

# LECTURE VIII

ACE 428  
Commodity Futures and Options

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# HEDGING WITH FUTURES

- ▶ **The goal**
  - ▶ pass flat price risk to someone else
  - ▶ stay with (smaller) basis risk
- ▶ Exchange cash price risk for *basis risk*
  - ▶ cash price volatility versus basis volatility
- ▶ Motivation for hedging
  - ▶ reduce risk (transfer risk)
  - ▶ **maximize profit**
  - ▶ facilitate trade
  - ▶ simplify managerial decisions

# Types of hedge

- ▶ Operational hedge
- ▶ Selective hedge
- ▶ Cross hedge
- ▶ Carrying-charge hedge
- ▶ Anticipatory hedge

## Types of hedge (2)

- ▶ Operational hedge
  - ▶ facilitates merchandising or processing operations
  - ▶ hedges input or output for a short time, often ignoring basis, to gain protection from rapid price changes while product processed
  - ▶ hedge acts as a temporary substitute and is liquidated as soon as trader takes corresponding cash position
  - ▶ examples: flour miller, exporter and importers

## Types of hedge (3)

- ▶ Selective hedge
  - ▶ trader decides to hedge based on price expectations
  - ▶ **holder** of commodity hedges if prices are **expected** to fall, and doesn't hedge if prices are expected to rise
  - ▶ timing of “pulling the trigger”
  - ▶ adds a speculative component
  - ▶ motivation: prevent large losses

## Types of hedge (4)

- ▶ Cross hedge
  - ▶ assume a futures position opposite to an existing cash position, **but in a different commodity**
  - ▶ usually because cash commodity does not have corresponding futures contract
  - ▶ prices of futures contracts and commodity must be highly **positively correlated**
  - ▶ examples: corporate bonds and T-bonds, sorghum and corn, boneless beef and live cattle
  - ▶ You essentially substitute one futures with another

## Types of hedge (5)

- ▶ Price correlations between DDGs, corn, soybean meal and grain sorghum

	2000-2005	2004-2011
DDGs - Corn	0.43	0.40
DDGs - Soybean Meal	0.38	0.28
DDGs - Sorghum	0.47	0.39
Corn - Soybean Meal	0.58	0.72
Corn - Sorghum	0.55	0.86
Soybean Meal - Sorghum	0.26	0.60

## Types of hedge (6)

- ▶ Carrying-charge hedge
  - ▶ Merchant purchases and stores commodity
  - ▶ Associated with the storage of a commodity
  - ▶ Seeks to profit from changes in price relationships (basis) rather than price level changes

## Types of hedge (7)

- ▶ Anticipatory hedge
  - ▶ Usually not matched or offset by an equivalent stock of goods
  - ▶ Temporary substitute for merchandising to be done later
    - expected purchase and sale in cash market
  - ▶ Allows merchant to establish an approximate forward price
    - facilitates financial position
  - ▶ Potential of risk reduction depends on relationship between buying and selling prices
  - ▶ Examples: flour miller, soybean crusher, livestock feeder

# Some examples

- ▶ Short hedge
  - ▶ Today ( $t = 0$ )
    - corn producer planning to harvest and sell corn in the future
    - places hedge using futures contracts at price  $F_0$
  - ▶ Harvest ( $t = 1$ )
    - producer sells corn in the cash market at price  $S_1$
    - producer offsets position in futures market at price  $F_1$
    - final result: net price received (NPR)
    - $NPR = F_0 + B_1$

# More examples

- ▶ Long hedge
  - ▶ Today ( $t = 0$ )
    - soybean processor planning future purchases of soybeans for  $t = 1$
    - places hedge using futures contracts at price  $F_0$
  - ▶ Harvest ( $t = 1$ )
    - soybean processor buys soybeans in the cash market at price  $S_1$
    - soybean processor offsets position in futures market at price  $F_1$
    - final result: net price paid (NPP)
    - $NPP = F_0 + B_1$

## More examples (3)

- ▶ Carrying-charge hedge
  - ▶ Today ( $t = 0$ )
    - grain elevator buys soybeans in the cash market at price  $S_0$
    - plan: store and sell the beans in the future
    - places hedge using futures contracts at price  $F_0$
  - ▶ Selling time ( $t = 1$ )
    - grain elevator sells soybeans in the cash market at price  $S_1$
    - offsets position in futures market at price  $F_1$
    - final result: net profit (NPr)
    - $NPr = B_1 - B_0$

## Target price and realized price

- ▶ Target price is the expected net price received (short hedge) or net price paid (long hedge) *at the beginning of the hedge*
  - ▶ target price = initial futures price + **expected** basis
- ▶ Uncertainty about expected basis (basis risk)
- ▶ Realized price is the actual net price received (short hedge) or net price paid (long hedge) *at the end of the hedge*
  - ▶ realized price = initial futures price + **realized** basis

## Target price and realized price (2)

- ▶ How do target (expected) price and realized price differ from each other?

$$\begin{array}{l} \text{initial futures price} \\ + \text{ expected basis} \\ \hline = \text{target price} \end{array}$$

$$\begin{array}{l} \text{initial futures price} \\ + \text{ realized basis} \\ \hline = \text{realized price} \end{array}$$

$$\text{realized price} - \text{target price} = \text{realized basis} - \text{expected basis}$$

## Target price and realized price (3)

- ▶ Change in the basis will determine how much money hedger will make or lose relative to his/her initial expectation
  - ▶ importance of predicting basis accurately
- ▶ If basis forecast goes wrong, hedge can even result in losses
  - ▶ basis risk
- ▶ **Hedgers are basis speculators**
- ▶ Hedgers are basis speculators

## Target price and realized price (4)

- ▶ Short hedgers
  - ▶ hedge future sale in cash market by selling futures contract
  - ▶ target price:  $E(NPR) = F_0 + E(B_1)$
  - ▶ go long in basis
  - ▶ if basis increases (realized basis  $>$  expected basis) they make more money because realized NPR is greater than expected NPR
  - ▶ if basis decreases (realized basis  $<$  expected basis) they make less money because realized NPR is smaller than expected NPR

## Target price and realized price (5)

- ▶ Long hedgers
  - ▶ hedge future purchase in cash market by buying futures contract
  - ▶ target price:  $E(NPP) = F_0 + E(B_1)$
  - ▶ go short in basis
  - ▶ if basis increases (realized basis  $>$  expected basis) they lose money because realized NPP is greater than expected NPP
  - ▶ if basis decreases (realized basis  $<$  expected basis) they save money because realized NPP is smaller than expected NPP

# Target price and realized price: An example

- ▶ Merchant hedging
  - ▶ Merchant purchases grain on October 1, stores until next May, and sells on May 1
  - ▶ On October 1
    - current local cash price = \$4.40/bu
    - May futures = \$5.00/bu
    - expectation: basis will be -\$0.35/bu
  - ▶ On May 1
    - local cash price = \$4.00/bu
    - May futures price = \$4.40/bu

## Target price and realized price (7)

- ▶ Target price = initial futures price (Oct. 1) + estimated basis for May 1
- ▶ Target profit = target price - initial cash price (Oct. 1) = expected change in the basis
- ▶ Realized price = initial futures price (Oct. 1) + realized basis for May 1
- ▶ Realized profit = realized price - initial cash price (Oct. 1) = realized change in the basis

## Target price and realized price (8)

- ▶ Payoff diagrams
  - ▶ Graphical representation of your expected gain/loss considering several possible scenarios
  - ▶ Example:
    - break-even price = \$3.00/bu
    - futures price today = \$3.30/bu
    - basis = 0 (producer's local market is also the futures market delivery point)