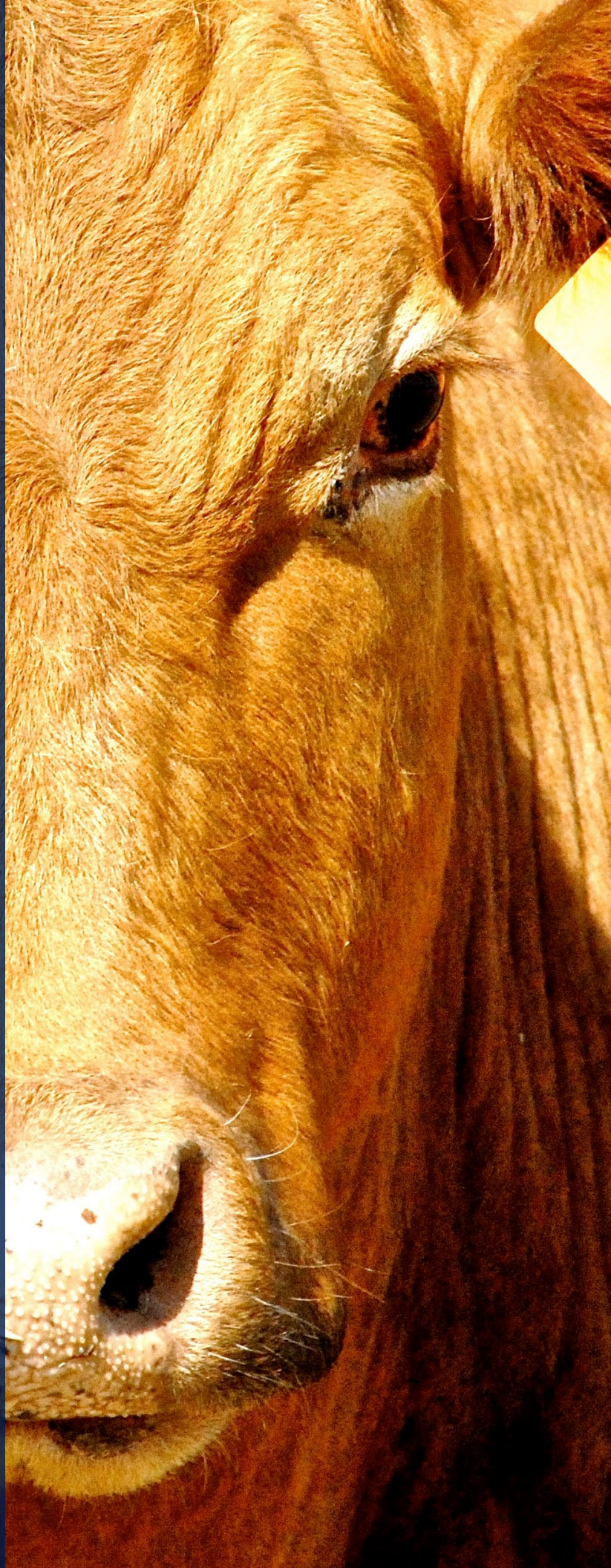
SDSU Extension

BEEF

Chapter 44

Calf Price Hedging Strategies

Matthew A. Diersen and
Heather Gessner



Chapter 44:

Calf Price Hedging Strategies

Introduction

While producers have various ways to physically sell calves, the price can be set at or before the actual sale date. Risk management tools such as futures hedging and forward contracting set the price in advance, with and without basis risk respectively. Alternative approaches use minimum price hedges to limit the risk of adverse prices while leaving favorable prices available. Common ways to do this include buying put options and purchasing Livestock Risk Protection (LRP) insurance. Establishing a synthetic put by selling futures and buying call options may be a useful tool when market volatility is high.

In this chapter, the ways cow-calf producers can manage price risk are discussed. The focus will match the typical sale of the calf crop in South Dakota, where the volume peaks during October and November for calves weighing 500–600 lbs. The tools discussed herein only cover price risk, not production risks (e.g., poor gains or mortality). Unless otherwise specified, the strategies and tools here are all based off of feeder cattle futures and options contracts. For additional examples of the mechanics of futures and options, see CME Group (2014).

Scope of Use

The use of futures and options contracts by cattle producers is difficult to quantify. Across all cow-calf operations, USDA (2008) found that only 3.5 percent used a forward pricing method. Use was positively related to the size of the operation. Among operations with 200 or more beef cows, 15.4 percent used forward pricing. Of those operations doing some forward pricing, 25.1 percent use futures and 4.8 percent use options. A survey of stocker operations in Oklahoma found that 29 percent use options (Johnson et al., 2013).

LRP statistics give comprehensive insight into its use at the national and state levels. The first year of LRP availability was the Risk Management Agency's fiscal year 2005. The number of feeder cattle

Key Points

- Knowing the volatility level may guide the use of different tools.
- Hedging calves with feeder cattle futures locks in prices, but not basis.
- Common price protection tools are buying put options and purchasing Livestock Risk Protection (LRP) insurance.
- LRP is price insurance with specific coverage periods, ending values, and coverage levels.
- A synthetic put option may be useful with high volatility.

covered using LRP since 2005 has fluctuated, and reached 307,358 head in 2014 (Figure 1). The coverage is relatively popular in South Dakota, where 82,618 head were covered in 2014. The national total insured represented less than 1 percent of the 34 million head U.S. calf crop in 2013. The proportion insured in South Dakota was higher, representing about 5 percent of the 2013 calf crop of 1.7 million head.

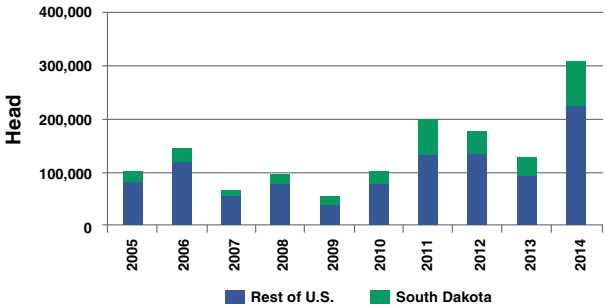


Figure 1: Livestock risk protection: feeder cattle. *Source: USDA-RMA.*

Producers can also purchase Livestock Risk Protection (LRP) specifically on calves (Diersen, 2013). Fields and Gillespie (2008) found that cattle producers preferred higher coverage levels (or low deductibles) when selecting livestock insurance. Fuez (2011) showed that put options and LRP both reduce downside risk at a similar cost for each type of protection, and demonstrated that hedging with futures limits upside potential.

Volatility

Market volatility is an important aspect to consider when exploring different marketing tools. There is seasonality in the level of price volatility cow-calf producers face, which is driven in part by corn market volatility in the mid-summer growing season. Feeder and live cattle option volatility has been high relative to actual risk observed in those markets (Brittain, Garcia, and Irwin, 2011), which tends to increase the cost of using these tools. They also found large differences in the volatility measured for put options and call options. The implication for cow-calf producers is to know how high the volatility is and to determine if costs of protection are warranted.

The volatility varies substantially from year to year and is a major driver of the cost of using protection strategies. To discern high or low volatility, implied volatility can be backed out from option prices. Historic implied volatility levels can be obtained from various sources such as www.barchart.com[1].

The volatility should be compared for the same contract month to account for seasonal market factors. The implied volatility in mid-June of the November feeder contracts shows its variability across years (Table 1). The prices that follow are per cwt. unless otherwise noted. An at-the-money put option with 150 days to maturity at a strike price of $160.00 would trade at $4.12 with 10% volatility, $5.76 with 14% volatility and $7.41 with 18% volatility. Premiums for put options decrease as the strike prices move further below the futures price or out-of-the-money. There is not empirical evidence of a strong, consistent summer volatility pattern in recent years.

Table 1: Implied volatility of November feeder cattle in mid-June (Annualized %).

2008	2009	2010	2011	2012	2013	2014
17.5	17.5	15.2	18.1	11.5	10.9	11.3

Data Source: www.barchart.com.

The premiums to purchase options and to purchase LRP insurance are tied directly to the implied volatility in the market. As the volatility increases, so do the premiums. When the volatility is low, the outlay for protection is low and coverage is available close to the underlying futures price. When the volatility is high, the outlay is high and the coverage would effectively move away from the futures price. In general, the strategy of buying put options is seen as attractive compared to selling futures when the volatility is low. When the volatility is high, a more complex strategy, buying synthetic put options, may be preferred, as discussed below.

Futures Strategies

Consider how a cow-calf producer in June could hedge calves using November feeder cattle futures (Table 2). A producer in June observes the futures contract trading at $170.00. Expecting a basis on calves of $15.00 gives an expected net price received of $185.00. To establish such a price, the producer

1 At the website, find the technical chart of interest, e.g., GFX14 (November Feeder Cattle). Use the "Add Study" feature, select "Implied Volatility", and then update the chart.

would sell a futures contract (covering 50,000 lbs or 90 head of calves weighing 555 lbs). By November, the futures price may fluctuate or stay at $170.00. Different futures position outcomes are shown in Table 2. If the futures price does not change the futures contract is bought back and the main cost is the commission (Scenario A).

Should the futures price fall by November, the producer would buy back the futures contract for less than it was initially sold for, resulting in a futures gain (Scenario B). However, the cash price received for the calves ($170.00) is lower in this example reflecting a lower market price for feeders and a basis that has decreased (by $5.00). The net price received would thus be $180.00, or less than expected. Should the futures price increase by November, the producer would pay margin calls and eventually buy back the futures contract for more than its initial selling price, resulting in a futures loss (Scenario C). In this case the cash price for the calves ($200.00) is higher than expected reflecting the higher feeder value and a basis that has increased (by $5.00). The net price received would be $190.00, or more than expected.

Put Options

An alternative to selling futures is to hedge calve prices using feeder cattle put options. Consider a cow-calf producer in June that hedges calves using November feeder cattle put options (Table 3). In June the producer observes futures trading at $170.00. As in the futures example earlier, the producer is expecting a basis on calves of $15.00, which would give an expected net price of $185.00. To establish a minimum price, the producer would buy a put option with a $170.00 strike price for $4.00, a premium or option cost consistent with a low level of volatility. Because the contract is for 50,000 lbs, the out-of-pocket premium is $2,000 plus a broker commission. If a hedger uses the put option to protect 90 head of calves, the cost is $23.06 per head. From the strike price ($170.00), subtract the premium ($4.00) and add the expected basis ($15.00) to obtain the expected minimum net price of $181.00.

Different put option position outcomes for the example are shown in Table 3. When the futures price ends the period unchanged, the put option would not have value (Scenario D).

Table 2: Selling futures with price and basis changes ($/cwt)

A. Futures at 170	**Cash Market**	**Futures**	**Basis**
June	Expect 185	Sell Nov 170	Expect +15
November	Sell 185	Buy back 170	Actual +15
	Cash Market	Futures Gain/Loss	Net Price Received
	185	No change	185

B. Futures fall to 160	**Cash Market**	**Futures**	**Basis**
June	Expected 185	Sell Nov 170	Expected +15
November	Sell 170	Buy back 160	Actual +10
	Cash Market	Futures Gain/Loss	Net Price Received
	170	10	180

C. Futures rise to 180	**Cash Market**	**Futures**	**Basis**
June	Expected 185	Sell Nov 170	Expected +15
November	Sell 200	Buy back 180	Actual +20
	Cash Market	Futures Gain/Loss	Net Price Received
	200	-10	190

Note: With a typical full-service brokerage commission charge of $75 per contract, the net price would be reduced by $0.15.

Table 3: Buying a put option with low volatility ($/cwt)

D. Futures at 170	Cash Market	Put Option	Basis
June	Expect 185	Buy Nov 170 for 4	Expect +15
November	Sell 185	Let Expire	Actual +15
	Cash Market	Option Net	Net Price Received
	185	-4	181

E. Futures fall to 160	Cash Market	Put Option	Basis
June	Expected 185	Buy Nov 170 for 4	Expected +15
November	Sell 175	Sell for 10	Actual +15
	Cash Market	Option Net	Net Price Received
	175	6	181

F. Futures rise to 180	Cash Market	Put Option	Basis
June	Expected 185	Buy Nov 170 for 4	Expected +15
November	Sell 195	Let Expire	Actual +15
	Cash Market	Option Net	Net Price Received
	195	-4	191

Note: With a typical full-service brokerage commission charge of $75 per contract, the net price would be reduced by $0.15.

By November, the put option would have increased in value if the futures price falls below the strike price. Assume the futures fall to $160.00. In November the put option would have an intrinsic value of $10.00 or the difference of the strike price and the futures price (Scenario E). The option is then sold resulting in a net gain of $6.00. The gain is added to the cash price of $175.00 yielding $181.00 for the calves. Assume instead that the futures rise to $180.00. The right to sell futures at $170.00, the definition of a put option, is now worthless (Scenario F). The option is allowed to expire resulting in just the cost of $4.00 being incurred. The cost is subtracted from the cash price of $195.00 yielding a net price received of $191.00 for the calves.

The net price across different final futures prices are shown in Table 4. As the futures fall in value the put option increases in value. The basis is assumed constant so the cash is a constant mark-up over the futures price. Adding the put option proceeds gives the net price. In this example, the minimum net price is $181.00 and there is technically no upper bound.

Livestock Risk Protection (LRP)

LRP functions similar to a put option. LRP is price insurance with specific coverage periods, ending values, and coverage levels. Whereas options contracts have set expiration dates, LRP has settlement times that are fixed weeks from the date of purchase. The coverage levels on LRP are analogous to the strike prices on put options, as both may result in deductibles. The cost to purchase LRP is a premium, much the same as a put option premium. While put options contracts are of a fixed size (50,000 pounds), LRP covers a specific number

Table 4: Potential outcomes from buying a put option ($/cwt)

If Nov Futures Are…	Value of 170 Put	A	B	C
		170 Put Gain/Loss	Cash Sale with $15 Basis	Net Price A+B=C
210	0	-4	225	221
190	0	-4	205	201
170	0	-4	185	181
150	20	16	165	181
130	40	36	145	181

of head. Thus, when covering few head, LRP may be cheaper on a per head basis than put options while providing the same type of price protection.

When used on beef steer calves, LRP settles to the CME Feeder Cattle Index® adjusted by a 110 percent factor regardless of the end date. While transferable to other parties, LRP is not as easy to offset as the exchange-traded contracts. LRP is designed to be purchased with an ending date closest to the earliest marketing date of the calves. As such, it is prudent to only purchase coverage out until the earliest period the producer would sell the calves. Also, note that sales of LRP can be suspended because of federal budget limits.

Synthetic Puts

During periods of high prices and high volatility, synthetic put options can be used. Here, a hedger sells a futures contract and buys an out-of-the-money call option (i.e., a call option with a strike price above the current futures price quote). A synthetic put option strategy is a way to establish a minimum price closer to the futures price compared to buying a put option outright. The synthetic put strategy still has a cash outlay component, but less than an at-the-money put option strategy could cost. There is also a potential for margin calls with the futures position.

Consider a scenario where the volatility is high. In this setting, the cost of an ordinary at-the-money put option would be high, for example $8.00. Buying an at-the-money option would also imply a floor price that is relatively low compared to the prevailing futures price. Instead, a producer may sell a futures contract in this environment and simultaneously buy an out-of-the-money call option (Table 5). The cost of the call in this case is $3.00 by moving out-of-the-money. In these scenarios the basis level is shown as a positive function of the futures price level. The base scenario has futures start and end at $180.00 (Scenario G). The main impact on the net price received is the cost to buy the call option and the commissions on the two positions.

If futures decrease to $165.00, there is a gain on the futures position and the call option will expire without value (Scenario H). The net price is the cash price, which has also fallen and has a lower basis, plus the gain on the futures position, less the loss on the option, giving $187.00 for this scenario. If futures increase to $195.00, there is a loss on the futures position (Scenario I). However, because

Table 5: Buying a synthetic put option with price and casis changes ($/cwt)

G. Futures at 180	Cash Market	Futures	Call Option	Basis
June	Expect 195	Sell 180	Buy Nov 190 for 3	Expect +15
November	Sell 195	Buy 180	Let Expire	Actual +15
	Cash Market	Futures Gain/Loss	Option Net	Net Price Received
	195	No change	-3	192

H. Futures fall to 165	Cash Market	Futures	Call Option	Basis
June	Expected 195	Sell 180	Buy Nov 190 for 3	Expected +15
November	Sell 175	Buy 165	Let Expire	Actual +10
	Cash Market	Futures Gain/Loss	Option Net	Net Price Received
	175	15	-3	187

I. Futures rise to 195	Cash Market	Futures	Call Option	Basis
June	Expected 195	Sell 180	Buy Nov 190 for 3	Expected +15
November	Sell 215	Buy 195	Sell for 5	Actual +20
	Cash Market	Futures Gain/Loss	Option Net	Net Price Received
	215	-15	2	202

Note: With a typical full-service brokerage commission charge of $75 per contract, the net price would be reduced by $0.30 because both a futures and an options position are used.

the futures price moves above the strike price of the call option, it will have value and may be sold for a gain (over its initial cost) of $2.00. The cash sale, reflecting a higher basis, is then added to the futures loss and call option gain giving a net price of $202.00.

The potential outcomes under different price scenarios for the synthetic put strategy are similar to the pattern observed for the put option strategy (Table 6). Note the net price levels have a similar pattern to the put options strategy except for the different premium cost and the basis risk in the synthetic example. The net price should be compared to a put option strategy where the premium of $8.00 would give a net price of $187.00 without a futures price change.

Summary

Before considering these tools, it is important to develop a general marketing plan so the best tools can be matched up with the individual's overall marketing philosophy and strategy. Calf prices and their volatility are related to current and expected feed prices, and other cattle prices. A futures contract will fix the price level, but not the basis level. Buying put options and buying LRP offer similar downside price protection. Complex strategies, such as buying synthetic put options, may be preferred as a way to manage risk in some special circumstances.

Table 6: Potential outcomes from buying a synthetic put option ($/cwt)

If Nov Futures Are…	A	Value of 190 Call	B	C	D
	$180 Futures Gain/Loss		190 Call Gain/ Loss	Basis/Cash Price	Net Price A+B+C=D
220	-40	30	27	25/245	258
200	-20	10	7	18/218	205
180	0	0	-3	15/195	192
160	20	0	-3	12/172	189
140	40	0	-3	9/149	186

References

Brittain, L., P. Garcia and S.H. Irwin. 2011. "Live and Feeder Cattle Options Markets: Returns, Risk, and Volatility Forecasting." Journal of Agricultural and Resource Economics 36, 1: 28-47.

CME Group. 2014. Self-Study Guide to Hedging with Livestock Futures and Options. CME Group, Chicago, IL.

Diersen, M. 2013. Insuring Calves Using Livestock Risk Protection. SDSU Extension Publication 02-2006-2013, South Dakota State University, Brookings, SD, April.

Fields, D. and J. Gillespie. 2008. "Beef Producer Preferences and Purchase Decisions for Livestock Price Insurance." Journal of Agricultural and Applied Economics 40, 3: 789-803.

Feuz, D.M. 2011. A Comparison of the Effectiveness of Using Futures, Options, or LRP Insurance to Manage Risk for Cow-Calf Producers. AG/Agribusiness/2011-01pr, Utah State University, May.

Johnson, R.J., D. Doye, D.L. Lalman, D.S. Peel, and K.C. Raper. 2013. Stocker Cattle Production and Management Practices in Oklahoma. Oklahoma Cooperative Extension Service AGEC-249, Revised February.

USDA. 2008. Beef 2007-2008 Part I: Reference of Beef Cow-calf Management Practices in the United States, 2007-08. USDA-APHIS-VS, CEAH. Fort Collins, CO #N512-1008.