Systematic Hog Price Management: Selective Hedging and Long-Term Risk Sharing Packer Contracts

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Summary and Implications

In addition to futures and options markets, long-term risk sharing hog procurement contracts offered by packers provide some degree of price risk protection for pork producers. The window contract and a moving average hedging strategy generated similar average returns and level of profit risk protection. The cost-plus contract provided a greater degree of risk protection from prices below cost of production and used a ledger account to ensure that prices average the same as the cash market over the long run.

Introduction

The futures market has long been available for pork producers to manage price risk for input purchases and output sales. However, relatively few pork producers use these tools (7). Yet risk management continues to be referenced as a key consideration for existing, as well as expanding and highly leveraged producers. Many expanding producers are entering long-term, risk-sharing marketing contracts with packers.

These extra-market transactions raise concerns to some in the industry regarding issues of market access, market reporting, and price discovery. Producers considering such contracts have expressed reservations about committing to only one packer. Effective hedging strategies that offer similar price- and profit-risk management to packer contracts would offer producers an alternative to long-term packer contracts. Such use of the futures market allows the producer to separate risk management from cash marketing decisions. Although not without concerns from producers about its influence on cash prices, managing risk in the futures market reduces broader market performance concerns.

Previous risk management and futures market studies of the live hog contract using ex ante prices typically show that the cash market provides larger, but more variable returns than routine hedging strategies. Selective hedging strategies using technical analysis have generated higher mean returns and comparable-to-less-risky returns (Hales, Bresee). The typical standard of comparison in most hedging studies is the cash market. However, in today's pork industry, producers may have other risk management alternatives available.

This paper is work in progress to examine alternative risk management strategies for pork producers. Two hypothetical packer contracts similar to those offered in the industry today are simulated and compared with prices produced by a simple, moving average, selective hedging strategy, and the cash market. Net prices received and budgeted returns for a typical farrow-to-finish operation over a 10-year period will be examined. Following is a brief description and history of packer contracts and the specifics of the two contracts that are examined here. Next is a description of a relatively simple hedging strategy that was also evaluated. The paper ends with a discussion of the results and promising areas of future research.

Long-term packer contracts. In recent years, long-term marketing agreements have emerged between hog producers and pork packers. A recent University of Missouri study indicated that approximately 26% of hogs marketed in 1994 were sold on a formula pricing agreement (Rhodes and Grimes). A much smaller, but growing percentage involved some type of price risk-sharing arrangement between the producer and packer. Two risk-sharing arrangements that have been offered by packers are the cost-plus and window contracts (6). The cost-plus contract bases the minimum price the producer receives for hogs on a standardized cost of production and the factors that influence costs (e.g., feed prices). The window contract sets an upper and lower price boundary and the producer receives the market price if it falls within these boundaries or window of prices. When prices are outside the window, the "pain or gain" is shared between the buyer and seller.

After the very low hog prices of late 1994 and the historically high grain prices of 1996, producers have become increasingly interested in some method of managing price risk. Likewise, lenders are encouraging producers to develop management and marketing strategies that increase the probability that operations can service debt payments in a timely manner. Declining hog production in traditional Hog Belt states with excess packer capacity, such as Iowa, has prompted packers to look for ways to secure a steady supply of hogs. Survey work by Rhodes, Hayenga, Grimes, and Lawrence confirms that long-term, risk-sharing contracts manage price risk (and possibly profit risk) for hog producers, increasing their ability to access capital and grow their operations. Such agreements also serve to secure a supply of known quality hogs for a packer.

Although risk-sharing contracts offer advantages to both buyers and sellers, questions remain as to how these marketing contracts perform relative to the cash market or hedging strategies that the producer could easily implement. Risk-sharing contracts are difficult to analyze. First, not all packers offer a contract; contracts do differ between packers and contract provisions have evolved over time as the market for contracts matures. Second, the contracts are typically confidential in nature and the details of specific contracts are not observable. This paper will model two hypothetical contracts based on reported features of contracts—a cost-plus contract and a window-price contract. The analysis is not intended to represent a specific contract offered by a packer, but rather to reflect a general type of agreement that may be available to producers. The prices

resulting from the contracts and a relatively simple futures hedging strategy will be compared with the Iowa-Southern Minnesota cash market over a 10-year period.

Materials and Methods

The cash market price used was the weekly average U.S. 1—2, 220—260 lb. barrows and gilts in the Iowa-Southern Minnesota market reported by the United States Department of Agriculture (USDA). Central Iowa weekly average corn prices paid to farmers were adjusted upward $0.20 per bushel to more closely reflect a river bid often used in cost-plus contracts. Decatur, Illinois, soybean meal prices (SBM) for Thursday were also used. The analysis assumed that the producer sold hogs each week and weekly prices from January 1987 through December 1996 were used. Futures prices used were the Chicago Mercantile Exchange Live Hog contract prices.

Cost-plus contract. The cost of production in cost-plus contracts is typically meant to represent that of above-average producers. The cost-plus contract in this analysis assumes a standard production budget based on an 8-week rolling average corn and SBM price. The budget has a whole-herd feed efficiency of 350 lb. of feed per cwt. of hog produced, and an 80% corn and 20% SBM diet. An additional $35 per ton of feed was included for vitamin and mineral premix, any feed additives, and grind, mix, and deliver charges. Nonfeed cost was set at $14/cwt. to cover other variable and overhead costs. Table 1 illustrates cost-plus prices at alternative corn and SBM prices. For example, the estimated cost of production per cwt. with $2.50/bu. river basis corn and $200/ton Decatur SBM is $39.63/cwt. At $4.50/bu. corn and $200/ton SBM, the cost increases to $49.63/cwt. Five dollars per cwt. was added to the estimated cost of production as the "plus" in the cost-plus contract.

Under a cost-plus contract, the producer receives the cost-plus price if the current market price is less than the contract price for that week. The difference over the market price that the producer receives is recorded in a ledger account. It is often required that this ledger account have a zero balance at the end of the contract period. If the ending balance is not zero, the party that is ahead must either the pay the balance to the party that is behind, or the contract is extended. This analysis assumes that, at prices below the cost-plus price, the producer receives the cost-plus price. Two different procedures are modeled at prices above the cost-plus level. In the first, the producer receives the cost-plus price and pays back the ledger account balance with the difference between the current price and the cost-plus price. Then the producer receives half of the difference between the current price and the cost-plus price with the other half going to establish a positive balance in the ledger account. In the second, the producer does not begin to pay back the amount owed until the cash price exceeds the cost-plus price by a cushion of $4/cwt. Then the full difference between the cash price and the cost-plus and cushion is paid toward the negative ledger account. The producer receives the full cash price once the ledger account is paid off and no positive balance is maintained. Interest at 5% is charged (earned) on negative (positive) balances.

The analysis is based on 100 lb. of hogs sold every week. The ledger amount accumulated at the end of the contract would be multiplied by the cwt. that a producer markets on average each week to arrive at the total balance in the account.

Table 1. Budgeted cost of hog production for cost-plus contract, per cwt.

Non-feed cost per cwt.	$14.00
Whole-herd feed efficiency	350
Diet percent corn (%)	80
Vitamins, minerals, and additives per ton of feed	$35.00

River	Decatur Soybean Meal						
Corn	$180	$200	$220	$240	$260	$280	$300
$2.50	38.93	39.63	40.33	41.03	41.73	42.43	43.13
$3.00	41.43	42.13	42.83	43.53	44.23	44.93	45.63
$3.50	43.93	44.63	45.33	46.03	46.73	47.43	48.13
$4.00	46.43	47.13	47.83	48.53	49.23	49.93	50.63
$4.50	48.93	49.63	50.33	51.03	51.73	52.43	53.13

Window contract. The window contract examined has a $38/cwt. lower boundary and a $48/cwt. upper boundary, and the producer and packer equally share prices above and below the boundaries. If the current price is between $38 and $48, the producer receives that price. If the current price is below $38, the producer receives $38 minus half of the difference between $38 and the current price. For example, if the current price is $33, the producer receives $38 - (38 - 33)/2 = $35.50. If the current price is above $48, the producer receives $48 plus half of the difference between $48 and the current price. At a current price of $56, the producer receives $48 + (56 - 48)/2 = $52. Although window contracts often do not require that a residual account be kept, this analysis monitors the residual account to measure the accumulated difference between the contract and cash prices.

Hedging strategy. A selective hedging strategy, based on a 10-day and 30-day moving average technique using daily prices for 26 weeks prior to marketing the hogs for slaughter, was examined. The start of the hedging period coincides approximately with birth dates of the market hogs, and ends with their sale for slaughter. Although only short futures positions were considered, the hedge was placed and lifted according to the moving average rule based on closing prices. If a buy or sell signal is given, the transaction is made on the following day's average price.

Results and Discussion

To the producer, the appeal of risk-sharing contracts will depend on the ability or willingness to bear risk and on the amount of downside risk he or she expects to face during the life of the contract. Although the past is not a perfect predictor of the future, past prices offer a method of comparing cost-plus and window contracts to cash prices and hedging. Cash prices averaged $47.35 over the 10-year period and ranged from $27.69 to $66.06 (Table 2).

The cost-plus contract in which the ledger account does not have a positive balance (Keep Dif) ended the period with higher prices than the cash market due to a large negative balance in the ledger account. The second cost-plus contract (Split Dif), the window contract, and the selective hedging strategy produced average prices that were less than the cash market and nearly identical to each other (Table 2). The two cost-plus contracts had comparable minimum prices that were well above those of the cash minimum. The window contract and hedging strategy had similar minimum prices that were between the cash and the cost-plus minimum. The cash market produced the highest maximum price and the largest standard deviation. The cost-plus Split Dif had the smallest standard deviation due to higher minimum and lower maximum prices.

A cost-plus contract often calls for a zero ending balance in the ledger account. If the balance is negative, the producer owes the packer; if the balance is positive, the packer owes the producer the amount in the ending balance. The residual in this analysis is calculated on 100 lb. per week. For example, a producer selling a semi-load a week (50,000 lb.) would owe the packer $253,000 under the Keep Dif contract and the packer would owe the producer $197,500 under the Split Dif contract. The window contract had a $364,000 ledger if the packer had required it. Table 3 summarizes estimated returns for a hypothetical producer who has slightly higher cost of production than is budgeted in the cost-plus contract. The producer is modeled to have whole-herd feed efficiency of 360 pounds of feed per hundredweight of hog produced and an 80% corn and 20% SBM diet. An additional $35.50 per ton of feed was included for vitamin and mineral premix and any feed additives. The estimated producer cost assumed a 20-week rolling average feed cost to more closely match the life of the market hog rather than the 8-week rolling average used in the cost-plus contract. Nonfeed cost was set at $15/cwt. to cover other variable and overhead costs. This producer average cost for the 10 years was $41, similar to that of

Table 2. Summary statistics for cash marketings, cost-plus and window contracts, and selective hedging, 1987 - 1996, ($ per cwt.).

		Cost-Plus		$38—48	
	Cash	Keep Dif Contract	Split Dif Contract	Window Contract	Selective Hedge
Average	47.35	48.18	46.60	46.23	45.99
Minimum	27.69	40.82	40.75	32.85	32.13
Maximum	66.06	63.75	59.50	57.03	62.70
Std. deviation	7.03	5.00	3.83	5.07	6.15
Ending balance	NA	-507	395	728	NA

he Iowa State University Swine Enterprise Records average producer for the comparable time period. This average cost is $3.32/cwt. less than the budgeted cost-plus minimum price level.

Average returns in the cash market were $6.35/cwt. and higher than all but the Keep Dif strategy, which is carrying a negative ledger balance that would have to be paid back, resulting in lower prices in the future. However, cash returns were negative nearly 20% of the time (Table 4) and had the largest range in returns,
-$10.50 to $27.65/cwt. Hedging produced lower returns with slightly higher minimum and slightly lower maximum returns. The percent of time this selective hedging strategy resulted in a loss was 22.5%, comparable to that of the cash market.

The two cost-plus strategies produced hardly any weeks of losses for this producer. Producers with higher production costs would have incurred some losses. Incorporating production risk that impacts production costs would also generate additional losses. The window contract generated less variation in returns and a comparable percent of losses compared with the cash market and hedging.

Conclusion

This paper compared long-term, risk-sharing contracts offered by packers to pork producers with the cash market and a selective hedging strategy. The considered contracts generated lower average returns and higher minimum prices than the cash market or the hedging strategy. The cost-plus contract that has a minimum price tied to cost of production reduced the incidence of a loss to near zero in the simulation and provided the greatest risk protection. The $38 - 48 window contract produced approximately the same percentage of loss as did the cash market and hedging strategy.

One important requirement of the cost-plus contract is that the ledger account must be zero in the end. That is, the prices paid under the cost-plus contract must average those of the cash market over the life of the contract, or the party ahead must repay the party behind to end the contract. Thus, the average price and return for the cost-plus contract must be evaluated with the balance of the ledger account in mind. In the scenario where the producer paid into the ledger when prices were high, the account ended with a positive balance. When the producer only paid into the ledger account when the balance was negative and prices were a predetermined amount above the minimum price, the account ended with a negative balance. For the ledger to return to zero, the average prices differ from the cash market average price only by the interest charges on the ledger balance.

Risk protection of long-term contracts is comparable to or better than the one hedging strategy examined here, and there is less transaction cost than in futures in the form of market monitoring and decision making. Are packer contracts the proverbial “free lunch”? Not necessarily. Although the minimum price was higher, the window contract did little to reduce risk of loss for the producer modeled in this analysis compared with the cash market or hedging, and it did exclude the chance of higher prices. The cost-plus contract that required the producer to pay into the ledger account resulted in a self-financed "Christmas Club." For the time period considered, it never had a negative balance. In the other cost-plus scenario, the packer became a banker; he or she automatically loaned the producer the price difference during low prices and was automatically paid back during higher prices. Although the producer's lender appreciates the risk reduction of this cost-plus contract, it is doubtful that the packer has first lien on the producer's assets.

Under any risk-sharing agreement, the packer is at risk of the producer not complying with the agreement when prices are higher in the cash market. The packer's interest in sharing price risk with the producer is likely due to the captive-supply nature of these long-term contracts. The contract is a form of non-price competition to secure a supply of known quality hogs for the plant. Given the continued interest in these contracts by both packers and producers, the industry will see continued growth and innovation of producer-packer marketing contracts in the future.

Table 3. Summary statistics for returns over simulated total cost by risk management strategy, 1987—1996, ($ per cwt.).

		Cost-Plus		$38—48	
	Cash	Keep Dif Contract	Split Dif Contract	Window Contract	Selective Hedge
Average	6.35	7.18	5.60	5.24	4.99
Minimum	-10.50	0.40	-0.12	-7.45	-9.34
Maximum	27.69	27.69	16.11	19.82	25.79
Std Deviation	7.42	5.26	3.06	5.88	6.61

Table 4. Distribution of returns by risk management strategy, percent of weeks, 1987—1996.

Return ($/cwt.)	Cash	Cost-Plus Keep Dif Contract	Cost-Plus Split Dif Contract	$38—48 Window Contract	Selective Hedge
Less than $-5	4.2	0.0	0.0	3.1	2.5
-$5 to 0	15.6	0.0	0.2	18.7	20.0
$0 to 5	25.4	43.7	52.3	27.3	32.5
$5 to 10	28.5	36.3	38.8	29.2	27.3
$10 to 15	13.1	9.4	7.5	16.3	9.4
$15 to 20	7.3	6.9	1.2	5.4	3.7
Over $20	6.0	3.7	0.0	0.0	4.6

One area of additional research needed is exploration of alternative futures and option strategies as risk management and/or price enhancement tools that can replace or complement packer contracts. Further research into packer-producer marketing contracts may also improve their ability to meet the needs of both parties. Although the worth of these contracts is dependent on future prices and price risk, analysis of historical performance of provisions of such contracts can provide useful insight.

A related area of needed research is how the increased use of producer-packer contracts impacts price discovery, price reporting, and overall market efficiency. Users of the contracts have gravitated to them presumably because the contracts enhance their operations by improving profits or reducing risk relative to open market transactions. However, questions remain about how these contracts may impact market access for other producers and processors if used as a form of price discrimination or as noncompetitive trade practices.

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