

# Hedging Grain Price Risk using Options on Futures Contracts

BRIAN COFFEY AND DAN O'BRIEN  
MANAGING RISK AND MARKETING GRAIN IN 2021  
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KANSAS STATE UNIVERSITY | 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



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# Options on Futures Contracts

- A option on a futures contract is a **right** to establish a futures position 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 \$4.50 Call option on December 2021 Corn

- Gives the holder the **right** to establish a long position in December 2021 Corn at \$4.50/ bu at any point during the life of the option.
- The **premium** is the price 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 Major Grain Futures Contracts

	Underlying Contract			
	Corn	Soybeans	KC HRW Wheat	Chicago SRW Wheat
<b>Contract Trading Unit</b>	5,000 bushels	5,000 bushels	5,000 bushels	5,000 bushels
<b>Contract Months</b>	Mar, May, Jul, Sep, Dec	Jan, Mar, Apr, May, Jul, Aug, Sep, Nov	Mar, May, Jul, Sep, Dec	Mar, May, Jul, Sep, Dec
<b>Strike Intervals:</b>				
All Months	\$0.10/bu	\$0.20/bu	\$0.10/bu	\$0.10/bu
2 Front Months	\$0.05/bu	\$0.10/bu	\$0.05/bu	\$0.05/bu
1 Serial Option	\$0.05/bu	\$0.10/bu	\$0.05/bu	\$0.05/bu
<b>Futures Settlement</b>	Deliverable	Deliverable	Deliverable	Deliverable
<b>Expiration</b>	Friday preceding by ≥ 2 days last month prior to Contract Month	Friday preceding by ≥ 2 days last month prior to Contract Month	Friday preceding by ≥ 2 days last month prior to Contract Month	Friday preceding by ≥ 2 days last month prior to Contract Month

Note: This basic summary is the authors' synthesis of CME Group material. To learn more about the details and contract specifications of grain and oilseed futures and options visit [https://www.cmegroup.com/trading/agricultural/files/pm255\\_self-study-guide\\_hedging\\_en\\_2019.pdf](https://www.cmegroup.com/trading/agricultural/files/pm255_self-study-guide_hedging_en_2019.pdf)



# Hedging with Options: Hedging the upcoming sale of Corn

- Situation: Grain producer wants to hedge the sale of 5,000 bushels of new-crop corn.
- Plans to Sell: 5,000 bushels of corn before December 2021
  - We will use 5,000 bushels to exactly fit coverage of one contract
  - Individuals should calculate expected sale volume and decide how much of the volume they want to hedge



# Hedging with Options: Hedging the upcoming harvest time sale of Corn

The hedger needs to choose:

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



# Hedging with Options: Hedging the upcoming harvest time sale of Corn

The hedger needs to choose:

- Contract: DEC Corn Contract
- Put or Call: The sale of corn is being hedged so a put is needed
- Number of options: 1 (one corn contract is for 5,000 bushels)
- Strike Price: hedger would check to see what is available



# Hedging with Options: Hedging the upcoming harvest sale of Corn

- DEC 2021 Futures: \$4.50 /bu

Selected Available Put Options

Strike	Premium	Per Option on 1 Contract
\$4.00 /bu	\$0.15 /bu	\$750
\$4.50 /bu	\$0.40 /bu	\$2,000

Approximate Price Floor

Strike Price + Expected Basis – Put Option Premium - Fees



# Hedging with Options: Hedging the upcoming harvest sale of Corn

Approximate Price Floor, ignoring fees

Strike Price + Expected Basis – Put Option Premium

Expected Basis = **-\$0.20 /bu**

Selected Available Put Options

Strike	Exp Basis	Premium	Price Floor
\$4.00 /bu	<b>-\$0.20 /bu</b>	\$0.15 /bu	\$3.65 /bu
\$4.50 /bu	<b>-\$0.20 /bu</b>	\$0.40/bu	\$3.90 /bu



## Hedging Outcomes: How does a Put Option Set a Price Floor? @ \$4.50 Put example

Example low-price outcome at the time of Corn sale:

Harvest Corn Cash \$ **\$3.50 /bu**

Harvest Corn Basis **-\$0.20 /bu**

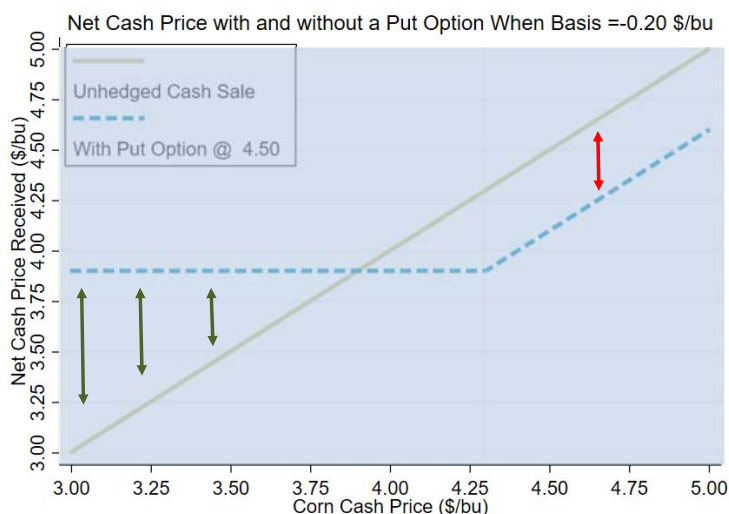
Harvest DEC Corn Futures \$3.70 /bu

@\$4.50 Put Option Value \$0.80 /bu Establish \$4.50 short position, then offset with a \$3.70 long position;  $\$4.50 - \$3.70 = \$0.80$

@\$4.50 Put Option Premium \$0.40 /bu Purchase Price

Net Price Received = **\$3.50** cash + \$0.80 Offset Put\$ - \$0.40 Buy Put\$ = **\$3.90 /bu Net\$**





- At any cash price above \$4.30 (implies futures above \$4.50), option is worthless and net price with the put is \$0.40 less than unprotected cash price
- At any cash price below \$4.30 (implies futures less than \$4.50), option has value and net price = \$3.90
- The option value increases as futures price decreases and offsets losses.



## Hedging Outcomes: How does a Put Option Set a Price Floor? @ \$4.00 Put example

Example low-price outcome at the time of Corn sale:

Harvest Corn Cash \$ **\$3.50 /bu**

Harvest Corn Basis **-\$0.20 /bu**

Harvest DEC Corn Futures \$3.70 /bu

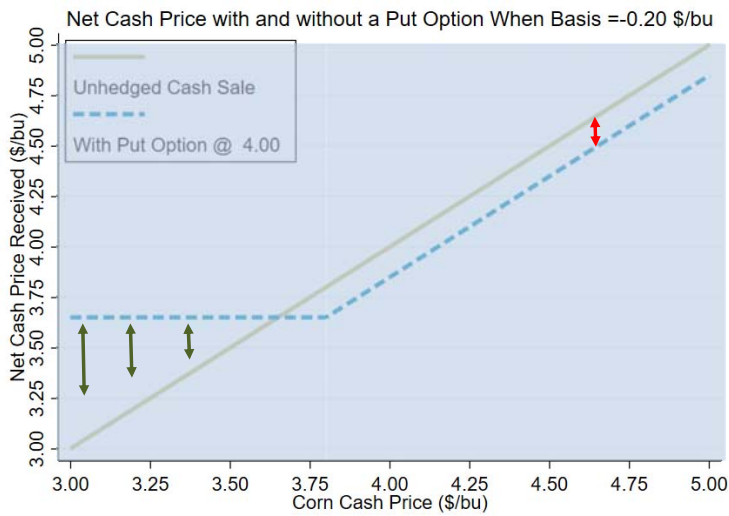
@\$4.10 Put Option Value \$0.30 /bu Establish \$4.10 short position, then offset with a \$3.70 long position; \$4.00-\$3.70 = \$0.30

@\$4.10 Put Option Premium \$0.15 /bu Purchase Price

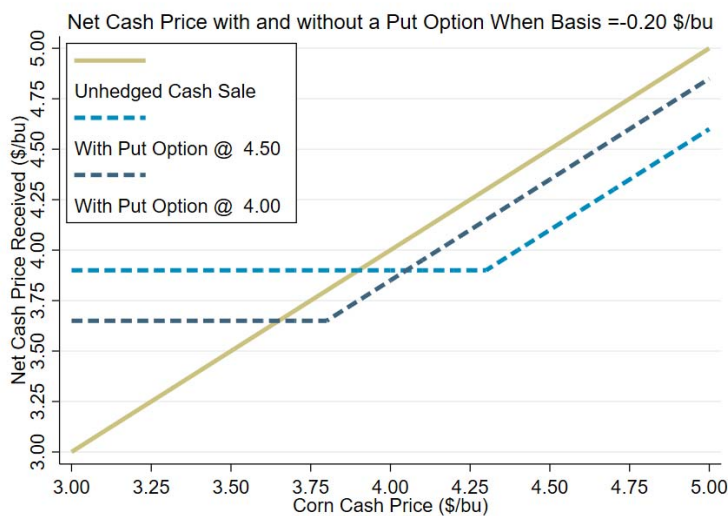
Net Price Received = **\$3.50** cash + \$0.30 Offset Put\$ - \$0.15 Buy Put\$ = **\$3.65 /bu** Net\$







- At any cash price above \$3.80 (implies futures above \$4.00), option is worthless and net price with the put is \$0.15 less than unprotected cash price
- At any cash price below \$3.80 (implies futures less than \$4.00), option has value and net price = \$3.65
- The option value increases as futures price decreases and offsets losses.



- The Net Price Chart compares the two put options
- Higher strike price costs more but defers more downside risk
- Many factors should be considered to decide which best fits your individual risk management goals.



# Hedging Outcomes: Importance of Basis Prediction

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

## Possible Outcomes Using \$4.50 Put Option if Basis Prediction is Incorrect

Cash Corn	Actual Basis	Corn Futures	Option Gain	Option Premium	Actual Price Floor
(\$ /bu)	(\$ /bu)	(\$ /bu)	(\$ /bu)	(\$ /bu)	(\$ /bu)
\$3.50	+\$0.40	\$3.10	\$1.40	-\$0.40	\$4.50
\$3.50	+\$0.20	\$3.30	\$1.20	-\$0.40	\$4.30
\$3.50	\$0.00	\$3.50	\$1.00	-\$0.40	\$4.10
\$3.50	-\$0.20	\$3.70	\$0.80	-\$0.40	\$3.90
\$3.50	-\$0.40	\$3.90	\$0.60	-\$0.40	\$3.70

Note: Expected Basis = -\$0.20 and Expected Price Floor = \$3.90  
Actual Price Floor Realized is also Net Price with Option



## Hedging with Options: Hedging the upcoming purchase of Corn for livestock feeding

Current:

- Expected Corn Cash: \$4.30 /bu (-\$0.20 /bu expected basis)
- DEC Corn Futures: \$4.50 /bu
- Call Options

Strike	Premium	Per Option on 1 Contract
\$4.50 /bu	\$0.45 /bu	\$2,250
\$5.00 /bu	\$ 0.30 /bu	\$1,500

Approximate Price Ceiling

Strike Price + Expected Basis + Call Option Premium + Fees



# Hedging with Options: Hedging the upcoming purchase of Corn for livestock feeding

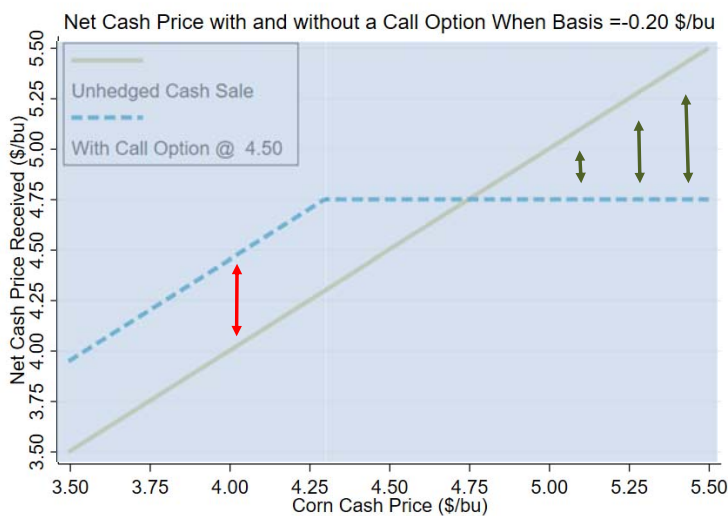
Approximate Price Ceiling, ignoring fees

Strike Price + Expected Basis + Put Option Premium

Expected Basis = **-\$0.20 /bu**

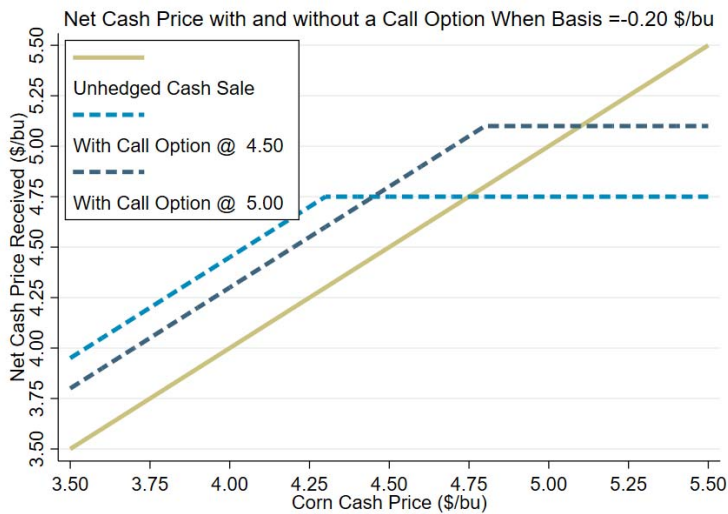
Selected Available Call Options

Strike	Exp Basis	Premium	Price Ceiling
\$4.50 /bu	<b>-\$0.20 /bu</b>	\$0.45 /bu	\$4.75 /bu
\$5.00 /bu	<b>-\$0.20 /bu</b>	\$0.30 /bu	\$5.10 /bu



- At any cash price below \$4.30 (implies futures below \$4.50), option is worthless and net price with the put is \$0.45 more than unprotected cash price
- At any cash price above \$4.30 (implies futures less than \$4.50), option has value and net price = \$4.75





- The Net Price Chart compares the two call options
- Higher strike price costs more but defers more upside risk
- Many factors should be considered to decide which best fits your individual risk management goals.



## Considerations when Hedging with Options

- Insurance Mentality
- Hedging means being offset
- Exercise vs. Sell
- Expiration
- Margin Calls
- Liquidity



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BRIAN COFFEY  
[BCOFFEY@KSU.EDU](mailto:BCOFFEY@KSU.EDU)

785-532-5033  
TWITTER: @BRIANKCOFFEY

DAN O'BRIEN  
[DOBRIEN@KSU.EDU](mailto:DOBRIEN@KSU.EDU)

785-462-6281  
TWITTER: @KSUGRAINS

