Hedging Expected Counter-Cyclical Payments

A producer eligible to receive a counter-cyclical payment for a crop may choose not to use the payment to reduce the crop's price risks.[15] Instead, a producer may choose a different way to reduce a crop's price risk, not to reduce a crop's price risk, or not to plant the crop. Choosing not to use counter-cyclical payments to reduce a crop's price risk raises the question: Can the expected counter-cyclical payment be hedged (insured) using existing financial instruments? Hedging an expected counter-cyclical payment involves protecting against loss of a counter-cyclical payment from an increase in the expected marketing-year average price.

This analysis examines the use of call options on futures contracts to hedge the expected counter-cyclical payment rate.[16] Call options can be used to hedge against the risk of a price rise because call options are a one-sided bet, paying out when a price rises above a specified level (the strike price) and paying nothing when a price falls below that level. Payments of call options on futures contracts tend to move opposite to counter-cyclical payments. Thus, a hedge with call options on futures contracts allows producers to protect against declines in counter-cyclical payments while capturing increases in counter-cyclical payments when prices fall.

The objective is to use call options in a way that makes their return move in opposition to the counter-cyclical payment rate. It is not possible to have call option gains move exactly opposite to the counter-cyclical payment rate losses (that is, to form a perfect hedge) because futures prices are not perfectly correlated with marketing-year average prices. We estimated the degree to which call options on futures contracts can reduce the variance of counter-cyclical payment rate losses.

We used appendix tables E-1, E-3, and E-5 and the policy parameters in table 1 to estimate counter-cyclical payment losses and the returns to hedging with call options on futures. The three appendix tables are based on the USDA-WASDE forecast errors and corresponding futures price forecast errors in the first month of the marketing year for marketing years 1977-2003.[17] Appendix E describes how the data were used to examine the hedging effectiveness of call options on futures contracts.[18] We estimated hedges that reduce the variance of counter-cyclical payment losses by the maximum amount. Table 5 shows the results from the hedging examination.

We estimated small reductions in the variance of counter-cyclical payment losses from hedging with call options for corn and soybeans (table 5). Our hedge ratio estimates—call option bushels to eligible counter-cyclical bushels—were also small. The largest corn variance reduction was 34 percent and the largest total hedge ratio was 0.31 (.00 + 0.31) call option bushels per eligible counter-cyclical payment bushel. The March corn call option contract provided almost all of the price protection because the hedge ratio for the corn December contract was essentially zero. The largest soybean variance reduction was 18 percent, and the largest total hedge ratio was 0.09 (0.01 + 0.02 + 0.06) call option bushels per eligible counter-cyclical payment bushel.

[15]Maximizing crop price risk reduction (hedging effectiveness) with counter-cyclical payments involves matching the ratio of sales each month to the amount eligible for counter-cyclical payments with the weights used to calculate the marketing-year average price. The monthly weights must be estimated because they are not known until the end of the marketing year. Hedging effectiveness depends on the precision in estimating the monthly weights and on the level of correlation between local and national marketing year prices.

[16]A call option on a futures contract provides the buyer with the right to receive a payment at option expiration at the rate equal to the futures price at contract expiration minus the option's strike price if the rate is greater than zero. An option seller must pay at this rate if greater than zero. No payment is given or received if the rate is less than or equal to zero, that is, if the futures price at expiration is less than or equal to the strike price. The payment rules provide protection against the price rising above the option's strike price.

[17]We could not construct a data set for cotton because WASDE cotton price forecasts are prohibited by Federal law. Data sets for barley and peanuts could not be constructed because they do not trade on U.S. futures exchanges. Rice futures have not been trading long enough for us to develop a data set. We chose not to examine oats.

[18]Our hedging analysis is made on a per bushel basis. Hedging effectiveness would be reduced by matching the number of bushels in call option contracts with a producer's eligible counter-cyclical payment bushels.

Table 5

Effectiveness of hedging counter-cyclical payments and hedging ratios using call options on futures contracts

Commodity	Call option contracts	Forecasted marketing-year average price	Variance reduction in counter-cyclical losses	Ratio call option gain to counter-cyclical losses	Hedge ratios[1]
		$/bu	*Percent*		
Corn					
	Dec.	1.95	12	0.23	.24
	Dec., Mar.	1.95	22	0.41	.00 .31
	Dec., Mar., May	1.95	34	0.45	.00 .18 .11
	Dec.	1.70	8	0.19	.17
	Dec., Mar.	1.70	20	0.36	.01 .22
	Dec., Mar., May	1.70	21	0.38	.02 .13 .08
Soybeans					
	Nov.	5.10	7	0.09	.04
	Nov., Jan.	5.10	13	0.13	.00 .06
	Nov., Jan., Mar.	5.10	18	0.18	.00 .01 .04
	Nov.	4.50	6	0.11	.07
	Nov., Jan.	4.50	11	0.16	.01 .07
	Nov., Jan., Mar.	4.50	17	0.21	.01 .02 .06
Wheat					
	Sept.	2.75	29	0.38	.46
	Sept., Dec.	2.75	48	0.60	.25 .31
	Sept., Dec., Mar.	2.75	51	0.63	.27 .18 .13
	Sept.	2.25	18	0.31	.32
	Sept., Dec.	2.25	33	0.54	.21 .24
	Sept., Dec., Mar.	2.25	36	0.60	.22 .13 .12

[1]Call option bushels per counter-cyclical payment bushel. Hedge ratios are for the corresponding call option contracts in the second column.

Source: Prepared by USDA, Economic Research Service using WASDE forecast errors and futures price forecast errors.

Estimated variance reductions in counter-cyclical payment losses and hedge ratios were considerably larger for wheat. In addition, the estimated ratios of call option gains to counter-cyclical losses were much larger for wheat. For wheat, the largest estimated variance reduction in counter-cyclical payments was 51 percent, and the largest total hedge ratio was 0.58 (0.27 + 0.18 + 0.13). The hedge included the September, December, and March contracts.

Risk of a counter-cyclical payment rate loss can be considerably less when the forecasted marketing-year average price is below the national loan rate. For example, our hedging examination for wheat estimated a 1-in-10 chance of a counter-cyclical payment rate loss with an expected loss of $0.18 per bushel when the forecast marketing-year average price was $2.25 per bushel. Expected counter-cyclical payment loss is the average loss given that there is a loss. Zero counter-cyclical payment losses (when the marketing-year average price is less than its forecast level and/or less than the national loan rate) are excluded when calculating expected loss. We estimated about a 1-in-2 chance of a loss with an expected counter-cyclical payment rate loss of $0.29 per bushel when the forecast price was equal to the national loan rate of $2.75 per bushel. Call options for hedging are less expensive with the lower $2.25 forecast price because their strike price would be far above the current futures price. A lower call option price is an important factor in deciding whether or not to hedge at the lower forecast marketing-year average price.

Maximum counter-cyclical payment rate losses are small when forecast marketing-year average prices are close to the effective target price, making hedging less attractive, although the chance of a loss may be large. We estimated an expected loss of $0.08 per bushel with a 1-in-2-chance of a loss when the forecasted wheat marketing-year average price was $3.30 per bushel—$0.10 per bushel less than the effective target price. Hedging effectiveness at the $3.30 per bushel forecast, measured by the reduction in counter-cyclical payment rate variance, was less than 12 percent.

The call option hedge does not protect the positive time value portion of the expected counter-cyclical payment. Positive time value of the expected counter-cyclical payment reflects the possibility that the marketing-year average price will be smaller than its forecast level. The call option hedge only provides protection against price increases relative to the marketing-year average price forecast level. This is advantageous for producers because positive time values should not be hedged; they reflect the potential gains in counter-cyclical payments that are associated with downside price risk.

The negative time values associated with the counter-cyclical payment rate can be hedged because they reflect the possibility that the marketing-year average price will be larger than its forecasted level, lowering payments.

Buying futures contracts is not appropriate for hedging a counter-cyclical payment. A hedge with futures can be effective when the marketing-year average price outcome is between the national loan rate and the effective target price. In this price range, losses on one side of the hedge tend to be offset by gains on the other side; however, when the marketing-year average price falls below the national loan rate, there would typically be losses on the futures side of the hedge without counter-cyclical payment gains.