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Futures, Options, and Farm Programs

Report to Congress on a Study Mandated by the Food Security Act of 1985

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Futures, Options, and Farm Programs: Report to Congress on a Study Mandated by the Food Security Act of 1985. By Richard G. Heifner, Joseph W. Glauber, Mario J. Miranda, Gerald E. Plato, and Bruce H. Wright. Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture. ERS Staff Report No. AGES 9003.

Abstract

Expanded use of futures and options markets by farmers can partly substitute for price support and deficiency payment programs in protecting farmers' incomes. Farmers can broaden their pricing alternatives and partly protect themselves against price declines within the year, but they can gain little interyear income stability by using futures, options, or cash forward contracts. Government programs to expand farmers' use of such contracts generally would not raise or stabilize market prices or farmers' incomes unless Government subsidies were involved. Such subsidies would be difficult to administer and offer few advantages over conventional loan and deficiency payment programs.

Keywords: Cash forward contracts, deficiency payments, farm programs, Food Security Act of 1985, futures, options, price support.

Preface

This report is part of the U.S. Department of Agriculture's (USDA) response to Section 1742 of the Food Security Act of 1985. Section 1742 calls for USDA to study the manner in which farmers might use futures and options markets, the extent of the price stability and income protection that producers might expect to receive from such participation and the Federal budgetary impact of such participation.

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Contents

Summary

Expanded use of futures and options markets by farmers can partly substitute for price support and deficiency payment programs in protecting farmers' incomes. Farmers can broaden their pricing alternatives and partly protect themselves against price declines within the year, but they can gain little interyear income stability by using futures, options, or cash forward contracts. Government programs to expand farmers' use of such contracts generally would not raise or stabilize market prices or farmers' incomes unless Government subsidies were involved. Such subsidies would be difficult to administer and offer few advantages over conventional loan and deficiency payment programs.

This report responds to Section 1742 of the Food Security Act of 1985, which calls for the Secretary of Agriculture to conduct a study to determine how farmers might use futures and options markets, the price stability and income protection attainable through such use, and the Federal budgetary impact of such participation. The futures-options pilot program mandated in Section 1743 of the 1985 Act is not covered in this report. In conducting this study, the U.S. Department of Agriculture consulted with the Commodity Futures Trading Commission, conducted a symposium to bring together information from industry and the academic community, performed statistical analyses, identified program alternatives, and evaluated the effects of alternative programs using computer simulations. The study supports the following conclusions:

- Farmers can expand their pricing alternatives, but as a group, they cannot raise the average prices they receive by forward pricing with futures, options, or cash forward contracts.

- Farmers can reduce risks from price declines within the year, but they can gain little or no interyear income stability by pricing their crops before delivery with futures, options, or cash forward contracts.

- Replacing Government loans or deficiency payments with programs to expand farmers' use of futures or options contracts would not reduce Government costs unless support levels were lowered. However, farm program budgetary uncertainties might be reduced by replacing deficiency payments or loan programs with subsidies for farmer hedging or by Commodity Credit Corporation hedging.

Futures, Options, and Farm Programs

Report to Congress on a Study Mandated by the Food Security Act of 1985

Richard G. Heifner, Joseph W. Glauber,
Mario J. Miranda, Gerald E. Plato,
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Introduction

To what extent can farmers' use of commodity futures and options markets and cash forward contracts substitute for farm programs? Is it possible to design a new type of farm program that operates through or in conjunction with futures and options markets, and offers significant advantages over existing programs? These are challenging questions to those familiar with the shortcomings of existing programs and the pricing and risk-shifting capabilities of forward markets. Although futures trading and price supports have coexisted since the 1930's, the two institutions have serious incompatibilities. Futures trading thrives on price uncertainty; it generally declines in volume as price supports are raised and become more effective in creating a price floor. Commodity options trading can be expected to be similar to futures trading in this respect. The relationships between Government programs and forward markets have received relatively little attention in the development of farm policies. This study examines these relationships and explores ways to integrate prospective programs with the forward pricing institutions of the market.

This report responds to Section 1742 of the Food Security Act of 1985, which calls for the Secretary of Agriculture to conduct a study to determine how farmers might use futures and options markets, the price stability and income protection attainable through such use, and the Federal budgetary impact of such participation (see Appendix I). In conducting this study, the U.S. Department of Agriculture consulted with the Commodity Futures Trading Commission, conducted a symposium to bring together information from industry and the academic community (Wright), performed statistical analyses, identified program alternatives, and evaluated the effects of alternative programs using computer simulations.

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This study does not cover the pilot program being conducted by the U.S. Department of Agriculture (USDA) under the provisions of Section 1743 of the 1985 Act. The pilot program involves a 41-county test of a specific futures-options program. The pilot program will tell us relatively little about the effects of a nationwide program or the differences in effects between alternative programs. Such information is brought together in this study by drawing from previous studies, identifying possibilities for alternative types of futures-options programs, measuring the relevant economic relationships, and using these relationships to explore the outcomes of possible futures-options programs.

The first part of this report describes the effects that farmers can expect from using existing forward pricing institutions. Major differences between futures, options, and cash forward contracts are described; actual use of forward contracts by farmers is reviewed; and the effects of forward contracting on the level and variability of farmers' incomes are assessed. The second part of the report identifies and evaluates possible Government programs to expand farmers' direct or indirect use of forward markets as a partial substitute for traditional farm programs.

Forward Pricing by Farmers

Futures and options trading generates information about price expectations and redistributes commodity price risks among traders. Farmers can benefit from using the price information generated on futures and options markets without actually engaging in trading themselves. For example, farmers can use prices quoted at planting for delivery at harvest as a guide in deciding what crops to plant, and they can use futures prices for delivery after harvest in deciding whether and how long to store.

Futures and options markets enable farmers, as well as merchants and processors, to price forward (that is, to set price or a minimum or maximum price ahead of delivery). By pricing forward, farmers can reduce revenue risks in growing and storing crops or producing livestock (hedging) or seek profits from price changes (speculation). Many farmers seek both lower risks and higher returns in pricing forward. Such forward pricing activities can be called selective hedging as contrasted with pure hedging or routine hedging where risk reduction is the sole motive. To raise average income by selective hedging requires the ability to correctly anticipate price changes.

Types of Forward Contracts

The forward pricing contracts available to farmers can be categorized into those that fix the price (futures and most cash contracts with local buyers) and those that establish a price limit (options and minimum-price contracts with local buyers). Each type of contract has advantages and disadvantages. The

choice among types of contracts depends upon the farmer's assets, trading skills, size of operation, and attitudes toward risk.

Futures Contracts

Futures contracts are contracts traded on an organized exchange and standardized with respect to size and to time, place, and grade allowed for delivery. Active futures markets exist for wheat at the Chicago Board of Trade, the Kansas City Board of Trade, and the Minneapolis Grain Exchange. Corn and soybean futures are actively traded at the Chicago Board of Trade and the MidAmerica Commodity Exchange, and cotton is traded actively on the New York Cotton Exchange.

Grains and soybean futures are traded in 5,000-bushel lots (1,000 bushels at the MidAmerica Commodity Exchange), while cotton futures are traded in 50,000-pound lots. The contracts call for delivery of standard grades at approved warehouses in designated cities. Discounts and premiums apply for nonstandard grades and for some delivery locations. Traders terminate most futures contracts with opposite futures transactions before delivery is required.

Farmers trade futures and options through futures commission merchants (brokerage houses). To buy or sell futures, one must make a margin deposit (initial margin) with a brokerage house to guarantee the contract. The trader's margin account is adjusted daily to reflect changes in the value of positions held. The brokerage house may call for additional margin (maintenance margin) if the price moves against the trader. It must call for additional margin if the amount remaining in the trader's margin account falls below a specified level.

Options Contracts

Trading in modern agricultural options began in 1984. A commodity option gives the holder the right, without obligation, to buy or sell a futures contract at a specified price (strike price) over a specified time interval. For this privilege, the option buyer pays the option seller a premium that is not refundable. Call options carry the right to buy and put options the right to sell. Commodity options can only be traded on an approved exchange. Active option markets currently exist for corn, wheat, and soybeans at the Chicago Board of Trade and for cotton at the New York Cotton Exchange.

Cash Forward Contracts

Contracting with local buyers is the most common form of forward pricing used directly by farmers. Many country elevators and cotton buyers offer contracts to farmers during the growing season that set prices for delivery at harvest. Country buyers typically cover their purchases from farmers by making cash forward sales to processors or other merchants, or by selling futures contracts. The resulting futures positions are held

until the country buyers sell the actual commodity to a processor or merchant.

A minimum-price cash forward contract provides a farmer price protection similar to that provided by a put option. Under a minimum-price cash contract, the farmer agrees to deliver the commodity and the buyer agrees to pay either the specified price or a higher price if the market rises.

Comparisons Between Different Types of Contracts

The major differences from the farmer's standpoint between various types of private and Government forward pricing instruments are summarized in table 1. None of the private contracts raise the average price that the farmer can expect to receive. Average prices over a period of years can be raised only by Government programs that reduce quantities reaching consumers or increase consumer demand.

Holding put options, entering minimum price cash forward contracts, and price support loans all enable the farmer to benefit from price increases. Options offer a wider choice of risk-shifting possibilities than futures or price supports.

Cash contracts can be sized to fit each farmer's needs, whereas futures contracts are traded in fixed quantities, 5,000 or 1,000 bushels of grain or soybeans and 50,000 pounds of cotton. These contracts are too large for some farmers. For example, one 5,000-bushel soybean contract covers the output of about 150 acres at current U.S. yields. This may be too much for small farmers, particularly those with crop share leases who would need to use the 1,000-bushel contracts traded on the MidAmerica Exchange where transaction costs per bushel tend to be higher. The farmer who trades only a few contracts per year may not qualify for the same discounted commissions and may not receive or want to pay for the same market information services as the larger trader.

Futures and options are traded on highly competitive and liquid markets, assuring each trader easy access to the best bids and offers available. Extra time may be required to find the best deal in the cash market.

A Government price support loan covers all that is produced by the farmer who qualifies for the program, while a private contract covers only the quantity that the farmer has elected to sell.

The farmer who sells futures or enters a fixed-price cash forward contract is obligated to deliver the commodity or buy back the contract. This can result in substantial additional financial loss if the farmer experiences a crop failure combined with a price increase over the growing season. Farmers with crops eligible for price support, those who hold put options, and those with minimum-price cash forward contracts avoid the risk of

having to buy themselves out of a contract on which they cannot deliver.

The farmer who holds futures or options contracts is exposed to basis risk. Basis risk is uncertainty about the difference between the futures price and the hedger's local cash price that will prevail at the end of the hedging period. By entering a

Table 1--Effects of different forward pricing instruments on farmers

Effect	Instrument				
	Sell futures	Buy put option	Fixed-price cash sale	Minimum-price cash sale	Government price support loan
May offer above-market price	No	No	No	No	Yes
Skews price distribution to right	No	Yes	No	Yes	Yes
Provides range of choices	Some 1/	Wide 2/	Varies	Varies	No 3/
Allows contract size to vary	No 4/	No	Yes	Yes	Yes
Assures competitive price	Yes	Yes	Varies	Varies	N.A.
Covers larger than expected output	No	No	No	No	Yes
Avoids obligation if crop fails	No	Yes	No	Yes 5/	Yes
Avoids basis risk	No	No	Yes	Yes	Yes
Avoids margin calls	No	Yes	Yes	Yes	Yes
Avoids risk of buyer default	Yes	Yes	Varies	Varies	Yes

N.A. = Not applicable.
1/ Choice of delivery dates.
2/ Choice of strike prices and delivery dates.
3/ Only one local support price is available, but loan repayments can vary.
4/ Two different sized contracts are available for some commodities.
5/ The farmer may have to pay premiums and associated costs for the buyer's put options.

cash forward contract with a local buyer, the farmer avoids dealing with basis risk directly. The basis risk is borne by the buyer who may take a slightly higher margin as a return for bearing this additional risk.

Holders of short futures positions receive calls from their brokers for additional margin deposits when prices rise. For a hedger, the value of the cash commodity being produced or stored increases by approximately the amount of the margin call.

However, margin calls can present serious cash-flow problems--the margin must be raised immediately, but the gain in value of the cash commodity cannot be realized until the commodity is sold. If growers could readily borrow money for margin calls using the enhanced value of their prospective crops as collateral, then margin calls would not be a problem. However, relatively few farm lenders seem ready to lend funds to farmers on short notice for meeting margin calls. Consequently, avoidance of margin calls is an important consideration for farmers who operate with small financial reserves and without ready access to additional short-term credit.

Cash forward contracts are defaulted occasionally; the risk of default depends upon the financial condition and integrity of the opposite party. Futures and options contracts are essentially free of default risk.

Some differences between price supports and private contracting not shown in table 1 deserve comment. Price support levels are normally set before planting each year; farmers can take out loans up to 6 months or more beyond harvest and may hold the loans up to 9 months before redeeming or forfeiting the commodity. In contrast, options with new, more distant maturity dates are introduced every few months, providing 5 or 6 different maturity months each year; each option contract is traded for about 8-10 months, with active trading limited to 4-6 months, before it matures. This limits how far ahead minimum prices can be set with put options.

Finally, both futures and options require dealing through a broker, which may be inconvenient for some farmers.

Actual Use of Forward Contracts by Farmers

Crop producers make considerable use of cash forward contracts, but relatively little direct use of futures and options contracts. From 10 to 30 percent of U.S. farmers typically price their crops before delivery using cash forward contracts with local buyers while less than 10 percent directly use futures. Forward pricing has been heaviest in the Midwest where 25-50 percent of corn and soybean growers have used cash forward contracts during typical years. Crop growers' use of agricultural options, which began trading in 1984, remains relatively small.

Farmers prefer cash forward contracts over futures or options contracts partly for the convenience of dealing with familiar local buyers. Avoidance of basis risk and margin calls and the ability to tailor contracts to the farmer's specific needs are also important considerations.

Effects on Farmers' Average Incomes

Futures, options, or cash forward contracts provide farmers a wide choice of forward pricing alternatives. On each occasion, pricing forward either raises or lowers the farmer's net return, depending on whether the market price falls or rises over the contract period. The gains and losses tend to balance out on average. Forward pricing cannot be expected to raise the average price received over a series of years by farmers as a group.

Risk Premiums in Futures Prices

The effect of forward pricing on farmers' average revenues depends on whether forward prices average higher or lower than the spot prices that prevail at delivery time. For example, forward prices at planting would average lower than spot prices at harvest if short hedgers paid long speculators a premium for carrying price risks over the growing season. In this case, producers would lose on average by selling forward and long speculators would gain. The bulk of the evidence suggests that competition among speculators keeps any such risk premiums in futures prices small, but the issue is not fully resolved.

Short positions held over the growing season in corn, cotton, and winter wheat futures made money more often than they lost money from 1960 to 1988, while short positions in soybean futures held over the growing season lost more frequently than they gained. However, short positions in corn, soybeans, and cotton lost money on average, while short positions in wheat made money on average. These averages were strongly affected by the sharp price movements in 1973 and 1974. The average losses or gains were small relative to errors of estimation for all four commodities and provide no clear evidence of risk premiums.

The degree of correlation between futures price changes and changes in the value of other assets in the economy provides additional information about the risk premiums to be expected in futures markets. Only those risks that cannot be spread or diversified command risk premiums when risk markets are efficient. Risks are diversifiable to the extent that they are uncorrelated with the risks on the "market portfolio," which contains all the assets in the economy. Most studies suggest that returns on commodity positions are not highly correlated with returns on stocks and other assets. This lack of correlation implies that speculators or investors should be willing to hold commodity positions for relatively small risk premiums.

Rewards for Skillful Trading

Traders who are skillful in forecasting prices can profit by trading futures or options. Producers who can forecast price changes can profit not only through pure speculation in futures or options, but also by selective hedging. Selective hedging involves entering and exiting hedging positions based upon anticipated changes in the forward price. This contrasts with routine hedging, which involves holding similar futures or options positions during the same stage of each production cycle.

Some advocates of selective hedging suggest that a favorable price occurs sometime during almost every production period. They advise farmers to set a price goal that covers costs of production and sell only when the price meets or exceeds the goal. Another approach for selective hedging, as well as speculation, involves trading in response to observed futures price patterns. This is called technical analysis. Most statistical analyses of futures price behavior indicate that no forecasting technique or trading rule is likely to be profitable on average over the long run. This suggests that neither selective hedgers nor speculators can increase their average returns by following simple trading rules.

A more comprehensive view is that actions of knowledgeable traders drive the futures price toward the best current estimate of the spot price that will prevail when the futures matures. These knowledgeable traders continue to trade only if they are rewarded for their efforts. Thus, they have incentives to compete for speculative profits and drive these profits toward zero, but never all the way to zero. This leaves room for the more skillful speculators and selective hedgers to make profits in the markets commensurate with their price forecasting skills.

As a group, farmers are probably no better at price forecasting than the average trader. Because little information is available about individual traders' positions, we know little about whether farmers gain or lose on average from their futures trades. One recent study suggests that commercial firms gain, large speculators approximately break even, and small traders lose on the average (Hartzmark). Most farmers would fall into the small trader category if they hedged because of the size of their operations. This suggests that farmers as a group are not likely to raise their average returns from selective hedging, although some of the more skillful may gain.

Indirect Effects of Forward Pricing on Farmers' Incomes

Forward pricing may indirectly affect a farmer's average income by reducing revenue uncertainty to the extent that the farmer can safely borrow more money and/or shift resources into expanded production. Bankers generally will lend more funds to merchandisers and processors on hedged inventories than on unhedged inventories. However, bankers apparently are much less inclined to increase lending to farmers who hedge. This probably reflects the relative ineffectiveness of hedging for reducing

revenue risks in growing crops because of yield uncertainty, difficulties in assuring that farmers maintain bona fide hedges, and the lack of familiarity with hedging by farmers and farm lenders.

Finally, to the extent that risk-averse producers can avoid risks by forward pricing or by other means, we would expect aggregate production to increase, putting downward pressure on prices. Whether farmers gain or lose depends upon whether the reduced risks compensate them for the lower prices they receive. In the long run, after farmers have had time to fully adjust to the lower risks, we would expect some to be better off and some to be worse off, depending on their preferences between risks and returns. Although society as a whole benefits, we cannot be sure that any particular group of farmers benefits from the lowered risks.

When all things are considered, expanded use of futures, options, or cash forward contracts is not likely to change the average incomes of farmers as a group by very much. The distribution of income may change. Farmers who are skillful or lucky in using the markets may gain, and those less skillful or unlucky may lose.

Effects on Farmers' Risks

By pricing their crops before delivery, farmers can reduce risks from price declines within the year, but they can gain little or no interyear income stability. Risk is present whenever returns cannot be predicted with certainty when resources are committed to production. For example, revenue risk over the growing season can be measured in terms of the deviations between revenues realized at harvest and revenues expected at planting. Similarly, long-term risk appears as deviations between revenues realized and revenues expected when investments are made in land, machines, and other fixed inputs. The appropriate measure of risk depends upon the farmer's financial situation, time horizon, and risk preferences.

Farmers are generally long in the cash market because they own commodities or inputs for producing commodities and expect to sell outputs later. Consequently, farmers generally can reduce exposure to price variation by holding short futures positions, put options, or fixed- or minimum-price cash forward sales contracts while their products are being produced or stored. Some farmers are at times short in the markets for inputs. An example is the livestock feeder who expects to buy feed in the future. For such a producer, the risk of a rise in feed prices may be partly offset by holding a long position in futures, holding call options, or entering cash forward contracts to buy feed. Long futures or options positions may also reduce risks for farmers who have sold their crops and remain eligible for Government deficiency payments that would be diminished by increases in market prices.

Risk-Reducing Effectiveness of Forward Pricing

The effectiveness of forward pricing in reducing farmers' revenue risks varies among crops and locations and depends upon the farmer's planning horizon. The risks in crop production arise mainly from two sources: price variability and yield variability. Yield variability contributes about as much as price variability to farmers' revenue risks, and neither forward pricing nor Government price support programs protect farmers against low yields. Because of yield uncertainty most farmers should sell no more than 50-80 percent of their prospective crops through futures or fixed-price cash forward contracts at planting; 30-50 percent hedges may be better when hedging costs are considered (Grant).

Risk-minimizing hedges generally reduce the standard deviation of crop revenues around planting time expectations by less than 50 percent (Grant; Heifner and Wright). The estimated reduction of revenue variability about long-term averages typically is much smaller, 0-20 percent (table 2). Because of yield variability, forward pricing is relatively less effective in reducing revenue uncertainty in crop production than in storage. This helps to explain why there is less hedging of growing crops than of crops in storage.

Options Compared with Fixed-Price Contracts

Commodity options offer farmers price protection that is similar to that provided by Government loans and deficiency payments. However, option buyers must pay a nonrefundable premium for the price guarantees embodied in option contracts.

Options offer a broader range of risk-management alternatives than futures because several strike prices are traded for each delivery date. The holder of a put option can benefit from price increases and can avoid margin calls. If the crop fails, the holder of a put option has no obligation to buy back the contract at a possibly higher price.

Options are not necessarily more effective than futures for assuring that the farmer's return falls above critical levels. Futures or cash forward sales provide the producer a higher assured net price than options, after option premiums are taken into account. Individual options contracts tend to be less actively traded than corresponding futures contracts. This may result in lower liquidity and higher transactions costs for options than for futures contracts.

Possibilities for Futures-Options Programs

Programs that expand farmers' direct or indirect use of futures or options markets could perform some of the functions currently performed by price support loans and deficiency payments, but such programs would offer few advantages over conventional programs. Possibilities include subsidies to farmers for forward contracting,

Government trading of futures or options to stabilize prices or shift budget risk, issuing or helping to develop new types of forward contracts, and purely educational programs. Government costs cannot be lowered by replacing loans or deficiency payments with such programs without lowering price and income support levels. Certain types of futures-options programs might help farmers develop skills needed to manage risks more effectively during an era of lower price supports.

Subsidizing Farmers' Use of Forward Contracts

Futures-options programs generally would not stabilize farmers' incomes or raise farmers' average incomes above free-market levels unless accompanied by subsidies. Subsidized options programs would look much like price supports to farmers because they would provide a price floor and leave open the opportunity to gain from a price rise. However the aggregate effects of subsidizing farmers' use of options or futures would be more like the effects of deficiency payments than price support loans

Table 2--Effects of routine forward pricing on uncertainty of net revenues in growing corn, soybeans, cotton, and wheat, selected locations, 1960-88 1/

Crop and State	Percentage reduction in revenue uncertainty	
	During growing season	Long-term
	Percent	
Corn:		
Iowa	35	20
North Carolina	27	17
Ohio	41	20
Soybeans:		
Arkansas	14	8
Georgia	9	7
Illinois	25	12
Cotton:		
Alabama	11	8
Arizona	40	15
Winter wheat:		
Kansas	23	5
Texas	11	1

1/ Estimates are for forward pricing 50 percent of expected output at planting. Uncertainty is measured as the standard deviation of differences between realized revenues and expected revenues.

Source: Heifner and Wright, 1989.

because there would be little impact on stock-carrying and year-to-year market price variability.

Subsidies for farmers' use of forward contracts might replace existing farm programs, supplement existing programs with added benefits for farmers, or operate as an alternative to existing programs for farmers to elect. Providing farmers added benefits or attractive alternatives to existing programs generally would increase Government costs. Hence, this study focuses on futures-options programs as replacements for current programs.

Effectiveness in Supporting Farmers' Incomes

Farm programs raise farmers' average incomes in three basic ways: (1) through direct payments to farmers; (2) by limiting quantities supplied to buyers, thereby raising prices; and (3) by increasing demand. Deficiency payments are direct payments to farmers equal to the difference between a Government-established target price and either the market price or the Government loan level, whichever is higher. Farm programs limit supplies by controlling acreage and by donating or otherwise disposing of surpluses. Government programs increase demand by subsidizing consumption or exports or by facilitating farmers' efforts to promote their products. Since futures-options subsidies would not increase demand and would not, by themselves, reduce supplies, such subsidies would be, in essence, direct payments with conditions on how farmers spend the money.

For raising farmers' incomes, direct payments generally cost the Government more than supply control or surplus disposal, but consumers are left better off because resources are not idled or wasted. The Food Security Act of 1985 lowered loan rates and moved toward greater reliance on direct (deficiency) payments. If target prices and loan rates were continued at 1989 levels, replacing the loan program with programs to subsidize farmers' purchases of put options with strike prices equal to the loan rates would have relatively little impact on farmers' revenues or Government costs (Glauber and Miranda).

Effectiveness in Reducing Farmers' Income Uncertainty

Subsidies for forward contracting might help farmers develop skills for managing price risks within the year. Subsidies would persuade some farmers to try forward contracting, but we cannot be sure that subsidies would lead to improved risk management. Farmers might concentrate on maximizing their subsidies instead of managing their risks. Differences in yield variability, related assets, and risk aversion make each farmer's optimal risk-management strategy unique. Imposing or even encouraging the same forward pricing practices on all farmers would be a disservice to many. These considerations suggest that farmers' reluctance to use forward markets for intrayear risk management might best be overcome with a flexible short-lived program aimed at farmers who do not already use forward markets.

A futures options program might be designed to partly stabilize farmers' incomes over a period of years. This could be done by paying farmers' premiums for buying put options with the same strike prices each year. The effects of such options subsidies on farmers' revenue variability would be similar to the effects of price support loans for any given level of support. Either program would typically reduce individual farmer's revenue variabilities by 15-25 percent compared with a free market (table 3) (Plato).

Farm programs can stabilize farmers' incomes across years in two ways: (1) by carrying buffer stocks from large crop years to small crop years, which stabilizes prices, or (2) by making larger direct payments in low-price years than in high-price years. Only buffer stocks can protect consumers against excessively high prices in years with short crops. Futures-options subsidies would have little effect on stock-carrying unless the holding of physical stocks were made a condition for receiving the subsidies.

The need for Government buffer-stock programs to stabilize farm prices has been widely studied and debated, but the issue is not resolved. Private storers should, in theory, provide the optimal amount of carryover from the standpoint of society, if they behave rationally and risk markets are complete and efficient. The experience of the United States and other governments in operating buffer-stock programs has generally not been favorable. Attempts to raise prices or remove too much of the year-to-year

Table 3--Projected effects of current programs and put option subsidy programs on the standard deviation of revenue per acre for selected crops and locations for 1989-98 1/

Type of farm	Percentage reduction in standard deviation of revenue per acre relative to no program	
	Current program	Subsidized puts
	Percent	
California cotton	27	27
Texas cotton:	17	17
Irrigated		
Unirrrigated	15	15
North Dakota wheat	14	14
Kansas wheat	19	19
Iowa soybeans	18	16
Iowa corn	27	21

1/ Results from computer simulations.

Source: Plato.

price variability have frequently resulted in the accumulation of large stocks and high storage costs.

Design of Futures-Options Subsidy Programs

Designing a futures-options subsidy program raises many complex issues. One of the first issues concerns the types of contracts to be included: put options, short futures positions, call options, cash forward contracts, or other types of contracts. Subsidizing farmers' purchases of put options would be a relatively simple way to stabilize their revenues from year to year. Problems of dealing with margin calls on futures and in determining what cash forward contracts were acceptable would be avoided. However, huge increases in the number of open put options contracts would be required, and such a program would be more difficult to administer and offer few advantages over a pure deficiency payment program.

Farmers' specific risk-shifting needs would be served better by a wider choice of contracts. Some farmers might prefer to use futures instead of options if the same rate of subsidization were available. Subsidizing cash forward selling might be the most effective way to expand forward pricing by farmers because farmers already use cash contracts more than futures and options.

Forward contracting subsidies might include paying futures or options commissions or option premiums, making interest-free or reduced-interest loans for margin deposits or option premiums, or guaranteeing returns by end-of-period payments, as provided under the 1988-89 futures-options pilot program. Commissions for buying and selling futures or options are generally less than 1 percent of the value of the commodity traded, while option premiums might be 5-10 percent or more, depending upon how much farmers' incomes were to be boosted. Guaranteeing farmers' returns by end-of-period payments might encourage farmers to make risky trades in the hope of achieving large gains, with the Government covering any losses.

Should the Government confine its subsidies to contracts that reduce farmers' risks? Such confinement would generally rule out the subsidation of farmers granting options, purchasing call options, and holding long futures positions. It would imply limiting preharvest subsidies for futures or cash forward sales to some fraction of the expected crop. It might also imply limiting subsidies for growers who have high basis risks. Determining what constitutes a risk-reducing forward contract can be difficult, but subsidizing purely speculative trades seems inappropriate.

Whether to subsidize contracting before harvest is another important question. Much of the price uncertainty for each year's crop is resolved during the growing season. The Government assumes part of this price risk by establishing a support price before planting. If instead, the Government were to subsidize farmers' purchase of put options or sale of futures at or before planting, then much of the Government's price risk

would be passed on to the marketplace. However, option premiums, which reflect the underlying price risks, would be higher.

Preventing arbitrary trading solely to qualify for subsidies could be a problem. If not required to hold positions for some minimum period, farmers might trade to qualify for subsidies and then immediately trade out of their positions. They might alternatively circumvent the intent of the program by qualifying for subsidies and then entering opposite positions with other brokers. Trained administrative personnel combined with farmers' recordkeeping and reporting would be needed to prevent such misuse of the program.

Many administrative details would have to be worked out to set up a program to subsidize forward contracting. Whether and under what conditions to allow farmers to roll over the contracts that they hold to contracts with later expiration dates is an example.

Futures-options subsidies would be difficult to administer. The rules for participants would need to contain much detail to prevent abuses. Few USDA program administrative personnel have the special knowledge of futures and options trading and experience that would be needed to advise the less knowledgeable farmers and prevent the unscrupulous from abusing the program.

Other Types of Futures-Options Programs

Use of futures and options markets could be encouraged or expanded through programs other than subsidizing farmers' trading. Possibilities include Government trading, support for developing new types of contracts, and purely educational programs.

Government Trading

Some of the goals of farm programs might be attained by direct Government trading of futures or options. The Federal Farm Board actually traded futures contracts in 1930-33 in an unsuccessful effort to stabilize wheat prices. In 1967, Houthakker proposed that the Government stabilize prices by buying distant futures during years when supplies were abundant and prices low, rolling these long positions over into later maturing contracts as necessary, and liquidating the positions during years when supplies were smaller and prices higher (Houthakker). By bidding up the price of distant futures during years of large supplies, the Government would enable private storers to benefit from carrying stocks to periods when supplies were smaller. Stock carrying would be discouraged in years when the Government liquidated its futures positions. If managed with great skill and with sufficient resources, such a program might overcome a possible failure of private storers to provide enough interyear storage. Avoiding the temptation to raise prices above long-term market-clearing levels and thereby accumulating ever-increasing Government futures positions would be a challenge.

The Government could shift to the marketplace some of the risks involved in guaranteeing farmers' prices either by trading futures or options for itself, by subsidizing farmer trading, or by issuing new types of Government obligations that are similar to commodity futures or options contracts. This would call for taking positions, or subsidizing farmers' taking of positions, early in the year before crop size and market price were determined. For example, the budget uncertainties involved in granting farmers price supports might be reduced by Government holding of put options or short futures positions from January, when the President's budget is forwarded to Congress, until harvest. In years when yields were large and prices low, the Government's profits on its put options or short futures positions would be available to help cover price support costs. In short-crop, high-price years, the Government would have low costs or possibly profits on its price support operations to balance against losses on its options or futures positions. Table 4 shows that returns on short futures positions held from January to harvest were positively correlated with deviations between actual program costs and estimated program costs for corn, wheat, cotton, and soybeans during 1980-88.

Support for New Types of Contracts for Farmers

The Government might issue new types of financial instruments or help develop new types of forward contracts for farmers. For example, farming involves investing in machines, equipment, farming skills, and land, which produce returns over many future years, but none of the forward contracts available enable farmers to price outputs more than 12-15 months in advance. Perhaps the Government should issue or help develop trading in contracts that price farm outputs some years ahead. A possibility is for the

Table 4--Correlations between Commodity Credit Corporation program cost deviations from estimates and gains on short futures positions held from January 15 to near harvest, 1980-88 1/

Short futures position	Correlation
	Billion dollars
December corn held to December 15	0.70
December wheat held to December 15	.61
November soybeans held to October 15	.29
December cotton held to October 15	.72

1/ The Commodity Credit Corporation program cost deviation is the actual cost realized for the commodity program minus the January estimate.

Source: Heifner and Wright.

Government to grant or sell to farmers put options with relatively low strike prices but long maturities. By holding such contracts, farmers might increase their probabilities of surviving in farming through low-price years. For various reasons, long-term contracting has not developed for agricultural commodities. Evaluation of the need and possibilities for such contracting is beyond the scope of this study.

Educational Programs

Because effective use of forward contracts requires knowledge and skills that many farmers have not acquired, any program to expand farmers' use of forward contracts or to develop new contracts for farmers would need an educational component. Purely educational programs are also a possibility. Expanded education about forward pricing could help farmers to more effectively manage intrayear risks. Educational programs might help some farmers to raise their incomes, but would likely have little effect on the average incomes of farmers as a group.

The Agricultural Extension Service and the Commodity Futures Trading Commission have in the past developed educational materials and sponsored modest educational programs on futures and options trading. During the spring 1988, the Extension Service provided instruction on futures and options trading for farmers in 41 counties as a part of the futures-options pilot program. This educational effort is being evaluated in a separate study.

Effects on Futures and Options Markets

Either direct Government trading or large-scale subsidization of farmer trading would require greatly expanded holding of long futures positions or granting of put options by private traders. Average month-end open interest in corn, wheat, cotton, and soybean futures currently runs at only 20-50 percent of production for these crops. Open interest in put options is much less. Open interest would not have to equal production, but it would have to expand significantly. The degree to which private traders would have to be compensated for carrying these larger positions is unknown. The character of agricultural futures and options trading could be altered greatly. This suggests that any nationwide futures-options program should be introduced gradually to allow time for the markets to adjust.

References

Glauber, Joseph W., and Mario J. Miranda. Dec. 1989. Subsidized Put Options as Alternatives to Price Supports. TB-1773. U.S. Dept. Agr., Econ. Res. Serv.

Grant, Dwight. 1989. Optimal Futures Positions for Corn and Soybean Growers Who Face Price and Yield Risk. TB-1751. U.S. Dept. Agr., Econ. Res. Ser.

Hartzmark, Michael L. 1987. "Returns to Individual Traders of Futures: Aggregate Results," Journal of Political Economy, Vol. 95, No. 6, pp. 1292-1306.

Heifner, Richard G., and Bruce H. Wright. Dec. 1989. Potentials for Substituting Farmers' Use of Futures and Options for Farm Programs. AER-628. U.S. Dept. Agr., Econ. Res. Serv.

Houthakker, H. S. Nov. 1967. Economic Policy for the Farm Sector. Washington, DC: American Enterprise Institute for Public Policy Research.

Plato, Gerald E. Dec. 1989. Effects of a Subsidized Put Option Program on Farmers' Revenue Risks. TB-1777. U.S. Dept. Agr., Econ. Res. Serv.

Wright, Bruce H., ed. 1988. Options, Futures, and Agricultural Commodity Programs, Symposium Proceedings. ERS Staff Report No. AGES870911. U.S. Dept. Agr., Econ. Res. Serv.

Glossary

Assured net price. The net price assured to the holder of an option; equals the strike price minus the option premium.

Basis. Difference between a specific futures price and a specific cash price for the same or a related commodity.

Call option. The right, without obligation, to buy a futures contract at a specified price during a specified time period.

Cash forward contract. A forward contract entered outside the rules of an organized futures exchange.

Deficiency payment. A payment from the Government to a farmer equal to the difference between the target price and the greater of the market price or the loan rate.

Exercise. The act of a commodity option holder to convert an option contract into a futures contract.

Fixed-price contract. A forward contract that establishes the specific price to be paid by the buyer to the seller.

Forward contract. An agreement between two parties calling for delivery of a product and payment at a future date. The agreement sets quantity, grade, time, and place of delivery, and either sets the price, sets a minimum or maximum price, or provides a formula for determining the price.

Forward market. An institutional arrangement for entering into forward contracts.

Forward pricing. Reaching agreement between seller and buyer on price, or a minimum or maximum price, for a delivery to occur in the future.

Futures trading. Buying and selling standardized fixed-price forward contracts under the rules of an organized exchange.

Futures-options program. A Government program designed to expand direct or indirect farmers' use of commodity futures or options markets.

Hedge. To enter a commodity futures or options position opposite to a cash position as a means of reducing exposure to price variation.

In-the-money option. An option contract that would yield a positive return to the holder if exercised. An option is in-the-money if the strike price exceeds the market price for a put or is less than the market price for a call. The magnitude of this difference is the intrinsic value of the option.

Intrinsic value. The amount that would be realized by exercising an option immediately and trading out of the resulting futures position. The intrinsic value is positive for an in-the-money option and zero otherwise.

Long position. Ownership of a commodity or resources committed to producing a commodity, or the holding of a contract to buy a commodity at a set or limited price.

Margin. A deposit made by a futures trader with a commodity brokerage firm or by a clearinghouse member with the clearing house of an exchange to assure compliance with contract terms. The initial margin is the amount required to enter a futures position; the maintenance margin is the amount required to continue a futures position without receiving a margin call.

Margin call. A request from a brokerage firm to a customer or from an exchange clearinghouse to a clearinghouse member for additional margin to cover the customer's futures position after a price change unfavorable to the customer.

Minimum-price contract. A forward contract that guarantees a specified price to the seller, allows for a higher price under certain conditions, and requires delivery.

Options contract. A contract that gives the holder the right, but not the obligation, to buy or sell at a specified price, particularly a standardized commodity options contract traded on an exchange.

Out-of-the-money option. An option contract that cannot be profitably exercised at the current market price. An option is out of the money if the market price exceeds the strike price for a put or is less than the strike price for a call.

Premium. The price paid by an option buyer to the option seller for an options contract.

Put option. The right, without obligation, to sell a futures contract at a specified price during a specified time period.

Risk aversion. Preference for a certain outcome over an uncertain outcome with equal expected value.

Risk premium. A return paid or earned for bearing risk.

Risky. Subject to randomness in outcomes that are not equally desirable to the decisionmaker.

Routine hedging. Hedging according to standard rules without attempting to anticipate changes in the futures price.

Selective hedging or discretionary hedging. Hedging that takes into account anticipated changes in the futures price.

Short position. The holding of a contract to sell a commodity at a set or minimum price.

Speculation. Holding a net long or short position in a commodity to profit from anticipated price change.

Spot delivery. Immediate delivery or delivery within the shortest time interval normally allowed in the trade to accommodate merchandising requirements, typically 1 day, 10 days, or within the month for agricultural commodities.

Uncertainty. Lack of predictability because of randomness or incomplete information.

Writer or grantor. A person who sells an option.

Appendix I: Sections 1741-1743 of the Food Security Act of 1985

Sec. 1741 (a). Congress finds that there is a need for investigation and development of alternative price support programs carried out by the Department of Agriculture; that agricultural producers and others have insufficient knowledge concerning the nature and extent of price stabilization available in the private sector; and that more information is needed to accurately access the Federal budgetary impact of producer participation in such private sector risk avoidance services.

(b). It is declared to be the policy of the United States that the Department of Agriculture conduct economic research to develop more information concerning the manner in which producers might utilize agricultural commodity futures markets and options markets in connection with their marketing of the agricultural commodities of their own production; and to determine the nature and effect widespread utilization of such markets by producers would have on the prices they receive for their agricultural

commodities, and to determine the feasibility of interfacing traditional Federal price support programs with private sector risk avoidance services.

Study by the U.S. Department of Agriculture

Sec. 1742. The Secretary of Agriculture shall conduct a study utilizing the services of the various agencies of the United States, including, but not limited to, the United States Department of Agriculture and the Commodity Futures Trading Commission, to determine the manner in which agricultural commodity futures markets and agricultural commodity options markets might be used by producers of agricultural commodities traded on such markets to provide such producers with price stability and income protection; the extent of the price stability and income protection producers might reasonably expect to receive from such participation; and of the Federal budgetary impact of such participation compared with the cost of the applicable established price support programs for agricultural commodities. The Secretary shall report the results of such study to the Committee on Agriculture, Nutrition and Forestry of the Senate and to the Committee on Agriculture of the House of Representatives on or before December 31, 1988.

Pilot Program

Sec. 1743. In connection with the study to be undertaken by the Secretary as required by section 1742 of this subtitle, the Secretary shall conduct a pilot program with respect to the crops of wheat, feed grains, soybean, and cotton in at least 40 counties which actively produce reasonable quantities of such major agricultural commodities traded on the commodity futures markets and the commodity options markets. The Secretary shall, in cooperation with the futures and options industry and the Chairman of the Commodity Futures Trading Commission, conduct an extensive educational program for producers in the counties selected for the pilot program. The program shall, among other things, provide that a reasonable number of producers, as determined by the Secretary, may at their election and in accordance with pilot program requirements developed by the Secretary, participate in the trading of designated agricultural commodities on a futures market or options market in a manner designed to protect and maximize the return on agricultural commodities of their own production marketed by them in accordance with program requirements. Participating producers shall be assured by the Secretary under the terms of the program, using funds of the Commodity Credit Corporation, that the net return received for the agricultural commodities that such producers allocate to the program in the manner specified by the Secretary is no less than the price support loan level for such agricultural commodity in the county where it is produced. In the formulation of the pilot program the Secretary shall utilize the services of an advisory panel selected by the Secretary consisting of producers, processors, exporters, and futures and options traders on organized futures exchanges.

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