

Principles of Hedging Livestock Using Futures Markets

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Hedging Concepts

- Hedging allows sellers or buyers of a product to manage the risk associated with the sale or purchase of that product
- A hedge involves **equal** and **opposite** positions in **cash** and **futures** markets
- Hedging reduces price risk because these positions offset each other—if one gains, the other loses
- For our purposes keep in mind...hedging is purely a risk management strategy

Hedging Concepts: Arbitrage

- Why do futures and cash positions offset each other?
 - Arbitrage

ar·bi·trage

/ˈərbəˌtræZH/ 

noun

1. the simultaneous buying and selling of securities, currency, or commodities in different markets or in derivative forms in order to take advantage of differing prices for the same asset.

Hedging Concepts: Arbitrage

- Futures and Cash Markets for a commodity are connected either by delivery or a cash index based on the cash commodity
- Traders all over the world can watch the cash and futures prices for arbitrage opportunities
- If markets are efficient, all this trading activity will bring together cash and futures prices for commodity in a somewhat predictable way

Hedging Concepts: Basis

- The difference between cash and futures price is referred to as basis
- Basis is usually defined as cash minus futures
- Grain basis is normally a negative number (futures price > cash price) but is often reported as a positive number
- For storable commodities that are deliverable, basis should reflect carry. Carry is made up of storage cost, cost of transportation to the terminal market, and risk of holding grain.
- Basis reflects local supply and demand conditions

Hedging Concepts: Basis

- Livestock basis can be positive or negative and has strong seasonal components
- For non-storable (or semi-storable) commodities basis is not as straightforward. We agree that it reflects local supply and demand conditions.
- Basis should also reflect differences in cash market livestock compared to futures contract specifications

Cash Position

- **Long position** is one where you have (or have invested so that you soon will have) some quantity of the physical commodity that you plan to sell. You have an excess.
 - A cow-calf operator with calves on cows to be sold as 600-pound weaned calves has long cash position in feeder calves
 - A cattle feeder who buys feeder cattle with the intent to finish and sell them as live cattle has long cash position in live cattle
 - A hog finishing operation with weaned pigs on feed with the intent of selling them as market hogs has a long cash position in market hogs (lean hogs)

Cash Position

- **Short position** is one where you need (or have invested so that you soon will need) to buy some quantity of the physical commodity. You have a deficit.
 - A cattle feeder who plans to buy feeder cattle to fill pens at some time in the future, with the intent to finish and sell them as live cattle has short cash position in feeder cattle
 - A beef packer who plans to buy live cattle to be slaughtered in the future is short in the live cattle cash market
 - A pork packer who plans to buy market hogs to be slaughtered in the future has short cash position in market hogs

Futures Market Position

- You establish a futures market position by entering into a futures contract
- A futures contract is a very specific instrument that allows market participants to commit to either delivering or accepting delivery of a commodity or you agree to settle the contract against some financial measure
- The contract specifies a delivery month, quantity, quality, specifications, procedures for settlement, how disputes are arbitrated, etc.
- The contract is a legally binding document

CMEGroup Livestock Contracts

Commodity	Quantity	Settlement
Feeder Cattle	50,000 lbs live weight	Cash Index: <ul style="list-style-type: none">• 700-899 lb feeder steers, Med-Large #1 and Med-Large #1-2; 8 total weight divisions• Direct sales in 12 States• Available daily prices
Live Cattle	40,000 lbs live weight	Physical Delivery: <ul style="list-style-type: none">• Live steers or heifers OR carcasses• 65% Choice, 35% Select, YG 3 (after 10/18)• 1,050-1,500 lbs live; 600-900 lbs carcass• Beef breeds
Lean Hogs	40,000 lbs live weight	Cash Index: <ul style="list-style-type: none">• Based on prior day slaughtered swine report• Average net price• Two days' data

Futures Market Position

- A person who commits to delivering is said to have **sold** a contract or is **short** a contract
- A person who commits to accepting delivery is said to have **bought** a contract or is **long** a contract
- Every futures contract that is traded has a person who is long and a person who is short. It is a zero sum game.

Financial Settlement and Delivery

- For contracts settled against a cash index and there is no chance of physical delivery.
- However, the concept is exactly the same
- Underlying livestock cash indices are based on negotiated cash market trade
- If your contract expires you must offset it based on the cash index (rather than with actual animals)
- If you are short futures...you must buy back the contract quantity at the index price
- If you are long futures...you must sell back the contract quantity at the index price

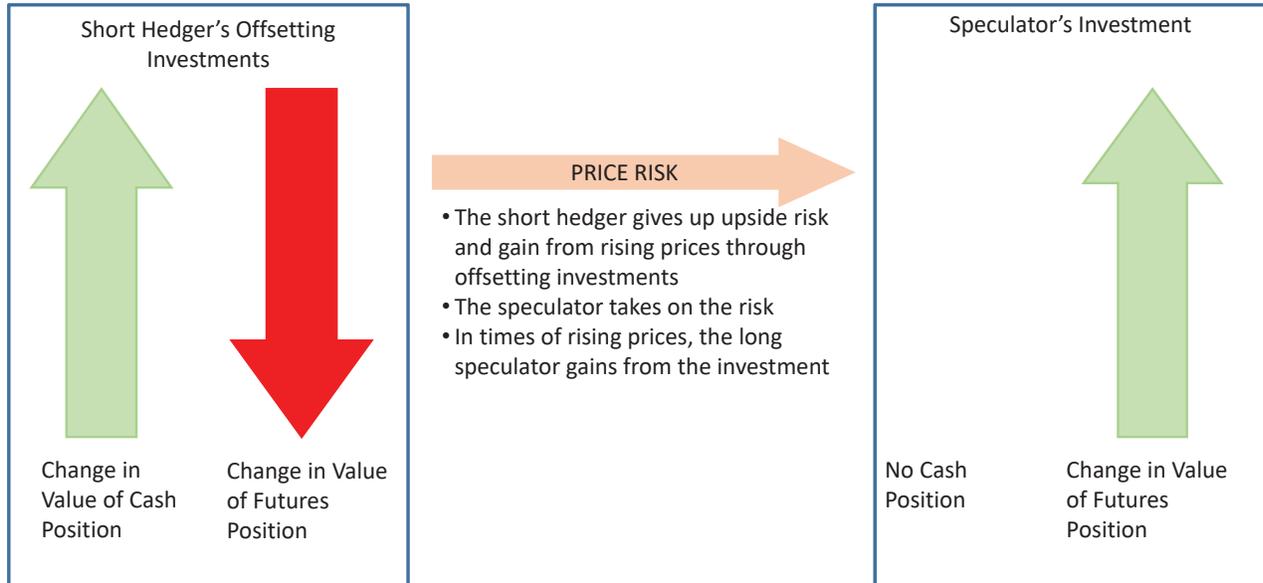
Hedging Concepts: Arbitrage

- Futures market traders can form a bias concerning whether prices will move one way or another, relative to cash prices
- They then trade based on this bias
- Traders who are active in a market for the sole purpose of making money on their trades are known as *speculators*
- Though a bit more complicated than our example, their actions to capitalize on arbitrage opportunities connect futures and cash prices for a given commodity

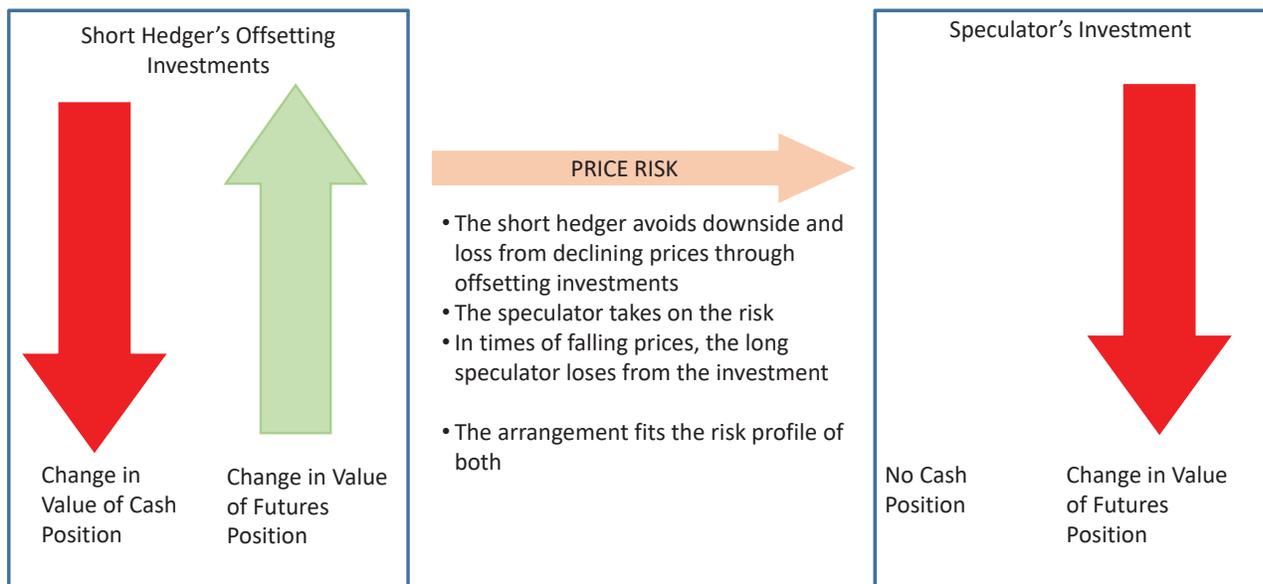
Hedging Concepts: Function of Futures Markets

- The ability to trade futures contracts allows for two important activities to occur
 1. Price Discovery
 2. Transfer of Risk
- Speculators take on price risk with the hopes of making money
- Hedgers pay to avoid price risk
- Speculators are necessary for hedging to take place

Transfer of Risk: Rising Prices Example



Transfer of Risk: Falling Prices Example



Hedging Examples

Example: Long Feeder Cattle Hedge by a Cattle Feeder							
Time	Cash Feeder Cattle			Feeder Cattle Futures			Basis
	Action	Price per cwt	Position	Action	Price per cwt	Position	
January 18, 2018	Planning to place feeder cattle in March.			Buy March feeder cattle futures contracts			
March 15, 2018	Purchase feeder cattle			Sell March feeder cattle futures contracts			
Net							

Example: Long Feeder Cattle Hedge by a Cattle Feeder

Time	Cash Feeder Cattle			Feeder Cattle Futures			Basis
	Action	Price per cwt	Position	Action	Price per cwt	Position	
January 18, 2018	Planning to place feeder cattle in March.	\$146	Short	Buy March feeder cattle futures contracts	\$147	Long	-\$1.00
March 15, 2018	Purchase feeder cattle			Sell March feeder cattle futures contracts			
Net							

Hedging Examples

- What does the long hedger expect to pay for the feeders?

Expected Price = Cash Price Paid + Gain/Loss in Futures Position
+[Commission/lbs purchased]

Expected Price = Futures Price when Hedge is Lifted + Basis
when Hedge is Lifted + [Commission/lbs purchased]

For our example, we will ignore commission

Hedging Examples

- What does the long hedger expect to pay for the feeders?

Expected Price =

Futures Price when Hedge is Lifted + Basis when Hedge is Lifted

How to predict?

- Simplest is to use futures at the time the hedge is placed
- Can consider seasonal patterns, analysts' predictions, etc.

Hedging Examples

- What does the long hedger expect to pay for the feeders?

Expected Price =

Futures Price when Hedge is Lifted + Basis when Hedge is Lifted

How to predict?

- Simplest is to use a seasonal average. For example, the calendar week you plan to lift the hedge.
- Regional basis charts are available at no charge
- The more specific to your operation, the better
- Think about what information you can collect

Hedging Examples

- What does the long hedger expect to pay for the feeders?

Expected Price =

Futures Price when Hedge is Lifted + Basis when Hedge is Lifted

In our example...let's use current futures and an expected basis of +\$2.00:

$$\text{Expected Price} = \$147 + (+\$2.00) = \$149$$

Example: Long Feeder Cattle Hedge by a Cattle Feeder

Time	Cash Feeder Cattle			Feeder Cattle Futures			Basis
	Action	Price per cwt	Position	Action	Price per cwt	Position	
January 18, 2018	Planning to place feeder cattle in March.	\$146	Short	Buy March feeder cattle futures contracts	\$147	Long	-\$1.00
March 15, 2018	Purchase feeder cattle	\$148	Long	Sell March feeder cattle futures contracts	\$141	Short	+7.00
Net							

Example: Long Feeder Cattle Hedge by a Cattle Feeder

Time	Cash Feeder Cattle			Feeder Cattle Futures			Basis
	Action	Price per cwt	Position	Action	Price per cwt	Position	
January 18, 2018	Planning to place feeder cattle in March.	\$146	Short	Buy March feeder cattle futures contracts	\$147	Long	-\$1.00
March 15, 2018	Purchase feeder cattle	\$148	Long	Sell March feeder cattle futures contracts	\$141	Short	+7.00
Net		\$148	None		-\$6.00	None	

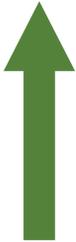
	Net Price Paid per cwt	Basis
Expected	\$149	+\$2.00
Actual	\$154	+\$7.00
Error		

	Net Price Paid per cwt	Basis
Expected	\$149	+\$2.00
Actual	\$154	+\$7.00
Error	-\$5.00	-\$5.00

Basis prediction was low, actual basis was more positive than expected
 The long hedger paid a higher than expected price
 Ability to predict basis determines ability to predict net price

Hedging Concepts: Basis

- Strong Basis
 - Cash is higher, relative to futures
 - Indicates a higher local demand and/or lower local supply of the cash commodity
- Weak Basis
 - Cash is lower, relative to futures
 - Indicates a lower local demand and/or higher local supply of the cash commodity

Stronger Basis	Basis	Weaker Basis
	+\$0.05	
	\$0.00	
	-\$0.05	
	-\$0.15	
	-\$0.25	
	-\$0.30	
	-\$0.35	

Hedging Concepts: Basis

- Stronger Basis Than Expected
 - Short hedgers benefit
 - Long hedgers fare worse
- Weak Basis Than Expected
 - Short hedgers fare worse
 - Long hedgers benefit

Did the hedge work?

- How do you determine if the hedge was effective?
- Tempting to look at the cash price without hedging: \$148 vs net priced paid with the hedge: \$154
- Relevant to the bottom line but not a way to evaluate the hedge
- Compare expected price to net price paid:
 - \$149 vs. \$154
- Not great, in this case...
- You should be comfortable with the returns from the expected price
- Achieving the expected price is the goal of the hedge...even if it means giving up potential cash gains

Hedging Concepts: Options

- A futures position is an obligation
- You can also buy or sell options on futures contracts
- An option is the right but not obligation to take a certain futures position within a certain time
- Put Option—the option to take a short position in a futures contract at a specified price during a certain time
- Call Option—the option to take a long position in a futures contract at a specified price during a certain time

Hedging Concepts: Options

- An option is described by a few things:
 - Strike price—Price of the underlying futures contract at which the holder can establish a futures position
 - Premium—amount that a person pays for an option (or the amount for which the seller sells an option); quoted in price per unit
 - Put/Call—what position the holder has a right to establish

Hedging Concepts: Options

- A few notes...
- Brokers differ in handling option fees. Some charge two fees up front. Some charge one fee and then another IF the option is exercised
- The holder of an option can also simply sell it back. The result is not the same as exercising but it is the same idea.
- As futures moves in the holder's favor the premium will increase and it can be sold back at a higher price than it was purchased for
- Options for deliverable contracts (like Live Cattle) expire at the BEGINNING of expiration month. Cash settled options expire at the expiration of the contract

Hedging Concepts: Options

- Understanding basis is still important, just as when hedging with futures
- Options eliminate undesirable price variability but allow for beneficial variability
 - Sellers of the cash commodity can benefit from rising prices
 - Buyers of the cash commodity can benefit from falling prices
- You pay for this convenience
- When a hedger buys an option, someone out in the market sold that option...just like with futures contracts, risk is transferred

Options Example

Option Example: Using a Put Option to Manage the Price Risk of Selling Market Hogs

- Strike Price = \$49.000/cwt
- Premium = \$4.625/cwt
- These prices are on the December contract from 8/13/18
- Remember...this means an option on 1 contract will cost \$1,850
- One contract will cover around 140 market hogs
- Put options to cover approximately 1,000 head = \$12,950

Option Example: Using a Put Option to Manage the Price Risk of Selling Market Hogs

- Strike Price = \$49.000/cwt
- Premium = \$4.625/cwt
- A put gives the right to sell at the strike price and, if offset by a cash position, will set an approximate price floor
- Approximate Price Floor = Strike - Premium + Expected Basis
- Let's use -\$3 as an expected basis
- Approximate Price Floor = \$49 - \$4.625 + (-\$3) = \$41.375

Put Option to Manage Price Risk of Selling Market Hogs						
Cash Price at Sale (\$/cwt)	Futures Price at Sale (\$/cwt)	Value of the Option (\$/cwt)	Premium (\$/cwt)	Net Impact (\$/cwt)	Effective Price Received (\$/cwt)	Basis (\$/cwt)
\$46.00	\$49.00	\$0.00	\$4.625	-\$4.63	\$41.375	-3.00

Strike Price = \$49/cwt

Put Option to Manage Price Risk of Selling Market Hogs						
Cash Price at Sale (\$/cwt)	Futures Price at Sale (\$/cwt)	Value of the Option (\$/cwt)	Premium (\$/cwt)	Net Impact (\$/cwt)	Effective Price Received (\$/cwt)	Basis (\$/cwt)
\$45.00	\$48.00	\$1.00	\$4.625	-\$3.63	\$41.375	-3.00
\$46.00	\$49.00	\$0.00	\$4.625	-\$4.63	\$41.375	-3.00

Strike Price = \$49/cwt

Put Option to Manage Price Risk of Selling Market Hogs						
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\$38.00	\$41.00	\$8.00	\$4.625	\$3.375	\$41.375	-3.00
\$41.38	\$44.38	\$4.63	\$4.625	\$0.00	\$41.375	-3.00
\$45.00	\$48.00	\$1.00	\$4.625	-\$3.625	\$41.375	-3.00
\$46.00	\$49.00	\$0.00	\$4.625	-\$4.625	\$41.375	-3.00

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\$41.38	\$44.38	\$4.63	\$4.625	\$0.000	\$41.375	-3.00
\$45.00	\$48.00	\$1.00	\$4.625	-\$3.625	\$41.375	-3.00
\$46.00	\$49.00	\$0.00	\$4.625	-\$4.625	\$41.375	-3.00
\$47.00	\$50.00	\$0.00	\$4.625	-\$4.625	\$42.375	-3.00
\$48.00	\$51.00	\$0.00	\$4.625	-\$4.625	\$43.375	-3.00

Strike Price = \$49/cwt

Put Option to Manage Price Risk of Selling Market Hogs						
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\$45.00	\$48.00	\$1.00	\$4.625	-\$3.625	\$41.375	-3.00
\$46.00	\$49.00	\$0.00	\$4.625	-\$4.625	\$41.375	-3.00
\$47.00	\$50.00	\$0.00	\$4.625	-\$4.625	\$42.375	-3.00
\$48.00	\$51.00	\$0.00	\$4.625	-\$4.625	\$43.375	-3.00

Strike Price = \$49/cwt

Put Option to Manage Price Risk of Selling Market Hogs						
Cash Price at Sale (\$/cwt)	Futures Price at Sale (\$/cwt)	Value of the Option (\$/cwt)	Premium (\$/cwt)	Net Impact (\$/cwt)	Effective Price Received (\$/cwt)	Basis (\$/cwt)
\$38.00	\$41.00	\$8.00	\$4.625	\$3.375	\$41.375	-3.00
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\$45.00	\$48.00	\$1.00	\$4.625	-\$3.625	\$41.375	-3.00
\$46.00	\$49.00	\$0.00	\$4.625	-\$4.625	\$41.375	-3.00
\$47.00	\$50.00	\$0.00	\$4.625	-\$4.625	\$42.375	-3.00
\$48.00	\$51.00	\$0.00	\$4.625	-\$4.625	\$43.375	-3.00
\$38.00	\$42.00	\$7.00	\$4.625	\$2.375	\$40.375	-4.00

Strike Price = \$49/cwt

Hedging Concepts: Options

- Once you pay a premium, it is gone forever
- The negative impact on selling price will never be more than the premium
- If prices move in your favor you can capture some of the upside risk in the cash market
- If prices move against you, a price floor is established, subject to basis risk

Hedging Concepts: Options

- A call option is the opposite of a put
- It establishes an approximate price ceiling
- Approximate Price Ceiling =
Strike Price + Premium + Expected Basis
- You are protected against rising prices and can still partially benefit from declining prices, subject to basis risk
- You can also sell options back instead of exercising them. The concepts remain the the same.

Hedging Concepts: Basis

- When using futures and options to hedge, basis matters
- Really, only basis matters
- How to determine a basis projection?
- 3-year averages are readily available—this is a good starting point
 - Cooperative Extension services through universities
 - Beef Basis
 - Private Firms

Hedging Concepts: Basis

- Work to get a basis tailored to your operation
 - Geography
 - Type/quality of animals
 - Seasonal patterns
- Reliable cash prices when you don't sell (or maybe when there is no trade)
- Over time, keeping your own records can help
- Using historical basis—consider the range as well as average

Cross Hedging

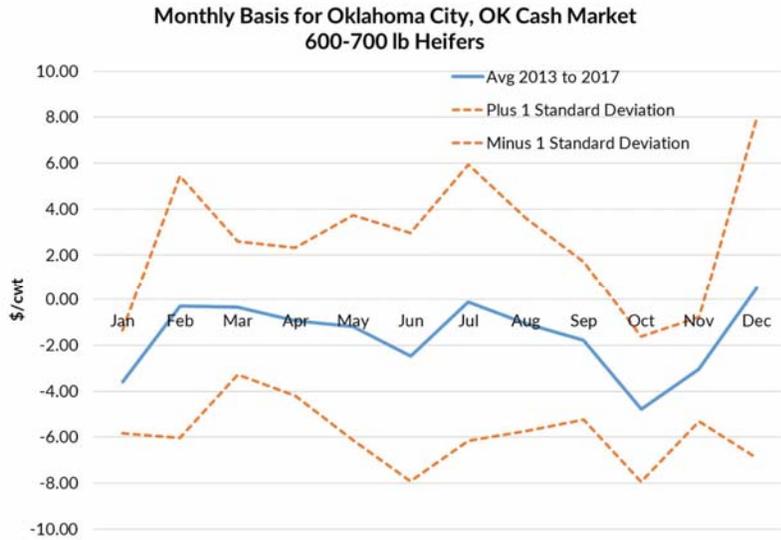
How opposite and how equal?

- Timing
 - Choosing a contract month
 - Match your selling or buying time window
 - Consider open interest and volume
 - Basis
- Size of Position
 - Get as close as possible to intended purchase or sale volume as possible
 - No exact match
 - Overhedged: futures position > cash position, you are speculating in the futures market
 - Underhedged: futures position < cash position, you are speculating in the cash market

How opposite and how equal?

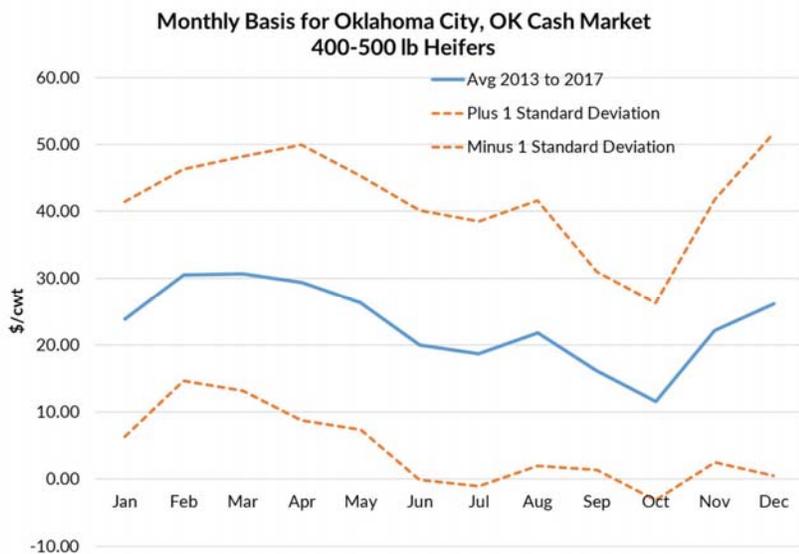
- Contract Match
 - Many livestock hedges are cross hedges, in that livestock do not exactly match the contract specifications
 - Close cross hedges
 - Using the Feeder Cattle Contract to hedge heifers
 - Using Live Cattle Contract to hedge beef steers not born in the US
 - Cross hedges a bit farther from the contracts
 - Using Live Cattle Contract to hedge live dairy breed steers/heifers
 - Using the Feeder Cattle Contract to hedge 500 lb weaned calves
 - Just like hedges, cross hedges work if cash and futures move together in a predictable way
 - Seasonal patterns can differ with cross hedges
 - If the cross hedge is not a close match, a 1 to 1 hedge ratio might not be the best strategy

Example: Basis for Cross Hedges



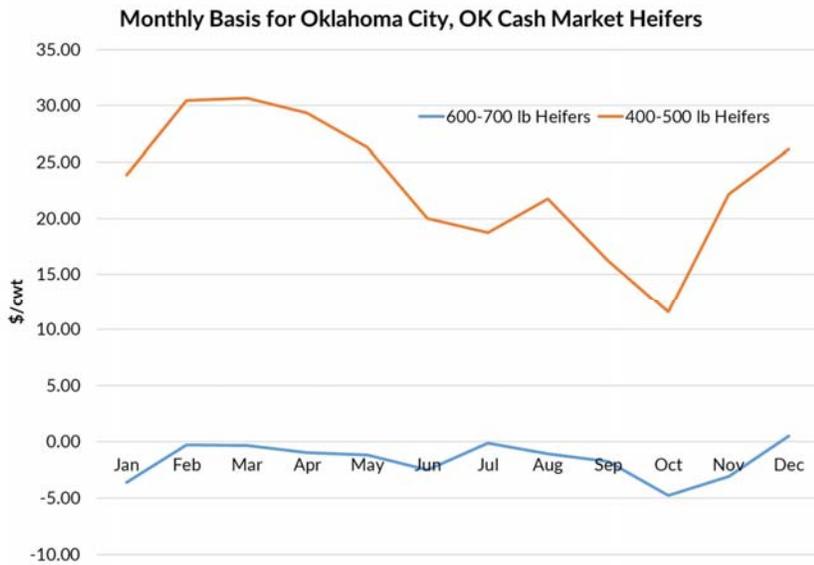
- Technically, hedging feeder heifers is a cross hedge
- Avg monthly basis between -\$5/cwt and \$1/cwt
- Standard deviations of monthly basis between \$2/cwt and \$8/cwt

Example: Basis for Cross Hedges



- As the weight moves outside contract specs, basis variability changes
- Avg monthly basis between \$11/cwt and \$31/cwt
- Standard deviations of monthly basis between \$14/cwt and \$26/cwt
- Cash markets for 6-7 and 4-5 weight feeders are closely related but not identical

Example: Basis for Cross Hedges



- Cash markets for 6-7 and 4-5 weight feeders are closely related but not identical
- Similar seasonal patterns but typically bigger movements in the basis for lighter calves

Hedging Concepts: Costs of Hedging

- Broker Fees
- NFA fees (\$0.02 per transaction)
- Opportunity cost of capital in the margin account
- Opportunity cost of researching/projecting basis and determining strategies

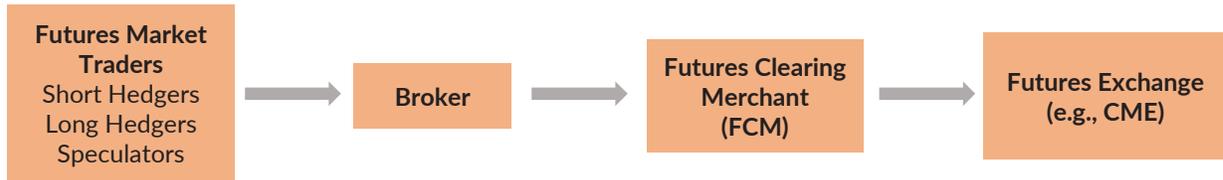
Hedging Concepts: Margin Accounts

- To open a futures position, you must deposit an amount equal to the initial margin needed for each contract times the total number of contracts traded
- There is a maintenance margin level for every contract. This can vary among brokers.
- The balance of your broker account is the money deposited plus the equity in your position(s)
- If this balance is below maintenance margin level, you must deposit cash to bring the balance up to initial margin level

Hedging Concepts: Margin Accounts

- Margin accounts require substantial capital
- Margin for one CME Feeder Cattle Contract is \$2,800
- \$8,400 margin to hedge about 200 head (800 lb animals)
- Capital is required to be held as long as your position is open

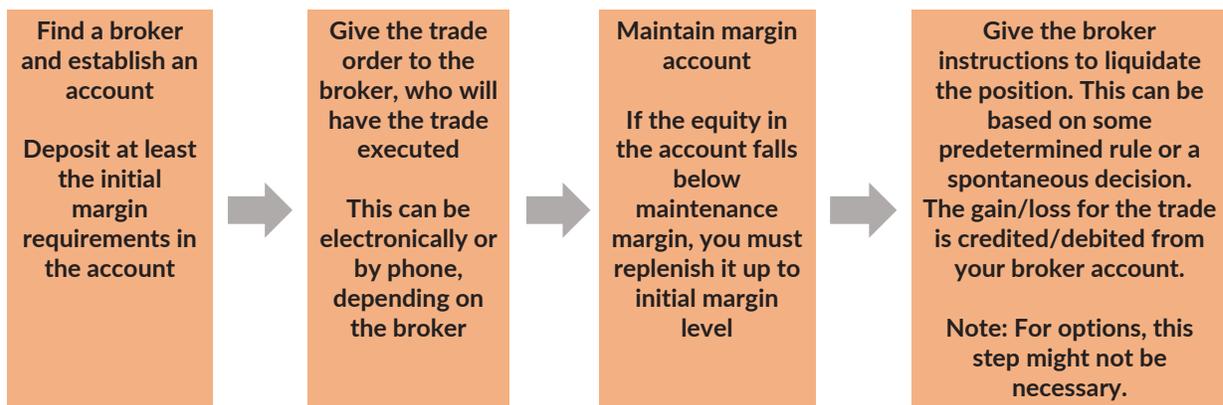
Mechanics of Trading Futures and Options



Anyone wishing to trade futures or options will work with a broker. A broker is licensed to place trades with an FCM. FCMs have a seat on a given futures exchange and have the right to trade on that exchange. It is the FCM that executes the trades with an exchange. It is possible that the broker and FCM are the same organization.

The relationship with the broker may be completely electronic, over-the-phone, in-person, or some combination.

Mechanics of Trading Futures and Options



You must pay a broker fee for every trade. Fees are generally in the range of \$5 to \$40. Higher fees come with more access to the broker for advice and guidance. Lower fees are for electronic platforms where the trader simply points and clicks to accomplish the above steps. **Choosing a broker is an important decision. Put some time and research into it.**

Hedging Concepts

- A producer is hedging (or hedged) if and only if she has equal and opposite positions in cash and futures
- Taking care to match contract size and cash position is important
- Any deviation from this involves speculating in either the cash or futures market
- A hedge trades flat price risk for basis risk
- Understanding your own basis is essential for an effective hedging strategy

Hedging Concepts

- Hedging is one possible risk management tool that can fit into a producer's big picture plan...but is not a substitute for good management
- Producers should evaluate their financial situation and their own personalities then decide whether hedging makes sense
- In general, a producer can hedge to target an acceptable return
- **Knowing per unit production costs is necessary for this to work**

Hedging Concepts

- If you are happy enough with a target return to hedge it, then be happy to take it...even if your hedge in a year means you gave up potential cash market gains
- **A hedge is effective if it allows you to achieve this target**
- What we have discussed today is basic, disciplined hedging for managing risk
- Many producers use more complex strategies that involve market timing and combinations of instruments

Hedging Concepts

- What we have discussed today is basic, disciplined hedging for managing livestock price risk
- Plan how using futures or options will mesh with other price risk strategies like insurance, cash contracts, etc.
- Don't forget other risks
 - Feed price
 - Fuel price
 - Weather
 - Disease

Resources

- Agmanager.info
 - <https://www.agmanager.info/grain-marketing/publications>
 - <https://www.agmanager.info/grain-marketing/publications#price-risk-publications>
 - <https://www.agmanager.info/livestock-meat/marketing-extension-bulletins/price-risk>
- Iowa State Extension and Outreach
 - <https://www.extension.iastate.edu/agdm/ldmarkets.html>
 - <https://www.extension.iastate.edu/agdm/cdmarkets.html>
- CME Group has excellent educational materials at no charge
 - www.cmegroup.com

Resources

- Beef Basis
 - Mix of no-charge and fee-based materials and data
 - <https://beefbasis.com/>
- Livestock Marketing Information Center (LMIC)
 - www.lmic.info
 - Market price report data, production data
 - Livestock and meat data
 - Access to most useful data requires a membership

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Supplemental Slides

Hedging Concepts: Margin Calls

- As an example of how margin calls work, consider a position of one feeder cattle contract
- Initial Margin = minimum required to open the position = \$2,800
- Maintenance Margin = amount at which a margin call is initiated = \$2,800 (initial and maintenance can be different)
- A short hedger sells a contract at the current futures price of \$145/cwt

Hedging Concepts: Margin Calls

Date	Cash Balance	Futures Price	Position Equity	Net Account Value	Margin Call
7/30	\$2,800	\$145	\$0	\$2,800	
7/31					
8/1					
8/2					
8/3					
8/4					

Initial Requirement = \$2,800
Maintenance Margin = \$2,800

Position = short @ \$145

Hedging Concepts: Margin Calls

Date	Cash Balance	Futures Price	Position Equity	Net Account Value	Margin Call?
7/30	\$2,800	\$145	\$0	\$2,800	
7/31	\$2,800	\$143	\$1,000	\$3,800	No
8/1	\$2,800	\$144	\$500	\$3,300	No
8/2					
8/3					

Initial Requirement = \$2,800
 Maintenance Margin = \$2,800

Position = short @ \$145

Hedging Concepts: Margin Calls

Date	Cash Balance	Futures Price	Position Equity	Net Account Value	Margin Call?
7/30	\$2,800	\$145	\$0	\$2,800	
7/31	\$2,800	\$143	\$1,000	\$3,800	No
8/1	\$2,800	\$144	\$500	\$3,300	No
8/2	\$2,800	\$147	-\$1,000	\$1,800	Yes, \$1,000—must restore net acct value to initial level
8/3					

Initial Requirement = \$2,800
 Maintenance Margin = \$2,800

Position = short @ \$145

Hedging Concepts: Margin Calls

Date	Cash Balance	Futures Price	Position Equity	Net Account Value	Margin Call?
7/30	\$2,800	\$145	\$0	\$2,800	
7/31	\$2,800	\$143	\$1,000	\$3,800	No
8/1	\$2,800	\$144	\$500	\$3,300	No
8/2	\$2,800	\$147	-\$1,000	\$1,800	Yes, \$1,000—must restore net acct value to initial level
8/3	\$3,800	\$147	-\$1,000	\$2,800	No

Initial Requirement = \$2,800
 Maintenance Margin = \$2,800

Position = short @ \$145

Monthly Basis for Oklahoma City, OK Cash Market Heifers and TX-OK Slaughter Steers

