Futures and Hedging Review

Chapter 4

Mindy Mallory

Highlights

- Review of futures contracts and how to calculate profit or loss on a trade
- Hedging examples from the sell side (farmer's hedge) and from the buy side (flour mill's hedge)
- Learn how basis risk impacts a hedge

Check Your Understanding

- Can you calculate the profit or loss from a trade?
- Can you fill out a hedging net revenue table given prices on key dates?

What is a Hedge?

Merriam-Webster defines a **hedge** as a means of protection or defense (as against a financial loss).

In the present context:

- A hedge is the use of a derivative contract to reduce or eliminate risk in your business' profits
- Understanding who is hedging and why is very helpful to understanding price relationships and what drives them to move up or down

Futures Contract Review

What is a Futures Contract?

A futures contract is a contract between two parties to buy and sell:

- At an **agreed-to price**
- A **specific quantity and quality** of something
- At a **specific location**

Example: CBOT Corn Futures

- 5,000 bushels of U.S. number 2 yellow corn
- At specific elevators along the Illinois River, Lake Michigan, or associated canals

How Futures Differ from Stocks

- Futures are traded on a centralized exchange (like the "stock market")
- Counter-parties do not know each other
- **Key difference:** When a trade takes place, no ownership transfer occurs
- It is simply a **promise to buy or sell** at a specific date in the future
- This is why there are many different futures contract "months" (e.g., December 2017 corn, March 2018 corn)

Margin and Marking to Market

Margin: An amount of money that acts as a performance bond

- Ensures both parties can make good on the contract if held until expiration

Marking to Market: Daily transfer of money from losers to winners

- As price moves up: money taken from seller's margin account, put into buyer's account
- As price moves down: money taken from buyer's margin account, put into seller's account
- Ensures everyone has financial capital required to honor contract terms

Futures Trading Example

At 10am the March corn futures contract is trading at \$4.50/bu.

- Trader A decides to **buy** one contract
- Trader B decides to **sell** one contract

At 1pm both traders close their position. Price has moved up to \$4.75/bu.

Since price went up by \$0.25/bu:

- Longs (buyers) gain: $+\$0.25 \times 5000 = +\$1250$
- Shorts (sellers) lose: $-\$0.25 \times 5000 = -\$1250$

Futures Trading Example

Time	Trader A	Trader B
10am	buy $4.50	sell $4.50
1pm	sell $4.75	buy $4.75
profit per bu	$4.75 - $4.50 = +$0.25	$4.50 - $4.75 = -$0.25
profit one contract	+$1,250	-$1,250

Closing Futures Positions

Very few contracts are held all the way to expiration (when transfer of ownership would take place).

Traders who originally bought:

- Sometime before expiration will **sell**, eliminating their obligation
- Getting them to a "flat" position

Traders who originally sold:

- Will **buy**, getting them to a "flat" position

Delivery

Deliverable Contracts

CME Group grain and oilseed futures are **deliverable contracts**:

- Ensures a link between the spot market and the futures market
- Only a few contracts traded are actually delivered on
- Purpose of futures market is not physical exchange, but rather **streamlined risk management** in a liquid market

Regular for Delivery

The exchange has designated large commercial grain handlers and warehouses as **regular for delivery**.

Delivery Territories (CME Group Rulebook):

- Chicago and Burns Harbor, Indiana Switching District
- Lockport-Seneca Shipping District
- Ottawa-Chillicothe Shipping District
- Peoria-Pekin Shipping District

Shipping Certificates

If someone with a short futures position wants to deliver:

- Cannot just show up with 5,000 bushels in trucks
- Must deliver a **shipping certificate** for 5,000 bushels from a regular for delivery warehouse
- A certificate giving the holder the right to demand load-out of grain meeting quality standards

Premium Charges:

- Fees collected by warehouse for storage space
- Corn and soybeans: shall not exceed 0.165 cents/bu/day ($\approx$4.95 cents/bu/month)

Taking Delivery

If the long party wants to take delivery:

- Must pay the full amount: Futures Price $\times$ 5,000 bushels
- Must pay premium charges to the warehouse to hold the shipping certificate

Who Hedges and How?

Farmer's Hedge

The Farmer's Situation

Consider a corn farmer who:

- Plants crop in April
- Waits for it to grow and mature through summer and fall
- Harvests in November
- Sells right after harvest at local grain elevator

The Problem: Entire income for the year comes from the sale of this grain, and a lot can happen to price between April and November.

A Grain Elevator in Royal, IL

Source: Daniel Schwen, CC-License

Ways to Reduce Income Risk

1. Crop Insurance

- Purchase a policy that pays indemnity if price goes down, yield is low, or both
- Does not directly interact with futures market

2. Forward Price Contract

- Local elevators offer forward contracts to buy grain
- Farmer delivers grain within specific date range at agreed price
- Eliminates price uncertainty for farmer
- Elevator transfers price risk to speculators by selling futures

Ways to Reduce Income Risk (cont.)

3. Futures Market

- Farmer goes directly to futures market to sell futures contracts
- Reduces but does not eliminate uncertainty (still faces basis risk)

4. Options Market

- Buy a put option for a premium paid upfront
- Put makes money if price goes down (like short futures)
- If price goes up, only loses original premium
- Maintains upside potential while protecting downside

The Basis

On May 1st:

- Local elevator offers \$3.50 for corn
- May futures trading at \$3.60
- The \$0.10 difference is largely due to geographic distance

Basis Definition

$$\text{Basis} = \text{Cash Price} - \text{Futures Price}$$

Basis reflects the price distance over space between the local cash market and the futures delivery point.

The Hedging Rule

To Hedge

Take the same action in the futures market (buy or sell) that you will do in the cash market at a future date.

The farmer will:

- **Sell** corn in the cash market in November
- Therefore, should **sell** (December) futures to hedge

Naturally Long

The farmer is **naturally long**:

- Essentially long the unharvested grain in the field
- "Long" is a financial position that gains value when price goes up and loses value when price goes down

To hedge:

- Take a position with the opposite profile
- Take a **short position** to hedge their naturally long position

Example Setup

On May 1st:

- Cash price in Royal, IL: $3.50
- December futures price: $3.75
- Basis (Dec): -$0.25

The farmer sells December futures to hedge.

Consider two scenarios for November:

1. Dec futures price went up to $4.00
2. Dec futures price went down to $3.60

Case 1: Price Up to $4.00, Basis Unchanged

Date	**Action**	**Cash Price**	**Dec Futures**	**Basis**
May 1st	Sell Dec Futures	$3.50	$3.75	-$0.25
Nov 1st	Buy Dec Futures & Sell Cash Corn	$3.75	$4.00	-$0.25
Profit Calculation:				
Cash:		$3.75		
Futures:			$3.75 - $4.00 = -$0.25	
Net per bushel:		$3.75 - $0.25 = **$3.50**		

Case 1: Key Takeaway

With basis unchanged:

- The farmer **eliminated uncertainty** over selling price
- By "selling ahead" in the futures market, price was locked in (except for basis)
- Farmer would have liked to sell for \$3.75 instead of \$3.50 net
- But by locking in, **gave up potential for upside**

Case 2: Price Down to $3.60, Basis Unchanged

Date	**Action**	**Cash Price**	**Dec Futures**	**Basis**
May 1st	Sell Dec Futures	$3.50	$3.75	-$0.25
Nov 1st	Buy Dec Futures & Sell Cash Corn	$3.35	$3.60	-$0.25
Profit Calculation:				
Cash:		$3.35		
Futures:			$3.75 - $3.60 = +$0.15	
Net per bushel:		$3.35 + $0.15 = **$3.50**		

Case 2: Key Takeaway

The hedge protected against deteriorating prices!

By selling Dec futures ahead of the cash sale:

- Price risk was reduced
- But not eliminated—still have **basis risk**

Basis Risk Examples

Now consider: futures price unchanged at $3.75 in November

But the basis changes:

- Case 3: Basis widens to -$0.50
- Case 4: Basis narrows to $0.00

Case 3: Futures Unchanged, Basis Widens to -$0.50

Date	Action	Cash Price	Dec Futures	Basis
May 1st	Sell Dec Futures	$3.50	$3.75	-$0.25
Nov 1st	Buy Dec Futures & Sell Cash Corn	$3.25	$3.75	-$0.50
Profit Calculation:				
Cash:		$3.25		
Futures:			$3.75 - $3.75 = $0.00	
Net per bushel:		$3.25 + $0.00 =	**$3.25**	

Basis widening was a loss to the farmer, even though general price levels unchanged.

Case 4: Futures Unchanged, Basis Narrows to $0.00

Date	Action	Cash Price	Dec Futures	Basis
May 1st	Sell Dec Futures	$3.50	$3.75	-$0.25
Nov 1st	Buy Dec Futures & Sell Cash Corn	$3.75	$3.75	$0.00
Profit Calculation:				
Cash:		$3.75		
Futures:			$3.75 - $3.75 = $0.00	
Net per bushel:		$3.75 + $0.00 = **$3.75**		

Narrowing of the basis was an increase in profit to the farmer.

Long the Basis

When a farmer hedges with futures, they are "**long in the basis**".

A futures hedge eliminates price uncertainty from general price levels:

- If prices go up $\rightarrow$ increase in cash price, but loss on futures position
- If prices go down $\rightarrow$ receive less in cash, but gain on futures position

However: The futures hedge does NOT protect against changes (good or bad) in the relative price between the local cash market and the futures price.

Flour Mill's Hedge

The Flour Mill's Situation

A flour mill:

- Buys large quantities of grain for making flour
- Wants to process grain year round
- Needs to hedge price risk at multiple points in time

Example: High commercial wheat flour mills can process upwards of **50,000 bushels** of wheat per month.

With wheat futures at 5,000 bushels/contract, they need **10 contracts** to hedge one month's wheat buying.

Hedging by Buying Ahead

Flour Mill Hedge Rule

Remember: A futures hedge always involves making a trade in the futures contract that is the same as what you will do in the cash market.

The flour mill **buys** grain, so their futures hedge should **buy** futures ("buying ahead").

Wheat Futures Contracts

There are **five wheat futures contracts per year**:

March	May	July	September	December

To hedge, the mill must use the **nearest contract month**.

Example: To hedge a February 1st purchase, use March futures (no February contract exists).

Hedging Strategy Example

On December 1st: Mill wants to lock in wheat purchase price for first six months of next year.

- January, February, March purchases $\rightarrow$ hedge with March futures
- 50,000 bu/month $\times$ 3 months $=$ 150,000 bu $=$ 30 contracts
- April, May purchases $\rightarrow$ hedge with May futures (20 contracts)
- June purchase $\rightarrow$ hedge with July futures (10 contracts)

Total: Buy 60 contracts on Dec 1st to hedge Jan–Jun purchases.

Lifting the Hedge

Hedges should be **lifted simultaneously** with activity in the cash market.

Example:

- On January 1st: Mill purchases 50,000 bu in cash market
- Simultaneously: Sell 10 March contracts (lift the hedge)
- After January 1st: Still holding 20 long March contracts for Feb & Mar purchases

Flour Mill Hedge: Real Data 2016

Date	Action	Long Position	Net Price Paid	Spot	Mar	May
Dec 1, 15	Buy 30 Mar, 20 May, 10 Jul			469.75	470	476.5
Jan 1, 16	Buy 50k spot, Sell 10 Mar	20 Mar, 20 May, 10 Jul	-479 + (479.25-470) = -469.75	479.00	479.25	485
Feb 1	Buy 50k spot, Sell 10 Mar	10 Mar, 20 May, 10 Jul	-444.75 + (445-470) = -469.75	444.75	445	453.25
Mar 1	Buy 50k spot, Sell 10 Mar	20 May, 10 Jul	-471.25 + (471.5-470) = -469.75	471.25	471.5	473.5
Apr 1	Buy 50k spot, Sell 10 May	10 May, 10 Jul	-477.75 + (478-476.5) = -476.25	477.75	NA	478
May 1	Buy 50k spot, Sell 10 May	10 Jul	-464.75 + (465-476.5) = -476.25	464.75	NA	465
Jun 1	Buy 50k spot, Sell 10 Jul	0	-431 + (431.25-483.25) = -483	431	NA	NA

Assumes basis is fixed at -0.25 cents under the nearby futures contract.

Soybean Crusher

Soybean Crusher's Hedge

The soybean crusher:

- **Buys** soybeans
- **Sells** soybean meal and oil

Their futures hedge would involve:

- **Buying** soybean futures (hedge the input)
- **Selling** meal and oil futures (hedge the outputs)

"Crush" hedges are more complicated because they involve buying one commodity, transforming it, and selling another commodity.

Importance of Line of Credit

Why a Line of Credit Matters

Anyone hedging with futures must have a **line of credit** to meet margin calls when the market moves against their hedge.

Example: Farmer sells futures as a hedge

- If price starts moving up $\rightarrow$ cash grain worth more, but futures hedge is losing money
- As short hedge loses money $\rightarrow$ margin needs to be maintained
- If prices move significantly against hedge $\rightarrow$ additional money needed for margin

The Role of the Lender

- Additional margin usually must come from a **lender**
- Lender knows it's a safe loan because prices are going up—the cash sale will cover any futures losses

Without a line of credit:

- Cannot maintain margin
- Short hedge position will be **forced to liquidate**
- Farmer will no longer be hedged

Summary

- **Futures contracts:** Agreements to buy/sell at an agreed price; profits/losses calculated by price movement $\times$ contract size
- **Delivery:** Most contracts closed before expiration; actual delivery uses shipping certificates
- **Hedging rule:** Take the same action in futures as you will in the cash market
- **Farmer (seller):** Sells futures to hedge; is "long the basis"
- **Flour mill (buyer):** Buys futures to hedge
- **Basis risk:** Hedging eliminates price level risk but not basis risk
- **Line of credit:** Essential to maintain margin when market moves against the hedge