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Farmers' Guide to Trading Agricultural Commodity Options

David E. Kenyon

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Preface

Trading in agricultural commodity options is expected to resume in 1984 after a nearly 50-year suspension. Options, like futures, can be used by farmers to manage their risks to make them less vulnerable to unexpected price shifts. This manual explains the concept of options, the terminology of option contracts, and the factors influencing option prices. It includes examples to show the comparative advantages, disadvantages, and profitability of options versus futures and how farmers' expectations of crop yields will affect their hedging strategies.

The author gratefully acknowledges the support and guidance of the Economic Research Service (ERS), U.S. Department of Agriculture (USDA), during the preparation of this guide. Special thanks are due to Allen Paul of ERS for many stimulating discussions concerning futures and options markets and for his editorial suggestions. Thanks are due also to Eugene Moriarty and Charles Conrad of the Commodity Futures Trading Commission, Dick Heifner of ERS, and David Holder and Randy Corley of the Extension Service, USDA, for their many helpful suggestions.

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Farmers' Guide to Trading Agricultural Commodity Options

David E. Kenyon*

Introduction

Beginning sometime in 1984, farmers will have available to them a new means of managing their price risks: they'll be able to buy and sell agricultural commodity options. Options will allow farmers to lock into a guaranteed price in selling their production (or in buying certain of their inputs), while still allowing them to take advantage of any favorable changes in prices that occur before the option's expiration date.

Trading in agricultural commodity options has been banned since 1936 (see box). So, for most farmers and others, options are totally new and require some explanation and investigation. The purpose of this manual is to acquaint farmers with the language of options trading, trading practices, potential uses, and some of the advantages and disadvantages of dealing in options. Good farm management requires that forward pricing decisions be integrated with the farmer's overall risk management strategy. The first step in that process is for the farmer to identify and evaluate the pricing alternatives available. This guide is designed to assist in that process.

Options trading in gold, Treasury bonds, and sugar began on October 1, 1982, and in preparing this manual, I assumed that most of the practices that apply to those options will apply also to agricultural commodity options. Nevertheless, the rules for commodity options were still being drawn up while this report was being written, so farmers should check with reliable sources before making any trading decisions. Some sources are listed on pages 22-24.

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What an Option Is

An option is a contract that gives the buyer the right but not the obligation to buy or to sell a futures contract at a specific price within a specified time period. The right to sell at a fixed price is a *put* option and the right to buy at a fixed price is a *call* option. The price at which the underlying futures contract may be bought or sold is the *exercise* or *strike price*. The right to buy or sell at the exercise price is good until the option expires. After the expiration date, the option is worthless. The cost of purchasing an option is the *premium*, which is determined by multiplying the option price per unit of commodity times the number of such units in the underlying futures contract.

For example, assume that the right to sell one December corn futures contract at $3.00/bushel is available from an option seller for 20 cents/bushel. Such a contract would be a *put* option (the right to sell) with a $3.00 *strike price* and a *premium* of $1,000 (20 cents/bu times 5,000 bu). A corn farmer who purchased such a put option could exercise the right to sell at $3.00 any time up to the expiration date. Assume December corn futures are $2.20/bushel in October and the farmer exercises the put option. The broker is so instructed and the farmer is assigned one short (sell) position in December corn futures at the $3.00/bushel strike price by the commodity exchange. To complete the transaction, the farmer immediately buys back the futures contract

History of Options Trading

Trading in options on domestic agricultural commodities has been banned in the United States since 1936. Prior to 1936, agricultural commodity options were traded by commodity exchanges and option dealers. In 1933, an attempt to manipulate the wheat futures market using options resulted in political pressure that eventually led to the 1936 ban. In the 1970's, trading of options tied to London commodity futures contracts became popular. Two large scandals involving these options led the Commodity Futures Trading Commission (CFTC) in June 1978 to suspend all options trading except for several established firms. In September 1981, the CFTC approved a 3-year pilot program: options trading in gold, Treasury bonds, and sugar began on October 1, 1982. In January 1983, the President signed the 1982 Futures Trading Act which lifted the 1936 ban on agricultural commodity options and authorized a 3-year pilot program in agricultural commodity options, with actual trading to begin in 1984.

at $2.20, making an 80-cent/bushel gross profit (a 60-cent net profit after subtracting the 20-cent price). On the other hand, if December corn futures reach $3.50/bushel at harvest, the farmer will not exercise the option since the market price is higher than the option exercise price. In this situation, the farmer lets the option expire. In either situation, the seller of the option keeps the premium.

Similarly, a hog farmer (for example) could pay $1,000 for a *call* option—the right to *buy* December corn futures at a price of $3.00/bushel at any time between the purchase and expiration date of the option. The farmer would let the option expire if prices at harvest had dropped to $2.20, since corn could be purchased cheaper in the cash market. However, if corn cost $3.50 at harvest, the farmer would exercise the option to purchase corn at $3.00 thus saving 30 cents/bushel (after subtracting the 20-cents/bushel price).

Options and Futures

The two illustrations above point out the major difference between options and futures contracts.

A *put* option establishes a minimum selling price but does not eliminate the opportunity to receive higher market prices.

A *call* option establishes a maximum buying price but does not eliminate the opportunity to buy at lower market prices.

A *futures* contract sets a fixed price since futures market gains or losses are offset by equal cash market losses or gains.

Options, therefore, permit farmers to establish desired selling prices without sacrificing their potential to benefit if prices increase after the put option is purchased. If prices rise, the option is not exercised and the farmer loses only the premium. If prices fall, the farmer can exercise the option, and obtain a price higher than the market price. Thus, with a put option, a farmer eliminates downside market price risk while retaining the opportunity to benefit from higher prices.

With a call option, a farmer eliminates price risk above the exercise price while retaining the opportunity to buy at market prices below the exercise price. Hence, options provide price insurance for farmers against undesirable price changes while allowing farmers to benefit

Options and Hedging

By buying and selling options, farmers can hedge their risks so they are not locked into selling their product at whatever prices happen to prevail at harvesttime. Options are only one means of hedging. Others include forward pricing, cash contracts, and futures contracts. The type of hedging instrument farmers use will depend on their overall marketing goals. For a good discussion of how hedging fits in with a farmer's goals, see *Farmers' Use of Forward Contracts and Futures Markets* (AER-320, Economic Research Service, USDA, 1976, 21 pages) available in microfiche ($4.50) or paper ($8.50). Send check or money order to National Technical Information Service, Identification Section, 5285 Port Royal Road, Springfield, Va. 22161. Ask for stock number TB-289880. For further information, call the NTIS order desk at (703) 487-4780.

The following titles are also recommended:

Black, Fisher. "The Pricing of Commodity Contracts," *Journal of Financial Economics*, Vol. 3, 1976.

Bowe, James J. "Reviewing the Concept." *Commodities*, July 1982.

Gardner, Bruce. "Commodity Options for Agriculture," *American Journal of Agricultural Economics*, Vol. 59, No. 5, 1977.

Sheldon, Randall E., and Jim W. Choi. "Agricultural Options," unpublished paper, Chicago Board of Trade, January 1983.

from favorable price changes. The degree to which farmers will use options will be largely determined by the cost of the option (the premium).

Option Prices and Premiums

Option prices are the sum of their intrinsic value and time value. The intrinsic value is the difference between the exercise price and current futures market price. The time value of options depends on three factors: the length of time to expiration, the volatility of underlying futures contract prices, and the interest rate. Buyers and sellers of options evaluate these variables and others (like taxes, price expectations, changes in Government programs, margin requirements and so forth) to determine what prices to bid and offer. Ultimately, option prices are determined by supply and demand in the market.

Intrinsic Value

Two variables that affect option prices are the option strike price and the price of the underlying futures contract. For a *put* option, if the strike price is above the market price of the underlying futures contract, the option contract is said to have intrinsic value; it is "in the money." That is, the option could be exercised immediately and have a value equal to the difference between the option strike price and the futures contract market price. As long as the market price is below the put exercise price, the option has intrinsic value.

For example, if in September a put option on October hogs has a strike price of $50, and the current market price of October hog futures is $40, the intrinsic value of the option is $10. Exercising the put, the buyer is assigned an October futures contract priced at $50—the exercise price. The October futures contract can immediately be bought for $40 for a $10 gross profit. This explains why the option is said to be "in the money"—it can be exercised immediately for a profit equal to the intrinsic value.

If instead, the October put option exercise price is $50, and the current October futures price is $50, the intrinsic value is zero. When the market price and exercise price are equal, the option is said to be "at the money."

If the current October futures market price is $55, a $5 loss would be realized if the buyer exercised the option at the existing futures price. When a loss would result from exercising an option, the option is said to be "out of the money."

The intrinsic value of a *call* option is positive when the futures market price is more than the exercise price and zero when the futures price is equal to or less than the exercise price. For example, an October call option with a $50 exercise price is in the money by the amount of difference between the $50 exercise price and the market price when October hog futures are above $50.

Option prices will always be equal to or greater than their intrinsic value. If the price were less than the intrinsic value, the option could be purchased and immediately exercised with the buyer making riskless profit equal to the difference between the price and the intrinsic value. For example, assume an October put option with a $50 exercise price could be purchased for $4/cwt when October hog futures were $45.

Given these prices, the option has an intrinsic value of $5 ($50-$45) which is worth $1,500 on one hog futures contract (300 cwt). Therefore, you could purchase this option for an immediate profit of $300 in the following manner. First, buy the option for $1,200 ($4/cwt times 300 cwt). Second, immediately exercise the option which would result in being assigned a short (sell) position in October hog futures at $50. Third, immediately buy back the hog futures for $45, making a profit of $5/cwt or $1,500 for one contract (ignoring commissions). This process would continue until the premium on October put options was bid up to at least $1,500, assuming October futures prices remained constant.

Time Value

The closer the expiration date, the lower the option premium, assuming everything else is constant. For example, in February, the premium on a July soybean option with a $7 exercise price would be less than the premium on a November soybean option with the same exercise price. The option with a longer time to maturity is worth more because the probability of the option moving in the money is greater. The longer the time before expiration, the greater the likelihood of changes in futures prices, hence the greater the value of the option contract. Option

Glossary

Call option The right, but not the obligation, to buy a futures contract at a specified price during a specified time period.

Put option The right, but not the obligation, to sell a futures contract at a specified price during a specified time period.

Premium The cost an option buyer pays the option seller for an option.

Strike price The price at which the option can be exercised—the price at which the futures position is established in case of exercise. Same as *exercise* price.

Exercise The process by which the option buyer converts the option into a futures position.

Expiration date The day when the owner of the option loses the right to exercise the option.

In the money The current market price exceeds the strike price of a call or is below the strike price of a put. The magnitude of this difference is the *intrinsic value* of the option.

Out of the money The current market price is less than the strike price of a call or is greater than the strike price of a put. Out-of-the-money options have time value. They have no intrinsic value.

sellers, therefore, demand higher premiums to offset the increased risk associated with selling a longer term option.

Options that are trading out of the money possess only time value. That is, their value reflects only the probability of the price moving in the money. In-the-money options possess both intrinsic and time value. As options move further or deeper in the money, the time value has a tendency to decline because prices are less likely to continue to move in the same direction.

More price volatility usually means higher premiums. As price volatility increases, the range of possible prices likewise increases. With a larger price range, the potential loss to option writers increases, hence, they require larger premiums. Future price volatility is difficult to predict because it is affected by many factors such as weather conditions, government policy and programs, and unexpected world events. Option sellers generally estimate future volatility based on past volatility, adjusted for any changes expected during the life of the option.

If interest rates rise, option prices will decline (assuming that exercise price, time to maturity, and price volatility all remain constant). An option gives the buyer the right to receive profit in the future by exercising

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Writer or grantor A person who sells an option.

Futures contract The agreement to buy and receive or to sell and deliver a commodity at a future date for a specified price.

Hedging The sale (or purchase) of futures against the physical commodity or its equivalent as protection against a price decrease (or increase).

Long One who has bought a futures contract.

Short One who has sold a futures contract.

Basis Historical differences between local cash price and the price of the near future contract.

Margin The amount deposited by buyers and sellers to insure performance on futures contracts. If a futures position is losing money, requests for additional money to maintain the margin deposit level are termed "*margin calls.*"

Offset The liquidation of a long or short futures position by an equal and opposite futures transaction.

Clearing corporation An agency associated with a futures exchange through which futures contracts are offset and fulfilled and through which financial settlement is made.

the option. If interest rates increase, the current value of profit in the future will decline. Hence, to reflect the reduced value of future profit, the option premium declines as interest rates rise.

Option Trading

Under the current pilot programs, option trading will be permitted only at exchanges approved by the Commodity Futures Trading Commission (CFTC). Like futures, trading in options will be conducted in a pit by open outcry and hand signals. Trading will be observed and regulated both by the exchanges and the CFTC. All trades will be reported to and cleared by the clearing corporation. It will make sure each option contract has a buyer and a seller at the same price and that all margin requirements are met. This process guarantees performance on all contracts.

Price Quotation

Each exchange determines the futures contract months in which it desires to trade options. The option contracts are named according to the underlying futures contract month against which the option is written. For example, sugar options are traded for the months of March, July, and October (fig. 1). In most cases, an option contract need not be traded for every futures contract delivery month. The exchanges attempt to select the months that will be of most interest to hedgers and speculators. Currently traded options expire in the month preceding the delivery month of the underlying futures contract.[1] For example, the option on the July sugar futures contract expires on the second Friday in June but is referred to as the July option. This procedure allows those who may have obtained a futures position through exercising an option adequate time to offset their position before the delivery month on the futures contract.

Option price quotes are arranged by option month and strike price. Options with strike prices of 7 to 16 cents per pound in half-cent and 1 cent increments were available on January 9, 1984 (fig. 1). Each exchange selects its own method for determining the strike price levels and increments to trade. Several strike prices above and below the cur-

[1]The expiration date for agricultural commodity options may be in the delivery month for the futures contract.

Figure I

Sugar Options Prices as Quoted in Newspapers (1/10/84)

Delivery month of underlying futures contracts

Closing March '84 futures price on Jan. 9, 1984

Estimated volume of puts and calls traded on Jan. 9, 1984

Total number of put and call contracts in effect

SUGAR OPTIONS

COFFEE, SUGAR & COCOA EXCHANGE

Sugar Option Prices 1/9/84 ¢/lb.

	Mar 84		Jul 84		Oct 84		Mar 85	
	7.57		8.22		8.64		9.70	
Strike Price	Settlement Call	Put	Settlement Call	Put	Settlement Call	Put	Settlement Call	Put
7.00	0.75	0.20	....	0.25	2.05	0.45	....	....
7.50	0.43	0.34	1.20	0.41	....	....	....	....
8.00	0.30	0.58	1.05	0.60	1.69	0.65	2.25	0.72
8.50	0.15	0.95	1.00	0.86	....	....	....	....
9.00	0.10	1.40	0.60	1.00	1.25	1.15	2.20	1.02
9.50	0.09	1.90	0.59	1.68	....	....	....	....
10.00	0.06	2.40	0.58	2.32	1.02	2.03	1.60	1.45
10.50	0.06	2.90	....	....	....	....	....	....
11.00	0.05	3.46	0.55	3.10	0.75	3.18	1.50	2.70
11.50	0.05	3.96	0.50	3.67	....	....	....	....
12.00	0.04	4.46	0.45	4.20	0.67	....	1.38	3.52
12.50	0.04	4.96	....	....	....	....	....	....
13.00	0.03	....	0.40	....	0.43	....	1.21	....
13.50	0.03	....	....	....	....	....	....	....
14.00	0.03	....	0.18	....	0.38	....	....	....
15.00	0.02	....	0.15	....	0.35	....	....	....
16.00	0.01	....	0.08	....	0.23	....	0.75	....

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rent price of the underlying futures contract are traded. As the price on the futures contracts approaches either the highest or lowest strike price, new strike prices are offered. As the price level increases, the increments generally become larger.

The prices of puts and calls are generally quoted in the same units as the underlying futures contract. For example, on January 9, 1984, the price of an October '84 sugar call option with a 7-cent/lb strike price was 2.05 cents/lb. To determine the premium for this option, the price per unit must be multiplied by the number of units per contract. One sugar futures contract is 112,000 pounds. Therefore, the October '84 call option with a 7-cent strike price cost $2,296 ($0.0205/lb x 112,000 lbs). The premium is $2,296.

How do you find the premium for a March '84 sugar put option with a 9-cent strike price as of January 9, 1984? Referring to figure 1 again, the price for this put option is 1.40 cents/pound times 112,000 pounds:

that computes to a premium of $1,568. In buying this put option, the purchaser buys the right to sell March '84 sugar futures at 9 cents/pound any day between January 9, 1984 (the date of purchase), and the expiration date in February 1984.

The July '84 sugar put option with a strike price of 8.00 cents cost 0.60 cent. This option is out of the money, since the current market price of July '84 sugar futures of 8.22 is above the strike price of 8.00 cents. The 0.60-cent price reflects only time value. The 9.50-cent July '84 put option cost 1.68 cents. On January 9, the July '84 sugar futures contract price was 8.22 cents. The 9.5-cent put option is in the money or has intrinsic value of 1.28 cents (9.50–8.22). The difference between the 1.68-cent option price and the 1.28-cent intrinsic value is the 0.40-cent time value. The price of all the put and call options that are in the money in figure 1 is greater than their intrinsic value. For example, the October '84 put with an 9-cent strike price was priced at 1.15 cents. On the same day, the October '84 sugar futures price was 8.64 cents. Hence, this option is in the money by 0.36 cent (9.00–8.64). Notice that as the strike prices on October '84 put options rise from 8 to 11 cents, the put option prices also increase. It is important that farmers understand that for put option strike prices above the current market price of the underlying futures contract, they will pay for the higher guaranteed selling price in the form of high premiums. Hence, farmers cannot establish higher selling prices just by buying options with higher strike prices because the higher premiums will reduce the net price (strike price minus option price) back to the current futures market price level.

Margin Requirements

For option *buyers*, the premium payment is the most money that can be lost, regardless of the price movement of the underlying futures contract. Hence, *buyers* of commodity options do not receive margin calls. The option seller (writer) must deposit a margin and may receive margin calls because he or she has the potential liability to provide a futures contract to the option buyer should the buyer elect to exercise the option. This margin procedure assures the option buyer that the option seller (writer) will always have sufficient funds on deposit with the clearing corporation to pay the difference between the option strike price and current market price should the buyer exercise the option. If the option price never increases, the option writer will receive no margin calls and the option will expire worthless. If the option expires

out of the money, the option buyer will lose the premium and the option writer will keep the premium as payment for providing the option buyer with price insurance.

Exercising Your Option

The decision to exercise an option lies with the buyer. If you, as the buyer, decide to exercise the option rather than offset your position in the option market, the following procedures are followed. For a put, the buyer is assigned by the clearing corporation a short (sell) position in the futures market equal to the strike price of the put option. Simultaneously, the writer of the put option is assigned a long (buy) position in the futures market at the same strike price. Then both the buyer's and seller's futures positions are adjusted to reflect the current market price using that day's futures settlement price. Since the buyer will exercise a put option only when the market price is below the strike price, the buyer's short (sell) position in the futures market will immediately show a profit. The futures contract of the writer will show an equivalent loss. Since the writer has been required to meet margin calls based on changes in the option price since writing the option, the writer will already have on deposit with the clearing corporation sufficient funds to cover the loss on the futures contract. At this point, the option contract has been terminated and both parties are free to trade their futures positions in their own best interests. In most cases they will trade out of their futures positions before contract maturity unless it is to their advantage to take or make delivery.

An example may help clarify the margin process for options. Assume on May 15 that you buy a December corn put option with a $3.00 strike price for a premium of $1,000. The option writer (seller) receives the $1,000 premium and must deposit it plus a maintenance margin of $500 for December corn futures contract with the clearing corporation. The writer's (seller's) total deposit is $1,500. The option writer's account is adjusted each day based on the option's closing price. If the option premium moves above $1,000, the option writer will receive margin calls. You, as buyer, will receive no margin calls regardless of price movement. If at harvest, December corn futures are $2.40, you can exercise your option and be assigned a short (sell) position in December futures at $3.00. This is adjusted to the market price of $2.40, so you (the buyer) realize a $3,000 profit ($3.00–2.40 = 0.60 × 5,000 bu = $3,000). The option writer (the seller) is assigned a long (buy) position in December corn futures at $3.00. When the writer's

account is adjusted to the market price, it will show a $3,000 loss. But since the writer has been required to post margin of at least $3,000 over the life of the option, his or her account already has enough money deposited to cover the loss. Assume that both you (the buyer) and the option writer decide to offset your futures positions. You, as buyer, make $3,000 from the futures position minus the $1,000 premium for a net gain of $2,000. The option seller loses $3,000 on the futures position but keeps the $1,000 premium for a net loss of $2,000.

Exercising a call option is exactly the same except that the call option buyer is assigned a long (buy) futures position and the option seller is assigned a short (sell) futures position at the option strike price.

Offsetting Your Option

U.S. options can be bought and sold on any business day. Therefore, given an active market, an option holder can always trade out of (offset) an options position before the option expires. Because of this feature, an option buyer does not need to exercise the option in order to realize profit. The trader can simply liquidate the option position by making an offsetting trade. Thus, a buyer of options does not need to become involved in trading the underlying futures contract.

To illustrate this point, consider the previous example where you bought a December put option with a $3.00 strike price for a premium of $1,000 on May 15. At harvest, December corn futures are $2.40 and you want to sell the put option. The put option premium will be at least $3,000 since the $3.00 December put option is in the money by 60 cents/bushel ($3.00 strike price minus $2.40 current futures price) or $3,000 for one option contract ($0.60/bu times 5,000 bu). You can sell the put option at harvest for $3,000, making a $2,000 profit (since the option cost $1,000 on May 15). If at harvest there is still some time left on the option before expiration, the premium will be somewhat greater than $3,000 to reflect the time value left on the option contract. Hence, you will make more than $2,000 when the option position is offset. Selling the option at harvest returns the same or more profit than exercising the option and avoids trading the underlying futures contract. Hence, most option buyers will choose to sell rather than exercise their option position.

The ability to trade in and out of options on a daily basis means that farmers can buy and sell price insurance as they deem it desirable. For

example, consider a farmer who purchases a December put option with a $3.50 strike price in the spring. During the growing season, prices decline to $2.50. At the $2.50 price, the farmer may decide that price protection is no longer needed since the Government loan rate is $2.50. Therefore, the farmer can sell the put option, gaining the $1.00 per bushel intrinsic value plus the remaining time value of the option.

Commissions

In addition to the premium, option buyers and sellers pay commissions to their brokers. Since option trading is new and volume relatively small, there is great variability in the level and manner in which commissions are charged: some brokers may charge a separate commission for each purchase and each sale of options; they may establish their commissions as a fixed rate or a percentage of the price with a minimum fee; some may assess an additional charge on option holders who exercise their options. It is important to remember that these commissions are in addition to the premium paid or received for the option.

Hedging Examples: Options vs Futures

Commodity options offer farmers a new way to manage their risks with different characteristics than futures. The two unique features of options are the minimum selling price (put) and maximum buying price (call) while incurring only the cost of the option premium. These limits permit farmers to take advantage of favorable price moves while being protected against unfavorable price moves. Hence, options are like price insurance.

In contrast, futures trading protects against unfavorable price moves but eliminates the possibility of benefiting from favorable price moves. In addition, since futures trading involves margin calls, which may impose cash flow problems and interest costs on margin funds posted, the total cost of trading futures is not known when the initial position is taken.

Several examples are given below to demonstrate how option pricing strategies work and how their results compare with those in hedging with futures. For ease of exposition, the put option contracts in the following examples were exercised rather than sold at harvest. In practice, most options will be sold rather than exercised, thus yielding larger returns, as previously demonstrated.

Example 1. Buying Put Options—Fixed Yields

A farmer in June expects to harvest 10,000 bushels of soybeans in October. For the moment, assume the yield is constant. The farmer, expecting a harvesttime cash price of 40 cents under November futures (a basis of 40 cents under), can sell two November soybean futures contracts at $7.00/bushel to lock in a cash price of $6.60/bushel ($7.00 futures minus a 40-cent basis). If futures fall to $6.00 and cash to $5.60 at harvest, the futures gain at the lower $6.00 price of $1.00/bushel will give a net price of $6.60. The net returns from selling 10,000 bushels of soybeans hedged with two futures contracts at $7.00/bushel when harvest prices are assumed to be $6.00, $7,00, and $8.00 per bushel are presented in table 1. Notice that the net returns are constant

Table 1—Returns to soybean farmer, with fixed yields, dealing in cash, futures, and options strategies

Strategy	*Harvest prices and production*			Average net return
Cash price	$5.60/bu	$6.60/bu	$7.60/bu	
Futures price	$6.00/bu	$7.00/bu	$8.00/bu	
Production	10,000 bu	10,000 bu	10,000 bu	
	Dollars			
Cash:				
Net returns	**56,000**	**66,000**	**76,000**	**66,000**
Sell two futures contracts:				
Cash market	56,000	66,000	76,000	
Futures return	10,000	0	−10,000	
Commissions	−100	−100	−100	
Net returns	**65,900**	**65,900**	**65,900**	**65,900**
Buy two put options:				
Cash market	56,000	66,000	76,000	
Option return	10,000	0	0	
Option premium	−5,000	−5,000	−5,000	
Commissions	−200	−100	−100	
Net returns	**60,800**	**60,900**	**70,950**	**64,200**
Write two call options:				
Cash market	56,000	66,000	76,000	
Option return	0	0	−10,000	
Option premium	5,000	5,000	5,000	
Commissions	−100	−100	−200	
Net returns	**60,900**	**70,900**	**70,800**	**67,533**

Farmer made pricing decisions when futures price was $7.00/bu.

regardless of price. These results assume that each harvest price outcome is equally likely to occur, that basis is constant at 40 cents/bushel, that production is constant at 10,000 bushels, that commissions are $50 per futures contract for the sell and buy, and that Treasury bills are deposited with the broker to satisfy margin requirements.

Now assume a farmer buys two November put options with a strike price of $7.00. Assume the price of this option is 50 cents/bushel for a premium of $2,500 per contract. With a 40-cent basis, the minimum cash price assured the farmer is $6.60. However, if prices increase, the farmer can let the option expire and sell at the higher cash market price. If November futures are $6.00 at harvest and the cash price is $5.60, the farmer can realize a gain of $1.00 per bushel—$10,000 on total production. However, the two options cost $5,000 in premiums and $200 in commission charges to buy and exercise them. The total net return, therefore, is $60,800. If November futures are $7.00 or $8.00 at harvest, the options will not be exercised. Returns are based on cash prices at harvest minus option premiums and commissions.

A comparison of net returns between selling futures and buying put options is very informative. First, observe that the average net return from selling futures is greater than that from buying put options (table 1). Across the three harvest price situations, assuming each situation has an equal probability of occurring, the futures contract gains and losses sum to zero and commission charges are $100. However, for the options strategy, average option returns are $3,333 but premiums and commissions average $5,133, for an average net loss of $1,800. The desirability of options strategies therefore will depend greatly on premium levels. With premiums of 50 cents/bushel, as in this example, the futures strategy appears more profitable, having a higher average return and a more stable net return. If the put option price were 30 cents/bushel, the two put options would cost $3,000, and the put option strategy would yield higher returns than the futures strategy.

The example assumes an equal $1.00 price decrease and increase after establishing the hedge at $7.00 or buying a put option with a $7.00 strike price. If the lowest possible price is $5.00, but the highest possible price is $10-15, then, over time, the option strategy might prove more profitable. For example, if futures drop to $5.00, the futures hedge returns $6.60/bushel—$4.60 cash plus $2.00 futures gain. Buying a put option would return $6.10/bushel—$4.60 cash plus $2.00 from

exercising the option minus the 50-cent option premium. Hence, the futures market returns 50 cents more per bushel. If soybean prices rise to $12.00, the futures strategy still returns $6.60/bushel—$11.60 cash minus $5.00 loss on the futures contract. However, at $12.00, the put option returns $11.10—a cash price of $11.60 minus the 50-cent option premium. If over a number of years the magnitude of the price increases is substantially larger than the price declines, then the option strategy will be more profitable than the futures strategy.

For any harvest futures price less than $7.50/bushel, the net returns from the futures strategy are greater than the returns from the option strategy. The futures strategy returns $6.59/bushel regardless of the harvest price ($7.00 futures price minus 40-cent basis minus 1-cent commission). At $7.50, the put option also returns $6.59—$7.10 cash minus 50-cent premium minus 1-cent commission. Since the 50-cent premium must always be paid, the put option returns will be lower than futures for harvest time November futures prices less than $7.50.

Although the average returns are lower for the option strategy, some farmers may prefer this strategy because it involves no margin calls. The futures strategy involves margin calls. The possibility of margin calls requires that the farmer have a large credit reserve or an arrangement with a lender for financing margin calls. Some farmers may feel that the potential costs involved in meeting margin calls more than offset the larger returns from futures.

The examples in table 1 assume that the options are purchased in June and held until harvest when they are exercised or expire worthless. In fact, the original options position can be offset on any business day until the expiration date. The decision to offset an options position will depend on expectations concerning the price level of the underlying futures contract. For example, if during the summer it appears that the futures price will be above the strike price at harvest, the farmer may want to sell the put option back thus recapturing part of the premium cost. Alternatively, an option holder, believing that the underlying futures price has reached its low point, may choose to sell the option before harvest. In both cases, the price expectation may prove to be wrong and in retrospect the farmer may wish the option position had not been sold. However, the added flexibility of being able to buy and sell options any time means that the farmer may be able to have price protection when needed without losing the entire premium, hence reducing the cost of the option strategy.

Most farmers will sell rather than exercise their put options at harvesttime for two reasons. First, unless they hold the option until expiration, the option will have some time value. Hence, by selling, a farmer can reduce the net premium cost. Second, selling rather than exercising the option eliminates additional commissions, margins, and trading decisions associated with the assigned futures position.

Example 2. Writing Call Options—Fixed Yields

Instead of buying put options for price protection, some farmers may attempt to increase returns by writing or selling call options. This would give the call option purchaser the right to buy a harvesttime futures contract from the writer at the specified strike price. Assume a soybean producer expects to produce 10,000 bushels of soybeans. For the moment, assume no yield risk. In June, the farmer sells (writes) two November call options with a strike price of $7.00 and receives a total of $5,000 in premiums from the option buyer. The farmer has to deposit with the broker $5,000 of margin to cover the option premium plus a $4,000 margin for the futures contracts underlying the call options. If option premiums rise above $5,000, the farmer will have to make margin calls on two option contracts.

If, by harvest, November soybean futures prices have declined to $6.00, the option buyer will not exercise the options since soybeans can be purchased cheaper in the cash market. The option writer therefore keeps the $5,000 in option premiums and receives back the $4,000 margin deposit. Hence, the net return is $60,900 (table 1). If the harvest price is $7.00, the options will not be exercised by the buyer and again the writer's returns are increased by the amount of the option premiums. If, however, November soybeans futures are $8.00 at harvest, the option buyer will exercise the options. The option writer will be assigned by the clearing corporation two short (sell) November soybean futures contracts at $7.00. When these are bought at the current futures price of $8.00, the option writer will lose $10,000 on the two futures positions. This $10,000 will already be on deposit with the option writer's broker since the seller would have been required to make margin calls as the option premium increased above $5,000. Under this situation, the option writer's return was reduced by $5,200 compared with the cash market ($5,000 option premium minus $10,000 option loss minus $200 commissions). The option writing strategy raises average returns but does not provide protection against declining prices like the put option strategy.

Example 3. Buying Put Options—Variable Yields

Options may appear to be a more attractive price management tool when yield risk is considered. For most crops, yields are uncertain when farmers make pricing decisions. In such cases, hedging only a portion of expected production will minimize the variance of returns over a number of years. The following example indicates why farmers do not hedge with futures 100 percent of expected production. If 100 percent is hedged and yields turn out to be low, prices will usually increase and losses in the futures market are not entirely offset by higher cash market prices because less production is available for sale. In contrast, with options, when yield is low and price high, the option buyer can let the option expire, losing only the option premium. In addition, if 100 percent of expected production can be priced using put options, a larger percentage of production will have price protection when yields are high and prices low.

Table 2 is designed to demonstrate the impact of yield risk on futures and options pricing strategies. In each of the three situations, expected production is 10,000 bushels when the pricing decision is being made. However, because of yield risk, actual production turns out to be 8,000, 10,000, and 12,000 bushels. The prices associated with these yield levels are not symmetrical. When production increases by 2,000 bushels, the price drops by $1.50, but when production declines by 2,000 bushels, the price increases by $2.50/bushel. This assumes that prices increase more rapidly for drops in production than they decrease for similar rises in production. Because of yield differences, only one instead of two futures contracts is sold to avoid additional futures losses if yields fall below expectations. These changes mean that both the production and price outcomes in table 2 are different from those in table 1. Each of the three possible outcomes is still assumed to have an equal probability of occurring.

The put option strategy generates higher average net returns than futures when yield risk is considered. When yields are above expectations and prices low, the two put options are exercised resulting in a $15,000 profit in the futures market. By contrast, the one futures position returns only $7,500. The $7,500 difference between the options and futures returns more than offsets the $5,000 of option premium costs. When yields equal expectations and the price does not change from that expected in June, the futures strategy produces greater net returns because of the relatively large option premiums. When yields

Table 2—Returns to soybean farmer, with variable yields, dealing in cash, futures, and options strategies

Strategy	Harvest prices and production Cash price . . . $5.10/bu Futures price . . . $5.50/bu Production . . . 12,000 bu	$6.60/bu $7.00/bu 10,000 bu	$9.10/bu $9.50/bu 8,000 bu	Average net return
	Dollars			
Cash:				
Net returns	**61,200**	**66,000**	**72,800**	**66,667**
Sell one futures contract:				
Cash market	61,200	66,000	72,800	
Futures return	7,500	0	-12,500	
Commissions	-50	-50	-50	
Net returns	**68,650**	**65,950**	**60,250**	**64,950**
Buy two put options:				
Cash market	61,200	66,000	72,800	
Option return	15,000	0	0	
Option premium	-5,000	-5,000	-5,000	
Commissions	-200	-100	-100	
Net returns	**71,000**	**60,900**	**67,700**	**66,533**
Sell one call option:				
Cash market	61,200	66,000	72,800	
Option premium	2,500	2,500	2,500	
Futures return	0	0	-12,500	
Commissions	-50	-50	-100	
Net returns	**63,650**	**68,450**	**62,700**	**64,933**

Farmer made pricing decisions when futures price was $7.00/bu and expected production was 10,000 bu.

are below expectations and prices high, the put option strategy is superior to the futures strategy. Under these circumstances the large loss on one futures contract is greater than the cost of the option premiums. Hence, when yield risk is considered, pricing with options may be preferred to hedging with futures.

Example 4. Writing Call Options—Variable Yields

If production is uncertain, option writing becomes more risky. If a farmer writes two call options for November soybeans, at a $7.00 strike price, the option return will be $5,000 as long as November soybean futures prices remain at or below below $7.00. If yields are less than

expected and prices increase, the call option writer will lose more than if yields had remained constant. For example, if futures prices increase to $9.50, the option writer loses $25,000 on the two options—$2.50/bushel times 10,000 bushels. If yields are constant and production is 10,000 bushels, the farmer gains $2.50/bushel in the cash market for a gain of $25,000. Hence, the option loss and the cash gain will offset each other. But, if yields drop and production is only 8,000 bushels, the cash gain is only $20,000 ($2.50 x 8,000). Hence, writing two call options when yield is uncertain causes an additional $5,000 loss. This is the same problem faced by a farmer attempting to hedge when yield and production are uncertain. To adjust for this yield uncertainty, the farmer ought to hedge only a portion of expected production. A farmer facing uncertain yields likewise ought to write call options against only a portion of expected production.

The net returns from writing one call option with a $7.00 exercise price against 50 percent of expected production when yield is uncertain are presented in table 2. When the futures price is at or below $7.00 at harvest, the option-writing strategy increases returns by the $2,500 premium less the $50 commission. When harvest futures prices are $9.50, the call option writing strategy loses $10,100 ($2,500 premium minus $12,500 option loss minus $100 commission).

Notice the difference in the returns in buying two put options versus writing one call option at each futures contract price level at harvest. At the lower price of $5.50, the put strategy has a larger return than the call strategy. The put strategy provides price protection when prices drop substantially below the option's strike price of $7.00. When futures prices are $7.00 at harvest, the call option strategy produces larger returns than the put strategy. Since prices do not change, price insurance is not needed in the form of put options (the premiums paid for price insurance reduce net returns). On the other hand, writing a call option increases net returns. At the higher price of $9.50, the put strategy yields larger returns than the call strategy. These results indicate that farmers may attempt to improve net returns by writing call options against a portion of their expected production when they do not expect prices to change much during the life of the option.

The potential to increase returns by writing call options suggests why farmers and others (including speculators) may choose to write options. If the underlying futures contract price is expected to be relatively stable, writing call options may be profitable. Since futures prices of

Advantages and Disadvantages of Options Compared with Futures

Options will provide farmers with a new price risk management tool. When farmers are considering the use of options or futures to manage price risk, they need to be aware of the major advantages and disadvantages of each. With this knowledge and understading of other financial and production risks, they can select the marketing tool which best meets their needs. The basic advantages and disadvantages of options versus futures as presented in this guidebook are outlined below.

Buying Put Options

Advantages

- Permits establishing a minimum selling price while retaining the opportunity to benefit from higher cash prices.
- Option buyer does not receive margin calls.
- Maximum loss is equivalent to original premium cost.

Disadvantages

- Option premiums may be relatively expensive.
- In some years, the option will expire worthless.

Selling Call Options

Advantages

- Cash market return can be increased by amount of the premium.

Disadvantages

- The call option seller does not have price insurance against falling prices.
- Maximum return is equivalent to the option premium. Losses can be virtually unlimited if prices move up.
- Option sellers receive margin calls if premiums increase after writing the option.

Selling Futures

Advantages

- Establishes a selling price within a narrow range bounded by basis error.
- Commissions are relatively inexpensive compared to premiums for options.

Disadvantages

- Eliminates the opportunity to participate in higher cash market prices.
- Requires a margin deposit and margin calls may occur if prices move higher.

many commodities spend a considerable amount of time trading within a narrow price range, there is reason to believe that some speculators and hedgers will find option writing to be a desirable strategy.

This means that farmers and other traders may be both option buyers and sellers. If option premiums seem high, traders will write options. If option premiums seem low, traders will buy options. This interaction of option buyers and sellers determines the equilibrium level of option prices.

The average net returns of the four strategies (table 2), although quite similar, can differ substantially with different production and price levels. Given that these results are based on assumed futures market prices, production levels, and option premiums, the results only suggest what might happen under actual conditions. The purpose of these examples is to illustrate the similarities of and differences between pricing with futures and options.

Sources of Information

This manual was written while the rules for trading options and the actual contracts to be traded were being developed by the commodity exchanges and reviewed and analyzed by the CFTC. Some of the procedures given in this report may therefore differ from those actually used once trading begins. In addition, the actual option contract terms will not be known until the CFTC approves the contracts to be included in the pilot program. Farmers interested in trading options are advised to consult with professional sources for additional information.

The *Cooperative Extension Service* in most States employs extension specialists, located at State universities, who keep abreast of new marketing developments like options. The Extension Service is developing a program to educate State extension specialists concerning agricultural commodity options. This program will include written material and educational programs designed for farmers. State extension specialists will be conducting workshops in commodity options in 1984. Local county extension agents should be able to put farmers in contact with the State extension specialist knowledgeable in agricultural commodity options.

Brokerage firms offer brochures explaining option trading procedures and trading techniques for options currently being traded. As new

agricultural commodity options are approved for trading, the brokerage firms will provide similar information on the new contracts. Some firms may hold seminars to acquaint individuals with the basics of trading options. These meetings should provide useful information, but the farmer should remember that their objective is to encourage trading. After obtaining basic information on options trading, specific questions about option trading can be answered by account executives in a local brokerage firm. The farmer should attempt to locate an account executive who understands farming and is a specialist in futures and commodity options. A specialist in these areas should be able to answer detailed questions and help prepare a well-defined trading plan consistent with the farmer's marketing objectives.

The *Commodity Futures Trading Commission* is responsible for designing the trading rules and regulations for agricultural commodity options. CFTC will evaluate and approve or disapprove the trading of specific options contracts submitted by the commodity exchanges. Once trading begins, CFTC has broad regulatory power to counter manipulation of the market and to promote fair dealing and an effective options market. Given the tainted history of options trading, the CFTC is proceeding carefully and slowly in designing the new program to guarantee contract integrity and fair trade practices. In the past, a few unscrupulous brokers operated outside the regulations using deceptive sales practices and did not comply with CFTC reporting requirements that monitor the financial integrity of the system. These practices have not to date occurred under the new options pilot program initiated in October 1982, but farmers should be careful in dealing with those selling option "deals" that appear unrealistically profitable. Sales persons offering such a deal should be checked out with local brokers with established reputations or with the CFTC.

Each *commodity exchange* publishes information booklets on commodity option contracts traded on its exchange. These booklets generally describe the specifications of the contract, how it is traded, and illustrate basic hedging and speculating strategies. These booklets are generally available from the exchanges free of charge upon request. Addresses of the major commodity exchanges are shown on the following page.

Office of Public Information
Commodity Futures Trading Commission
2033 K St., N.W.
Washington, DC 20581

Chicago Board of Trade
La Salle and Jackson St.
Chicago, IL 60604

Chicago Mercantile Exchange
30 South Wacker Driver
Chicago, IL 60606

Coffee, Sugar & Cocoa Exchange, Inc.
4 World Trade Center
New York, NY 10048

New York Cotton Exchange
4 World Trade Center
New York, NY 10005

Kansas City Board of Trade
4800 Main Street, Suite 274
Kansas City, MO 64112

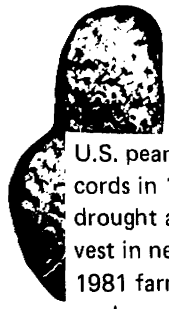
New York Mercantile Exchange
Commodities Exchange Center
4 World Trade Center
New York, NY 10048

Minneapolis Grain Exchange
150 Grain Exchange Building
Minneapolis, MN 55415

Commodity Exchange, Inc.
4 World Trade Center
New York, NY 10048

Mid America Commodity Exchange
444 West Jackson Blvd.
Chicago, IL 60606

Peanuts Now a Billion-Dollar Crop



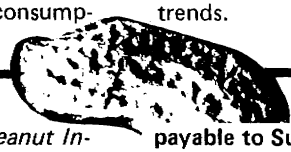
U.S. peanut production set new records in 1981 following the 1980 drought and the worst peanut harvest in nearly 20 years. With a 1981 farm value of over $1 billion, goobers are the Nation's ninth largest cash crop and one of the most versatile.

U.S. peanut production nearly doubled since 1950, even though peanut acreage remained fairly constant. Annual per capita consumption rose from 6.5 pounds in 1950 to 9 pounds today. About 15 percent of the 1981 peanut crop were crushed for oil and about 25 percent went into peanut butter.

U.S. Peanut Industry, a report by USDA's Economic Research Service, gives a comprehensive picture of the last 3 decades of U.S. peanut production and consumption and world trade. The report tells you:

- Major markets for peanut exports.
- Primary uses for different peanut varieties.
- Causes of yield increases.
- Major production and marketing practices.
- Effects of Government programs (including the 1981 farm bill) on peanut farmers.

Extensive tables give supply and demand data for the past 30 years; charts highlight major peanut trends.



For your copy of *U.S. Peanut Industry* (by W.C. McArthur, Verner Grise, et al., Agricultural Economic Report No. 493; 45 pages; $4.75), write to Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Make your check or money order payable to Superintendent of Documents; ask for stock number 001-000-04310-2. For faster service, call GPO's order desk at (202) 783-3238 and charge your purchase to your VISA, MasterCard, or GPO Deposit account. Bulk discounts available.

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Since agricultural economics affects everyone's pocketbook, it pays to stay on top of trends in farm production, food prices, international agricultural trade, and rural America and its natural resources.

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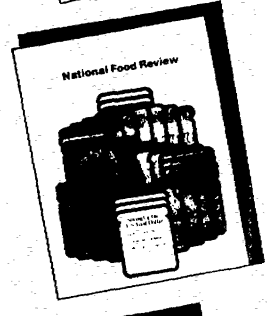
FARMLINE provides a broad overview. Wide-ranging articles cover the production and marketing of farm commodities, world agriculture and trade, farm finances, land and water issues, changes in rural America, and other vital topics. Published monthly except January, **FARMLINE** costs $16 for one year ($20 foreign).



NATIONAL FOOD REVIEW focuses on food issues. Food price trends, nutrition, product safety, food processing, retailing, regulation, and other food-related topics are covered in this quarterly magazine. **NATIONAL FOOD REVIEW** costs $8.50 for one year ($10.65 foreign).

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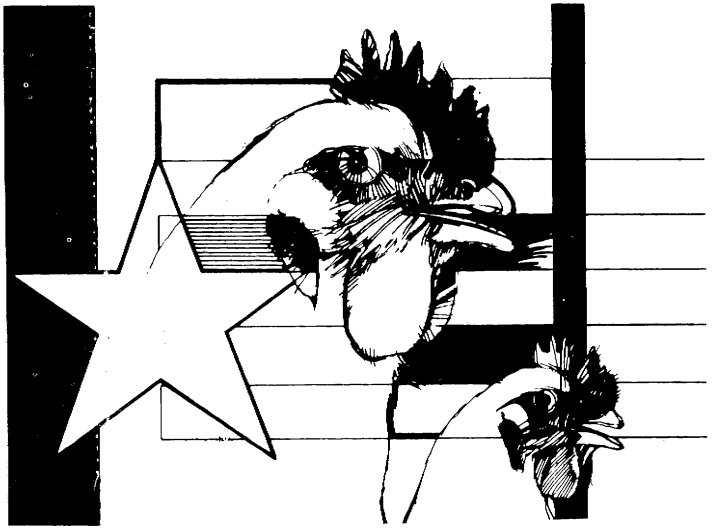
Advances Made in the Poultry Industry

The U.S. Poultry Industry: Changing Economics and Structure, by Floyd A. Lasley. AER-502. 32 pp. $3.25. Order SN: 001-000-04342-1 from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

This report looks at changes in the U.S. poultry industry over the last 25 years. While per capita consumption of poultry meat in 1981 has nearly doubled since 1960, retail prices rose only 74 percent for broilers, 67 percent for turkeys, and 59 percent for eggs. Vertical integration and technological advancements in the poultry industry have vastly improved production and efficiency, and enabled producers to hold costs down. Farm sales totaled $3.6 billion for eggs, $4.5 billion for broilers, and over $1.2 billion for turkeys in 1981, up from about $2 billion for eggs, $533 million for broilers and $270 million for turkeys during the early fifties. Consumers paid only 86 percent more for poultry in 1981 than they did in 1960, compared with a 212-percent increase for all food.



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