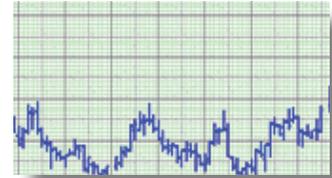


Introduction to Futures Hedging for Grain Producers

Collin Allgood, Leigh Maynard, and Cory Walters, Department of Agricultural Economics



Introduction

This guide is written for farm producers who want to know the basics of how futures markets operate and how to use them for protection against the risk of falling prices. The examples all relate to grain farms because the author, Collin Allgood, is a grain producer. While a student at the University of Kentucky, he wrote this guide as part of an independent study course supervised by Leigh Maynard. The following material is a summary of several textbooks and online resources. The advantages of using this guide are that (1) it is much shorter than reading all of the references listed at the end of the guide, (2) it contains more up-to-date information than many textbooks that were written before futures information and brokerage services were available online, and (3) it was written by someone learning about futures markets for the first time and is therefore written clearly for an audience at the same level of experience. If you have any questions or want more information contact Cory Walters, grain marketing extension specialist in the Department of Agricultural Economics.

History of Futures Markets

Futures markets came into existence to resolve inequities between demand and supply. In the 1800s, farmers descended on Chicago in the fall to sell their grain, establishing Chicago as the new grain market center. There was often so much grain and not enough buyers that many farmers had to dump their grain into Lake Michigan, creating a short supply of grain in the spring. In 1848, a handful of grain merchants banded together to form an organized grain exchange—the Chicago Board of Trade (CBOT). The CBOT provided a meeting place for buyers and sellers to get together and conduct business. This smoothed out supply and brought a certain amount of price stability over the course of the year (CME, p. 1).

What determines the price of a commodity? Simply stated; supply and demand. If there is a large supply, or lack of demand, prices are pushed down. Similarly, if there is a supply shortage, or high demand, prices will rise. Therefore, price acts as the market regulator for

supply. To successfully understand the futures markets, one must first understand the basic concepts of demand and supply and how markets react to the factors that influence supply and demand (E-futures, p. 1).

Producers face risks of varying degrees, and these may take the form of weather, biological, production, policy, and marketing risks. This guide will focus on marketing risks associated with grain production and the tools available to assist grain producers in protecting themselves against marketing risk. Marketing risk includes not only fluctuations in prices but also changes in contracting terms, grades and standards, and the opportunity to sell the product. Futures markets provide one possible means for managing price risk (Catlett and Libbin, 2007, p. 3).

Functions of Futures Markets

Futures markets are closely related to the ideas of competition. Many buyers and sellers participate in futures contract

markets, and the futures contracts for a commodity are homogenous except for price and expiration date. This limits any one trader from influencing prices. Futures markets are useful in a variety of ways, but the four main functions of futures markets are:

- To facilitate the management of price risk.
- To aid producers and firms in discovering forward prices.
- To provide a means for producers and firms to request and secure additional operating capital from lending institutions.
- To provide a source of information for decision making.

Futures markets are extensions of the cash markets, making them work more efficiently by providing information to both traders and non-traders. Futures are the forward pricing of commodities and, because of the relationship with cash markets, futures markets are the primary price discovery system for many commodities.

Futures prices serve as reference values for producers and are “expected prices” at a specific time in the future, not necessarily where cash market prices will be at that point in time. Futures markets are a zero-sum game; for every dollar won, someone else loses a dollar. Futures markets operate as “paper markets.” Traders can participate in the futures market without possessing the physical commodity. Traders exchange commodity or product obligations for monetary obligations (Leuthold, Junkus, and Cordier, 1989, pp. 3-6).

Futures Contracts, Exchanges, and Trading

A futures contract is a standardized, legally binding agreement between the buyer and seller to exchange a commodity (or its cash value) in the future at a price, quality, quantity, location, and time. Futures contracts are created when the buyer and seller enter the market and make an agreement on price. There is no limit on the number of contracts in existence. Ownership does not change hands, and only a small amount of money is posted by both buyer and seller to guarantee performance. Futures contracts can be easily liquidated, and few contracts are taken to maturity. Traders use futures contracts to protect themselves from

price fluctuations or to profit from them. The only variable in a futures contract is price, and the risk to both parties is unlimited (Leuthold, Junkus, and Cordier, 1989, p. 23).

The two types of positions in the futures market are short and long (we will define the short position in greater detail in the “Short Hedging” section). When a trader purchases a futures contract, he/she is “long” and profits when the market moves higher (i.e., buy low, sell high). A trader is “short” when he/she sells a futures contract and profits when the market moves lower (i.e., sell high, buy low). Producers are typically “short” futures because they plan on selling a crop in the future. Table 1 shows a producer selling a futures contract in September. He later sells his grain and offsets the futures contract in October for a net gain of \$0.30 per bushel (Efutures, p. 2).

Table 1. Chronological order of a futures hedge.

Date	Cash Market		Futures Market		
	Action	Price	Action	Price	Net
15 Sep			Sell	\$3.90	
15 Oct	Sell	\$3.20	Buy	\$3.60	
Net		\$3.20	+	\$0.30	\$3.50

Source: Adapted from an example given by Dr. Leigh Maynard, Associate Professor of Agricultural Economics, University of Kentucky, personal communication, 2009.

The sample futures quote in Figure 1 shows the contract month, latest price, change range for the day, open and close, high and low, volume of trading, and high/low limit. The contract specifications tab lists contract size, grade, tick size, and other valuable information for traders. The performance bonds/margins tab lists the margin requirements for each commodity. The product calendar tab lists trade, settlement, holding, position, notice, and delivery for each delivery month.

Futures contracts are forward contracts, representing a pledge to make a transaction at some point in the future, but futures contracts differ from the standard forward cash contract. Futures contracts have standardized terms, trade on formal exchanges, are regulated by overseeing agencies, and are guaranteed by a clearinghouse. Futures contracts have a margin requirement that is settled daily by the clearinghouse. Unlike other legally binding agreements, futures contracts can easily be liquidated by assuming an offsetting position (Leuthold, Junkus, and Cordier, 1989, p. 26). Figure 2 shows how to offset a trading position.

While generic forward contracts result in the physical delivery of a commodity, futures contracts can be closed out by offsetting a trade, taking delivery of

Figure 1. Sample futures quote.

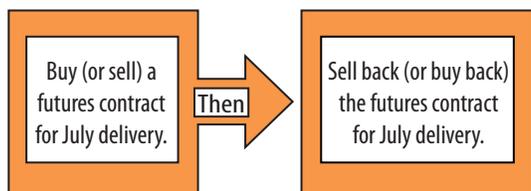
Corn Futures

Quotes Contract Specifications Performance Bonds/Margins Production Calendar Resources										
Month	Charts	Last	Change	Prior Settle	Open	High	Low	Volume	Hi/Lo Limit	Updated
Dec 2009 OPI	 	328'0	-8'2	336'2	335'2	341'4	322'6	89543	366'2/306'2	1:08:10 PM CST 9/17/2009
Mar 2009 OPI	 	341'4	-8'0	349'4	348'4	354'4	336'2	12513	379'4/319'4	1:08:06 PM CST 9/17/2009
May 2010 OPI	 	350'2	-8'4	358'6	357'6	363'0	345'4	1230	388'6/328'6	1:08:10 PM CST 9/17/2009
Jul 2010 OPI	 	358'6 b	-8'2	367'0	366'0	371'0	353'6	3359	397'0/337'0	1:08:09 PM CST 9/17/2009
Sep 2010 OPI	 	366'0 b	-9'2	375'2	380'0	380'0	362'4	335	405'2/345'2	1:08:07 PM CST 9/17/2009

Source: Adapted from CME: Chicago Mercantile Exchange, Sept. 16, 2009. <http://www.cmegroup.com/trading/commodities/grain-and-oilseed/corn.html>.

Note: The number after the ' mark is in eighths. For example, 3.36' is 3.36 and 3/8 per some unit of trading.

Figure 2. How to offset a trading position.



Source: Adapted from “An Introduction to Futures and Options,” Sept. 16, 2009, p. 7. <http://www.cme.com>.

goods, or arranging for an exchange of goods. One advantage of trading futures contracts is the ability to use financial leverage (E futures, p. 4). Table 2 compares both forward and futures contracts.

Contract size, place of delivery, quality, and maturity month of futures contracts are standardized. Contract sizes correspond with standard units of trade in the cash market. Agricultural contracts specify acceptable quality and grade of the commodity. Most commodity contracts specify four to eight delivery months per year, corresponding with existing trade practices. Futures contracts also state the delivery location, involving either licensed warehouses or approved livestock yards (Leuthold, Junkus, and Cordier, 1989, pp. 23-24). Table 3 shows the contract specifications for each major grain commodity and the corresponding month symbols.

Once a contract expires for a specific delivery month, settlement takes place. Settlement is done in one of two ways. First, the commodity is physically delivered to the exchange by the contract seller, and the exchange delivers the speci-

fied commodity to the buyer of the contract. This method is unusual as most contracts are offset well before expiration. Most futures contracts are cancelled out by purchasing an offsetting position—that is, by buying a contract to cancel an original sale (offsetting a short position) or by selling a contract

to cancel an original buy (offsetting a long position). The second method of settling a futures contract is cash settlement. This occurs when a cash transaction is made based on the contract’s reference price. The account is credited or debited the difference between the position price and the settled index price (E futures, p. 3).

Traders participate in the futures markets for different reasons. These include brokers executing orders for public customers, brokers executing orders for firms involved in daily cash markets, professional speculators attempting to profit from price fluctuations, and hedgers representing commercial firms to protect against negative price movements. This unique mix of traders makes the futures market competitive and efficient and gives it liquidity.

Traders can alter market positions by placing different types of orders. The first, and simplest, is the market order, where the broker is instructed to either buy or sell contracts promptly for the best price. If traders wish to obtain the best possible price rather than buying

or selling quickly, a limit order can be placed. Limit orders specify the time or price for filling a contract. To protect themselves from disastrous losses, traders can also place what is called a stop-loss order. Finally, spread orders involve purchasing one futures contract while simultaneously selling another contract to profit from changes in price relationships.

Futures contracts are regulated by both the federal government and the exchanges. Regulation keeps futures trading open and competitive and relatively free of price fixing, distortion, and collusion. Each exchange sets daily price limits and minimum movements for most contracts. Price limits allow the market to digest new information without overreacting, giving traders an opportunity to react accordingly. For example, corn prices are only allowed to move \$0.30 above or below the opening price. Table 4 shows examples of daily price change limits of grain commodities under normal conditions, but limits can expand during volatile periods.

Table 4. Commodity daily price change limits.

Commodity	Price Limit
Corn	\$0.30
Wheat	\$0.60
Soybeans	\$0.70
Soybean meal	\$20.00
Soybean oil	\$0.025
Soybean crush	\$0.00125

Source: Information obtained from “An Introduction to Futures and Options,” Sept. 16, 2009. <http://www.cme.com>.

Table 2. Comparison of forward versus futures contracts.

	Forward Contract	Futures Contract
Transaction nature	Custom-tailored	Standardized
Contract size	Negotiable	Standardized
Delivery date	Negotiable	Standardized
Prices	Private negotiation	Public auction-type
Security deposit	May be zero	Required by both parties
Breaking contract	Difficult	Easy to offset position
Regulation	Federal/state laws	CFTC/NFA/self-regulation
Guarantor	None	Exchange clearinghouse

Source: Adapted from “An Introduction to Futures and Options,” p. 6. Sept. 16, 2009. <http://www.cme.com>.

Table 3. Futures contract specifications for different commodities.

	Contract Specifications		Month Symbols	
	Contract Size	Delivery Months		
Corn	5,000 bushels	H, K, N, U, Z	January	F
Wheat	5,000 bushels	H, K, N, U, Z	February	G
Soybean	5,000 bushels	F, H, K, N, Q, U, X	March	H
Soybean meal	100 short tons	F, H, K, N, Q, U, V, Z	April	J
Soybean oil	60,000 pounds	F, H, K, N, Q, U, V, Z	May	K
Soybean crush	5,000 bushels	F, H, K, N, Q, U, V, Z	June	M
			July	N
			August	Q
			September	U
			October	V
			November	X
			December	Z

Source: Adapted from “An Introduction to Futures and Options,” p. 28. Sept. 16, 2009. <http://www.cme.com>.

Within the exchange, the clearinghouse matches the two traders and guarantees the process of trading. The clearinghouse balances all futures markets transactions and money flows. The primary functions of the clearinghouse are:

- To match and reconcile all futures transactions.
- To assure financial integrity of these transactions.
- To provide the mechanism for delivery.

Futures markets are unique to other markets in that traders are required to post a margin. The initial margin serves as a security deposit. Initial margins vary on the type of contract traded. Because the margin requirement is only a fraction of the full value of the contract, customers can participate with relatively small financial investments. After depositing the margin, a trader must keep a minimum amount of money in his/her account, a maintenance margin level. Margin deposits allow the exchange clearinghouse to calculate paper profits and losses at the end of each day and add or subtract them from the trader's margin account balance. If a trader's account falls below the required maintenance margin level, a margin call is placed. A trader must either deposit more money into his/her account or offset the position to close the contract. The futures position of each trader is zero at the beginning of trade the next day. Margin deposits and any other margin calls are returned to a trader after a position is offset (Leuthold, Junkus, and Cordier, 1989, pp. 37-39).

Additional Information and Links

The basic fundamentals of how futures markets and contracts operate are explained in this guide. Note that this is only an abbreviated picture of the futures market. More information can be obtained from the exchange Web sites, university publications, and various books and guides. Producers considering entering into the futures market may find it helpful and necessary to consult these sources for more in-depth information. The following

sites and links will provide a good source of reference.

CME Group:

- <http://www.cmegroup.com/education/product-specific/the-basics.html>
- <http://www.cmegroup.com/education/market-commentary/Commodities/index.html>

Efutures:

- <http://www.efutures.com/education/index.php>

Pricing Strategies

Agricultural prices are discovered in the market through the interaction of current supply and demand. Supply of major food and feed grains is the sum of production in a current year plus carry-over stocks from previous years. Demand includes storage, feed use for livestock, food for human use, industrial use, and exports to other countries. The demand and supply of food and feed grains are highly interrelated with the demand and supply of livestock and their products (Leuthold, Junkus, and Cordier, 1989, pp. 123-124). Expected futures prices are tied into a number of external factors, and those factors are constantly changing, thus affecting expected prices. Price signals come from two main sources—the analysis of external events that affect the markets and the analysis of historical patterns of price movements (CME, p. 68). Market analysis is about the selection of the market and instruments to trade, timing when to open or close trades, and maximizing profits. Market analysis also assumes market efficiency, reflecting all of the knowable information about a specific commodity at any given time together with the opinions of all market participants regarding that information (Schlanger, 2009).

Risk management is critical in developing a successful trading plan. New traders need to exercise control over how much capital they risk per trade and on trading in general. The more detailed a trading plan is, the more likely the trade will have success. A trading plan should define the risk per trade and maximum losses per

month and year. The most basic question new traders should ask themselves is how much money they are willing to risk and whether they can afford to lose it (Efutures, p. 10).

Price forecasting is an essential tool for both speculators and selective hedgers in order to understand the factors that affect supply and demand levels, ultimately driving prices. Selective hedgers, such as grain producers, utilize price forecasting for setting hedges during risky times when prices are most likely to be volatile. Increases in costs of inputs, severe weather forecasts, and the anticipation of new government policies can encourage producers to set hedges in order to protect from falling prices. There are two primary methods used to forecast future price movement: fundamental analysis and technical analysis.

Basis and Price Relationships

Prices for many agricultural products are also discovered in both the cash and futures markets. Traders look at information about current market conditions as well as expected demand and supply conditions for the future in making decisions about whether to participate in the futures market. The futures market takes into account global information, whereas the basis takes into account local demand (which may be influenced by global demand—i.e., export sales). The basis is simply defined as the cash price minus the futures price. Basis represents the relationship between the cash and futures market.

Storage costs do not change noticeably from day to day, so in the short run, cash and futures prices maintain their relative positions, and the basis remains fairly constant but tends to be negative for most grains. Over the long run, cash prices rise relative to futures prices. The basis gradually gets smaller as the futures contract nears maturity. At harvest time when a new crop year begins, the basis usually weakens. This is due to the increased supply of grain in the new crop year. The basis can change abruptly on any day due to economic events that affect either the

cash or futures market.

This is especially seen in local markets where storage capacity constraints, labor issues, or irregularity of availability in shipping may occur. Variations in basis from year to year are due to changes in size in inventory, crop size, and demand for storage. The basis also varies over space. The closer a producer is located to a central shipping route or to large processors, the more valuable the commodity is; the basis weakens in favor of the producer (Leuthold, Junkus, and Cordier, pp. 124-125).

Below is a link to Iowa State University's Center for Agricultural and Rural Development basis maps. The maps show relative basis differences for corn and soybeans across Iowa and the Midwest. The purpose of these maps is to determine if a farmer's choice on where to deliver grain can be influenced based on basis differences across the region. Generally, basis tends to fall as producers make delivery at a location that has multiple modes of transportation and river access.

- http://www.card.iastate.edu/ag_risk_tools/basis_maps/

Fundamental Analysis

Fundamental analysis is based on market economics. Fundamental analysis focuses on the cause of external events to the trading market that are likely to affect prices in the market. Fundamental forecasts are based on potential shifts in demand and supply and how those shifts will affect commodity prices. The most common external events that lead to changes in the market include weather, current inventory levels, government policies, economic indicators, and trade balances (Leuthold, Junkus, Cordier, 1989, p. 74).

At the base of fundamental analysis lies the relationship between supply and demand and how this relationship will impact commodity prices. Figure 3 shows how the price of a commodity reacts in consideration to forces that affect supply and demand. When the supply of a commodity decreases and the demand stays the same, then price for that commodity

Figure 3. Effects on price from a change in supply and demand.

SUPPLY	DEMAND	PRICE
Down	Same	Rises
Same	Up	Rises

Source: Adapted from "An Introduction to Futures and Options," Sept. 16, 2009, p. 69. <http://www.cme.com>.

will rise. When the demand of a commodity increases and the supply stays the same, then the price for that commodity will rise (CME, p. 69).

Fundamental analysis involves watching and understanding last year's projected production, usage, and ending stocks to predict the direction of price movement. The fundamental approach compares current year's statistics with those of previous years in order to determine how prices moved in similar situations. Fundamental analysis also takes into account factors affecting acreage and yield numbers. Low prices for a specific crop can encourage producers to plant other crops, while high prices act as an incentive for producers to plant more of that crop. Weather is also an underlying factor in fundamental analysis, as extreme weather conditions can greatly affect yield and production, thus affecting supply (CME, p. 70).

The fundamental approach to analysis assumes an efficient market—where information is disseminated perfectly and is acted on rationally. However, one can easily see through volatile price movements that the notion of market efficiency does not always hold true, especially in the short term. A substantial amount of the fundamental analysis revolves around the release of key government reports. The major government reports include the *Planting Intentions Report*, *Crop Progress* reports, and the *World Agricultural Supply and Demand Estimates (WASDE)* reports. If the reports are in line with the market's expectations, the impact on prices will be minimal. If information in the reports contradicts expectations, market prices can respond dramatically. Before the release of these reports, most traders have a general expectation of what the report will state, so

information in the report is often already built into the futures price. Only when the report varies significantly from the traders' expectations do prices respond dramatically. Price volatility is usually higher leading up to and on the report's release date. New data are always filtering through the markets and creating price changes. One piece of information may suggest a price move in one direction, while a combination of other factors may drive prices in the opposite direction (Efutures, p. 12). The following link provides a useful calendar of the major government reports' release dates:

- <http://www.thectr.com/mmix/ef/index.php>

Figure 4 shows a sample *World Agricultural Supply and Demand Estimates (WASDE)* report. The information that traders watch in these reports is beginning stocks, production levels, usage levels, exports, and ending stocks. A projected price range per bushel is also included. WASDE reports are published on a monthly basis throughout the year.

Supply levels and projected supplies analyze the factors of production of a commodity. The interaction between input factors and their prices determines the level of production for producers. Costs of operation, inability to get financing, swings in fuel prices, and changes in labor costs also determine a producer's supply. Analyzing quantity supplied also involves knowing current inventory levels, carryover stocks, projected usage of the commodity, import and export levels and projections, government programs and seasonal reports, and production levels in other countries (Leuthold, Junkus, and Cordier, 1989, p. 74).

Demand for grain commodities depends on analyzing domestic and foreign factors. Usage for processing by firms plays an important role in determining national demand. Food processors and livestock feed processors both determine demand on a national level, and that demand is based on the supply of grain by producers. Exports are influenced by world economic conditions, weather, exchange rates, and trade policies. The U.S.

Figure 4. U.S. feed grain corn supply and use.

WASDE-475-12 Item	October 2009		2009/10 Projections	
	2007/08	2008/09		
		Est.	September	October
Corn				
Area	Million acres			
Planted	93.5	86.0	87.0	86.4
Harvested	86.5	78.6	80.0	79.3
	Bushels			
Yield per harvested acre	150.7	153.9	161.9	164.2
	Million bushels			
Beginning stocks	1,304	1,624	1,695	1,674
Production	13,038	12,101	12,954	13,018
Imports	20	14	10	10
Supply, total	14,362	13,739	14,660	14,702
Feed and residual	5,913	5,231	5,350	5,400
Food, seed & industrial	4,387	4,976	5,475	5,480
Ethanol for fuel	3,049	3,700	4,200	4,200
Domestic, total	10,300	10,207	10,825	10,880
Exports	2,437	1,858	2,200	2,150
Use, total	12,737	12,065	13,025	13,030
Ending stocks, total	1,624	1,674	1,635	1,672
CCC inventory	0	0	0	0
Free stocks	1,624	1,674	1,635	1,672
Outstanding loans	106	171	225	225
Avg. farm price (\$/bu)	4.20	4.06	3.05 - 3.65	3.05 - 3.65

Source: Adapted from "World Supply and Demand Estimates," United States Department of Agriculture, Office of the Chief Economist, October 2009. <http://www.usda.gov/oce/commodity/wasde/>.

dollar exchange rate is a very important factor affecting how competitive U.S. grain crops are in the world market. Approximately one-third of total U.S. grain production is exported to other countries. A lower U.S. dollar exchange rate can increase exports, making it cheaper for these countries to purchase U.S. grain (Luethold, Junkus, and Cordier, 1989, p. 74).

Technical Analysis

Technical analysis focuses exclusively on market information, primarily price movements. Trading volume and open interest for a specific commodity and contract month also play a role in technical analysis. Volume is the actual number of trades that have taken place during a specific time period, typically one trading session. Open interest refers to the number of open positions held over from one trading session to the next. Technical analysis works on the assumption that all fundamental information is already reflected in

the price and that it is more important to study previous price movements to gain an understanding of how prices will move in the future (CME, p. 76).

Charts, tables, and graphs are the major tools used in technical analysis. It is important to understand that a sequence of price movements often indicates the likelihood of future price movements, but exceptions to past patterns can occur. Technical analysis operates under the assumptions that the market is inefficient, information and market opinion are reflected in the price, and recurring price patterns will provide clues to future price movements. Technical analysis involves identifying price behavior patterns that suggest the possible initiation, continuation, or conclusion of a trend (Efutures, p. 13).

Figure 5 shows a support level. Support is a floor where interest in buying a commodity is stronger than the pressure to sell. A support level can be identified by prices failing to fall below a previous set of lows.

Figure 6 shows a resistance level. Resistance is a horizontal ceiling where the pressure to sell is greater than the pressure to buy. Resistance levels can be found by prices failing to rise above a previous set of highs (Efutures, p. 13).

Figure 7 shows a double top formation. Double tops, or bottoms, occur when a price movement does not break past a previous high or low. This usually indicates that the market has found a point where prices have unsuccessfully tried to break twice. Prices will typically reverse direction, ending the trend.

Figure 8 shows a bull flag formation. A bull flag is one example of flags and pennants. There are also bull pennants, bear pennants, and bear flags. Bull pennants and flags indicate prices will rise, while bear pennants and flags indicate that prices will fall. These represent short-term patterns when there is an abrupt price movement followed by a sideways price movement. The pattern is completed by another abrupt price movement in the same direction. Traders often use these as price signals as an entry point into the market (Efutures, p. 16).

Figure 9 shows a down-trending line in prices. This is simply a line extending the lows of a trending market. If the price closes through a trend line, the trend usually reverses. The trend line is used as support or resistance (Efutures, p. 14).

Grain Hedging Basics

Profit uncertainty arises from risks associated in the costs of production and the final price received. Rising output prices are generally beneficial to producers, and falling output prices are generally harmful. Cash prices and futures prices tend to rise and fall in a parallel fashion. By hedging, producers can control or minimize their risk in the cash market (Wisner and Hofstrand, 2006). Hedging allows producers to manage price risk by transferring the risk (i.e., for a producer—a lower price) to someone else. The market does not guarantee a profit, but hedging can assist a producer in obtaining a desired net price for his or her crop

Figure 5. Support level.



Figure 6. Resistance level.



Figure 7. Double top formation.

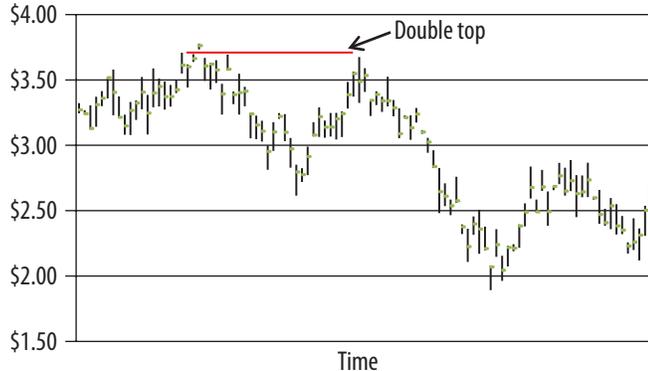


Figure 8. Bull flag formation.



Figure 9. Down-trending line in prices.



(Leuthold, Junkus, and Cordier, 1989, p. 137). Price movements are uncertain due to changes in weather and yields, foreign and domestic policies, and other supply and demand forces. Although producers do not have direct control over price, they do control when and how to hedge (Crane).

Establishing Prices

Prices for grain commodities are established in the cash market and futures market. The futures market trades contracts for delivery at some point in the future. The cash market is where actual

delivery of most grain is made to country elevators or processors and terminals. The difference between the cash market price and the futures price is the basis (cash price minus futures price). The basis differs depending on location. Hedging involves either entering into a contract or selling grain futures contracts as a temporary means of protecting against price risk. It is only temporary, as the grain will eventually be sold in the cash market (Wisner and Hofstrand, 2006).

For example, assume a western Kentucky corn producer has harvested 15,000 bushels of corn and placed it in

storage in grain bins. By selling 15,000 bushels of corn futures (three contracts), the producer has now hedged his crop and shifted the risk of declining prices to someone else. In this example, the producer owns 15,000 bushels of corn and is short (sold) 15,000 bushels of futures corn. Since the producer has sold futures, the expected price has been established based on the current futures price and the expected futures basis. Selling futures in a hedge leaves the basis unpriced. The final value of the corn is still subject to fluctuations in the local basis price, but basis risk is typically less than futures

price risk. By selling futures, the producer has eliminated the loss that could occur on the cash grain from a decline in futures prices (Wisner and Hofstrand, 2006).

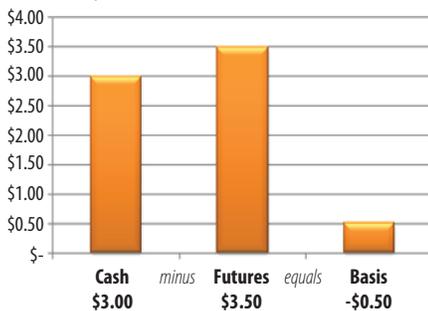
Figure 10 shows the difference between the cash price and the futures price, which constitutes the basis. The most substantial component of the cash price is the futures price. The basis accounts for the costs of carrying, storage, and transportation costs for local elevators, terminals, and processors.

Types of Marketing Tools

There are a number of widely used marketing tools and contracts that producers use to protect against price risk and market their grain. These include sell at harvest, storing for later sale, cash forward contracts, deferred pricing contracts, basis contracts, and hedging with a futures contract.

- Sell at harvest is the most easily understood and most common form of marketing grain. The selling price is known immediately, but prices are typically lowest at harvest.
- Storing for later sale involves producers storing grain in on-farm bins and selling at a later time. This type of marketing extends the pricing window and increases delivery flexibility, but quantity may deteriorate, and producers will face increased storage costs.
- Cash forward contracts occur when a producer signs a contract to deliver a fixed quantity and grade of grain at a specified price and location. Cash

Figure 10. Graphical example of the relationship between cash, futures, and basis.



Source: Adapted from Robert Wisner and Don Hofstrand, "Grain Price Hedging Basics," Ag Decision Maker (Ames: Iowa State University, 2006). <http://www.extension.iastate.edu/agdm/crops/html/a2-60.html>.

forward contracts eliminate the risk of falling prices; however, producers are locked in to the specified price, and if market conditions improve and prices rise, they cannot take part.

- A deferred pricing contract involves delivering grain to an elevator and is sold by a specified date at a price to be determined in the future. Deferred pricing contracts extend the pricing window, and gains are captured when prices rise, but storage costs may increase, and there is a risk of adverse price or basis changes until the grain is priced.
- A basis contract involves delivering grain to a commercial elevator and is sold prior to a designated date at a specified amount above or below a futures price. Basis contracts extend the pricing window, and there is no basis risk, but knowledge of basis levels is required.
- Hedging with a futures contract involves selling an appropriate amount of futures contracts in order to offset a cash market position. Futures contracts are bought back when grain is sold on the futures market. Futures hedging extends the pricing window and eliminates the risk of adverse futures

price movements, but there is a risk of adverse basis changes, and margin requirements have to be made up front (Crane). Table 5 summarizes the pros and cons of each strategy.

Producers seeking to minimize price risk through the futures market will use a selective hedge. With a selective hedge, producers decide whether or not to hedge based on price expectations. If prices are likely to fall, then producers will want to place a hedge. If prices are likely to rise, then it will not be in the producer's favor to set a hedge. Selective hedging is often done to prevent large losses and shift price risk to someone else (Leuthold, Junkus, and Cordier, 1989, pp. 145-146).

Short Hedging

A short hedge involves the sale of a futures contract. If you are long the commodity (that is, you own the commodity and plan to sell it in the future), then you must go short, or sell the commodity, in the futures market (CME, p. 52). Since producers own the crop and will sell after harvest, short hedging is the position that grain producers will want to assume. Figure 11 shows what position hedgers should take in the futures market based

Table 5. Pros and cons of contract strategies.

Contract Type:	Advantages:	Disadvantages:
Sell at harvest	<ul style="list-style-type: none"> • Easily understood • Immediate price • No storage costs • No deterioration 	<ul style="list-style-type: none"> • Low harvest price • Short marketing window • Eliminates other alternatives • Elevator congestion
Storing for later sale	<ul style="list-style-type: none"> • Extends pricing decision • Increases delivery flexibility • Return on storage if prices rise 	<ul style="list-style-type: none"> • Quality may deteriorate • Increased storage costs • Risk of adverse pricing during storage
Cash forward contracts	<ul style="list-style-type: none"> • Extends pricing decision • Eliminates adverse price risk • Easily understood 	<ul style="list-style-type: none"> • Increased production risk; delivery obligation (production risk may be offset with crop insurance) • Reduces marketing flexibility • No gain if prices rise
Deferred pricing contract	<ul style="list-style-type: none"> • Extends pricing decision • Gain when prices rise • May eliminate storage 	<ul style="list-style-type: none"> • Interest costs and storage fees • Risk of adverse price/basis change
Basis contract	<ul style="list-style-type: none"> • Extends pricing decision • May reduce commercial storage • No risk of adverse basis change 	<ul style="list-style-type: none"> • Risk of adverse price change • Basis knowledge required
Futures contract hedging	<ul style="list-style-type: none"> • Extends pricing decision • Eliminates adverse price risk • Easy to reverse (liquidity) • Basis more predictable than price 	<ul style="list-style-type: none"> • Risk of adverse basis change • Margin requirements • Requires knowledge of futures and basis • Eliminates gain from rising cash price

Source: Adapted from Dr. Laurence M. Crane, "Marketing Alternatives to Manage Risk."

Figure 11. Linkage between two types of hedgers.



Source: Adapted from "An Introduction to Futures and Options," CME: Chicago Mercantile Exchange, October 27, 2009, p. 52.

on whether they are seeking to purchase the commodity or possess the commodity to sell. Long hedgers (commodity users) worry about rising input costs. Short hedgers (commodity producers) worry about falling output prices.

The futures market is specifically designed for hedgers to minimize their chance of loss due to falling prices in the futures market. The hedger attempts to reduce the risk or price uncertainty through the sale of futures contracts. Through hedging, producers can lock in a price that will make their revenues more predictable (CME, pp. 53-54).

Hedging Examples

Perfect hedges rarely exist but can help in understanding hedging. In a perfect hedge, the producer takes opposite sides in the markets and can accurately predict what the basis will be when the hedge is lifted in the future. If one sets a hedge and can predict the "closing basis," then there is neither price risk nor basis risk, and the future outcome will be known with certainty. For example, suppose a producer correctly predicts that the corn basis against December futures will be $-\$0.20$ per bushel on November 1. Table 6 shows how a perfect hedge works.

Table 6. Example of a futures hedge when basis changes.

Date	Cash Transaction	Futures Transaction	Basis
Oct. 1	Stores grain Cash market @ \$3.65/bushel	Sells Dec. futures/ Contract @ \$3.95/bushel	$-\$0.30$
Nov. 1	Sells grain on cash market for \$3.60/bushel Loss of \$0.05	Buys back Dec. futures/Contract @ \$3.80/bushel Gain of \$0.15	$-\$0.20$

Source: Adapted from Lowell B. Catlett and James D. Libbin, *Risk Management for Agriculture: A Guide to Futures, Options, and Swaps* (New York: Thomson Corporation, 2007), p. 82.

A corn producer harvests his corn and has 10,000 bushels, which he puts in storage in grain bins on October 1 when the cash price at the local elevator is $\$3.65$ per bushel. He suspects that prices will fall by the time the stored grain is dried down, so he sets a hedge in the futures market by selling two December futures corn contracts (5,000 bushels each contract) for $\$3.95$. The basis (cash minus futures) is $\$0.30$. On December 1, the producer sells his grain at the local elevator for $\$3.60$ per bushel, where his suspicions were correct that cash prices would fall. He then simultaneously buys back the December futures contracts at a price of $\$3.80$ per bushel, where the basis between cash and futures prices strengthened $\$0.20$. The total loss on the cash market, if he chose to sell on October 1, is $-\$0.05$ ($\$3.65 - \3.60), and the total gain on the futures market is $\$0.15$ ($\$3.95 - \3.80), so the overall net gain of $\$0.10$ ($\$0.15 - \0.05) exactly equals the strengthening of the basis of $\$0.10$. The gains in the futures market offset the losses in the cash market exactly to the extent predicted. Had he not hedged against falling cash prices, he would have lost $\$0.05$ per bushel, or $\$500$ (Catlett and Libbin, 2007, pp. 83-84).

Table 7 shows another hedging example, but instead of storing soybeans that have already been harvested, the producer is hedging a crop still in the field. The producer plants 1,500 acres of soybeans and typically averages a yield of 50 bushels per acre on a good year. The estimated total yield comes out to 75,000 bushels. When the producer plants his crop in early May, the local cash price for soybeans is $\$9.65$ per bushel. He harvests his crop in mid-October and receives a local cash price of $\$9.37$ per bushel, $\$0.28$ below the price when he planted his crop. When he planted the crop, he also sold 15 January contracts for the following

year at a price of $\$10.05$ per bushel. When he sold his crop on the local market in October, he also bought back 15 January contracts for a price of $\$9.55$ per bushel. This example shows a strengthening basis gain of $\$0.22$ from $\$0.40$ in May to $\$0.18$ in October. The local cash price when the crop was planted was $\$9.65$. The farmer did not have the crop to sell at that time, so he could not take advantage of that price. When he sold the crop several months later, the price had fallen to $\$9.37$ per bushel, a price decline in the cash market of $\$0.28$ per bushel. However, the futures position gained $\$0.50$ per bushel during the same time because the futures price declined by $\$0.50$, thus the 22-cent improvement in the basis ($\$0.50 - \0.18). In this case, the producer was better off by placing hedges to protect from falling prices in the local cash market, thus gaining from the 22-cent change in the basis (Catlett and Libbin, 2007, pp. 91-92).

Hedging is most successful when the basis is predicted using local cash market prices. Deterioration in the basis will result in a net loss for the hedger (i.e., lower cash price). Price direction is unimportant; only the relative movements between the cash and futures markets—basis—matters. Hedging is useful because it replaces cash price risk with basis risk (remember cash price = futures price + basis, so futures price is fixed with hedging). The basis between locations is easier to predict than price levels. By obtaining historical basis levels, a producer can observe seasonal patterns in the basis at the local market to make better, more informed decisions on whether it is in the producer's favor to set a hedge.

Hedging Strategies

There is not a single tried-and-true strategy that is successful for all traders. Some may use trading signals to indicate when to enter the market and sell contracts, while others may employ a uniform strategy consisting of hedging in specific increments throughout the growing season. The two primary questions that one should attempt to answer when creating a hedging plan are:

Table 7. Example of a perfect futures hedge.

Date	Cash Transaction	Futures Transaction	Basis
May 1	Plants 1,500 acres soybeans	Sells Jan. soybean futures at \$10.05/bushel (5,000 bushels per contract with 15 contracts)	-\$0.40
	Estimated production of 50 bushels/acre (75,000)		
	Local cash price \$9.65/bushel		
Oct. 15	Harvests 67,500 bushels and sells locally at \$9.37/bushel for total revenue of \$631,125	Buys 15 Jan. soybean contracts at \$9.55/bushel	-\$0.18
		Net gain of \$0.50/bushel	Change of \$0.22

Source: Adapted from Lowell B. Catlett and James D. Libbin, *Risk Management for Agriculture: A Guide to Futures, Options, and Swaps* (New York: Thomson Corporation, 2007), p. 91.

- When should I place a hedge?
- How much should I hedge?

Hedging plans should fit the specific needs and desires of the producer. Different people will prefer different strategies based on their risk preferences. One common example is illustrated in Figure 12.

In this example, a producer would set hedges for one-third of the crop each time a sell signal occurs, given that the expected net price will be above the producer's predetermined acceptable level. Other producers may choose to hedge only two-thirds of their crop and leave the remaining one-third exposed to price risk. Producers who choose to hedge later in the season are more willing to accept breakeven levels, thus minimizing the chance for gaining any kind of profit. Although hedging strategies are widely varied and a truly successful strategy may only come through trial and error and learning from mistakes, hedging remains a better alternative than leaving an entire crop totally exposed to price risk.

Futures Options

Options on futures provide additional financial flexibility for producers and traders (CME, p. 81). An option on a futures contract derives its value from the underlying futures contract, which in turn derives its value from the underlying cash commodity. The buyer of an option is buying the right but not the obligation to buy or sell futures contracts at some time in the future. The seller of the option takes on risk and therefore demands compensation for selling the option. This compensation is called the premium. The futures price at which the option buyer can buy or sell futures is called the strike price. Options operate similarly to insurance policies. The basic premise of insurance is that the owner of a policy has purchased the right but not the obligation to use the benefits of the coverage. The buyer of the insurance policy pays a premium in order to gain a certain level of coverage or protection. With a typical homeowner policy for fire coverage, the seller would be the insurance company and the buyer would be the homeowner. If no fire occurs, the buyer would let the option expire, and the insurance company would keep the premium. If a fire occurs, the buyer would exercise the right to the coverage, and the insurance company would be obligated to provide benefits based on the contract terms. The terms and concepts associated with

options are almost interchangeable with those of insurance. The buyer of options purchases a certain level of price protection (strike price) and pays a premium for that protection. If the price protection is not needed, the option is allowed to expire. Standard futures contracts cannot provide this level of protection (Catlett and Libbin, 2007, pp. 114-115).

Put Options

Two types of options are available for grain commodities. An option to buy a futures contract is known as a call option. People who buy calls are predicting that the price of the underlying commodity will rise, thus protecting themselves from price increases. An option to sell a futures contract is known as a put option. People purchasing puts are forecasting that the price of the underlying futures commodity will fall. Grain producers will want to assume a short position, or sell futures contracts, in the market so the relevant options are puts. For the purposes of this guide, only put options will be discussed. The option buyer has no futures risk beyond the price of the premium paid for the option. Options offer more flexibility and require less capital financing than standard futures positions. Producers who purchase options can exercise, offset, or let the option expire (CME, p. 82). Figure 13 shows the available alternatives that producers have when purchasing options on futures contracts.

Figure 12.



If futures prices fall below an acceptable level, then producers may exercise the option, essentially locking in a price floor where losses are only limited to the price of the premium. If prices remain stable or rise, producers may offset the price, or part of the price, of the option by selling it back. Futures options are offset, or sold back, in the same way standard futures contracts are sold and bought. As the option moves closer to the expiration date, the option loses value. Producers can resell the option to recover part of the cost if they decide that it is not necessary to hold on to it or exercise it. Finally, producers can simply let the option expire and only incur a loss of the price of the premium (CME, p. 82).

Options buyers have the right but not the obligation to exercise the option, so rational traders will only exercise those options that have a gain, not a loss. Producers who purchase an option create a price floor for their commodity when prices are expected to fall. There is a limited loss and unlimited gains associated with buying put options on a futures contract. Once the option is exercised, the producer cannot lose any more than the premium paid for the option (Catlett and Libbin, 2007, p. 123). If prices rise, then the producer will gain from the rising futures price minus the premium paid for the option.

Strike prices are the set prices in which the option can be exercised. A strike price that is the same as the underlying futures price is said to be “at the money.” For put options, the strike prices that are above the current futures price are said to be “in the money” because one could exercise the option for a profit, selling futures at

the high strike price and buying at the low current futures price. “Out of the money” strike prices for puts are below the current price (Catlett and Libbin, 2007, p. 116). Option premium prices are influenced by how far “out of the money” they are, length to expiration, and volatility of prices. In general, the farther “out of the money” an option’s strike price is, the cheaper it is. Options that are farther from expiration will conversely have more expensive premiums. Also, options for commodities that have relatively volatile swings in prices will have higher premiums (Maynard, personal communication, 2009).

Put Options Hedging

Hedging with options creates the right but not the obligation to hedge with a futures contract. With a standard futures hedge, when prices move in favor of the cash position, the futures position lost an approximately equal amount. With an option hedge, the purchaser can let the option expire and not take a futures position, only losing the price of the premium. It is this characteristic that makes options a useful alternative to standard hedging (Catlett and Libbin, 2007, p. 132).

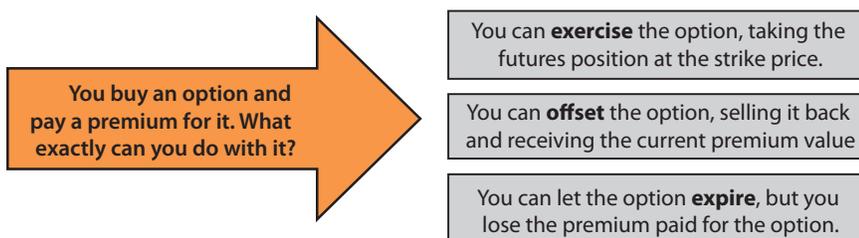
A corn producer is concerned that the price of corn will fall during the growing season and the cash market prices will fall when the corn is harvested and sold in the fall. A standard futures hedge would involve selling a corn futures contract during the growing season. A short futures position would gain in value if the corn price decreased. The producer could also hedge with options and, instead of selling a futures contract, an option hedge for the producer would involve buying

a put option on corn futures. The corn producer has bought the right but not the obligation to hedge. If corn prices fall, the producer will exercise the option and set a short futures hedge. If prices rise and the hedge is not needed, the producer can let the option expire and only lose the price of the premium (Catlett and Libbin, 2007, p. 132).

In Table 8, the corn producer would never receive anything less than \$3.35 per bushel, subject to basis risk, regardless of how low prices fall. When the cash price increased, the option can be allowed to expire, and the producer will only lose the premium. This put hedge sets a floor below which prices cannot fall. The potential gain is unlimited and reduced only by the amount of the options premium, simply taking the strike price and subtracting the premium amount. Since there are numerous combinations of strike prices and premiums, a producer can customize the expected price floor to meet his or her needs and acceptable price levels (Catlett and Libbin, 2007, p. 132). When choosing a strike price and premium, and whether it is “in the money” or “out of the money,” a producer should base these decisions on needed breakeven, or breakeven plus profit, levels to create an acceptable price floor. By basing strike price and premium decisions on needed breakeven levels, a producer has set a floor that has enough protection but is not set at a level that is above the needed protection and paying extra for price protection that is not needed. A producer must employ good record-keeping practices in order to determine the desired breakeven price and acceptable price floor level (Maynard, personal communication, 2009).

In the example in Table 8, the cash price at the local elevator is \$3.50 per bushel on July 1. The producer purchases a put option on December corn futures at a strike price of \$3.60 per bushel and a premium of \$0.15 per bushel. If on October 1, the producer harvests and sells his or her crop locally for \$3.00 per bushel (a \$0.50 drop in the cash market) but at the same time exercises the put option and sells a futures contract in December corn futures at

Figure 13. Available alternatives after purchasing a put option.



Source: Adapted from “An Introduction to Futures and Options,” CME: Chicago Mercantile Exchange, December 1, 2009, p. 81.

Table 8. Chronological example of purchasing a put option to hedge.

Cash		Option
July 1, corn crop growing current cash corn price @ \$3.50/bushel		Buys a put option on December corn futures at a strike price of \$3.60/bushel and premium of \$0.15/bushel (at-the-money option)
Price Decrease		
October 1, harvests and sells corn locally @ \$3.00/bushel		Exercises the option; receives a sell position in December corn futures @ \$3.60/bushel; buys December corn futures @ \$3.20/bushel; gains \$0.50/bushel
	Less	\$0.15 premium
	Total Profit	\$0.35 net gain
Price Increase		
October 1, harvests and sells corn locally @ \$4.00/bushel		Lets option expire Loss of premium = \$0.15/bushel

Source: Adapted from Lowell B. Catlett and James D. Libbin, *Risk Management for Agriculture: A Guide to Futures, Options, and Swaps* (New York: Thomson Corporation, 2007), p. 133.

\$3.60 per bushel and then buys back the December corn futures contract at \$3.10 per bushel, the producer will gain \$0.50 per bushel in the futures market. The producer has successfully hedged against falling prices with a put option and has a net gain of \$0.35 (\$0.50 gain in futures less \$0.15 premium). The net hedged option price in this scenario equals \$3.00 on the cash market plus the \$0.35 net gain in futures option for a total of \$3.35 per bushel (Catlett and Libbin, 2007, p. 133).

In the second scenario, the producer harvests his crop and sells it on October 1 for \$4.00 per bushel. Since cash prices rose above the strike price, it is likely that futures prices also rose above the strike price. There is no need in this case to exercise the put option, since the price floor will be set well below the cash price received. The producer will let the option expire and lose the put premium of \$0.15. The net hedged option price in this scenario equals \$4.00 on the cash market less the \$0.15 premium for a total of \$3.85 per bushel. The only other option the producer would have in this example would be sell the option before it expires at a reduced price to recover at least a portion of the option premium (Catlett and Libbin, 2007, p. 133).

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