Hedging Kansas Live Cattle: Summary of Outcomes over the Past 10 Years

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Hedging

Cattle feeders have many alternatives to manage risk associated with their business. One alternative for managing the risk around the selling price of live cattle is hedging their physical cattle with a position in the futures market using the CME Group Live Cattle Contract. This paper will not give a detailed explanation of how hedging works. There are several resources for readers who want to refresh knowledge about the basics of hedging. CME Group has self-study guide <u>here</u>. There is a PowerPoint presentation available on AgManager <u>here</u>. Below is a list of terms, and their definitions, as used throughout this study.

Term	Definition for This Study				
Cash Price	Weekly weighted average price of fed steers and heifers sold via				
	negotiation, as reported under Livestock Mandatory Price Reporting				
	Reports LM_CT164 (up to 12/2017) and LM_CT157 (after 12/2017)				
Futures Price	Weekly average price for the relevant CME Group Live Cattle Contract				
Basis	The difference between cash and futures, calculated as: Cash Price –				
	Futures Price				
Expected Basis	Expected Basis for a calendar week is the simple average of basis in				
	that calendar week for previous three years.				
Expected Price	The price at which a cattle feeder expects to sell live cattle <i>when they</i>				
	are placed in the lot as feeder cattle. This will be determined in				
	different ways for the purposes of this study:				
	1) The current Cash Price for live cattle when feeder cattle are				
	placed				
	2) The current price of the relevant futures contract when feeder				
	cattle are placed				

Table 1. Key Terms and Definitions

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	3) The current price of the relevant futures contract when feeder
	cattle are placed <i>plus the expected basis for the week the</i>
	finished live cattle will be marketed
Unhedged Cash Price	Price at which finished live cattle are sold. This will be the current
	Cash Price.
Hedged Net Price	Cash Price at which finished live cattle are sold plus gains/losses from
	the futures hedge position

Outcomes of Hedging Live Cattle

In the following sections, I will compare hedged and unhedged live cattle marketing outcomes in several ways. It is important to state early on that hedging is not meant to control price level or enhance profit and it cannot. This is an essential fact to understand and it will be repeated several times in this paper and explained in more detail.

Simulated Hedges for This Study

Disciplined hedging, in the context of cattle feeding, means that as soon as a producer owns and places physical cattle on feed they establish a futures position. That position is approximately equal to the pounds of live cattle they expect to sell. The position is also opposite the physical cattle position, because the producer enters into a futures contract that requires providing ("selling") live cattle in the future. In hedging terms, the producer is short live cattle futures, as he has promised to deliver live cattle that do not yet exist. The producer holds that futures position and liquidates it immediately upon pricing the finished live cattle. In this way, the investment in the physical commodity and investment in the futures position are always offsetting each other. Producers employ various deviations and adjustments to this strategy. However, the results presented here use this strict definition of hedging.

Hedges are assumed to always be for 23 weeks (approximately 160 days on feed). There are live cattle contracts available for six months of the year: February, April, June, August, October, and December. The futures position is established in the contract which will be nearby in 23 weeks. For example, a hedge placed on January 3, 2010 will be lifted June 6, 2010. That means the June contract is the relevant futures contract. A hedge placed on February 14, 2010 will be lifted on July 18, 2010. In this case, the August contract is used. For this study, 23-week hedges were simulated from January 2010 to June 2020. There were no deviations from placing a hedge and lifting it 23 weeks later.

Price Received per Hundredweight

To give some perspective we begin with comparing prices received with and without hedging. The price without hedging is Cash Price (Table 1) in the week the live cattle are marketed. The price received with hedging is the Hedged Net Price (Table 1). This is the Cash Price plus gains/losses from the futures position. Though there are short-term exceptions, live cattle cash and futures prices trend in the same direction. Therefore, the value of physical cattle and value of a short hedger's futures position will move in opposite directions. If the price of live cattle is trending up, the physical cattle are gaining value and the futures position is losing value. In this way, the hedger gives up the chance to profit from unexpected price increases and but mitigates harm from unexpected price declines. The chart below compares hedged and unhedged outcomes.



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Hedged price is sometimes higher and sometimes lower than the unhedged price. In general, when prices are trending upward, hedged prices are lower than unhedged. The opposite is true for downward price trends. This is no surprise. However, it is worth emphasizing that hedging does not always result in lower prices received. In fact, the descriptive statistics of these price series reveal a relationship that is likely surprising to some.

Price Series Unhedged Cash Price	Average 122.96	<u>St. Dev.</u> 17.99	Minimum 84.02	<u>Maximum</u> 172.83
Hedged Net Price	122.48	17.87	85.79	171.86
Nearby Futures	121.45	17.80	84.63	170.76

Table 2. Summary Statistics of Price Series from January 2010 to June 2020

Over the ten-year period the average unhedged cash price was \$0.48 per cwt higher than the hedged price. Further, the standard deviations of the two series differ by only \$0.12 per cwt. The importance of comparing the aggregate statistics is to give a reminder that hedged prices follow the same general trends as unhedged. As shown by the chart, unhedged prices are at times higher and at times lower. In other words, hedgers avoid gains and losses. *However, the average prices received from hedged and unhedged marketing of live cattle are very similar over long time periods*. This gives some confidence that Kansas prices and the live cattle futures prices are related in the way they should be. That is, there is no obvious upward or downward bias in the hedged price, compared to unhedged.

Comparing the price levels gives some indication of how hedging works but it is not a measure of how well hedging works. *The real benefit of hedging is that it affords the hedger a greater ability to predict the net price received.* This is done by eliminating price level risk and replacing that with basis risk. With this in mind, we can compare expected price with actual price received with and without hedging.

Expected vs. Actual Price Comparisons

When placing feeder cattle, a producer should have some expectation of sale price of resulting finished live cattle. There are countless ways to achieve this. Some methods are public, such as forecasts from government or university cooperative extension services. Other methods, such as using a marketing service, are private and come at cost. In this study, we will consider only three straightforward methods for determining an expected selling price:

- 1) Cash Price at the time of feeder cattle placement
- 2) Relevant Futures Price at the time of feeder cattle placement
- 3) Futures Price at the time of feeder cattle placement + Expected Basis

Numbers 1 and 2 are scenarios with no hedging. Number 1 is a naïve expectation that prices will not change. Arguably, one could say that no producer would think this. However, it is likely that placing feeder cattle is attractive to many when live cattle prices are high and, absent another source, current live cattle prices might serve as a target for feeders. Number 2 uses relevant futures price—the price of the futures contract for the month in which finished live cattle will be sold. Note this is not the nearby contract. In the case of this study is it the 3rd or 4th deferred contract, depending on the month of placement. Academic research has found that using futures price to predict sale price is by no means perfect but performs well relative to other methods. Finally, number 3 is the method a hedger uses to calculate expected price. In this case, one needs a method to predict basis 23 weeks into the future. A straightforward way to do this is to use a three-year moving average of basis in each calendar week of the month. A basis table for Kansas is provided in the appendix of this paper as an example. Extension services regularly provide such basis tables. Some are based on three-year moving averages and others on moving averages of a different length. The weakness of these tables (and the one in this paper) is that they are based on state-level prices. They are a good starting point but producers wishing to consistently hedge are encouraged to track and record basis at the most local level possible and use those numbers.

Below are charts for each method comparing expected price to actual price received with comments.





The distance between the lines is the error of prediction. Notice that errors can be pleasant or unpleasant surprise. For example, in the bull market conditions of 2014, actual price received generally exceeded expected price. During the downturn of 2016, actual price was almost always lower than expected.





Using futures to predict expected price yields similar results to using cash to do so. It is worth mentioning that, if one statistically compares the errors between the preceding two charts, using futures to predict price turns out to be a better strategy.



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The stark difference in prediction errors¹ between hedging and not hedging is obvious in the third chart. The expected price turns out to be at times higher and at times lower. However, the magnitude of the errors is far smaller than those of the first two strategies. *This is the major benefit of hedging—producers have expected price predictions that are much more accurate and have the ability to plan ahead regarding profit/loss.* The chart above does not indicate whether a feeder could sell hedged live cattle profitably. It is simple shows that a feeder can hedge output in a way that allows more accurate prediction of actual sale price. That allows the producer to decide whether or not to place feeder cattle based on expected price. If they are placed, the hedge removes price risk and exposes the feeder to much less volatile basis risk. The feeder is free to try to increase margin by cutting costs, increasing daily gain, or any other management strategy while not being concerned about price risk.

¹ The source of prediction errors for these is hedges is simply the difference between Expected Basis and Basis at the time of marketing. The outcomes are presented as prices to demonstrate outcomes in the most relevant way.



The following table compares the summary statistics of the prediction errors. *Prediction error is defined as: Expected Price – Actual Price*. Note the implications of that definition. A negative prediction error occurs when actual selling price exceeds expected. A negative error is a good surprise. A positive error is the opposite. A positive error means actual price received is lower than expected.

Prediction Method	Average	St. Dev.	Minimum (good surprise)	Maximum (bad surprise)
Cash at Placement	-1.03	13.39	-29.95	38.61
Relevant Futures at Placement	-2.03	10.94	-42.77	34.73
Futures + Expected Basis (Hedged)	-0.61	3.11	-14.47	8.90

Table 3. Summary Statistics of Prediction Errors from January 2010 to June 2020

On average, every method's expected price is lower than actual price received. In other words, producers get a good surprise, on average. However, hedging has an error that is closer to zero, making it a more accurate predictor, on average. This is one of the many times the average does not tell the whole story. The maximum positive error (bad surprise) is highlighted. This is the largest bad surprise for the ten-year period. The worst case for hedging is an actual net price of \$8.90 per cwt less than expected. Certainly a bad surprise. Compare this to the other methods. The worst case using cash at placement to predict sale price was a positive error of \$38.61 per cwt. This is catastrophic. *In cattle feeding (or any business), average returns are important but the average hides these extremes, which an operation might not be able to survive.*

Hedging to Protect Against Catastrophic Losses

Since the futures position is (approximately) equal and offsetting to the cash position in a hedge, gains in the futures position will offset losses in the value of the physical commodity during times for price declines. In the face of severe price moves a hedge can protect a firm from possibly fatal losses. A more in-depth analysis of the bad surprises mentioned when discussing Table 3 will demonstrate this.

	Range of Positive Prediction Errors (Bad Surprises)				
Prediction Methods	0-10 \$/cwt	10-20 \$/cwt	20-30 \$/cwt	>30 \$/cwt	
Cash at Placement	113	70	44	7	
Relevant Futures at Placement	169	43	13	2	
Futures + Expected Basis (Hedged)	234	0	0	0	

Table 4. Frequency of Positive Prediction Errors January 2010 to June 2020

Table 4 reports the number of weeks actual selling price was below expected price and how far short actual price was of expected. Under the strategy of using cash price at placement to predict sale price, there were 51 weeks (out of 549) where the shortfall was greater than \$20 per cwt. Using futures to predict, the number of weeks with that shortfall is 15. In the case of hedging, the shortfall was never more than \$10 per cwt. This protection against huge losses is quite impressive, in light of Table 2. A producer avoids these extreme downturns and only sees the long-term average price level decrease by \$0.43 per cwt.

Seasonality

The previous breakdown of prediction errors was across time. It is also important to think about the seasonality of prediction errors—is it more or less difficult to hedge during a certain time of year? To do this we can look at prediction errors in a certain calendar week across years. This is a way to look for seasonal patterns in hedging prediction errors. The following chart shows the ten-year average (2010 to 2019) error for each calendar week, along with the most positive (worst surprise) and most negative (best surprise) observed in each week. One graph should not be considered rigorous statistical analysis but it is encouraging that no overwhelming patterns emerge. That is reassurance that hedging Kansas cattle works the same all year. In general, it seems that the latter half of the year has a tighter range between extreme errors than the first half. Keep in mind the 23-week feeding period assumed in these simulated hedges. Cattle being marketed in week 40, were placed in week 18 and the hedge was set at placement. Calendar week 18 had extreme values in 2017 and 2018 and these markedly impact the

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average. This is partially a function of how the timing of hedges is set up for this study. Week 18 is sometimes the end of April, in which case a hedge is being lifted at expiration of the April contract. Other years, it is the first week of May, in which case a hedge is being lifted 8 weeks from expiration (of the June contract). This disparity likely drives the range of errors for week 18. It is a reminder that, a hedger must be mindful to use a basis prediction carefully and ensure that it corresponds to the contract that will be used in the hedge.



Two Brief Case Studies of Extreme Price Declines

Finally, we will look at two recent situations where live cattle prices decreased quite rapidly and unexpectedly: 1) the fire at the Holcomb, KS plant in 2019 and 2) the COVID-19 pandemic of spring 2020. This will allow a realistic look at how hedging functions in extreme situations.



August 2019: Fire at a Major Packing Plant

On August 9, 2020 there was a fire at the Tyson beef plant near Holcomb, KS. The details of the fire and surrounding problems were well-publicized and I leave it to the reader to learn more about the situation from other sources should they wish to do so. The relevance of the fire to this study is that the sudden closure of a major beef packing plant (the Holcomb plant was estimated to have been responsible for 5-6% of total US slaughter) resulted in sudden decreased demand for live cattle. That, in turn, depressed prices severely. Zooming in on the earlier chart of hedged vs. unhedged prices shows just how severe the shock was. The orange line labeled "Unhedged Cash Price" is the average price for fed steers and heifers in Kansas during the time period. The shock occurs in August and I include July on the graph to show how dramatic it was. I include all of October as it seems that, by then, cash prices rebounded to roughly pre-fire levels.



Hedges are 23 weeks with no selective criteria

Data Sources: USDA AMS and CMEGroup data compiled by LMIC

At the beginning of August 2019, cash prices were at \$110.99 per cwt and fell to a low of \$99.45 per cwt in mid-September. Hedged prices, on the other hand, stayed between \$115 and \$120 per cwt during the time. The reason being that a systemic shock, like the plant fire, also caused futures prices to plummet. Short hedgers realized an increase in their futures positions during those weeks, offsetting the drop in cash prices. In fairness, the sharp decrease in hedged price during October must also be considered. During this time futures prices rallied faster than cash, so hedgers did not fare as well in those few weeks. During the 17-week period shown on the graph, the average unhedged price was \$106.79 per cwt and the average hedged price was \$116.66 per cwt.

The magnitude of the losses avoided by hedging could also be considered on a per-head basis. The value of gain is the payment a feeder receives for transforming a lighter animal into a finished animal. For this study, value of gain was calculated as follows. Assume an 800-pound feeder calf was purchased at the price listed in that week's CME Group Feeder Cattle Index.² Assume the calf gains an average of 3.25 pounds per day over the next 23 weeks (161 days) and is marketed as a 1,323.25-pound finished animal at the current prices. Hedged and unhedged definitions remain the same. The finished animal is either marketed at the Cash Price or Net Hedged Price received.

² The Feeder Cattle Index is a composite of 600 to 899-pound calves sold at several auction across the country. It is not specific to Kansas.





Average hedged value of gain was \$390.59 per head over the period, compared to unhedged value of gain of \$267.20 per head. The widest difference in September saw the gap between the two measures at greater than \$200. As with earlier analysis, this measure communicates nothing about profitability as no feed, vet med, yardage, or other costs are considered.

This is also an opportunity to look at prediction errors during an extreme time. The next chart shows the prediction errors (Expected Price – Net Price Received) for hedgers during the time period of the Holcomb fire.



Even in such an unprecedented and disruptive time, errors stayed in a window of -\$3 to \$3 per cwt. The prediction errors during the futures rally of October 2019 were indeed unfavorable to hedgers. However, those of August and September were generally favorable.



This brief case study of the Holcomb fire situation is meant to show how hedging can protect against catastrophic losses. Please note that this analysis assumes that a producer could sell live cattle at the prevailing cash prices during the time period. There may have been localized instances where feeders were unable to do so for a week or more. In those cases, producers faced extremely difficult circumstances and complexities that this study does not address.



Spring 2020: COVID-19 Disruptions

It is difficult to comprehend the total impact of the COVID-19 pandemic on agricultural and food markets in 2020. The turbulence in live cattle and beef markets was at historic levels and those in the sector will continue to deal with repercussions for some time. For the purposes of this study, we will focus on hedged and unhedged live cattle prices during spring of 2020. The next chart reports the prices received under cash sales versus the 23-week hedging regime described earlier. To be clear, this is a narrow section of the first chart in this paper.



When it became clear that COVID-19 conditions would cause many meat packing plants to close completely or drastically reduce production, markets reacted to the expected decrease in demand for live cattle. There were likely many other factors at play, but the plant closures were a major concern. This systemic shock caused cash and futures prices to decline. In this case, short hedgers saw gains in

futures position to offset the cash declines. This example is extreme, to say the least. Net price received for hedged cattle remained over \$130 per cwt during May. That is because these hedges were placed during the early part of 2020, when cash and futures prices were very strong. Notice that Hedged Net Price began to trend downward in June. As mentioned earlier, this is no surprise as live cattle price levels, in general, declined. However, hedging still provided protection against the catastrophic losses of these sharp declines.

Using the same feeder cattle and average daily gain assumptions as in the Holcomb case study, we can compare hedged and unhedged value of gain for the spring of 2020. Here the difference in hedged and unhedged were, at one point, was over \$400 per head. For the 22 weeks shown on the chart, hedged value of gain was \$221 per head higher than unhedged, on average.



Hedges are 23 weeks with no selective criteria

Assuming 800 lbs at placement and 3.25 lbs per day gain over 161 days Data Sources: USDA AMS and CMEGroup data compiled by LMIC



The prediction errors in the case of spring 2020 are larger than those of the fall 2019 case. Basis was at historic positive levels. So, using the three-year average basis to predict price was not very accurate. In the spring of 20202, though, the prediction errors were good surprises as actual price was above expected price.



Futures price is weighted average five-area negotiated live steers and heiters Futures price is weekly average of the relevant CME Live Cattle contract Hedges are 23 weeks with no selective criteria Data Sources: USDA AMS and CMEGroup data compiled by LMIC



Limitations

This paper gives an overview of ten years of simulated hedging outcomes for Kansas live cattle. Constructing a price series based on uniform hedges allows comparison of hedged prices to unhedged prices. The degree to which hedgers can more accurately predict final net price was also demonstrated. This is because predicting a hedged outcome is subject to basis risk, which is less volatile than price risk. All of this analysis shows the clear advantages of hedging using state-level data. This approach, though helpful, also has some limitations for practitioners wishing to hedge sale of live cattle. Here is a list of what I consider to be the most important limitations of this study, in no particular order.

- A hedger will be most successful by understanding basis at the most local level possible. State-level basis measures offer a guide and starting point but hedgers should implement a system to collect and store local cash prices to understand local basis.
- The hedged prices and value of gains were generated as a continuous weekly series, to allow comparison with unhedged measures. This approach is effective at big picture comparisons and examining hedging live cattle in Kansas at the state level. Producers will want to take care to adjust to specific situations. For example, if feeder only markets finished cattle in May and October every year, then attention should be given to those months. Similarly, the approach used here reports average benefits of hedging. I have tried to add to that by showing distributions of prediction errors. However, it is good to remind practitioners that these benefits are realized over time. A single hedge in a given year should never be used to evaluate a risk management strategy.
- This study ignores broker fees. There are a range of broker services available, ranging from access to electronic platform where the hedger makes all decisions to a full-service approach where the broker consults with the hedger and develops a plan. Commissions can vary widely and prospective hedgers should understand what they are getting for their commission fees and what other options are available.
- This study did not mention margin requirements. For futures contract entered into, a hedger must maintain a certain amount capital in a broker account as a margin. Nearby live cattle contracts currently have a margin requirement of \$2,500 per contract. A contract will hedge the sale of about 30 head of live cattle. If a short hedger's futures position reaches a certain level negative equity due

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to rising futures prices, more capital must be placed in the account the maintain the margin. Once the hedge is lifted, the hedger gets the money in the margin account back. If the futures position is lifted with negative equity the margin capital can go toward paying that. If the futures position closes with a positive equity, the hedger receives all margin contributions back. Financing margin accounts is a critical aspect of a hedging program. *Prospective hedgers should talk with their broker and lender and develop a plan for financing margin requirements.*

• A hedger can experience the problem of slippage, if attempting to sell several contracts at one time. Basically, even though a hedger puts in an order to sell several contracts at the same time, the contracts may get filled at different prices. Since the hedger is selling, the fill price from one contract to another might decrease. That means some contracts will target a lower predicted price than others.

None of these limitations negate the lessons learned from the ten years of simulated hedges. Neither are the limitations reasons not to hedge. They are real-world concerns that hedgers should consider carefully when building a risk management plan.



Append	ix 1
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Three-Year Moving Average Basis in \$/cwt						
Cash = We	eighted Avera	ge of Cash No	egotiated Stee	rs and Heifer	s in Kansas	
Futures =N	Nearby CME	Group Live C	Cattle Contrac	et		
Calendar						
Week	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
1	-1.358	-0.705	0.403	0.852	0.381	0.827
2	-0.665	0.539	1.801	1.282	0.406	0.895
3	0.244	1.983	4.229	3.899	2.237	0.305
4	-0.206	2.593	5.569	5.003	3.266	0.690
5	-0.711	1.979	4.134	4.175	2.324	0.542
6	-1.094	1.947	2.568	3.270	0.903	0.507
7	-0.827	-0.290	1.238	2.260	1.893	0.845
8	-0.0799	0.481	0.634	1.339	0.421	-0.214
9	0.0902	0.200	0.640	2.863	3.536	3.045
10	1.094	3.515	3.650	5.073	3.706	3.564
11	0.959	3.092	3.513	5.219	4.895	4.501
12	1.756	3.696	3.521	4.696	4.728	4.798
13	2.574	3.131	2.679	3.125	4.072	3.876
14	2.156	2.871	2.426	3.588	3.575	2.995
15	2.297	1.973	1.896	2.011	2.849	1.922
16	0.838	0.925	1.223	1.809	2.374	1.520
17	1.422	1.057	0.799	1.498	1.617	1.224
18	6.635	7.897	5.623	8.310	11.75	14.85
19	5.877	7.983	9.280	10.55	12.09	11.60
20	6.142	7.176	8.608	9.707	10.73	9.446
21	3.979	6.104	7.854	8.671	7.295	5.413
22	4.282	5.503	6.587	7.822	7.098	6.427
23	3.812	3.273	4.868	4.633	6.370	6.001
24	1.570	1.117	2.917	3.819	5.355	3.843
25	0.513	0.218	1.426	1.226	1.742	1.071
26	0.727	-0.0537	0.404	-0.985	-0.407	-0.678
27	0.129	0.893	4.565	3.644	5.544	4.111
28	-0.610	0.717	4.212	3.867	5.583	
29	-0.444	1.422	4.491	3.553	4.840	
30	0.140	1.840	4.426	2.943	3.908	
31	0.229	1.495	3.090	2.438	3.383	
32	0.618	1.311	2.101	2.429	2.539	
33	1.101	1.504	2.553	1.456	1.963	
34	0.649	0.578	1.848	1.526	1.647	•
35	1.610	0.821	1.721	0.898	-0.114	



						Continued
Calendar						
Week	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
36	0.545	1.735	4.371	1.928	0.926	
37	0.255	-0.362	1.348	-0.0894	0.526	
38	0.427	-0.477	1.292	-0.210	-0.0130	
39	-0.0402	-1.395	-1.100	-1.894	-1.199	
40	0.590	-1.451	-1.655	-1.628	-0.839	
41	0.337	-0.166	-0.473	-0.774	-1.122	
42	0.551	0.847	0.863	0.961	-0.360	
43	1.003	-0.00376	0.411	1.168	2.177	
44	-0.927	-1.426	-0.560	-0.158	-0.177	
45	-0.367	-1.554	-0.917	-0.999	-0.0984	
46	0.302	-0.213	0.703	-0.517	-0.160	
47	0.0917	-0.541	0.274	-0.399	0.477	
48	-0.0325	-0.475	0.214	-0.509	1.332	
49	-0.734	-1.299	0.547	0.732	2.463	
50	-0.545	-0.612	0.0700	0.666	1.436	
51	-2.444	-2.246	-1.353	-0.431	0.0462	
52	-1.021	-1.810	-0.997	-0.676	1.051	•

Three-Year Moving Average Basis in \$/cwt Cash = Weighted Average of Cash Negotiated Steers and Heifers in Kansas Futures =Nearby CME Group Live Cattle Contract

This basis table was constructed using a three-year moving average. The resulting averages are reasonable predictions for basis in a given year. For example the entire column labeled 2017-2019 is the average of each week's basis across 2017, 2018, and 2019. These values would be used to predict basis in 2020. This approach works better in some years than others but is one of the most straightforward ways to arrive at basis predictions. Hedgers are encouraged to take such averages as starting points and adjust, as possible, to local basis.

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