Managing Hog Price Risk: Futures, Options, and Packer Contracts

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In recent years, the hog market has redefined the parameters of risk and the need for risk management. Prior to the fourth quarter of 1998, a month of prices at $28 in 1994 was considered disastrous. Prior to 1998, low prices still covered feed bills and most of the direct cost of production. Prior to 1998, operations would generally cash flow without attention to marketing and price risk management. That thinking has changed for both producers and their lenders as they turn more attention to managing price risk.

Many producers have signed packer contracts as a way to manage price risk, or at least to assure market access. Approximately three-fourths of U.S. hogs are under contract or are owned by packers (Table 1). While the contracts assure market access for the producers, relatively few contracts provide true protection from price risk. The most common contract is a formula price contract tied to the cash market. The price paid may be a three-day or weekly average, but nearly all of the consequence of price fluctuation is borne by the seller. Even the ledger contracts simply smooth the cash flow over time, but the producer repays the amount borrowed to protect him from low prices at a time of higher prices.

Table 1. Hog Procurement Methods, 1999.

Procurement Method	Percent
Cash market purchase, live basis	8.0
Cash market purchase, carcass basis	18.8
Formula-priced contract based on cash market	32.3
Fixed price contract based on futures	8.3
Fixed agreement based on feed price	5.7
Formula contract with window	7.9
Other purchase methods	1.4
Self production	17.7
Total	100.1

Source: Meat Packer Vertical Integration And Contract Linkages in the Beef and Pork Industries: An Economic Perspective

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Lean hog futures and options have offered a tool for managing price risk for a number of years, but have received relatively little use by producers. Producers often charge that these tools are too complicated to use and list basis risk, high premiums, margin calls, lack of profit potential, and too many choices as faults of these tools. This paper evaluates alternative futures and options strategies over time and compares them to the cash market and to packer contracts to address the following questions:

- Can futures/options strategies effectively manage price or, more importantly, profit risk?
- Which strategies work best and when should they be used?
- Do futures/options strategies manage profit risk "better" than packer contracts do?

Following a discussion of recent changes in basis risk and the efficient market hypothesis is an evaluation of risk management strategies using decisions based on the time of sales, profit objectives, and a simple price-forecasting model. Then futures and options strategies will be compared with five packer contracts.

Understanding Basis

Basis is the difference between the local cash price and the nearby futures price. Futures and options strategies can be effective only if the basis is more predictable than the futures price and, generally speaking, it is. However, since the switch to cash settlement on lean hog carcasses, the basis has been wider than expectations, based on history. Although far from perfect, history is the best predictor of basis. Universities and commodity brokers track historic basis patterns and make them available to producers to use when considering hedging decisions[1]. Marketings that are 100% hedged will receive the expected hedge price if the actual basis at slaughter is the same as the predicted basis at the time the hedge was placed. That is to say, the only surprise will come from an unpredictable basis, but the producer is trading cash market price risk for basis risk, which is typically less. A cash forward contract with a packer will lock in a basis and a price, but also locks the producer in to delivery of the hogs to a particular packer.

[1] Historic Iowa Southern Minnesota lean hog basis is available at www.econ.iastate.edu/faculty/lawrence/hogs/

Managing Risk or Enhancing Revenue

Producers often make risk management decisions based on two criteria, "sinking the ship" and "missing the boat." A common complaint about futures/options is that "I missed the boat." A price was locked in and later prices went higher, or a put option premium was paid and because prices did not fall below the strike price, the option expired with no value. Using perfect hindsight the producer can easily evaluate the marketing decision. The benchmark wasn't whether the strategy effectively managed risk by keeping the ship afloat, but rather that the net price would have been higher if the producer had done nothing. Based on the information at the time the pricing decision was made, it was the best thing to do; after the fact, it was not the most profitable choice. The obvious solution is better information, but it is not that easy.

The efficient market hypothesis (EMH) is a widely held belief that large, open, frequently traded markets like stocks and futures are very efficient. That is, all the information available about what a price will be on a particular date (i.e., expiration day for the Lean Hogs on the 10^{th} business day of the contract month) is already factored into the market. As a result, it is impossible to consistently outperform the market. On any given day, the futures market provides a consensus forecast of what prices will be at expiration of the contract. If that was not true, people would figure out that someone was consistently a winner and follow the person's trades, and the market would quickly adjust accordingly. As a result, it is not possible to routinely beat the market to increase revenue on every trade. However, selectively used futures/options may help producers avoid very low returns or potentially take advantage of unusually high returns and generate a more predictable cash flow over time. Managing market risk under the assumption of the EMH implies that producers should focus attention on price objectives and a systematic approach to futures/options decisions rather than trying to outguess the market. It also leaves the risk management decision in control of the "manager." While the following analysis will focus on selected decision rules, managers have the ability to evaluate each marketing decision separately before choosing a strategy.

Alternative Strategies

This paper will evaluate various futures and options strategies using monthly data from 1987-1999 with the cash market as the benchmark. To simplify the analysis, the outcomes are stated in dollars per hundredweight and it is assumed that the contract size matches production

levels. Cash prices are the Iowa-Southern Minnesota price for the 15th of the month, north central Iowa corn price, and commercial protein supplement. Cost of production is the Iowa State University Extension Estimated Livestock Returns for Farrow to Finish Operations (M1284) and it is assumed that the producer's projected breakeven when the marketing decision is made four months prior to slaughter is the same as the actual cost of production. The basis is the previous five-year average basis for Iowa-Southern Minnesota barrows and gilts that would be available at the time the hedging decision is made. Table 2 defines the strategies evaluated.

Table 2. Definition of Risk Management and Marketing Strategies [a/].

CASH	Sell all hogs at the cash price at market time
FUTURES	Hedge all hogs with a futures contract
50 FUTURES	Hedge 50% of hogs with a futures contract, 50% sold in the cash market
OTM2P	Buy a put option 2 strike prices out-of-the-money
OTM1P	Buy a put option 1 strike prices out-of-the-money
ATMP	Buy a put option at-the-money
ITM1P	Buy a put option 1 strike prices in-the-money
ITM2P	Buy a put option 2 strike prices in-the-money
O2PO2C	Buy a put and sell call options 2 strike prices out-of-the-money
O1PO1C	Buy a put and sell call options 1 strike price out-of-the-money
O1PO2C	Buy a put option 1 strike price out-of-the-money, sell call option 2 strikes price out-of-the-money

[a/] Futures/options decisions made 4 months prior to slaughter

A summary of cost and prices is found in Table 3. The cost estimate in this series seems high by today's standards, but is representative of full economic cost for average farrow to finish producers over the period of time studied. The average return over total cost was $2.04/cwt. As discussed above, basis risk was less than price risk as the standard deviation and range were smaller for the basis than for price. Consistent with earlier studies, futures prices show a slight downward bias (Zulauf). That is, on average the futures price at sale time was higher than the futures price at placement. Interestingly, the risk premium (placement versus sale) for the at-the-money put was relatively small, $.09/cwt.

Table 3. Hog Marketing Summary Statistics for Costs and Prices, 1987-99, $/Cwt Live Weight[a] .

	Average	Standard Deviation	Minimum	Maximum
Sale Price	45.58	8.10	13.00	63.25
Estimated Breakeven	43.54	3.50	37.69	54.18
Feed Cost	23.65	3.78	15.85	35.18
Futures hedge price				
At Placement	45.92	6.08	26.55	58.81
At Sale	46.66	8.27	16.27	64.55
Basis risk[b]	-0.33	4.33	-11.71	13.51
At-the-money put premium				
At Placement	2.23	0.87	0.12	5.42
At Sale	2.14	3.60	0.00	22.02

[a/] Live prices for Iowa-Southern Minnesota barrows and gilts, costs from Iowa State University M1284, futures and options from Chicago Mercantile Exchange (adjusted to live weight)

[b/]Basis risk is defined as actual basis – expected basis

Table 4 summarizes the net returns to the marketing strategies as defined. CASH had the highest and FUTURES had the lowest average return. It was just the opposite if compared on some measure of risk. The option strategies will always produce returns that are less than CASH in rising markets and less than futures in falling markets. These results confirm that theory. Average returns to option strategies were nearly linear between those of CASH and FUTURES, decreasing with increasing strike prices.

When comparing strategies with an objective like breakeven, CASH was above breakeven the most often (62%), FUTURES had positive returns least often (51%), and the options strategies were similar to each other at about 56-58%. Comparing the strategies to CASH indicates that hedging all or half of the hogs (50 FUTURES) with futures generated returns greater than the cash market 44% of the time. The options strategies are interesting in that the higher the average return, the lower the percent of time that the return was higher than the cash

market. The higher the level of protection (strike price) purchased, the more often it will pay off better than CASH, but the higher the cost of the insurance (premium).

Table 4. Summary of Returns to Alternative Risk Management Strategies, 1987-99.

	Average	Standard Deviation	Minimum	Maximum	Positive Returns (%)	Beats Cash Sales (%)
CASH PRICE	2.04	7.92	-26.77	23.52	62	NA
FUTURES	1.09	5.98	-10.75	16.45	51	44
50 FUTURES	1.56	6.48	-18.46	16.44	57	44
OTM2P	1.83	7.13	-14.51	22.82	58	19
OTM1P	1.72	6.96	-13.51	22.20	56	22
ATM	1.59	6.72	-12.99	21.30	58	25
ITM1P	1.46	6.55	-11.99	20.20	54	31
ITM2P	1.30	6.52	-11.51	19.32	55	36
O2PO2C	1.66	6.53	-13.56	18.71	57	30
O1PO1C	1.37	6.27	-12.29	18.23	54	37
O1PO2C	1.55	6.40	-12.59	18.63	56	27

Table 4 summarized strategies across all months and years. Do the results change if individual months are considered separately? Table 5 summarizes the strategies by marketing month and shows that there are certain times of the year when one strategy is dominant. What it shows is that, if you are simply playing the averages, the cash market works well in March through August, futures work better from December to February, and options window strategies have a place in the fall. However, if you factor in the benchmarks such as price greater than breakeven and returns greater than the cash market, the preferred strategy is less clear-cut. The differences in average returns were often small and the percent of time the strategy exceeds CASH returns is typically small as well. One exception may be September marketings where CASH produced the smallest average return. Keep in mind that the average return for any given month represents only 13 years and a single extreme number can affect the average.

Table 5. Average Return and Percent with Positive Returns by Sales Month and Marketing Strategy, 1987-99.[a]

Sales Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
CASH ($)	-0.48	2.10	0.39	0.87	4.79	6.52	5.79	5.80	2.17	2.04	-3.13	-2.38	2.04
% Greater than $0	46	62	46	54	69	69	85	77	62	77	46	46	62
FUTURES ($)	-0.30	2.18	-1.70	-2.39	1.02	3.65	5.10	4.47	4.11	1.41	-2.94	-1.54	1.09
% Greater than $0	31	62	38	23	54	69	85	77	69	46	23	38	51
50 FUTURES ($)	-0.39	2.14	-0.66	-0.76	2.91	5.09	5.45	5.14	3.14	1.72	-3.04	-1.96	1.56
% Greater than $0	38	62	46	38	69	69	92	85	62	62	31	31	57
OTM2P ($)	-0.66	1.37	-0.13	0.24	3.91	6.15	5.57	4.90	3.17	2.26	-3.10	-1.66	1.83
% Greater than $0	46	54	46	46	69	77	77	69	62	69	31	46	58
OTM1P ($)	-0.60	1.09	-0.45	-0.16	3.69	5.90	5.66	4.60	3.68	2.19	-3.24	-1.67	1.72
% Greater than $0	38	54	38	38	77	77	77	69	62	62	31	46	56
ATMP ($)	-0.58	1.14	-0.80	-0.66	3.30	5.43	5.65	4.43	4.21	2.06	-3.36	-1.74	1.59
% Greater than $0	38	62	31	38	69	77	85	77	77	62	31	46	58
ITM1P ($)	-0.54	1.37	-1.16	-1.25	2.89	5.02	5.52	4.63	4.71	1.55	-3.39	-1.82	1.46
% Greater than $0	38	62	31	38	62	77	85	77	77	46	31	31	54
ITM2P ($)	-1.02	1.64	-1.63	-1.88	2.43	5.03	5.48	4.76	5.08	1.34	-3.57	-2.03	1.30
% Greater than $0	38	62	31	38	62	85	85	85	77	46	31	23	55
O2PO2C ($)	-0.60	1.87	-0.42	0.26	2.30	4.85	4.91	4.73	4.08	2.38	-2.81	-1.57	1.66
% Greater than $0	31	62	46	38	62	69	85	69	69	69	46	38	57
O1PO1C ($)	-0.63	1.93	-0.94	-1.50	1.70	4.24	4.97	4.44	4.91	2.05	-3.01	-1.75	1.37
% Greater than $0	31	62	31	31	69	69	85	77	77	62	31	31	54
O1PO2C ($)	-0.55	1.59	-0.74	-0.13	2.08	4.60	5.00	4.43	4.60	2.31	-2.95	-1.59	1.55
% Greater than $0	31	62	38	38	69	69	85	77	77	62	31	38	56

[a/] Percent of 13 years that returns were positive using selected market strategy.

Black cells indicate the highest average monthly return; shaded cells indicate the highest percent of years with positive returns.

The marketing decisions discussed above represent "no-brainer" strategies. They imply following only one strategy every month for 13 years and comparing the results. However, managers can use their brains, evaluate information, and make decisions. While the complexities of the possible decision are beyond the scope of this paper, there are some simple "if-then-else" decisions that can be examined. Table 6 summarizes the results of three if-then-else risk management strategies.

- Rule #1: if the "expected price" four months prior to slaughter is greater than breakeven cost of production, then use the risk management tool, else stay in the cash market.
- Rule #2: if the "expected price" four months prior to slaughter is greater than breakeven cost of production, then use the risk management tool, else hedge using FUTURES.
- Rule #3: if the "expected price" four months prior to slaughter is greater than breakeven cost of production, then use the risk management tool, else buy a put option two strike prices out-of-the-money (OTM2P).

The expected price is the price a producer expected to receive by using the risk management tool, assuming that the actual basis is the same as the expected basis. For example, the expected price from hedging with futures is the futures price four months prior to expiration plus the expected basis, minus commission. The expected minimum price from buying a put option is the strike price minus the premium, plus the basis minus commission. The column labeled percent of time tool used indicates the percent of the months that the if-then statement was true and the tool was used.

Rule #1 produced average returns that were comparable to the Table 4 results for each tool, but the percent of times with a positive return was slightly higher than the no-brainer strategy. This decision rule implies that a manager will settle for breakeven, but if the market isn't offering that price, then he or she will stand the full risk of the cash market. It is an optimist's strategy–things will get better. Rule #2 is a pessimist's strategy. If the tools can't be used to cover breakeven, then hedge with futures to protect from even lower prices. Notice that the average returns were higher than the FUTURES strategy in Table 4, but generally lower than using the tool alone. Returns were positive about half of the time, but the percent of time that returns beat CASH was higher than RULE #1. Rule #3 is a realist's strategy. If return over breakeven isn't available, an out-of-the-money put is bought to protect against lower prices, but

the producer can receive higher price if they occur. As expected, the option based strategy generated results located between the CASH and FUTURES based strategies.

Rules #2 and #3 had lower average returns than Rule #1, but they both had higher minimum returns because they took some protection against falling prices even though breakeven couldn't be covered at decision time. They also had a smaller standard deviation, but approximately the same maximum price, suggesting that they reduced the variation on the lower side of average.

Table 6. Summary of Returns to Selected If-Then-Else Risk Management Strategies, 1987-1999.

Use Selected Tool if Expected Price is Greater than Breakeven Else ***Stay in the Cash Market***[a]

Tool	Average	Standard Deviation	Minimum	Maximum	% of Time[b] Tool Used	Positive Return (%)	Time Above Cash (%)
FUTURES	1.68	6.89	-26.77	16.45	51	67	23
50 FUTURES	1.86	7.17	-26.77	16.44	51	66	23
OTM2P	1.91	7.73	-26.77	22.82	24	62	4
OTM1P	1.87	7.63	-26.77	22.20	33	63	7
ATM	1.78	7.44	-26.77	21.30	40	65	11
ITM1P	1.84	7.31	-26.77	20.20	46	65	16
ITM2P	1.85	7.28	-26.77	19.32	49	66	20

Use Selected Tools if Expected Price is Greater than Breakeven Else ***Hedge with Futures***

Tool	Average	Standard Deviation	Minimum	Maximum	% of Time Tool Used	Positive Return (%)	Time Above Cash (%)
50 FUTURES	1.27	6.33	-10.75	16.44	51	51	44
OTM2P	1.27	6.69	-10.75	22.82	24	49	38
OTM1P	1.26	6.70	-10.75	22.20	33	49	37
ATM	1.16	6.48	-10.75	20.20	46	48	39
ITM1P	1.16	6.48	-10.75	20.20	46	48	39
ITM2P	1.17	6.44	-10.75	19.32	49	49	42

Use Selected Tools if Expected Price is Greater than Breakeven Else ***Buy a Put Option Two Strikes Out-of-the-Money.***

Tool	Average	Standard Deviation	Minimum	Maximum	of Time Tool Used	Positive Return (%)	Time Above Cash (%)
FUTURES	1.66	6.32	-14.51	16.45	51	63	31
50 FUTURES	1.83	6.63	-14.51	16.44	51	63	31
OTM1P	1.81	7.04	-14.51	22.20	33	58	19
ATM	1.76	6.88	-14.51	21.30	39	61	22
ITM1P	1.78	6.77	-14.51	20.20	46	62	25
ITM2P	1.79	6.74	-14.51	19.32	49	63	28

a/ Expected Price is calculated four months prior to slaughter and assumes the expected basis will be the actual basis.

b/ Percent of months that the marketing tool was selected versus the default strategy.

A second decision rule compares the expected price explained above to a forecast of market prices rather than to a price objective such as breakeven. A simple seasonal price forecasting model was developed and used to predict what cash price will be in four months.

- Rule #4: if the "expected price" four months prior to slaughter is greater than forecast price for that date, then use the risk management tool, else stay in the cash market.
- Rule #5: if the "expected price" four months prior to slaughter is greater than forecast price for that date, then use the risk management tool, else buy a put option two strike prices out-of-the-money (OTM2P).

The seasonal forecast model uses the 10-year rolling average seasonal index (SI). Divide the current month's price by the SI for the current month and then multiply by the SI for the month of interest (four months into the future).

Table 7 summarizes the results to Rules #4 and #5. In general, average returns were higher than those in Table 4 or Table 6 with the greatest difference coming from Rule #4. The minimum returns were higher, and the percent of time that returns were positive was relatively high compared with the other strategies, but the percent of time that returns beat CASH was relatively small.

Packer Contracts as Risk Management Tools.

Five packer contracts were simulated over the same 1987-99 period described earlier. The original analysis of the contracts was based on weekly data (Lawrence). For this monthly analysis, the results for the week containing the 15th of the month were pulled from the weekly study. The five contracts are not meant to represent any particular packer contract, but do accurately reflect contracts that have been offered. While few if any such contracts were available prior to 1993, these were simulated for the entire period for comparison purposes.

Table 7. Summary of Returns from Using a Seasonal Price Forecast to Make Risk Management Decision.

Use Tool If Expected Price is Greater Than Seasonal Forecast Price Else ***Stay in Cash Market***

Tools	Average	Standard Deviation	Minimum	Maximum	% of Time Tool Used	Positive Return (%)	Time Above Cash (%)
FUTURES	2.40	7.35	-26.77	23.52	37	62	21
50 FUTURES	2.22	7.52	-26.77	23.52	37	62	21
OTM2P	2.26	7.37	-14.51	23.52	27	60	12
OTM1P	2.33	7.30	-13.51	23.52	29	61	13
ATM	2.32	7.26	-12.85	23.52	35	62	15
ITM1P	2.46	7.04	-11.99	23.52	42	62	21
ITM2P	2.49	7.03	-11.48	23.52	45	62	23
O2PO2C	2.07	7.13	-13.56	23.52	35	60	16
O1PO1C	1.42	6.45	-12.29	20.48	60	54	22
O1PO2C	2.04	6.92	-12.59	23.52	44	58	17

Use Tool If Expected Price is Greater Than Seasonal Forecast Price Else ***Buy Put Option Two Strike Price Out-of-the-Money***

Tools	Average	Standard Deviation	Minimum	Maximum	% of Time Tool Used	Positive Return (%)	Time Above Cash (%)
FUTURES	2.34	6.77	-12.71	22.82	47	62	32
50 FUTURES	2.01	7.07	-18.46	22.82	47	62	62
OTM1P	1.91	7.05	-13.51	22.82	29	59	19
ATM	1.95	6.98	-12.71	22.82	35	61	21
ITM1P	2.05	6.86	-12.71	22.82	42	61	24
ITM2P	2.11	6.85	-12.71	22.82	45	62	27
O2PO2C	1.73	6.89	-13.56	22.82	35	58	23
O1PO1C	1.21	6.31	-12.71	19.58	60	54	27
O1PO2C	1.70	6.75	-12.71	22.82	44	57	23

The contracts are defined as follows:

COST+	Price is determined by a budgeted cost of production tied to rolling average corn and soybean meal prices.
LEDGER 1	Floor price is determined by a budgeted cost of production tied to rolling average corn and soybean meal prices. At cash prices below the floor price, the producer receives the floor price and borrows the difference between the cash and floor price. At prices above the floor, the producer stays at the floor price and the difference goes to pay down the ledger balance.

LEDGER 2	Floor price is determined by a budgeted cost of production tied to rolling average corn and soybean meal prices. At cash prices below the floor price the producer receives the floor price and borrows the difference between the cash and floor price. At prices above the floor, the producer gives up half the higher price that goes toward the accumulated ledger balance.
WINDOW 1	Between $42 and $47 the producer receives the cash price. For prices above or below the $42-47 window the producer and packer split the difference equally.
WINDOW 2	The bottom of the window is determined by a budgeted cost of production tied to rolling average corn and soybean meal prices. The top of the window is fixed at $7.50/cwt above the bottom. The producer receives the cash market price if it is inside the window, and the lower (upper) price if the cash market is below (above) the window.

Table 8 summarizes the returns to the cash, futures and two options strategies, and the five packer contracts. First, keep in mind that because ledger balances must be repaid, the average price in the long run for a ledger contract will be the same as the CASH price. When the returns to the ledger are higher than the cash market as LEDGER 1 returns are in this example, the ledger balance is negative and the producer will have to pay it off at a later date. When returns are lower, as LEDGER 2 is here, it suggests that there is a positive balance in the ledger account. Notice that the producer in this example has a higher cost of production than is assumed in COST+ and WINDOW 2 because the average returns are negative.

From a purely risk management perspective, the packer contracts outperform the futures and options strategies. The standard deviations and minimums are lower, and in some cases much lower. The LEDGER contracts showed the highest percent of positive returns. While LEDGER 1 will have to pay back higher than cash prices paid at some later date, it will be paid back at a time of higher prices. It is no surprise that the shortfall with packer contracts is that the maximum is lower than that of other strategies. This is often by design by the packer that wants protection from high prices, but it limits the larger profit potential that high prices offer producers. It is also important that producers have a cost of production that is comparable to or better than what packers build into the contract specifications. These performance assumptions

are defined in the contract, and producers must be able to compare their own costs and input prices to what is allowed in the contract.

Table 8. Summary of Returns from Packer Contracts, Cash and Futures, 1987-99

	Average	Standard Deviation	Minimum	Maximum	Positive Returns (%)	Beats Cash Sales (%)
CASH	2.04	7.92	-26.77	23.52	62	NA
FUTURES	1.09	5.98	-10.75	16.45	51	44
OTM2P	1.83	7.13	-14.51	22.82	58	19
O2PO2C	1.55	6.40	-12.59	18.63	56	27
COST+	-0.44	0.78	-2.03	2.28	25	36
LEDGER 1	2.28	3.78	-3.86	18.97	76	46
LEDGER 2	1.94	2.47	-1.80	11.35	81	42
WINDOW 1	0.20	5.12	-13.52	14.67	47	23
WINDOW 2	-0.55	3.21	-5.22	4.49	46	20

Summary

Pork producers have a wide variety of tools to manage price risk available to them. However, there is no clear-cut best strategy for all producers or one that works consistently over time. The efficient market hypothesis essentially guarantees that a single strategy will not be profitable every time. Thus, producers looking for a simple solution are out of luck.

Producers who choose to depend solely on luck may be disappointed as well. The cash market did offer the highest average return over the period that was studied and produced positive returns more often than other no-brainer strategies; however, it was still a relatively high-risk strategy. Perhaps the most promising strategies were those that used a simple if-then-else decision rule relative to a seasonal price forecast with the default strategy being to buy a cheaper put option two strike prices out of the money. This strategy had average returns higher than that of the cash market and produced a comparable percent of positive returns to the cash market, but avoided the extremely low prices and returns that the cash market had.

Packer contracts did reduce risk but, depending on the contract, at the expense of profits. The variation of returns was greatly reduced under some of the contracts evaluated. However,

the simulated cost of production for the producer was higher than was practical for the contracts considered. The cost-plus contract in particular produced an average return that was negative, indicating that this producer had costs that were too high to be successful on the contract. However, if the goal is to manage price risk, the packer contracts performed better than the futures and options strategies evaluated in this study and it is little wonder that their use has grown.

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