

Risk Management using Options on Futures and LRP

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Agricultural Economics

Options on Futures Contracts

- A futures contract is a legally binding **obligation** to provide or accept a certain quantity and quality of a commodity at a certain time in the future
- Contract is defined by:
 - Commodity specs
 - Expiration month
 - Position: either long or short

Options on Futures Contracts

- An option on a futures contract is the **right** to establish a futures position in that futures contract at a given strike price
- An option is defined by:
 - The underlying futures commodity and contract month
 - Whether the option is a Put (right to establish a short position) or Call (right to establish a long position)
 - Strike price
 - Premium

Options on Futures Contracts

A \$253 Call option on January 2024 Feeder Cattle

- Gives the holder the **right** to establish a long position in January 2024 Feeder Cattle at \$253 at any point during the life of the option.
- The **premium** is the amount you pay for this right

Options on Futures Contracts

An option has three possible outcome

- The option can expire worthless
- The holder can choose to exercise the option (or the option may be automatically exercised) at expiration
- The holder can sell the option

Options on Futures Contracts

An option premium is one-time fee that is best thought of as being gone forever...similar to an insurance premium.

An option premium reflects how volatile a contract price is expected to be and has two sources of value:

- **Intrinsic Value:** the value of possible gain in the futures market, if the option were exercised immediately; never $< \$0$
- **Time Value:** the more time until expiration, the higher the possibility of the option being valuable

Options on Futures Contracts

Options are described in three categories:

- In the Money (ITM): An option with positive intrinsic value
Puts: Strike Price > Futures Price
Calls: Strike Price < Futures Price
- At the Money (ATM): Strike Price = Futures Price
- Out of the Money (OTM): An option with no intrinsic value
Puts: Strike Price < Futures Price
Calls: Strike Price > Futures Price

Summary of CME Group Options on Livestock Futures Contracts

	Underlying Contract			
	Live Cattle	Feeder Cattle	Lean Hogs	Pork Cutout
Contract Trading Unit	40,000 lbs live weight of beef steers or heifers (70% Choice and 30% Select)	50,000 lbs live weight of feeder steers (700 to 899 lbs)	40,000 lbs of lean value hog carcasses	40,000 lbs of 215-lb, 55-56% lean pork carcasses (0.55-0.70 in. of back fat at the last rib or equiv.)
Contract Months	Feb, Apr, Jun, Aug, Oct, Dec, Plus one serial	Jan, Mar, Apr, May, Aug, Sep, Oct, Nov	Feb, Apr, May, Jun, Jul, Aug, Oct, Dec	Feb, Apr, May, Jun, Jul, Aug, Oct, Dec
Strike Intervals:				
All Months	\$2.00/cwt	\$2.00/cwt	\$2.00/cwt	\$2.00/cwt
3 Front Months	\$1.00/cwt	\$1.00/cwt	\$1.00/cwt	\$1.00/cwt
Spot Month		\$0.50/cwt		
Futures Settlement	Deliverable	Financial	Financial	Financial
Expiration	First Friday of Contract Month	Expires with underlying contract	Expires with underlying contract	Expires with underlying contract

Note: This basic summary is the author's synthesis of CME Group material. To learn more about the details and contract specifications of livestock futures and options visit <https://www.cmegroup.com/trading/agricultural/livestock.html>

Hedging with Options: Hedging the upcoming sale of feeder cattle

- Situation: A producer purchases 600-pound weaned calves in October with the plan to background them up to about 800 pounds and market them in January.
- Purchase: 62 weaned calves, average weight of 600 at \$270
- Plans to Sell: 62 feeder cattle in January, targeting an average weight of 806.5 pounds for a total of 50,000 lbs live weight of feeder cattle

Hedging with Options: Hedging the upcoming sale of feeder cattle

The hedger needs to choose:

- Contract
- Put or Call
- Number of options
- Strike Price

Hedging with Options: Hedging the upcoming sale of feeder cattle

The hedger needs to choose:

- Contract: January Feeder Cattle Contract
- Put or Call: The sale of cattle is being hedged so a put is needed
- Number of options: 1 (one feeder cattle contract is for 50,000 lbs of live weight)
- Strike Price: hedger would check to see what is available

Hedging with Options: Hedging the upcoming sale of feeder cattle

- Current Futures: \$250/cwt

Selected Available Put Options

Strike	Premium	Per Option on 1 Contract
\$250/cwt	\$6/cwt	\$3,000
\$253/cwt	\$7/cwt	\$3,500
\$255/cwt	\$8/cwt	\$4,000

Approximate Price Floor

Strike Price + Expected Basis – Put Option Premium – Fees

Hedging with Options: Hedging the upcoming sale of feeder cattle

Approximate Price Floor, ignoring fees

Strike Price + Expected Basis - Put Option Premium

Expected Basis = -\$3/cwt

Selected Available Put Options

Strike	Exp Basis	Premium	Price Floor
\$250/cwt	+\$4/cwt	\$6/cwt	\$248/cwt
\$253/cwt	+\$4/cwt	\$7/cwt	\$250/cwt
\$255/cwt	+\$4/cwt	\$8/cwt	\$251/cwt

Hedging Outcomes: How does a Put Option Set a Price Floor?

Example low-price outcome at the time of feeder cattle sale:

Feeder Cattle Cash **\$245/cwt**

Feeder Cattle Futures \$241/cwt

Feeder Cattle Basis +\$4/cwt

@\$255 Put Option Value \$14/cwt Establish \$255 short position, then offset with a \$241 long position; $\$255 - \$241 = \$14$

@\$255 Put Option Premium \$8/cwt

Net Price Received = $\$245/\text{cwt} + \$14/\text{cwt} - \$8/\text{cwt} = \$251/\text{cwt}$

Hedging Outcomes: How does a Put Option Set a Price Floor?

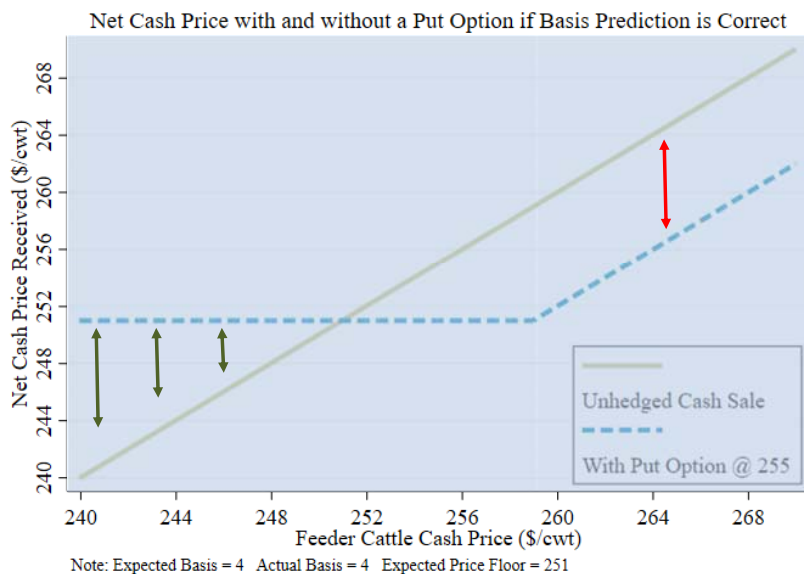
Example low-price outcome at the time of feeder cattle sale:

Feeder Cattle Cash	\$270/cwt
Feeder Cattle Futures	\$266/cwt
Feeder Cattle Basis	+\$4/cwt

@\$255 Put Option Value \$0/cwt \$255 short position would be offset with a \$266 long position; do not exercise

@\$255 Put Option Premium \$8/cwt

Net Price Received = \$270/cwt + \$0/cwt - \$8/cwt = \$262/cwt



- At any cash price above \$259 (implies futures above \$255), option is worthless and net price with the put is \$4 less than unprotected cash price
- At any cash price below \$259 (implies futures less than \$255), option has value and net price = \$251
- The option value increases as futures price decreases and offsets losses. Futures price is correlated with cash price, so lower cash prices imply lower futures prices.

Hedging Outcomes: Importance of Basis Prediction

If basis prediction is incorrect, price floor prediction will be incorrect by the same margin:

Possible Outcomes Using \$255 Put Option if Basis Prediction is Incorrect

Feeder Cattle Cash (\$/cwt)	Actual Basis (\$/cwt)	Feeder Cattle Futures (\$/cwt)	Option Gain (\$/cwt)	Option Premium (\$/cwt)	Actual Price Floor (\$/cwt)
\$250	\$0	\$250	\$5	-\$8	\$247
\$250	\$2	\$248	\$7	-\$8	\$249
\$250	\$4	\$246	\$9	-\$8	\$251
\$250	\$6	\$244	\$11	-\$8	\$253
\$250	\$8	\$242	\$13	-\$8	\$255

Note: Expected Basis = \$4 and Approximate Price Floor = \$251
Actual Price Floor Realized is also Net Price with Option

Practical Issues of Hedging with Options

- Only manages price risk
- Insurance Mentality
- Hedging means being offset (option on 1 FC contract = 50,000 lbs)
- Understanding your basis
- Liquidity

What is Livestock Risk Protection?

If you have feeder or fed cattle and market prices are lower than expected, you can get paid

Even shorter version: Lower cost put option

LRP and related statistics

Jan 1 2023 KS beef cow inventory – 1.3 million

Jan 1 2023 KS calf inventory – 635,000 (could include dairy calves)

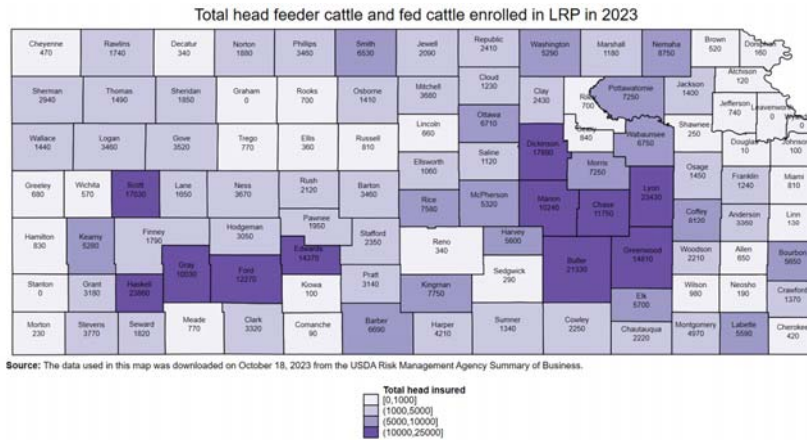
Jan 1 2023 KS cattle on feed – 2.5 million

LRP – 2023 endorsements

Feeder cattle: 321,000

Fed cattle: 82,000

LRP is used in most KS counties



LRP is available for

- Feeder cattle under 100-599 lb or 600-1000 lb
 - Calves, steers, heifers, Brahman, dairy, unborn
- Fed Cattle
 - Heifers and steers, 1000-1600 lb
- Swine

LRP guarantee and payments calculation

Guarantee: producer selected coverage price X target weight

Indemnity: (Coverage price – actual price) X target weight

LRP – major producer decisions

1. Coverage price
2. Timing of purchase and marketing

Minor decision: weight to insure at

Example: 13-week LRP endorsement

- Feeder cattle – Steers weight 2 – will be sold in January
- \$250 “coverage price” with producer premium of \$4.33 / cwt
- Lowest “coverage price” of \$232/cwt has a producer premium of \$0.68/cwt (equivalent to a 92% coverage level)
- Premium due at end of the LRP contract
- Insure 1 to 12,000 head (up to 25,000 head per year), target weights are flexible with a range

Risk Management using Options on Futures and LRP

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Hedging Resources:

Price Risk Management for Cow-Calf Producers – Extension Article Series

<https://www.agmanager.info/crop-insurance/livestock-insurance-papers-and-information/price-risk-management-cow-calf-producers>

Basics of Hedging Livestock Price Risk with Options on Futures Contracts:

<https://agmanager.info/livestock-meat/marketing-extension-bulletins/marketing-strategies-and-livestock-pricing/hedging-0>

LRP Resources:

2022 Crop Insurance Workshop

<https://agmanager.info/events/kansas-crop-insurance-workshop/2022-crop-insurance-workshop-presentations/livestock-risk>

Historic LRP net returns

<https://www.agmanager.info/crop-insurance/livestock-insurance-papers-and-information/historic-performance-livestock-risk>

Others

<https://agmanager.info/crop-insurance/livestock-insurance-papers-and-information>

<https://www.agmanager.info/crop-insurance>

<https://www.rma.usda.gov/Policy-and-Procedure/Insurance-Plans/Livestock-Insurance-Plans>

<https://www.agmanager.info/livestock-meat/livestock-marketing-charts/>

<https://agmanager.info/2020-risk-and-profit-conference-presentations/hedging-kansas-live-cattle-summary-outcomes-over-past>

<https://agmanager.info/k-state-feeder-cattle-risk-management-tool>