Chapter 4
Basis Considerations for LRP Insurance

In this chapter, you will learn:

- how LRP basis differs from traditional futures basis;
- why fed cattle and swine LRP basis are less variable than futures basis; and
- why feeder cattle LRP basis variability is similar to futures basis variability.

4.1 Introduction

In the first three chapters, LRP insurance, as a livestock price hedging instrument, was compared to using options contracts. As a hedging alternative, it is important to compare and contrast LRP with traditional futures and options hedging, and many similarities and differences have already been addressed. A general overview of LRP insurance was provided in the first two chapters of this course. Additionally, some specific underwriting rules and provisions along with limitations, advantages, and disadvantages imposed by those rules were covered. Chapter 3 discussed the mechanics of LRP including how to locate Coverage Prices and premiums, how Actual Ending Value (AEV) is determined, and how to calculate premium costs for LRP. This chapter examines basis risk associated with LRP insurance and compares it to the basis risk associated with futures and options hedges. Also, the differences between LRP basis and futures basis will be discussed for fed cattle, feeder cattle, and swine LRP.

4.2 LRP Basis vs. Futures Basis

When using CME put options or futures contracts to protect against price level changes, hedgers remain exposed to basis risk, a change in the difference between their local cash price and futures price[1]. However, hedging is an effective risk management strategy because, on average, basis is much less variable than price. Hedging eliminates price risk, or the risk that futures prices will decrease, but it does not eliminate basis risk. As a result, livestock producers using futures or options to hedge selling prices often use historical basis data to forecast expected basis and cash selling prices for future livestock sales. Similar to using futures or options, cattle producers using LRP insurance to hedge sales prices are also exposed to a type of basis risk. However, the difference between producers' selling price and futures price, or *futures basis*, is not relevant when using LRP. Instead, the difference between the producers' selling price and the cash price index used to determine AEV, or *LRP basis*, is used to calculate the expected selling price for future sales of livestock. Changes in the relationship between a producers' cash sale price and the AEV (i.e., changes in the LRP basis) will determine whether the actual selling price resulting from the LRP hedge is equal to the expected selling price. Consequently, forecasting LRP basis is important when hedging with LRP.

In general, when hedging with futures or options contracts, a producer would calculate an expected selling price (ESP) for the livestock. ESP is calculated by adding the basis expected at the time the livestock will be sold to the price level hedged with the futures or options contracts. For example, assume Joe Farmer expects to sell fed cattle in September and hedges a price level of $85.00/cwt by selling October CME Live Cattle futures contracts. Joe determines from his state's Extension service that the historical futures basis for September for his area is -$2.00/cwt (the cash market price is expected to be $2.00/cwt under the October CME Fed Cattle contract price in September). Joe's expected selling price for the fed cattle is $83.00/cwt (not including commission or brokerage fees associated with the futures trades). When Joe actually sells the cattle in September, his actual selling price (ASP) will be equal to $85.00/cwt plus the actual basis in September. If the actual basis is -$2.00/cwt as expected, then his ASP will equal ESP at $83.00/cwt. If actual basis in September turns out to be stronger than expected at -$1.00/cwt, ASP would be higher at $84.00/cwt. Conversely, if actual basis is weaker than his expectation at -$3.00/cwt, ASP would be lower at $82.00/cwt. When hedging with futures contracts, the ASP only deviates from ESP by basis being weaker or stronger than expected. When hedging with options, producers are still exposed to the same type of basis risk—ASP can be higher or lower if basis is stronger or weaker than expected. However, options hedges can have a higher ASP if prices increase because options allow hedgers to participate in price rallies.

In much the same way, hedging with LRP requires an understanding of how basis will affect the outcome

[1] University of Nebraska-Lincoln Extension Circulars EC04-833, EC04-834, and EC04-835, covering hedging and basis considerations for swine, fed cattle, and feeder cattle LRP insurance, are available online at **www.lrp.unl.edu**. They provide a review of futures and options hedging as well as historical LRP basis data that can be used to make basis predictions when hedging with LRP.

of a hedge. Keep in mind that LRP provides a price floor or minimum expected selling price (MESP—similar to a put option hedge) that can be calculated by subtracting premium cost from the Coverage Price and then adding basis. If AEV is less than the Coverage Price on the end date of the coverage endorsement, an indemnity will be paid in the amount of the difference. When this happens, ASP will be equal to MESP if the actual basis is the same as the forecasted basis.

To illustrate this, assume Joe Farmer has hogs he intends to sell near the end of July and he purchases LRP insurance with a Coverage Price of $66.41/cwt. The premium for the insurance is $1.65/cwt (after subsidy). Joe expects LRP basis (the difference between his local cash market price and the CME Lean Hog Index) to be about $1.00/cwt at the end of July. (This expectation is based on historical data which are reported in UNL Extension Circulars EC04-833, 834, and 835 located online at **www.lrp.unl.edu**). Therefore, Joe's MESP is $65.76/cwt ($66.41/cwt less $1.65/cwt plus $1.00/cwt). Now assume that when coverage ends and Joe sells his hogs, AEV is $62.41/cwt, but Joe's LRP basis is $1.00/cwt as expected. He will receive a cash price of $63.41/cwt (AEV + $1.00/cwt basis) plus a $4.00/cwt indemnity payment. As a result, his ASP is $65.76/cwt (cash price of $63.41/cwt plus $4.00/cwt LRP indemnity less $1.65/cwt LRP premium). Because Joe's basis forecast was correct and prices decreased, ASP was equal to MESP. If LRP basis had strengthened, Joe would have received a higher cash price in his local market (the AEV would be unchanged), and his ASP would have been higher than MESP. For example, if LRP basis turned out to be $3.00/cwt, Joe's ASP would be $67.76/cwt ($65.41/cwt plus $4.00/cwt less $1.65/cwt). Conversely, if LRP basis had weakened, Joe would have received a lower cash price and ASP would have been lower than MESP. If basis had been at -$1.00/cwt, Joe's ASP would be $63.76/cwt ($2.00/cwt lower than MESP) because his cash price would be $2.00/cwt lower than his forecast. If prices had increased and AEV was higher than the Coverage Price on the end date (assuming actual basis equaled forecasted basis), ASP would be higher than MESP. However, LRP basis risk is still present in that an LRP basis weaker (stronger) than forecasted will decrease (increase) the ASP even when AEV is above the Coverage Price.

From this discussion, it is apparent that basis risk is an important consideration for hedging both with futures or options contracts and with LRP insurance. However, LRP basis is generally more advantageous for Nebraska producers because Nebraska cash market prices are weighted relatively heavily into the cash price indexes used to determine AEV. In other words, LRP protection is based on prices closer to typical Nebraska selling prices. In general, the result is lower basis variability, or risk that basis will vary from an expected future value. Reduced basis risk means it is easier for a producer to more accurately forecast expected selling prices for future livestock sales. This allows for financial planning and protection of break-even sale prices because ESP is a general expectation of gross revenue. By calculating ESP, budgetary decisions can be made with more confidence and precision. The next three sections will discuss LRP basis for fed cattle, swine, and feeder cattle.

4.3 Fed Cattle LRP Basis

Fed Cattle AEV is determined by the 5-Area Weekly Weighted Average Direct Slaughter Steer Price for steers grading 35 percent to 65 percent choice sold FOB on a live weight basis. Recall from Section 3.4 that the 5-Area price includes cash prices from Texas/Oklahoma, Kansas, Colorado, Iowa/Minnesota, and Nebraska. Nebraska prices, then, are weighted relatively heavily into calculating the 5-Area price. As a result, the AEV closely follows the Nebraska cash market. *Figure 4.1* shows futures basis and LRP basis for Nebraska fed steers from January 2000 to January 2005. As the graph shows, LRP basis is fairly close to zero meaning there is little difference between the Nebraska cash price and the 5-Area price. Also, LRP basis is quite stable—its range is relatively narrow and fluctuations small. Futures basis, however, shows much more variability in that it experiences a wider range and greater fluctuations than LRP basis. For example, prior to September 2003 when atypical market conditions caused unusual cash price increases, LRP basis ranged from about $2.00/cwt to -$2.00/cwt while futures basis ranged from about $5.00/cwt to -$5.00/cwt. When futures basis peaked in October 2003 at $13.24/cwt, LRP basis was much smaller at $5.32/cwt. Likewise, when futures basis reached a minimum of -$7.52/cwt, LRP basis was at -$2.99/cwt.

Table 4.1 summarizes statistics for LRP basis and traditional futures basis for Nebraska direct steers and heifers from January 2000 to January 2005. The mean LRP basis for Nebraska fed steers of $0.07/cwt indicates that, on average, the Nebraska direct steer price is $0.07/cwt higher than the 5-Area price. The Nebraska fed heifer price averaged $0.16/cwt higher than the 5-Area price from January 2000 to January 2005 (during this time the Nebraska fed heifer price averaged $0.09/cwt higher than the Nebraska fed steer price). The mean steer and heifer LRP basis was $0.36/cwt and $0.37/cwt higher than the traditional nearby futures basis, respectively. The range in LRP basis from January 2000 to January 2005 was about one-third to

one-half of the range in futures basis. Standard deviation is a measure of variability, and a higher standard deviation for basis is associated with more variability and increased difficulty in forecasting the basis for a future date. As shown in *Table 4.1*, the standard deviation for Nebraska steer and heifer LRP basis is considerably lower than for futures basis, indicating that LRP basis is less variable (more predictable) about its mean. There is a reduction in standard deviation of more than 60 percent when using LRP basis relative to futures basis for both fed steers and heifers.

Figure 4.2 shows seasonal Nebraska LRP basis from 2001 to 2005. The graph shows that average LRP basis in Nebraska is typically weak early in the year and increases through spring, peaking in May. It is expected that basis would weaken through the second half of the year, eventually reaching a low in December. However, as the graph shows, average basis remained strong, ranging from $0/cwt to $1.00/cwt through most of the second half of the year. The reason for this disparity is that in the fall of 2003, cattle markets reached historically high prices and basis was also much stronger than usual. The maximum line shows the unusually strong basis from 2003. The average, then, is likely higher than what would be typical because it incorporates these outliers.

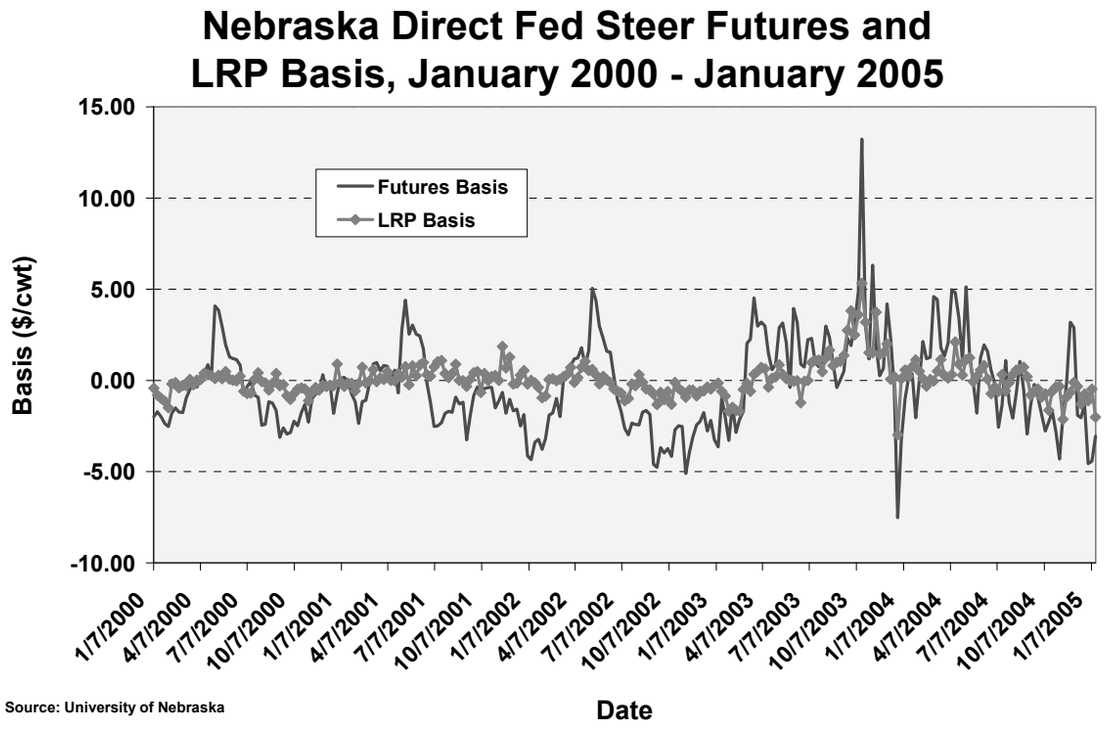


Figure 4.1

Table 4.1. Nebraska Direct Steer and Heifer LRP Basis and Futures Basis Summary Statistics, January 2000-January 2005.

	LRP Basis ($/cwt)	Futures Basis ($/cwt)	LRP Basis ($/cwt)	Futures Basis ($/cwt)
	Steers		*Heifers*	
Mean	0.07	-0.29	0.16	-0.21
Minimum	-2.99	-7.52	-2.34	-4.85
Maximum	5.32	13.24	4.17	12.09
Standard Deviation	0.94	2.46	0.82	2.29

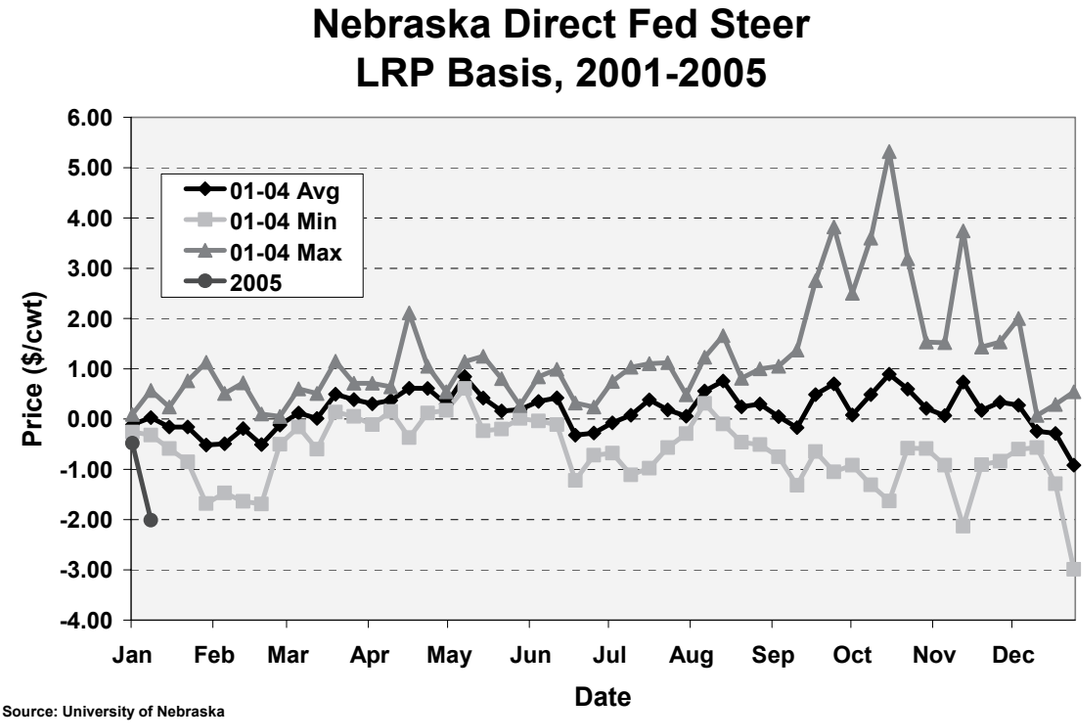


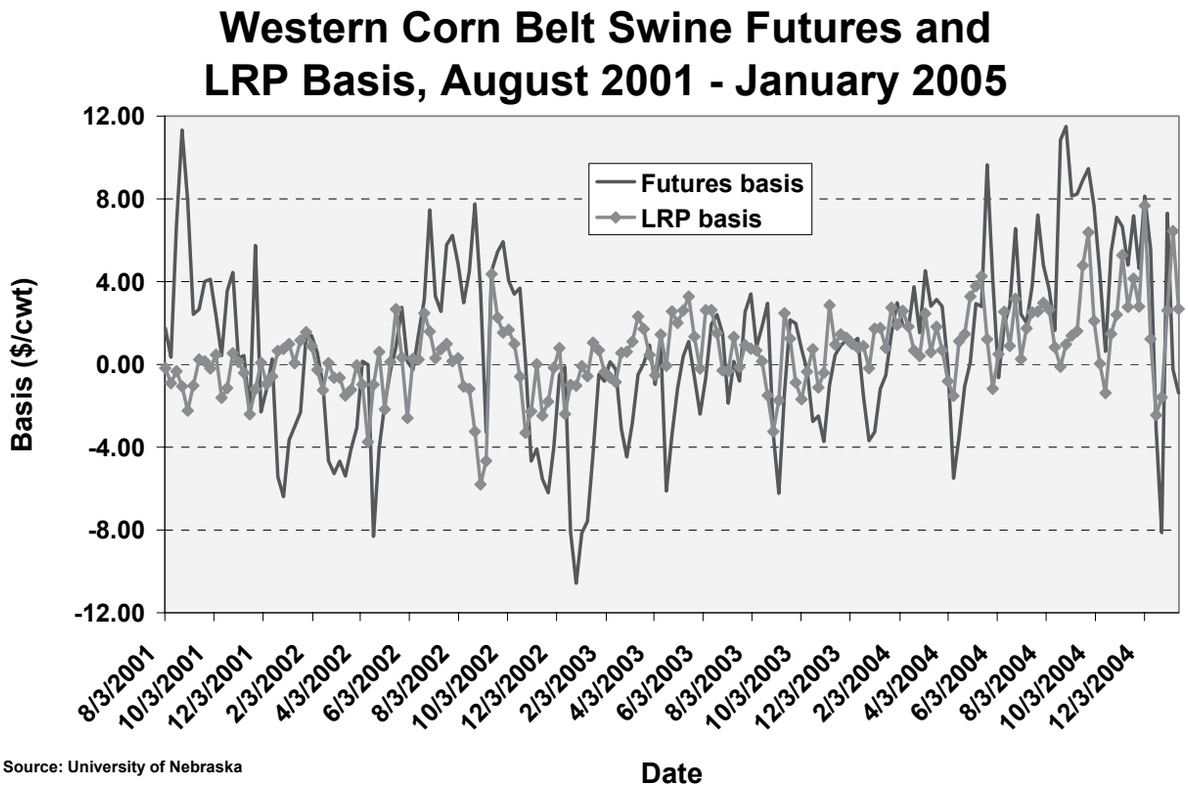
Figure 4.2

4.4 Swine LRP Basis

Swine LRP basis is also generally more stable and has less variation than futures basis. Swine LRP is indemnified on the CME Lean Hog Index which represents an average national cash price. *Figure 4.3* shows futures and LRP basis for Nebraska producers from August 2001 to January 2005 (LRP basis is calculated using Western Corn Belt [WCB] prices which are generally representative of Nebraska prices[2]). *Figure 4.3* indicates that LRP basis is generally more stable and closer to zero than futures basis. Futures basis ranges from about $11.00/cwt to -$11.00/cwt while LRP basis typically ranges from about $4.00/cwt to -$4.00/cwt. In addition, changes in futures basis tend to be more extreme than changes in LRP basis. This means AEV tracks more closely to WCB prices (and, therefore, Nebraska prices) than the futures market. This is in large part because the CME index price (used to determine AEV) includes in its weighted average prices for hog sales made in the WCB. This is also true for other price series including Eastern Corn Belt, Iowa/Southern Minnesota, and national price series. Another important factor is that hogs are a fairly uniform commodity—there is little substantive difference between hogs grown in Nebraska versus hogs grown in Illinois or North Carolina. Therefore, hog prices are fairly equivalent across different parts of the country. With somewhat consistent prices across the country, the index of hog prices tends to be relatively stable and representative of most hogs. Still, there is not always a one-to-one correspondence between the WCB and the CME index, so WCB average hog LRP basis changes.

Table 4.2 reports summary statistics for LRP basis and traditional futures basis for hogs using the WCB price series as well as Iowa/Southern Minnesota (IA/S. Minn.), Eastern Corn Belt (ECB), and national base and net price series from August 2001 to January 2005. The mean LRP basis for the WCB average hog price of $0.57/cwt indicates that, on average, the WCB average hog price is $0.57/cwt higher than the CME index. Relative to the CME index, the base price series are lower than the average price series (i.e., the base price series result in a weaker basis) because the average price series include quality premiums/discounts which are typically positive (the base price series does not include premiums). The mean LRP basis for all the price series was about $0.34/cwt lower than the traditional nearby futures basis. They all vary by the same amount because they are calculated based on the same AEV and futures prices, which are the same for all the regional price series. The range in LRP basis was substantially smaller than the range in futures basis. Like fed cattle basis, swine LRP basis is much less variable, as measured by standard deviation, than futures basis meaning LRP basis is easier to accurately predict. Standard deviation for LRP basis is less than half of standard deviation for futures basis for all the "Average" or "Net" price series and slightly over half

[2] University of Nebraska Extension Circular EC04-833, *Hedging and Basis Considerations For Swine Livestock Risk Protection Insurance,* reports historical LRP basis data for other price series including Eastern Corn Belt, Iowa/Southern Minnesota, and national prices.



Source: University of Nebraska

Figure 4.3

Table 4.2. Swine LRP Basis and Futures Basis Summary Statistics, August 2001-January 2005.

Hog Price Series	Mean	Minimum	Maximum	Standard Deviation
	($/cwt)	*($/cwt)*	*($/cwt)*	*($/cwt)*
WCB Base				
LRP Basis	-2.68	-17.07	2.58	2.36
Futures Basis	-2.33	-23.60	8.42	4.36
WCB Average				
LRP Basis	0.57	-5.80	7.67	1.93
Futures Basis	0.91	-10.58	11.50	4.20
IA/S. Minn. Base				
LRP Basis	-2.81	-17.02	2.63	2.53
Futures Basis	-2.46	-23.56	8.29	4.58
IA/S. Minn. Average				
LRP Basis	0.51	-5.62	6.68	1.88
Futures Basis	0.85	-10.57	11.86	4.20
ECB Base				
LRP Basis	-3.24	-19.93	-0.19	2.26
Futures Basis	-2.90	-23.32	9.22	4.25
ECB Average				
LRP Basis	-0.41	-6.21	2.59	1.44
Futures Basis	-0.07	-10.27	11.97	4.00
National Base				
LRP Basis	-2.22	-6.36	2.52	1.73
Futures Basis	-1.88	-10.33	10.37	3.67
National Net				
LRP Basis	0.27	-3.97	5.79	1.82
Futures Basis	0.62	-8.16	12.94	3.67

for the "Base" price series. This indicates a significant reduction in basis risk when using LRP basis relative to futures basis.

Figure 4.4 shows seasonal swine LRP basis patterns. The LRP basis is fairly constant through the first part of the year at around $1.00/cwt before increasing in mid-April and peaking in May at about $4.00/cwt. Then it decreases through the summer before reaching a low of about -$3.00/cwt near the end of August. LRP basis then strengthens through the end of the year. As with fed cattle, the average basis for the fall is likely abnormally high because of unusually strong basis between August and December 2004.

4.5 Feeder Cattle LRP Basis

Producers selling feeder cattle in Nebraska do not experience the same reduction in LRP basis variability relative to futures basis as those selling fed cattle and hogs. *Figure 4.5* shows futures and LRP basis for 700 to 799 pound steers for Nebraska from January 2001 to January 2005. Both futures and LRP basis are positive in Nebraska and vary substantially, indicating that, on average, Nebraska cash prices are higher than both AEV and feeder cattle futures. One factor contributing to the variation between Nebraska feeder cattle prices and national average prices is that the national price includes sales from many different parts of the country.

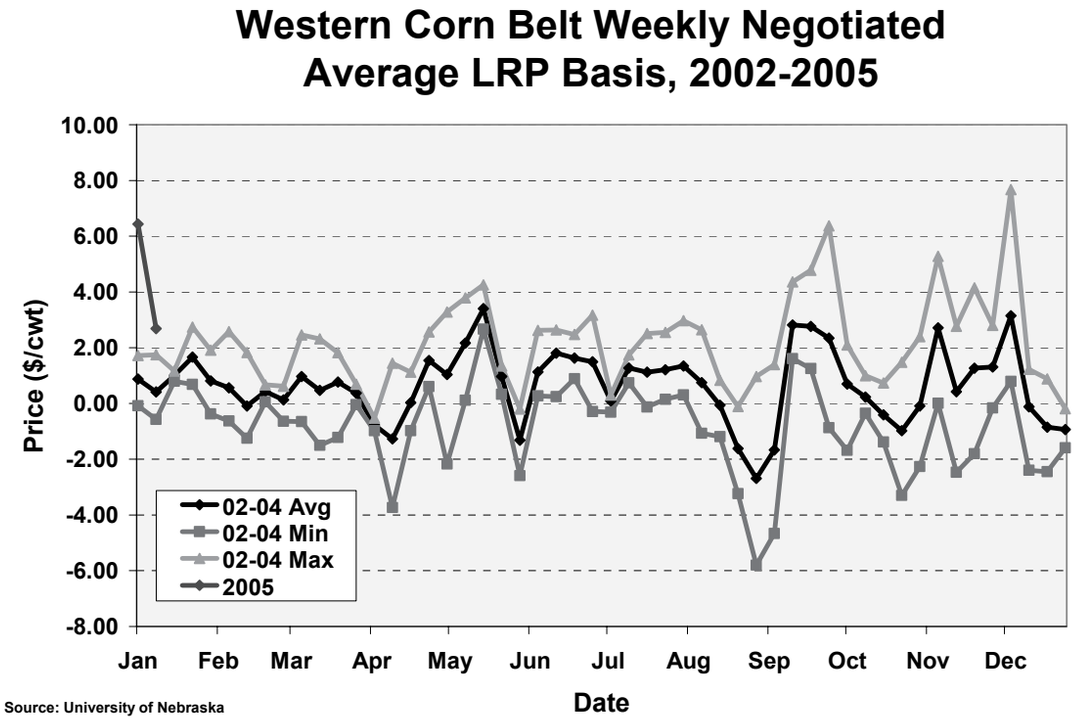


Figure 4.4

Furthermore, unlike hog sales, much variation in quality exists in feeder cattle markets, and as a result, there can be significant differences in feeder cattle prices from various parts of the country. Therefore, although the national cash index is generally representative of Nebraska prices, there is still significant variation between the two.

Table 4.3 reports summary statistics for LRP basis and futures basis for Nebraska feeder steers and heifers weighing from 500 to 900 pounds in 100-pound increments from 2002 to 2004. The mean LRP basis for Nebraska 700 to 800 pound feeder steers of $4.44/cwt indicates that, on average, the Nebraska 700 to 800 pound feeder steer price is $4.44/cwt higher than the CME feeder cattle cash index (LRP AEV). The stronger LRP and futures basis for 600 to 700 pound feeder steers is a reflection of higher cash prices paid ($/cwt) for lighter animals. For corresponding weight categories, steer futures basis is stronger than heifer futures basis due to higher cash prices paid for steers as a result of better feeding performance (e.g., average daily gain, feed efficiency). The substantially lower LRP basis for 500 to 600 pound steers relative to futures basis is a result of the 110 percent price adjustment factor applied to AEV (see Section 3.5). Similarly, the heavier weight feeder heifer LRP basis averages are higher than the futures basis due to the 90 percent price adjustment factor. Additionally, the range observed for LRP basis versus futures basis varies. For some weight and sex categories, it is slightly smaller for LRP basis while in others, the range in futures basis is smaller. Variability in basis, again measured by standard deviation, was slightly smaller for LRP basis than for futures basis for all steer and heifer weight categories except 500 to 600 pound steers. This suggests that LRP basis is slightly less variable (i.e., slightly easier to predict) than futures basis. However, the difference in variability between LRP and futures basis is relatively small for feeder steers and heifers in comparison to the differences in LRP and futures basis variability for fed cattle and swine. Essentially, the decrease in basis risk when hedging with LRP versus futures contract is negligible for feeder cattle.

Figure 4.6 shows the seasonal trend for 700 to 799 pound feeder steer LRP basis in Nebraska. Seasonally, LRP basis is lowest in the winter months (November to February). It strengthens through the spring and reaches a maximum level in May before declining through the summer and fall months. The minimum LRP basis is generally around $1.00/cwt in November while the highest is about $8.00/cwt in May. For 500 to 599 pound feeder steers in Nebraska, LRP basis increases through the first part of the year and peaks in late March. Basis then decreases through the middle of the year and reaches a low in October before rising again through the end of the year[3].

[3]Seasonal basis trends for various weights of feeder steers and heifers in Nebraska are reported in University of Nebraska-Lincoln Extension Circular EC04-835, *Hedging and Basis Considerations For Feeder Cattle Livestock Risk Protection Insurance.*

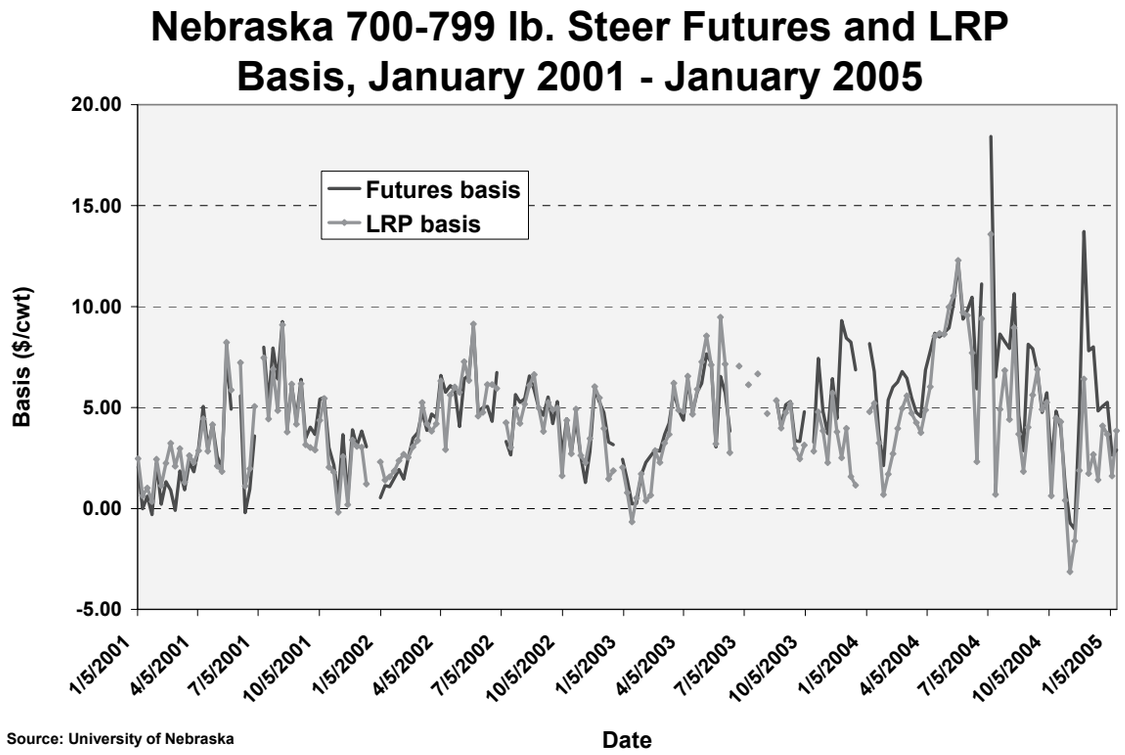


Figure 4.5

Table 4.3. Nebraska Feeder Steer and Heifer LRP Basis and Futures Basis Summary Statistics, January 2002-December 2004.

Feeder Cattle Price Series	Mean	Minimum	Maximum	Standard Deviation
	($/cwt)	*($/cwt)*	*($/cwt)*	*($/cwt)*
500-600 lb. Steer				
LRP Basis	9.56	-5.65	23.08	7.02
Futures Basis	19.60	5.74	36.23	6.97
600-700 lb. Steer				
LRP Basis	10.19	1.30	21.75	4.13
Futures Basis	11.07	1.74	26.60	4.34
700-800 lb. Steer				
LRP Basis	4.44	-3.13	13.58	2.62
Futures Basis	5.32	-1.02	18.43	2.77
800-900 lb. Steer				
LRP Basis	0.03	-7.88	7.18	2.38
Futures Basis	0.92	-7.43	12.03	2.84
500-600 lb. Heifer				
LRP Basis	9.02	-1.37	18.96	5.08
Futures Basis	9.93	-1.54	20.43	5.35
600-700 lb. Heifer				
LRP Basis	11.63	3.10	18.55	3.21
Futures Basis	3.39	-5.14	11.73	3.36
700-800 lb. Heifer				
LRP Basis	7.31	-0.53	18.34	2.48
Futures Basis	-0.93	-9.15	8.10	2.59
800-900 lb. Heifer				
LRP Basis	4.03	-7.67	11.32	2.52
Futures Basis	-4.19	-18.15	3.41	2.71

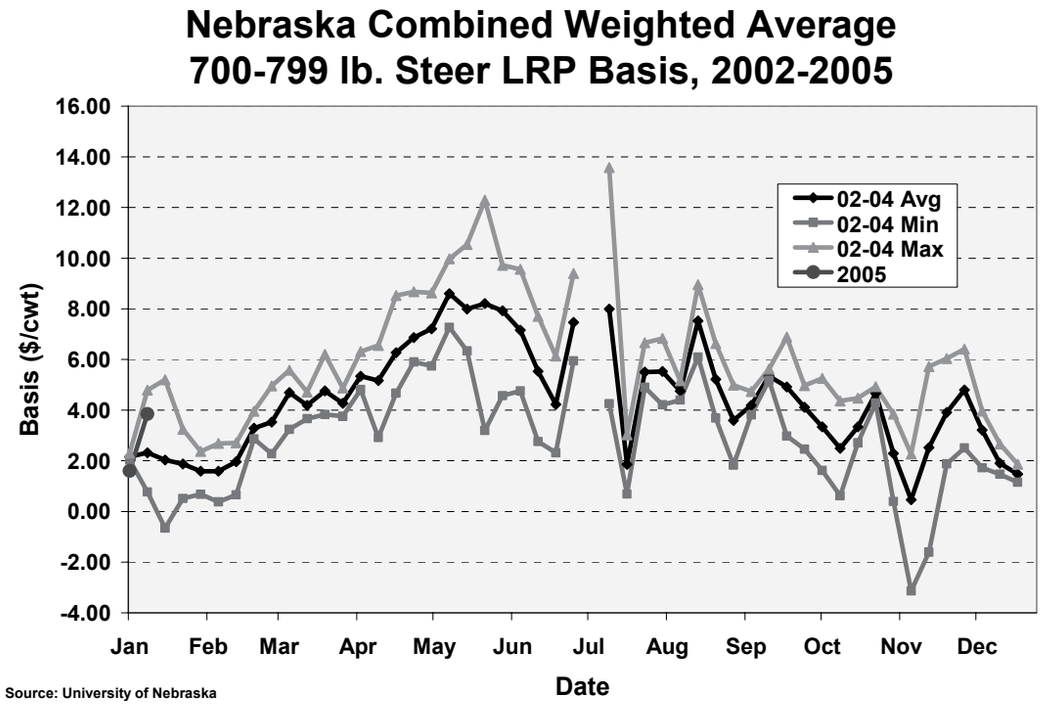


Figure 4.6

4.6 Summary

LRP insurance provides an advantage to Nebraska fed cattle and swine producers by reducing basis variability and risk. Basis is easier to accurately predict when using LRP insurance than when hedging with futures or options contracts. However, Nebraska feeder cattle producers see no significant reduction in basis risk when using LRP insurance relative to futures hedging. Nebraska producers can find the basis data discussed in this chapter online at **www.lrp.unl.edu** under Resources. These data can be used to make basis forecasts when planning future livestock sales. Additionally, basis data for other states can be found at the same Web site. Data are available for fed cattle from Iowa/Minnesota, Colorado, Kansas, and Texas/Oklahoma. Data are available for swine from the Eastern Corn Belt, Iowa/Southern Minnesota, and national base and net prices. Data are available for feeder cattle from Colorado, Wyoming, Kansas, Texas, and the Dakotas. When using any of these data, producers should select the price series most representative of their market and adjust the prices and basis data reported by the differences they expect to receive for their quality of livestock and specific sale location.