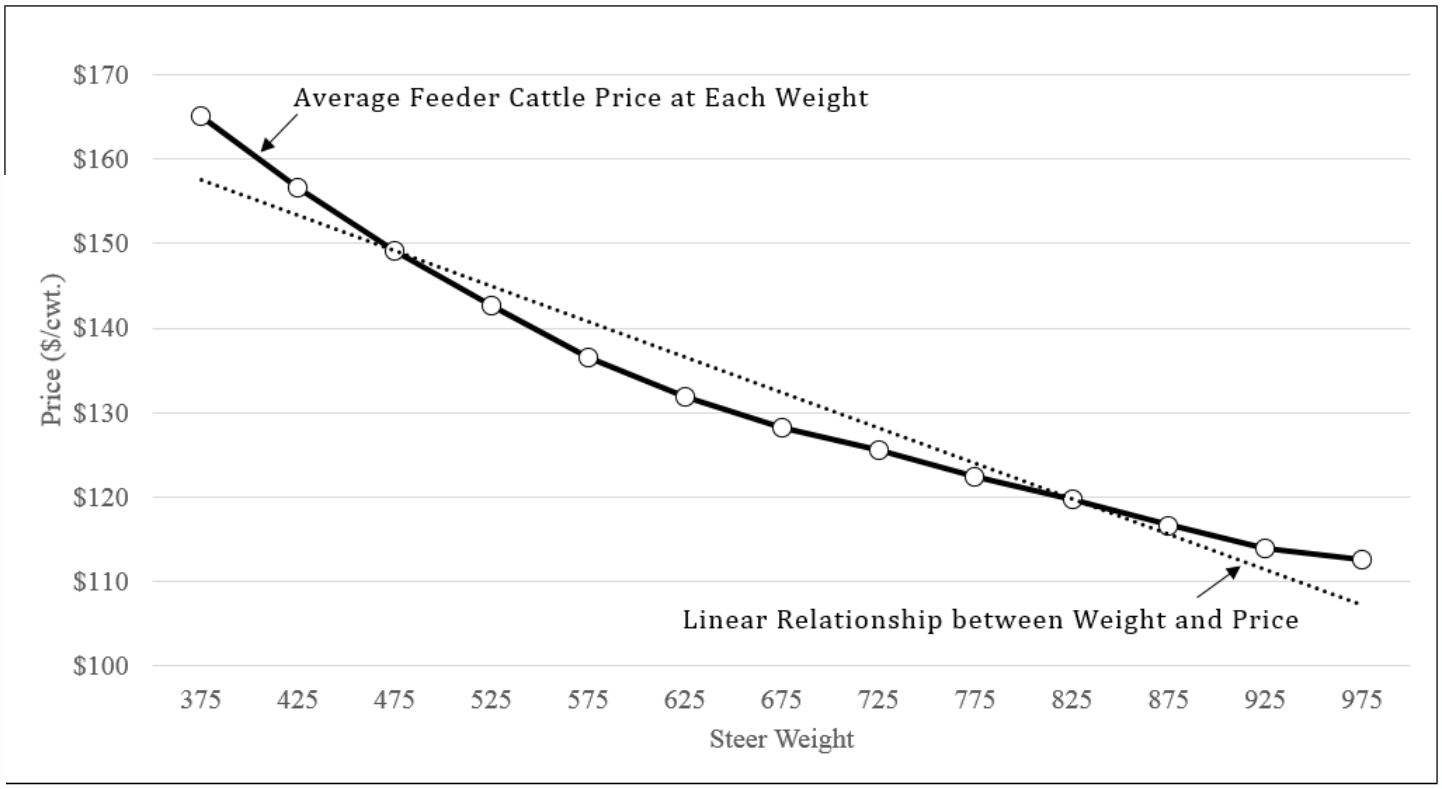

Figure 1. Oklahoma Feeder Steer Price-to-Weight Relationship, Simple Average of Weekly Prices, 2000 to 2017.

dency for prices of lightweight cattle to be higher on a per unit basis and decline as weight increases. Certainly, this is the average relationship between price and weight, though it is subject to considerable short-term variation under variable market circumstances. The entire set of feeder cattle prices rise and fall according to broad economic (demand and supply) conditions over time pushing the line higher or lower.

The graph in figure 1 appears to be a nearly linear decrease in prices as weight increases. A closer examination of the graph shows slight curvature, with a steeper slope between lighter weight categories and a flatter slope at higher weights (the linear relationship is provided for visual comparison). This means that as weight increases the amount of price decrease is less. The exact relationship of prices by weight is subject to considerable variation under different market conditions. These rather subtle changes in the relationship of feeder cattle prices by weight, combined with overall price levels, provide the bulk of the economic signals to coordinate the vast and complex set of cattle and beef industry activities.

While the price-weight relationship in figure 1 seems quite simple, it actually represents a broad array of information and reflects decisions by many diverse participants of the cattle industry. It is easy to forget that the set of prices across weights represent different flows in feeder cattle production. The prices on the left side of the graph represent lighter and younger cattle, i.e., calves that result from current production in the cow-calf sector while the prices of heavy feeder cattle on the right side of the graph are animals which are not only heavier, but are as much as a year older and represent a different flow of cattle production. The left side of the graph captures cow-calf sector decisions and production, while the right side of the graph represents feedlot buyer decisions and in between, stocker and backgrounding activities serve to arbitrage between those levels to redirect cattle by weight and time (Peel, 2006).

Cattle Industry Coordination

Cow-calf production determines the supply of cattle available to all other sectors of the industry. Calf prices resulting from the underlying supply and demand for calves set the height of the left side of the price-weight line. From a given supply of feeder cattle at any point in time, feedlots largely determine how those animals will flow through the industry to ultimately become a continuous stream of beef production. In other words, cow-calf production determines the intercept of the price-weight relationship while feedlots determine the slope

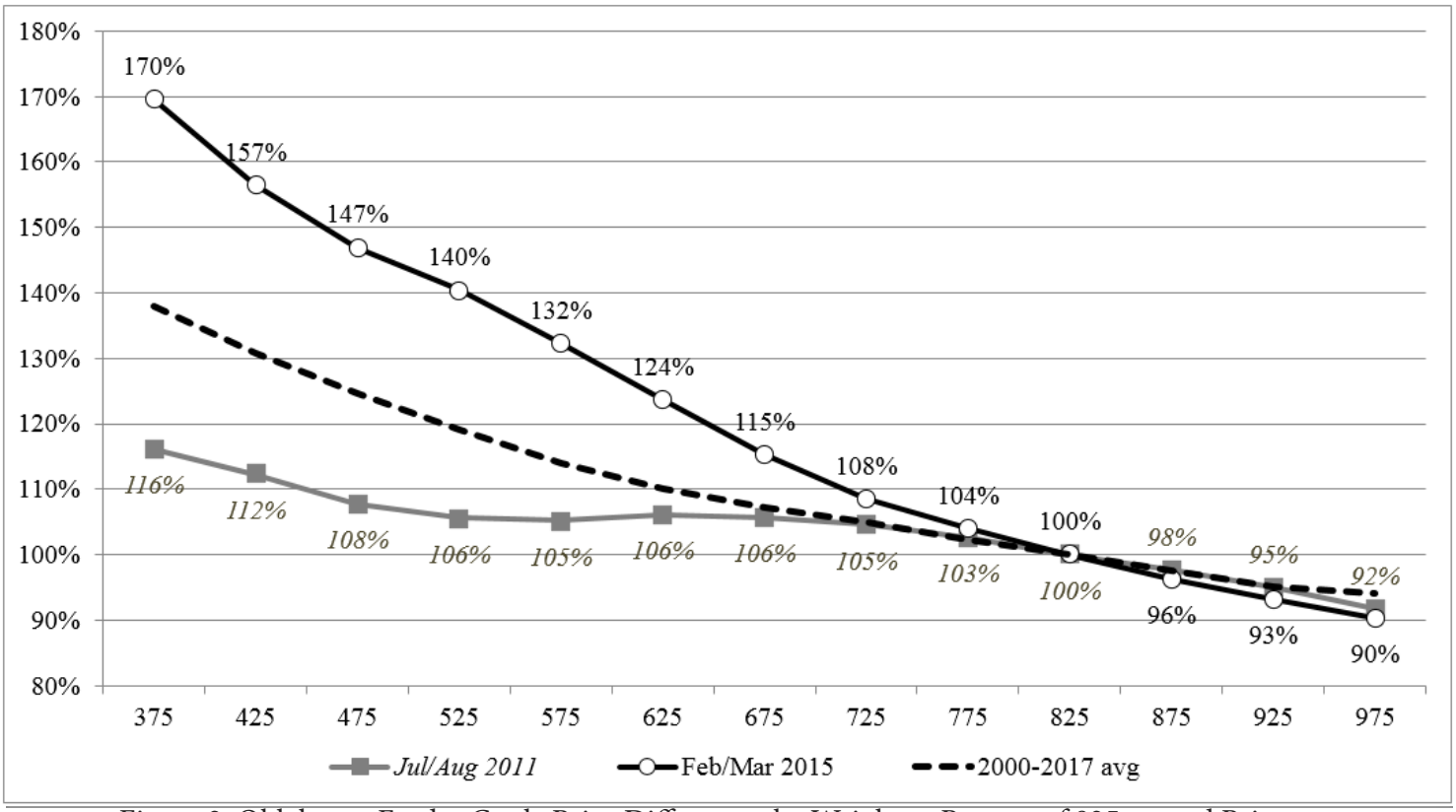

Figure 2. Oklahoma Feeder Cattle Price Differences by Weight as Percent of 825-pound Price.

of the line.

While the heaviest feeder cattle inevitably enter feedlots for finishing, the ruminant biology of cattle gives feedlots considerable flexibility to place cattle over a wide range of weights. If the cost of gain is attractive or the supply of heavy feeder cattle is limited, feedlots may decide to place relatively more lighter or middle-weight feeder cattle thereby changing the relative supply and demand for feeder cattle of different weights. This is reflected in figure 1 as a change in the slope and possibly the shape (curvature) of the price-weight line. Feeder cattle prices for different weights will change as feedlot cost of gain changes relative to the cost of adding weight to feeder cattle outside of feedlots using forage. For example, if corn prices rise as a result of a poor corn crop, cattle markets have the greatest flexibility among all livestock industries to adjust short-term corn demand by placing feedlot cattle at heavier weights. Alternatively, if forage is in short supply, cattle can move into feedlots sooner and utilize more grain. This means that the price-weight line not only captures the supply and demand of various sizes of feeder cattle but also reflects changes in feed and forage markets as well (Peel, 2003).

Figure 2 shows feeder cattle prices of various weights as a percent of heavy feeder cattle prices. The figure includes the average relationship of feeder prices over many years but also shows the wide variation in that relationship over time by capturing two extreme periods of different cattle and feed market conditions. The upper line in the figure represents a period in 2015 of record high cattle prices and rather low feed prices resulting in a much steeper relationship between lightweight and heavyweight feeder prices, i.e. a faster decline in prices as weight increases. This is contrasted with the lower line in figure 2, which is from a period in 2011 with somewhat below average prices but very high feed costs. In this situation, much less premium exists for lightweight cattle compared to heavy feeders resulting in a relatively flat price-weight relationship.

Stocker and backgrounding activities arbitrage prices of various cattle weights to capture the value of gain for adding weight to feeder cattle. Stocker or backgrounding may be done by commercial stocker producers: by cow-calf producers retaining ownership of calves; or by feedlots purchasing calves for backgrounding prior to being fed a finishing ration.

Table 1. Price Versus Weight of Oklahoma Feeder Steers, Average and Extremes, 2000 to 2017.

Steer Weight	Average, 2000-2017 (A)	Percent of 825 lb. Price (B)	Jul/Aug, 2011 (C)	Percent of 825 lb. Price (D)	Feb/Mar, 2015 (E)	Percent of 825 lb. Price (F)
375	$165.11	138%	$153.55	116%	$341.33	170%
425	$156.62	131%	$148.45	112%	$314.87	157%
475	$149.22	125%	$142.36	108%	$295.61	147%
525	$142.65	119%	$139.59	106%	$282.50	140%
575	$136.51	114%	$139.01	105%	$266.20	132%
625	$131.86	110%	$140.19	106%	$248.84	124%
675	$128.28	107%	$139.75	106%	$231.90	115%
725	$125.51	105%	$138.22	105%	$218.22	108%
775	$122.45	102%	$135.65	103%	$209.14	104%
825	$119.71	100%	$132.21	100%	$201.16	100%
875	$116.69	97%	$129.14	98%	$193.51	96%
925	$113.86	95%	$125.61	95%	$187.38	93%
975	$112.55	94%	$121.27	92%	$181.66	90%

Stocker production activities are largely driven by the margins offered in feeder cattle markets for adding weight to lighter weight animals. Stocker producers have many choices about what size of animals to buy or retain, how much weight to add and how long to own the animals. Different combinations of beginning and ending weight and timing are evaluated relative to the gross margin or value of gain offered in feeder markets at any point in time. The stocker value of gain is given by equation 1:

$$V = \frac{\left(P_f W_f - P_b W_b\right)}{\left(W_f - W_b\right)} \quad (1)$$

V is the value per pound (or cwt.) of adding additional weight — from *Wb*, initial weight, to *Wf*, final weight — based on the per unit price *Pb* at weight *Wb* and *Pf* at weight *Wf*. In other words, value of gain is the gross margin from buying and selling the animal divided by the pounds of gain. Of course, profitability of stocker production must consider the value of gain relative to the cost of production for various production systems (Peel, 2006).

Though often misunderstood, the value of gain is not simply the final or selling price. In other words, selling an animal 100 pounds heavier does not mean that those 100 pounds are worth the selling price per pound. This is illustrated when equation 1 is rewritten as:

$$V = P_f + \frac{W_b\left(P_f - P_b\right)}{\left(W_f - W_b\right)} \quad (2)$$

Equation 2 illustrates that, while the value of gain is positively related to the final price (*Pf*), it must be adjusted by the second term in the equation. The second term captures the change in value of the initial weight (*Wb*) when the animal is sold at a heavier weight (*Wf*). This adjustment is normally negative since lighter weight animals typically have a higher price per unit than heavier animals, i.e., (*Pf* – *Pb*) is usually negative. Thus, the value of gain for stocker production is normally less per pound than the selling price of the animal. This is illustrated in several examples from table 1, which contains the prices used for figure 2.

Consider a stocker or backgrounding activity that starts with a 475-pound steer, adding 250 pounds to sell at 725 pounds. From table 1, using average beginning and ending prices (column A) results in a value of

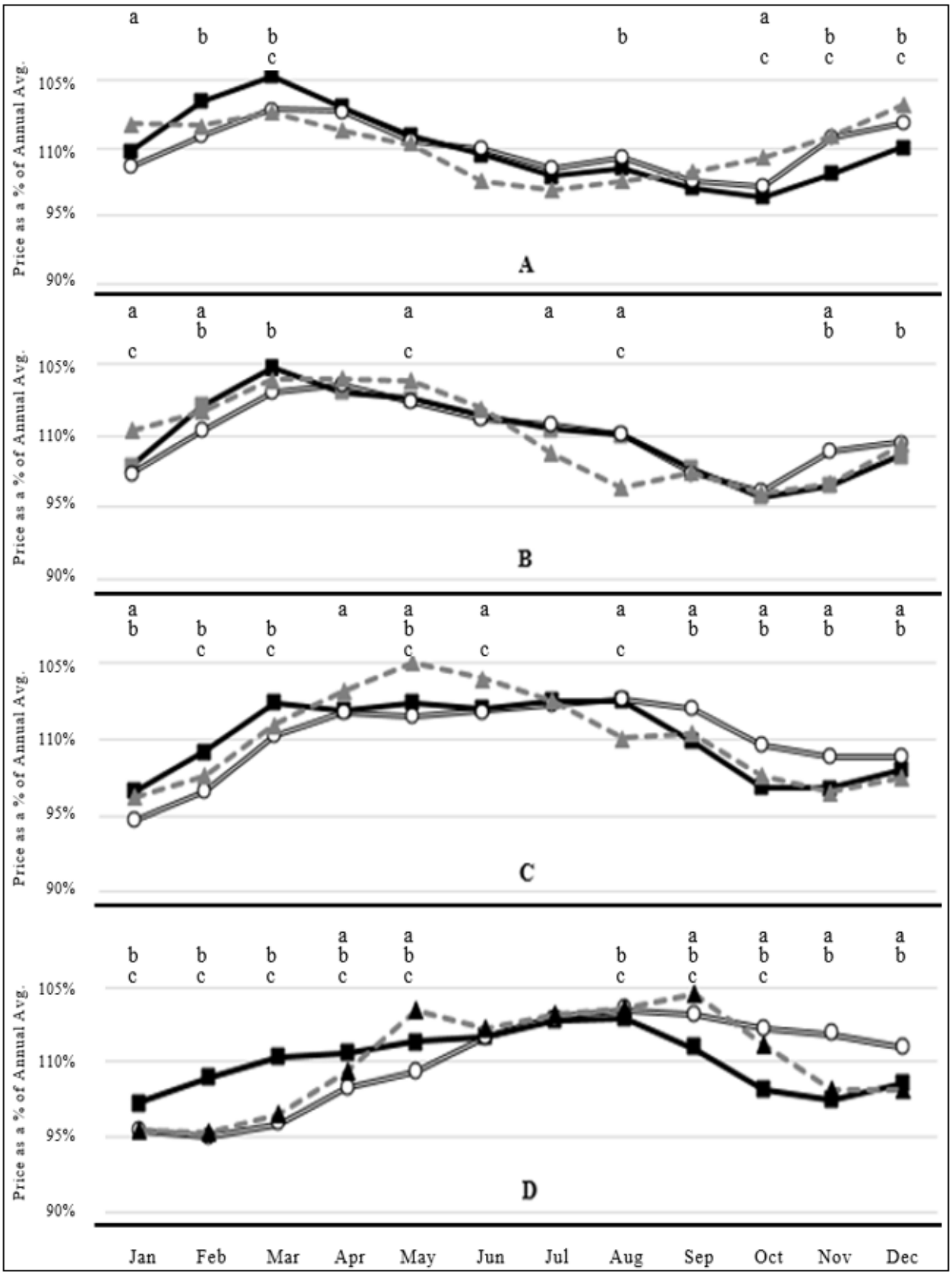

Figure 3. Seasonal Tendency of Feeder M&L #1 Steer Price for Three Locations (GA, OKC, and MT) across Four Weight Groups (A: 400-500 pounds, B: 500-600 pounds, C: 600-700 pounds, D: 700-800 pounds), 2000 to 2017. *Note: 'a' denotes statistically different monthly seasonal indices between OKC and MT, 'b' between OKC and GA, and 'c' between MT and GA.)*

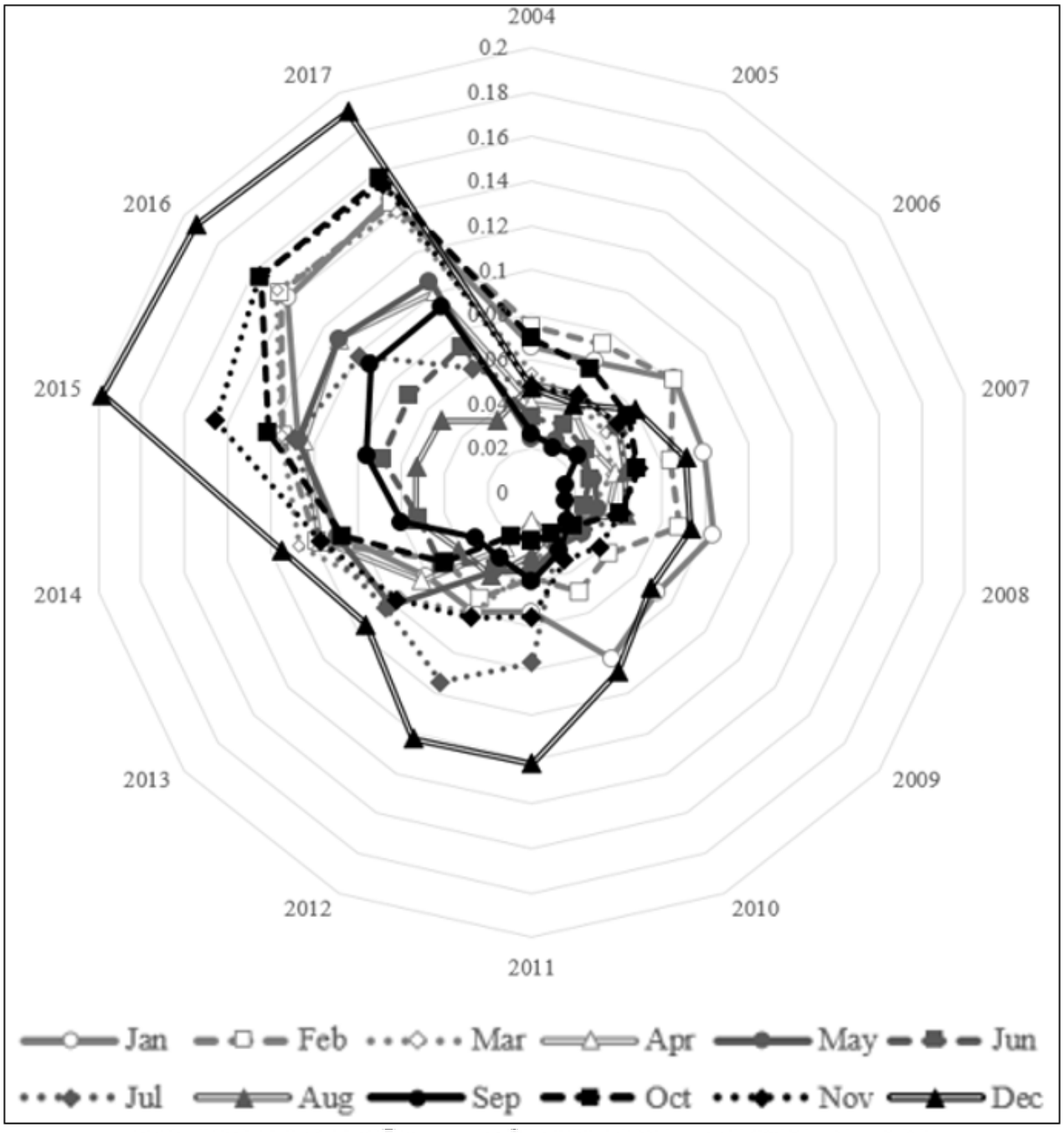

Figure 4. Five-year Rolling OKC Steer Price Seasonal Standard Deviation(rings)by Year(outer circumference)and Month (lines).

gain of $0.80/pound calculated using equation (1) as: ($125.51 x 7.25 – $149.22 x 4.75)/(725 – 475). Note that the value of gain is lower than the selling price of $125.51/cwt. or $1.2551/pound. In 2015, cattle prices were near record levels (column E) resulting in a value of gain of $0.71/lb. calculated as ($218.22 x 7.25 – $295.61 x 4.75)/(725 – 475). However, in 2011 (column C), the value of gain was $1.30/pound, calculated as ($138.22 x 7.25 – $142.36 x 4.75)/(725 – 475). Notice that the value of gain at lower cattle prices in 2011 is higher compared to the high prices in 2015. Stocker production (and feedlot production) is a margin operation where profitability is driven primarily by buy-sell margins rather that absolute price levels.

The prices in table 1 show extreme variation in feeder price-weight relationships but it is clear from the examples from table 1 that the value of gain varies significantly under variable market conditions. Value of gain is the primary economic signal for stocker producers about what size animals to buy, how much weight to add and the timing of stocker production. The principal driver of changes in what stocker producers see as value of

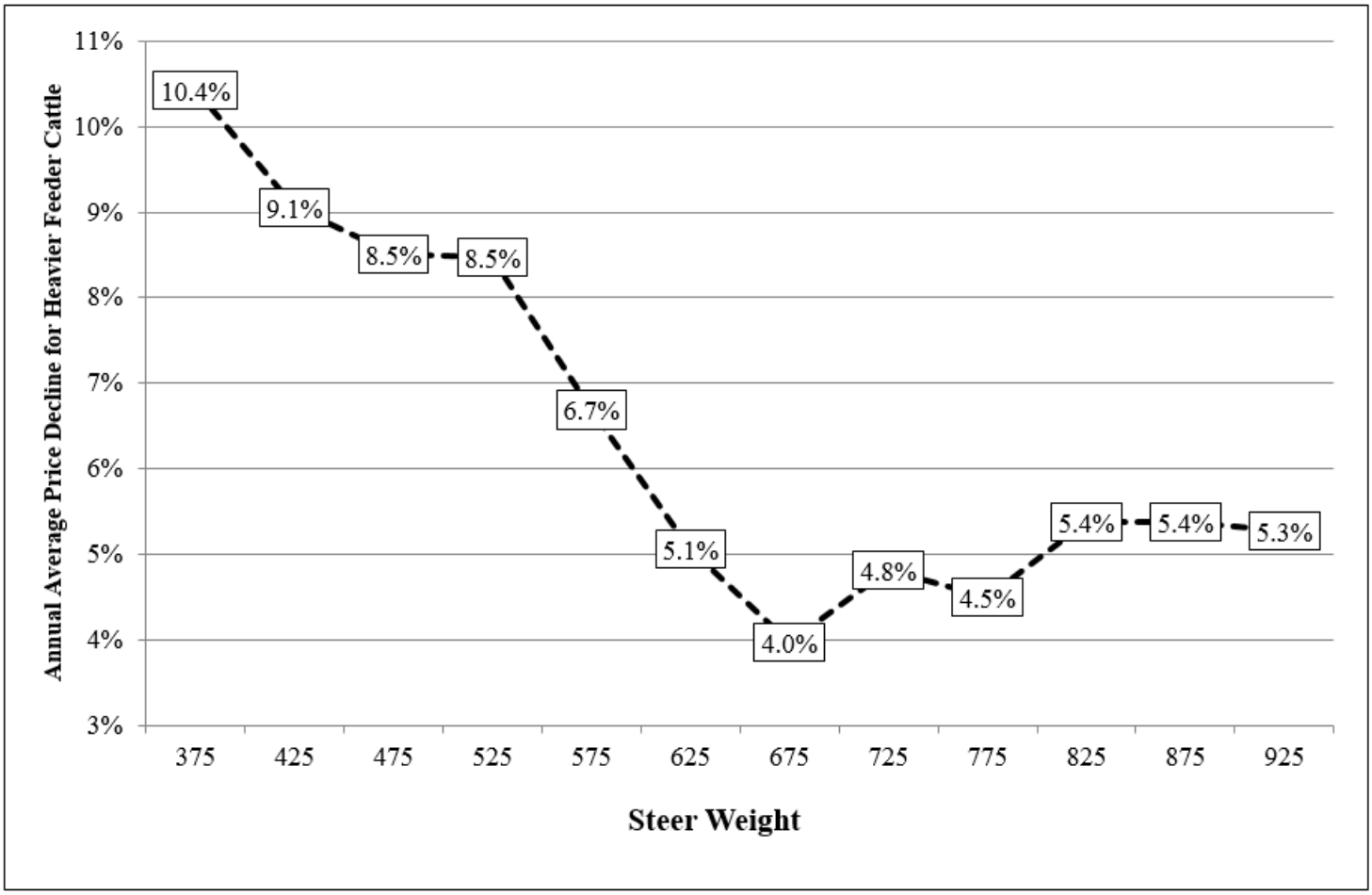

Figure 5. Oklahoma Feeder Cattle Price Slide, average from 2000 to 2016.

gain is feedlot decisions about placement of various weights of feeder cattle. Feedlot cost of gain determines what feedlots are willing to pay for lighter weight feeder cattle, which, in turn, drives the price-weight relationship in feeder cattle markets and the value of gain (Peel, 2006, 2011).

For instance, consider the 2011 example in table 1. Feedlot cost of gain was very high in this period and thus feedlots were unwilling to pay much of a premium for lighter weight cattle. In other words, when feed costs are high, feedlots would rather buy weight in the form of heavier feeder cattle than buy lightweight cattle and put the weight on in the feedlot. The impact of this in feeder markets is to have lower prices for light and middleweight cattle (less feedlot demand) relative to heavy feeders resulting in a flatter price-weight relationship. In turn, this leads to the higher value of gain that encourages stocker producers to put more weight on feeder cattle outside of feedlots. The value of gain is really the mirror image of the feedlot cost of gain and it is this connection that coordinates feeder cattle markets through economic signals among unrelated stocker and feedlot producers widely separated in time and space. In essence, changes in the slope and shape of the price-weight line provide key economic signals to shift cattle production (added weight) to whichever is the lower cost sector at a point in time; the stocker or feedlot. Anderson and Trapp (2000) reported that the relationship of feeder cattle prices were less responsive to feed (corn) prices than conventional rules of thumb suggested. The reported inference is, based on the assessment that feedlots adjust the weights of cattle coming onto the feedlot.

Equation 2 also highlights the relationship between final (selling) price and the slope of the price-weight line. Since the value of gain reflects the feedlot cost of gain, the slope of the price-weight line depends on the overall price level and will change for a given feed cost level if feeder cattle price level changes. For example, in order for the value of gain to reflect a given feedlot cost of gain, higher final price in equation 2 must be offset by a larger adjustment to bring the value of gain back down to reflect feedlot cost of gain. This means the beginning (purchase) price must be higher relative to the final price resulting in a steeper price-weight line. Numerous pricing models have been developed to disentangle how quantitative and qualitative factors influence

Table 2. State Feeder Steer Price as a Percent of Nebraska Feeder Steer Price, 2000 to 2017.

State	2000-2017 Mean	N	2000-2009 Mean	N	2010-2017 Mean	N	State	2000-2017 Mean	N	2000-2009 Mean	N	2010-2017 Mean	N
	400-500 pound steers							600-700 pound steers					
AL	87.99%	216	88.97%	120	86.78%	96	AL	86.46%	216	87.39%	120	85.29%	96
CO	96.60%	179	96.11%	105	97.28%	74	CO	95.38%	179	95.39%	105	95.37%	74
GA	85.07%	216	84.92%	120	85.24%	96	GA	83.07%	216	83.09%	120	83.06%	96
IA	96.80%	160	97.45%	64	96.37%	96	IA	97.89%	159	99.00%	64	97.15%	95
KS	96.84%	215	96.50%	119	97.27%	96	KS	96.51%	215	96.43%	119	96.60%	96
KY	85.78%	96	N/A		85.78%	96	KY	88.46%	96	N/A		88.46%	96
MO	93.63%	216	93.58%	120	93.68%	96	MO	95.46%	216	95.52%	120	95.39%	96
MT	95.21%	216	94.32%	120	96.32%	96	MT	95.43%	216	95.27%	120	95.62%	96
ND	95.34%	144	94.40%	77	96.43%	67	ND	96.98%	142	96.75%	72	97.21%	70
NM	93.28%	216	94.42%	120	91.86%	96	NM	89.59%	216	90.31%	120	88.70%	96
OK	94.42%	216	94.67%	120	94.10%	96	OK	94.71%	216	95.07%	120	94.26%	96
SD	97.49%	213	96.87%	117	98.25%	96	SD	98.85%	214	98.83%	118	98.87%	96
TN	84.56%	207	85.43%	111	83.56%	96	TN	85.40%	207	85.91%	111	84.82%	96
TX	91.65%	216	91.13%	120	92.31%	96	TX	91.39%	216	91.33%	120	91.46%	96
WY	97.59%	200	97.46%	112	97.75%	88	WY	96.27%	212	96.71%	117	95.71%	95
	500-600 pound steers							700-800 pound steers					
AL	86.46%	216	87.09%	120	85.66%	96	AL	86.36%	211	87.29%	116	85.23%	95
CO	96.01%	179	96.13%	105	95.85%	74	CO	95.83%	179	95.98%	105	95.62%	74
GA	83.14%	216	83.03%	120	83.28%	96	GA	82.52%	216	82.56%	120	82.47%	96
IA	97.07%	159	97.85%	64	96.55%	95	IA	98.55%	159	99.58%	64	97.86%	95
KS	96.31%	216	95.99%	120	96.72%	96	KS	97.26%	216	97.43%	120	97.06%	96
KY	87.20%	96	N/A		87.20%	96	KY	90.64%	96	N/A		90.64%	96
MO	94.23%	216	94.16%	120	94.31%	96	MO	96.46%	216	96.56%	120	96.35%	96
MT	94.87%	216	94.58%	120	95.23%	96	MT	94.89%	216	94.38%	120	95.53%	96
ND	96.00%	147	95.38%	79	96.71%	68	ND	N/A		N/A		N/A	
NM	90.65%	216	91.11%	120	90.07%	96	NM	90.35%	215	91.46%	119	88.97%	96
OK	93.58%	216	93.84%	120	93.26%	96	OK	96.60%	216	96.98%	120	96.13%	96
SD	97.98%	214	97.89%	118	98.09%	96	SD	98.92%	215	99.00%	119	98.83%	96
TN	84.42%	207	85.02%	111	83.72%	96	TN	86.01%	207	86.42%	111	85.54%	96
TX	90.17%	216	89.56%	120	90.93%	96	TX	94.05%	216	94.01%	120	94.11%	96
WY	96.64%	203	97.04%	111	96.16%	92	WY	96.82%	215	97.07%	120	96.50%	95

feeder calf price (see: Schroeder et al. (1998), Coatney, Menkhaus, and Schmitz (1996), Dhuyvetter and Schroeder (2000), Avent, Ward, and Lalman (2004), Williams et al. (2012), Zimmerman et al. (2012), Parish et al. (2018)). These fundamental relationships in feeder cattle prices are reflected in characteristic patterns in feeder prices by location, time and weight. Following sections detail these feeder cattle market relationships that can assist cattle producers marketing cattle.

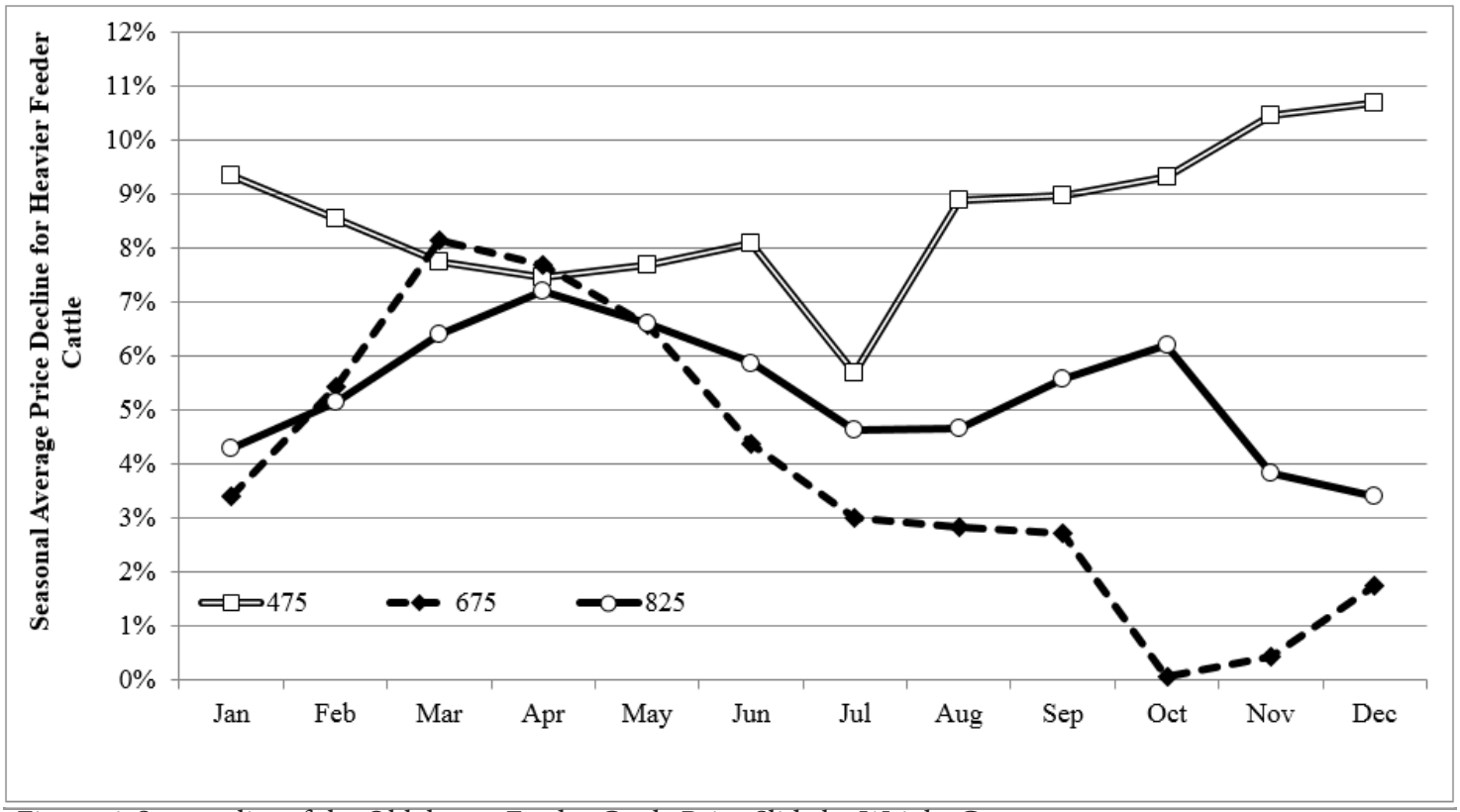

Figure 6. Seasonality of the Oklahoma Feeder Cattle Price Slide by Weight Group.

Time: Seasonality in Cattle Markets

Feeder cattle prices fluctuate during the calendar year, resulting in seasonal tendencies of prices. Seasonality is largely a function of when cow-calf producers time their calving seasons (supply) and feedlot demand. Monthly seasonal price patterns of feeder steers in Oklahoma City, Georgia, and Montana from 2000 to 2017 are depicted in figure 3. Seasonal price indices were calculated using monthly prices from 2000 to 2017 from the three market locations based on the following:

$$Index_i = \frac{\sum_{k=1}^{18}\left\{\frac{P_{i,j}}{\left[\frac{\sum_{i=1}^{12} P_{i,j}}{12}\right]}\right\} - MAX_{k=1}^{18}\left\{\frac{P_{i,j}}{\left[\frac{\sum_{i=1}^{12} P_{i,j}}{12}\right]}\right\} - MIN_{k=1}^{18}\left\{\frac{P_{i,j}}{\left[\frac{\sum_{i=1}^{12} P_{i,j}}{12}\right]}\right\}}{18-2}$$

Index is the average seasonal index value for specific month, *i*, which is from January through December across *k* years, an 18-year timeframe from 2000 to 2017. The seasonal calculation is an Olympic average in that the index does exclude the maximum (MAX) and minimum (MIN) seasonal index value for a specific month within a given year.

Light weight steer prices, those from 400 to 500 pounds (depicted in panel A), in Oklahoma City and Georgia increase relative to the annual average from January to March, then typically decline in price before reaching a seasonal low in October. Light weight steer prices follow a slightly different pattern in Montana in absolute terms. Prices rise modestly until March before falling to a seasonal low in July. Montana calf prices then rise throughout the remainder of the year. Seasonal index values which are statistically different, based on one student's t-test, are denoted in figure 3 for all markets.

As steer sale weights increase from light to heavy, the pattern of prices for all locations morph to that depicted in panel D, the seasonal pattern of 700- to 800-pound steers. In this instance, prices across all locations

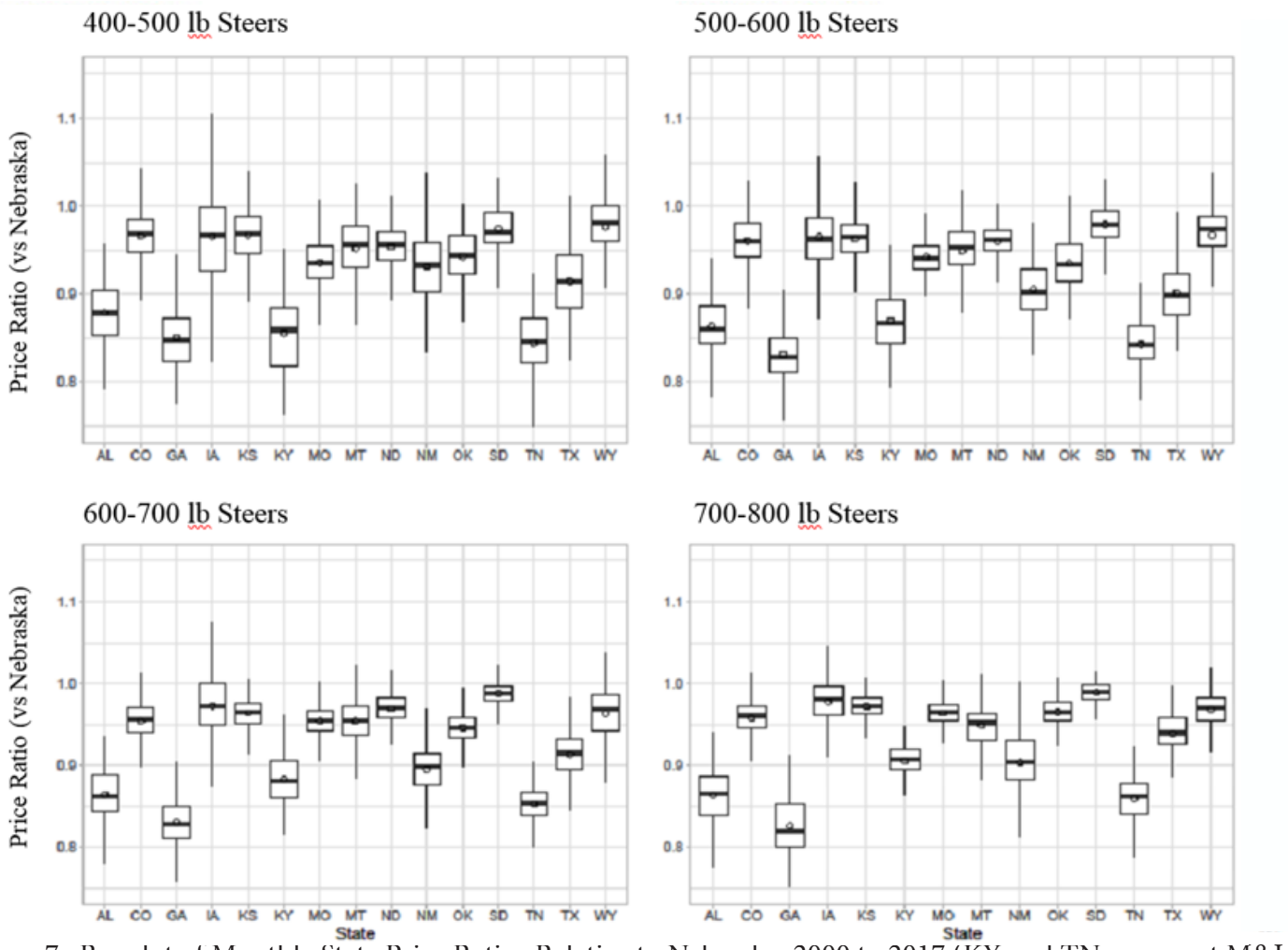

Figure 7. Boxplot of Monthly State Price Ratios Relative to Nebraska, 2000 to 2017 (KY and TN represent M&L #1-2 steers versus M&L #1 steers for all other states, including Nebraska). Note: circles represent average price ratio.

experience a seasonal low in January, then increase through August, and finish the calendar year falling – Montana peaks in September. The decline is tempered in Oklahoma City, while Georgia prices fall at a much steeper rate.

While some common tendencies exist to the seasonal nature of feeder cattle prices across the United States, figure 3 indicates that prices are not only differentiated by season but also by weight and location. Further, the price patterns examined here show increased variation of the price seasonality. Figure 4 depicts the five-year standard deviation of each month, rolling forward each year. The end of each five-year period is designated outside the circles; the months are depicted by the lines inside the circle and standard deviation is defined by the rings inside the circle, which increases from the center outward. So, for example, the five-year rolling standard deviation of December's price index increases starting in 2010 and again in 2015. Except for June and August, which remain rather stable, all other months have a similar tendency of increased variation.

Form: Feeder Cattle Price Slides

The common thread in the cattle market — i.e., the coordination of the cow-calf, stocker, and feedlot production systems — is the relationship of feeder cattle prices at various weights, also referred to as the cattle price slide. The feeder price slide shows the adjustment in feeder prices at various weights at a point in time (Figure 5). Feeder price slides are most commonly used when cattle are forward priced with a base weight and price such as when cattle are contracted in direct sales or video auctions prior to delivery. If the cattle weight differs from the base weight, the price slide shows how much the base price should be adjusted. Price slides are really just measuring the slope of the price weight line at various weights. Price slides have been the subject of common

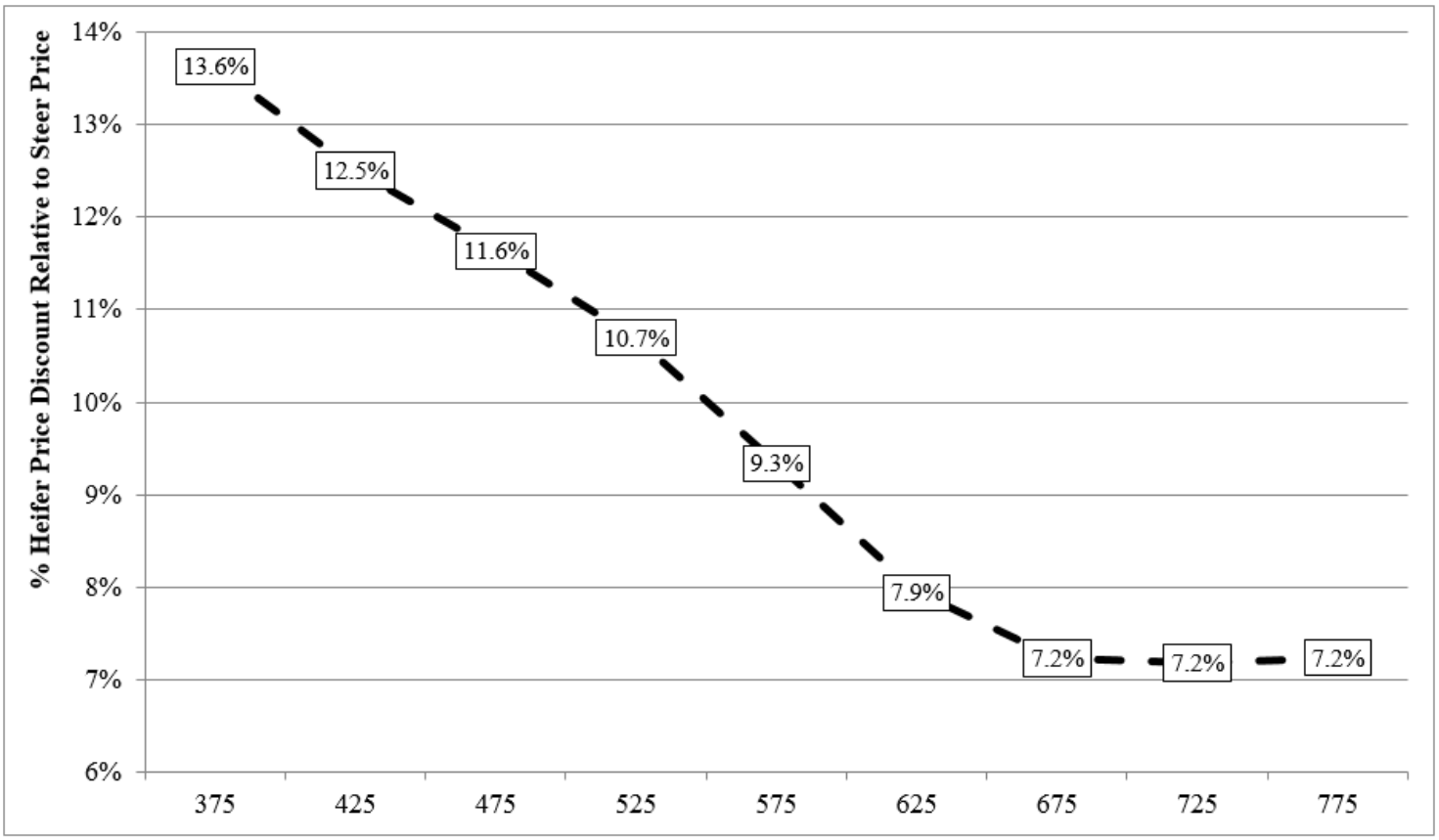

Figure 8. Oklahoma Heifer Discount Relative to Steer Price, 2000 to 2016.

rules of thumb in the industry for many years. It is very common to hear that "calves have a $0.10/lb. slide" or "yearlings have a $0.06/lb. slide".

The previous discussion of the changes in the slope of the price-weight line at different price levels means that the price slide should be more variable than the rules of thumb would suggest. Tonsor and Mollohan (2017) report that beyond the common factors that led to rules of thumb, more recent issues such as weather, policies, and animal disease occurrences have resulted in alterations to the price-weight relationship. In fact, price slides are best expressed as price changes as a percent of the base or beginning price (Figure 5). Figure 5 is based on average price changes between adjacent fifty-pound weight groups. On average, the percent price adjustment (slide) is higher for lightweight cattle and decreases for heavier feeder cattle. This is reflected in the curvature noted in figure 1.

To understand the price slide and how it is used, consider a forward contract for calves that has a base sale weight of 500 pounds with a base price of $175/cwt. and allows for an 8.5 percent slide if weight is heavier. On delivery, suppose the calves actually weigh 530 pounds. The price slide is $14.90/cwt. or $0.149/pound (0.085 x $175/cwt.). The net price for the calves 30 pounds heavier is adjusted down by $4.47/cwt. (30 x 0.149) to $170.53/cwt. ($175 – $4.47). Notice that the size of the price slide would change with higher or lower prices. For example, a base price of $250/cwt would have a price slide of $21.25/cwt. or $0.2125/pound with the same 8.5 percent slide. This more closely captures the changes in the price-weight relationship at different price levels and it coincides with findings by Tonsor and Mollohan (2017). The results reported that the responsiveness of price differentials are greater than price levels.

Figure 5 shows the average annual price slide, but price slides do vary seasonally. Figure 6 shows the monthly average price slide for three weights of feeder cattle. Price slides for the lightweight calves and the heavyweight feeders vary somewhat but are relatively constant through the year. However, middleweight feeders have a pronounced variation in the price slides at various times of the year ranging from eight percent in the

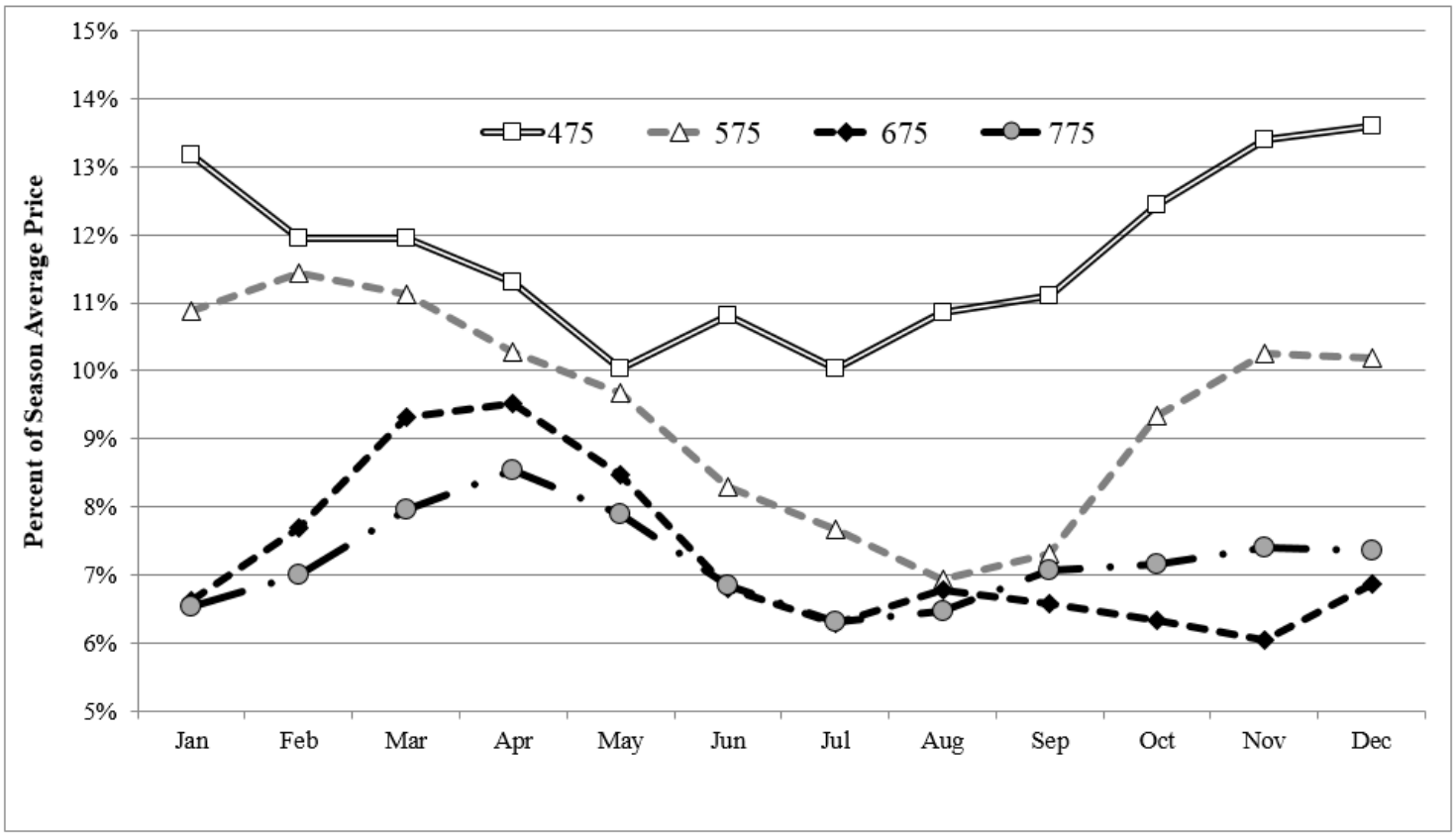

Figure 9. Seasonality of Oklahoma Heifer Discount by Weight Class (Relative to Steer Price), 2000 to 2016.

spring to less than one percent in the fall.. This likely relates to the additional market dynamics in those middleweight feeders to achieve market coordination in cattle markets.

Space: Market Leaders and Geographic Diversity

Feeder cattle in the United States are often sold at local auctions, therefore prices are specific to location and local market dynamics. Highfill and Peel (2015) determine that Nebraska commonly has the highest feeder cattle prices across the U.S.[2] Table 2 provides the average of monthly medium and large #1 steer prices for individual states from 2000 to 2017 as a percentage of Nebraska's monthly state price for four weight increments.[3] All reported values are below 100% indicating that Nebraska remains the highest average market price for feeder cattle.

Additionally, in table 2 the same calculations are reported; however, the data are split at December 2009/ January 2010 – approximately at the midpoint of the time series. In spite of the increased variation reported above with respect to seasonality, the price relationship for states over time, relative to Nebraska, maintains a similar spatial pattern as the reported values pre- and post-2009/10 are similar.

The boxplot in figure 7 reports the 25th, 50th, and 75th percentiles of the denoted state, along the horizontal axis, as a percent of Nebraska's price for four weight groups. The lines extending from the box depict the data that fall outside the low and high quartile up to 1.5 times the inter-quartile range (IQR). Data beyond the 1.5 IQR (i.e., outliers) are excluded for clarity. Figure 7 indicates that instances have occurred where a state's price exceeded Nebraska's, but these instances are few. The states where these events have happened are those states lying near Nebraska (largely from states bordering Nebraska). Not surprisingly, due to costs associated with transportation, the farther away from Nebraska the lower the state's relative price, with southeastern states consistently reporting the largest discount. Additionally, from figure 7, the variability of the ratio increases for lightweight (400-500 pound steers) and heavyweight (700-800 pound steers) for southeastern states.

2 Highest as reported by USDA, AMS for common cattle at specific weights.

3 Reported average calculated as: $Price\ Ratio_S = \frac{\sum_{i=Jan\ 2000}^{Dec\ 2017}[P_{S,i} - Nebraska\ P_i]}{12 \times 18}$ where S denotes the specific state.

Gender: Steer/Heifer Price Differentials

The pricing of feeder heifers relative to steers is often guided by rules of thumb in the industry, i.e., heifer calves are $10 or $15/cwt. back of the steers. The steer-heifer price differential depends on overall price levels and is better represented as a percent discount to steer prices (Figure 8). Figure 8 shows that average heifer price discounts to steers are highest for lightweight heifers at roughly 11% to 13% and declines steadily to about 650 pounds, holding steady at higher weights at just over 7 percent. The percent discounts mean that the absolute size of the discount depends on price level as well as weight. For example, if 500 pound steer calves are priced at $175/cwt., a 12% discount for heifers of comparable weight would be $21/cwt. resulting in a heifer price of $154/cwt. A steer price of $250/cwt. would result in a 12% discount of $30/cwt. and a heifer price of $145/cwt. However, heifer discounts vary seasonally as shown in figure 9. Lightweight heifers have the most seasonal variation in discount relative to steer prices with somewhat different patterns depending on weight. Seasonal variation in the heifer discount is less for the heavyweight feeder heifers.

Data

All data utilized in this analysis were reported by USDA, Agricultural Marketing Service, collected and compiled by the Livestock Marketing Information Center (LMIC, 2018). Prices represent negotiated sales of medium and large #1-2 steers, unless otherwise noted.

Summary

The cattle industry is complex and as such the markets that coordinate multiple production stages exhibit similar complexity. A thorough examination of cattle prices across the spectrum of the feeder market is provided, from lightweight calves to heavyweight feeders across time, place and form. The typical price-weight relationship is represented as a deceptively simple line graph but captures complex market coordination through changes in the height, slope and shape of the price-weight line. Dissecting the market is equally complex since separating a singular price determinant requires holding all other factors constant. First, it is shown that while prices follow a pattern during the calendar year, the pattern changes based on weight (form) and location (space). Further, common patterns that once existed are less reliable in the current market environment. Next, the relationship of prices across various weights are analyzed. The traditional price slide is dependent upon cattle price levels as well the prices of inputs (feed and/or forage) and feedlot dynamics. Finally, analysis shows that location- specific prices exhibit common trends, where Nebraska is typically the epi-center of prices, but cattle weight (form) plays a role in the magnitude of the price relationship.

The principal function of markets is to allocate resources to efficiently achieve desired levels of production. The multi-sector structure of the cattle industry, combined with the resource flexibility due to ruminant biology puts a large burden on markets to coordinate cattle production across time, place and form. Feeder cattle markets play a central role in helping the industry adjust to dynamic market conditions thereby increasing efficiency and industry competitiveness.

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