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Commodity Options as Price Insurance for Pork Producers – Pork Industry Handbook
Michigan State University Cooperative Extension Service

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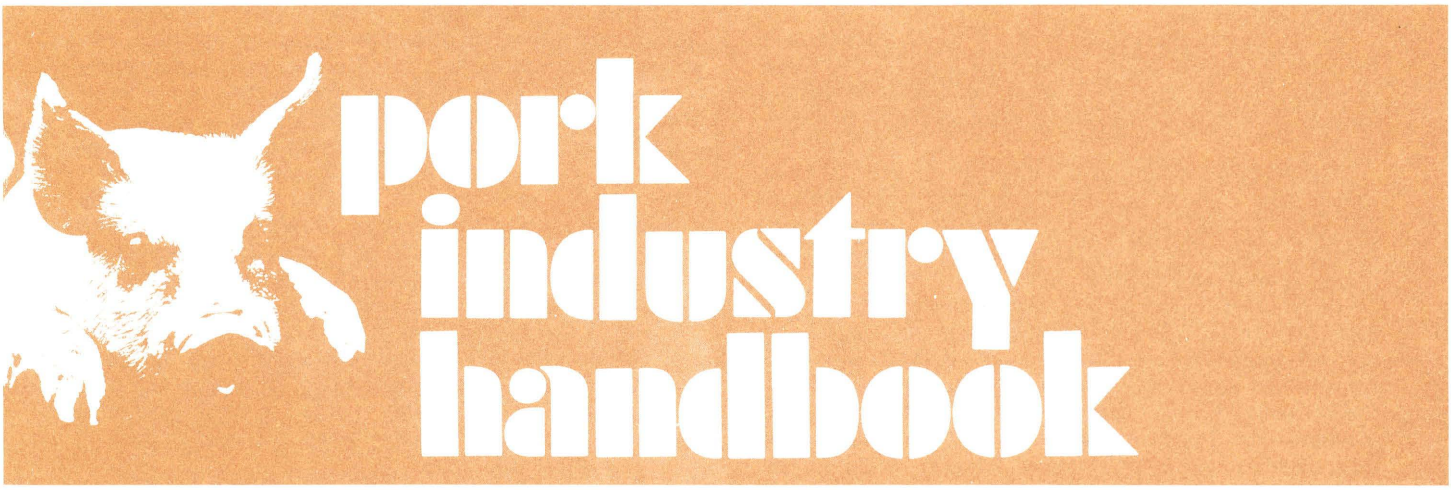

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Commodity Options as Price Insurance for Pork Producers

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Most pork producers are familiar with insurance. Producers insure buildings against fire, equipment against accidents, and their lives against death or injury. Insurance trades a small but certain loss (insurance premium) for possibly a large but uncertain loss.

In pork production, one of the greatest risks faced is that of unfavorable price change. Prices for the finished hogs have been so uncertain that many times prices expected to be profitable — when decisions were made regarding facility investment, breeding, or feeder pig purchases — ended up unprofitable instead. Additional risk may also be incurred on the feeding side as unfavorable grain price increases may "wipe away" anticipated profits.

Because of these risks, producers might want to "insure" prices against declines, while taking advantage of price increases. Producers have this opportunity by using the commodity options market.

What is the Commodity Options Market?

The commodity options market is simply a market in which producers may purchase the opportunity to sell or buy a commodity at a specified price.

Purchasers in these options markets have the "opportunity" but not the "obligation" to exercise their agreement. Therefore, the markets are appropriately named "option markets" since they deal in an option, not an obligation.

Just as a farmer may purchase the right from an insurance firm to collect on a policy if his buildings burn, he can purchase the right to sell his commodities at a specific price if prices go below the specified price. A separate market exists to purchase the right to buy commodities at a specified price if prices are higher than the specified price.

So there are actually two separate commodity options: one that insures products for sale against price declines and another that insures products purchased against cost increases.

For instance, if one desired to buy the right to sell his hogs for $46/cwt., the live hog options market might provide the opportunity. By paying the market determined premium, one could then collect on the option if prices are below $46/cwt. when the hogs were actually sold. If prices are higher than $46/cwt., the hogs are sold for the higher price, and the cost of the premium is absorbed.

While this is a simplified version of the actual way in which producers operate in the options market, the concept is a very simple one. Just as with other types of insurance, by paying a premium, insurance can be purchased against price declines or increases. One could collect on the option (policy) only if the price moves in an unfavorable direction.

THE "IN'S" AND "OUT'S" OF OPTIONS

Puts and Calls

As mentioned, there are actually two types of commodity options: a *call option* and a *put option.* The call option gives the holder the right, but not the obligation, to *buy* the underlying commodity from the option writer at a specified price on or before the option expiration date. The put option gives the holder the right, but not the obligation, to *sell* the underlying commodity to the option writer at a specified price on or before the option expiration date. The call option and the put option are two distinct contracts. A put option is *not* the opposite side of a call option. Distinguish the two types of options by remembering that the holder of the put option can choose to "put-it-to-em" that is, sell the product, while the holder of the call option can "call-upon-em" to provide the product.

Buyers and Sellers

In the option market, as in every other market, each transaction requires both a buyer and a seller. The buyer of an option is referred to as an option holder. Holders of options may be either seekers of price insurance or speculators.

The seller of an option is sometimes referred to as an option writer. The seller may also be either a speculator or one who desires partial price protection. Whether one chooses to buy (hold) or sell (write) an option depends primarily upon one's objectives.

Buyers and Sellers of hog options "meet" on the Chicago Mercantile Exchange. Rather than physically meeting, all transactions are carried out through brokerage firms which act as the buyer and seller representative at the exchange. For this service, the brokerage firm charges a commission. The exchange has no part in the transaction other than to insure its financial integrity. In effect, the exchange offers a place for option buyers and sellers to get together under organized rules of trade.

Strike Price

The "specified price" in the option is referred to as the *exercise price* or *strike price.* This is the price at which the underlying commodity can be exchanged and is fixed for any given option, put or call. There will be several options with different strike prices traded during any period of time. If the price of the underlying commodity changes over time, then additional strike prices may be traded.

Underlying Commodity

The "underlying commodity" for the commodity option is not the commodity itself but rather a futures contract for that commodity. For example, an October hog option is an option to obtain an October delivery hog futures contract. In this sense the options are on futures and not on the physical commodity.

Because options have futures contracts as their underlying commodity, each options contract "stands" for the same quantity as the underlying futures contract. That is, most grain options represent 5,000 bushels, while the hog option represents 30,000 pounds of live hogs.

Expiration

Futures contracts have a definite predetermined maturity date during the delivery month. Likewise, options have a date at which they mature and expire. The specific date of expiration for all livestock option contracts is the last Friday of the month which is at least three business days prior to the first business day of the underlying futures delivery month. For example, a $46/cwt. October hog put option is an opportunity to sell one October live hog futures contract at $46/cwt. This option can be executed by the holder on any business day until the last Friday of September that is more than three business days before the first business day of October. Trading in options is not conducted during the futures contract delivery month. Upon expiration, the option becomes worthless.

Option Premiums

The option (put or call) writer or grantor is willing to incur an obligation in return for some compensation. The compensation is called the option premium. Using the insurance analogy, a premium is paid on an insurance policy to gain the coverage it provides, and an option premium is paid to gain the rights granted in the option. The premium is determined by public outcry and acceptance in an exchange trading pit, and like all commodity prices, it can be expected to change daily.

While the interaction of supply and demand for options will ultimately determine the option premium, two major factors will interact to affect the level of premiums. The first factor is the difference between the strike price of the option and the price of the underlying commodity.

This differential in prices may give the option "intrinsic" value. For example, consider an October live hog put option with a strike price of $46/cwt. and the underlying commodity with a current price of $45/cwt. The option could be sold for at least $1/cwt. since others would be willing to purchase the right to sell at $46 when the market is currently $45. This $1 is said to be the intrinsic value. As long as the market price on the underlying commodity (the futures contract) is below the strike price on a put option, the option has intrinsic value. Of course, the converse of the price relationship is true for a call option. A call option has intrinsic value when the market price is above the strike price.

Any option that has intrinsic value is said to be "in-the-money." An "in-the-money" option has value to others because the market price is below the put or above the call strike price. An option is said to be "out-of-the-money" and has no intrinsic value if the current market price is above the put or below the call strike price. When the market price of the commodity and the strike price are equal, the option is said to be "at-the-money," and will have no intrinsic value.

A second factor that will influence the option premium is the *length of time to expiration* of the option. Assuming all else is held constant, option premiums will usually decline in value as the time to expiration decreases. This phenomenon reflects the *time value* of an option. For example, in March the time premium on a $46 June hog option will be less than the premium on a $46 August option. The option with a longer time to expiration has a greater probability of moving "in-the-money" than the option with less time. Therefore, it is worth more on that factor alone. The longer the time period, the greater the chance that events will occur that could cause substantial movement in futures prices and change the value of the option. As a result, the option writer requires a greater premium to assume the risk of writing a longer term option.

"Out-of-the-money" options have a value that reflects time value. "In-the-money" options possess both time value and intrinsic value.

Offsetting An Option

The method by which most holders of "in-the-money" options will realize any accrued profit is by resale of the option. This is referred to as "offsetting" an option position. Options can be offset anytime between their purchase and expiration date if the holder so desires. Most option buyers will offset their position rather than exercise the option to avoid losing any remaining time premium and (or) assuming a futures market position and its resultant decisions, margin deposits, and commissions. In most situations, the option can be resold to another trader at a premium at least equivalent to the intrinsic value that results from an "in-the-money" price relationship.

Exercising an Option

Another method by which the holder of an option could realize accrued profit is by "exercising" the option. The decision to exercise an option lies only with the holder. The opportunity to exercise the option means the option buyer can always get the intrinsic value of the option premium even if there is little or no trading (no opportunity to offset) in the option being held. It also provides for a means of continuing price protection after the

option expires. If the decision is made to exercise, the following procedures are followed. For a put, the holder is assigned a short (sell) position in the futures market equal to the strike price. At the same time, the option grantor is assigned a long (buy) futures position at the same price. Then both positions are adjusted to reflect the current futures settlement price. It is rational to exercise a put option only when the market price is below the strike price so that the holder's futures position will show a profit. The futures position of the grantor will show an equivalent loss. At this point, the option contract has been fulfilled and both parties are free to trade their futures contracts as they see fit. For the "price insurance" buyer of the put, this would result in immediately trading out of the futures position or holding it until the hogs were sold (providing this was before the futures contract matures). Exercising and eventually trading out of the futures does result in an additional brokerage commission.

EVALUATING AND USING OPTIONS MARKETS

Now that the mechanics of options trading has been explored, it is time to consider two critical questions. (1) What do varying strike prices mean in terms of price insurance? (2) How does a producer actually obtain this insurance?

First, let's consider a method for evaluating the price insurance levels being offered.

Evaluating Option Prices

Example Hog Options Quote
April Live Hog Option
$50.10 = April Futures Close

Strike prices	Settlement	
	Calls	Puts
$/cwt.	$/cwt.	$/cwt.
46.00	4.35	0.35
48.00	2.80	1.10
50.00	1.65	1.85
52.00	0.95	2.95
54.00	0.25	4.50

There are three steps to consider in evaluating options prices. The first step is the selection of the appropriate option contract month. To do this, select the option whose underlying futures will expire closest to, but not before, the time the physical commodity will be sold or purchased. For example, if a group of pigs were to be finished and sold in late March to early April, the April option would be appropriate.

The second step is to select the appropriate type of option. To insure products for sale at a later time against price declines, then the producer would be interested in buying a put (the right to sell). If the producer's motive is to insure future commodity purchases against cost increase (for instance corn needed to feed the hogs), then the purchase of a call (the right to buy) will be needed. To continue our example: if the pork producer wishes to insure the hogs he will be selling in late March, then he will be interested in purchasing an April put option.

The third step to consider in evaluating option prices is to calculate the minimum cash selling price (MSP) being offered by the put option selected. For a call option, the maximum buying price (MBP) would need to be calculated. These calculations can be accomplished in five steps.

(1) Select a strike price within the option month. For instance, a $50 April put.

(2) Subtract the premium from the strike price for a put, or add the premium for a call. From the example quotes, a $50 April put cost $1.85/cwt. So, the result is $50.00 - 1.85 = $48.15/cwt.

(3) Subtract (for a put) or add (for a call) the "opportunity cost" of paying the premium for the period it will be outstanding. For example, if the option premium of $1.85/cwt. is paid in January and the option is expected to be liquidated by an offsetting resale in late March, an interest cost for the three month period needs to be added. If borrowed funds are used and the interest rate is 12% (for example) then the cost would be 1% per month or 3% for 3 months. The interest cost associated with a $1.85/cwt. put option premium would be $0.06/cwt. This leaves a net price of $48.15 - $0.06 = $48.09/cwt.

(4) Subtract the commission fee for both buying and offsetting the option. Assume the brokerage firm charges $75 per round turn for handling each option contract. The per cwt. commission fee would be $0.25 ($75 for 30,000 lbs). The net price is now $48.09 - $0.25 = $47.84/cwt.

(5) One final adjustment must be made to these prices. The option strike price must be localized to reflect the difference between prices at the major commodity markets (futures market) and the local cash market. To localize the price, adjust the prices from step 4 by the normal difference (the basis) between the futures market delivery point price and the local cash price for the time, place, and quality to be delivered. This basis reflects the price differences between the futures delivery points and local markets. By adjusting the option price for basis, a minimum selling price can now be obtained for a put or a maximum purchase price obtained for a call. See PIH-19 *Using Futures Markets for Hedging* for additional discussion on basis and its calculation.

For example, if the local normal late March/early April Market Hog basis is $0.50 per cwt. less than the major futures markets delivery points, then the likely minimum local cash selling price of the option can be determined by subtracting this difference. The minimum local cash price becomes $47.84 - $0.50 = $47.34+. The plus references the fact that this is the minimum price expected from a cash sale projected by a purchased put option.

Farmers can buy more or less price insurance by buying options with different strike prices. To determine the minimum selling price suggested by each strike price, just repeat steps 1 through 5. An evaluation of each strike price on the previous example would result in the minimum selling prices in Table 1.

Options Arithmetic: An Example

Once the relevant options prices have been evaluated, the next question is how would the producer go about obtaining a certain level of price insurance. Perhaps an example will help illustrate the total process. Let's continue with the example of a pork producer who will be selling market hogs in late March. By checking the options quotes today, (January) he observes he could purchase an April hog option to sell (a put) at $50/cwt. for $1.85/cwt. To further localize this strike price, he also subtracts the normal difference between his local markets in late March and the futures market prices at that time (basis). For this example let's ignore the other cost of commission and interest on our premium. This then would give him an expected minimum selling price of $50 - 1.85 - .50 (expected late March basis for #1 and #2 hogs) or $47.65/cwt. By comparing this with his other pricing alternatives and his production cost, he decides that the pur-

Table 1. Minimum selling prices for put options with different strike prices.

Strike price	-	Premium	-	Interest	-	Commission	-	Basis	=	Minimum selling price
					Dollars per hundredweight					
46.00	-	0.35	-	.01	-	0.25	-	0.50	=	44.89
48.00	-	1.10	-	.03	-	0.25	-	0.50	=	46.62
50.00	-	1.85	-	.06	-	0.25	-	0.50	=	47.34
52.00	-	2.95	-	.09	-	0.25	-	0.50	=	48.21
54.00	-	4.50	-	.14	-	0.25	-	0.50	=	48.61

chase of this put would be an appropriate strategy for 150 of his market hogs. He calls his broker and advises him that he wants to purchase one "$50 April hog put at $1.85." He then forwards a check for $555 (300 cwt. x $1.85/cwt.) to his broker.

As April approaches, one of three things will happen. Either prices will stay relatively unchanged or rise above the option strike price making the option worthless, or fall making the producer's option valuable. Remember, for a put option, if the current futures price is above the strike price, the option is said to be "out-of-the-money." If futures are below the strike price, it is "in-the-money."

First, let's assume the futures market prices at the end of the feeding period are $52/cwt. Thus, the option is "out-of-the-money." Since no one is willing to pay for an option to sell at $50/cwt. when they could sell currently for $52/cwt., the option expires worthless. In this case, the producer will sell his hogs at his local market and not use the option. The net price would be $51.50 cash price less the premium of $1.85/cwt. or $49.65/cwt. The actions in both markets are summarized in Table 2.

In this case, the insurance policy was not needed. "Fire didn't burn the barn down" and had this been known in advance, the farmer could have saved the premium. However, just as "fire" or other disasters can't be perfectly predicted, price movements can't be predicted with complete accuracy either. For this reason, the producer was willing to substitute the known loss (premium) for the possibility of a larger unknown loss.

What happens if the producer does need to collect on his option position? Let's assume the futures market price at the end of March is $45/cwt. In this case, the option to sell does have value because others are willing to purchase the right to sell hog futures at $50 when they are currently only $45/cwt. Remember, this means the option is "in-the-money." One way to collect on an options policy (offset) is very much like collecting on insurance. Since the value of the loss is $5/cwt., the producer should be able to sell the option back for at least this amount. He calls his broker and tells him to sell the April put at $5 or better. This cancels the option, and the broker sends a check for $5 per cwt. x 300 cwt. or $1,500 (less his commission). Since he paid a premium of $1.85/cwt., he really netted $3.15 on the option trade. The producer sells his hogs for $44.50/cwt. and adds the $3.15/cwt. gained on the option market to get the net price of $47.65. Thus, the option is successful in assuring the minimum price of $47.65, his goal when he bought the option on January 15. The actions in both markets are summarized in Table 3.

Table 2. Price increase example.

Cash market	Hog option market
January 15	
Expect to sell 150 hd. hogs in late March Expected basis = -.50 Therefore: Expect minimum selling price of $47.65 (strike price - premium - basis)	Buy an April hog put option at a $50 strike price for $1.85 per cwt. premium
March 26	
Sell 150 hd. market hogs locally @ $51.50	April hog futures trading at $52. Let April option expire
Results	
	Offset premium received - original premium paid = 0 - $1.85 = -$1.85
Cash price + gain or loss in options market = Actual price received = $51.50 - $1.85 = $49.65	

Table 3. Price decrease example.

Cash market	Hog option market
January 15	
Expect to sell 150 hd. hogs in late March Expected basis = -$.50 Therefore: Expect minimum selling price of $47.65 (strike price - premium - basis)	Buy an April hog put option at a $50 strike price for $1.85 per cwt. premium.
March 27	
Sell 150 hd. market hogs locally at $44.50*	April hog futures at $45.00. Sell an April hog put opt. at a $50 strike price and receive a premium payment of $5 per cwt.
Results	
	Offset premium received - original premium paid = $5 - $1.85 = $3.15
Cash price + gain or loss in options market = Actual price received for hogs = $44.50 + $3.15 = $47.65	

* April hog futures are trading at $45.00, so basis is actually $.50 cwt. ($45.00 - $44.50).

In this case "fire burnt the barn," and the producer was able to collect on his option (policy). Just as with insurance, he collects to the extent of his loss. In options terminology, we are talking about the strike price (face amount of policy) less the current futures price of hogs. Thinking in the terms of fire insurance, the "barn didn't burn to the ground"; it was only damaged. Thus, you "collect" the amount of money it will take to restore it to its insured value.

A second way in which the "insurance" could have been recovered would be to exercise the option, converting it into a sell (short) position in the futures market. If the futures position were then immediately closed out with a purchased April Futures (long), the \$5/cwt. difference would be realized (\$50 - \$45 current futures) with only an additional commission for the futures purchase. This would also be the route to completion of the options "insurance" if the hogs were not sold until after the option had expired. For example, if the hogs need another two weeks to finish out, the options would be exercised on its expiration (late March for this example), and the futures positions closed out on the day the hogs were actually sold.

Table 4 shows how the purchase of the April hog put works to insure a minimum price, no matter the actual market price.

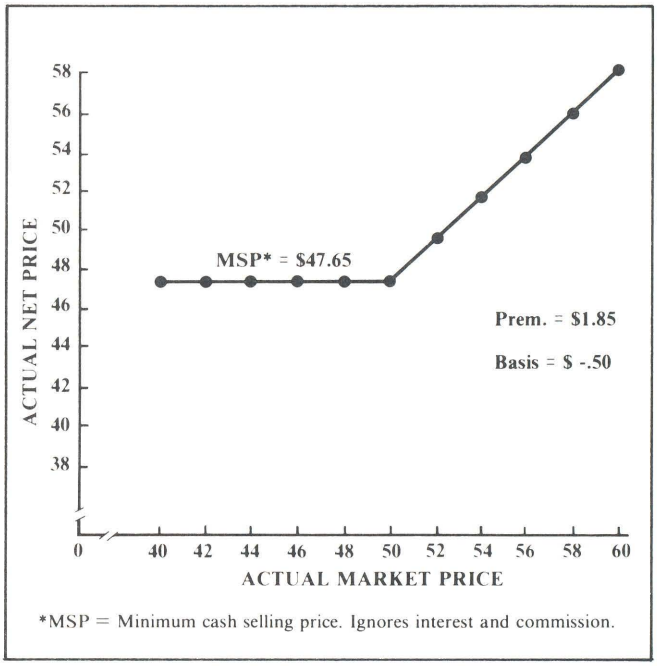
Notice also, that while the maximum price obtainable is not set, it will always be \$1.85/cwt. less than the market price because of the premium paid.

Actually, the producer will not be able to judge in advance *exactly* what his basis will be when he sells the hogs. If the actual basis is better than anticipated (cash price closer to or even over the futures), then the realized net price from the options will be higher by this amount. If the actual basis is worse than anticipated (cash price further under the futures), then the realized net price from the options will be lower by this amount.

Figure 1 summarizes the resulting net price of purchasing an April put for \$1.85/cwt. under several market prices in late March and a realized -.50/cwt. basis. It also makes clear why put option purchases are sometimes referred to as "floorpricing."

Buying More or Less Insurance

Let's suppose the previous pork producer had been faced with purchasing two other levels of insurance (as he was) along with the \$50 put for \$1.85. Let's also look at the outcomes of the \$46 put with the premium of \$.35 and the \$54 put with the premium of \$4.50. Using a -\$.50/cwt. expected difference between futures prices and local cash prices, the lowest price insurance results in a MSP of \$46 - .35 - .50 = \$45.15/cwt., and the highest price insurance in a MSP of \$54 - 4.50 - .50 = \$49/cwt. Remember that the purchase of the \$50 put in the previous example resulted in a MSP of \$47.65. Which should the producer choose? The answer of course, depends upon his objectives. How-



*MSP = Minimum cash selling price. Ignores interest and commission.

Figure 1. Possible outcomes when a \$50 April hog put is purchased.

Table 4. Possible outcomes when a \$50 April hog put is purchased.

Futures Market price in late March	-	Difference between local hog price & futures price (basis)	-	Premium paid in January	+	Min. sell value of April put in late March	=	Net price received
				Dollars per hundredweight				
				Out of the money				
60	-	.50	-	1.85	+	0	=	57.65
58	-	.50	-	1.85	+	0	=	55.65
56	-	.50	-	1.85	+	0	=	53.65
54	-	.50	-	1.85	+	0	=	51.65
52	-	.50	-	1.85	+	0	=	49.65
				At the money				
50	-	.50	-	1.85	+	0	=	47.65
				In the money				
48	-	.50	-	1.85	+	2.00	=	47.65
46	-	.50	-	1.85	+	4.00	=	47.65
45	-	.50	-	1.85	+	5.00	=	47.65
44	-	.50	-	1.85	+	6.00	=	47.65
42	-	.50	-	1.85	+	8.00	=	47.65
40	-	.50	-	1.85	+	10.00	=	47.65

ever, examination of the outcomes from purchasing the $46 put along with the $54 put can illustrate the differences in each.

As can be seen by Figure 2, the lower strike price put results in a lower price received (as compared to the $50 put) until the $46 strike price is exceeded. Beyond a $48.50 actual market price, the net price received is higher than the purchase of the $50 put. Why is this? The $50 put costs $1.85, while the $46 put costs only $.35. This initial cost must be subtracted from all the higher selling prices to obtain the actual net price received. The purchase of the lower price put can be thought of as purchasing insurance with a high deductibility. The insurance costs less, but offers lower coverage. However, when the policy is not needed, the net proceed may be higher.

The opposite is true for the purchase of higher priced insurance (higher strike price). The deductibility is lower, but the higher premium paid for this increased coverage results in a lower net price received when the insurance is not needed. As can be seen in Figure 3 at futures market prices beyond the $54 strike price, the realized net price is lower than the $50 strike price and the $46 strike price purchase because of the higher premium payment.

This example has explored only one of many potential pricing strategies through options. In a very similar manner, the purchase of a call option against future feed purchases may be used to "insure" against price increases. However, only through the purchase of puts and (or) calls as discussed, can option pricing be thought of as price insurance or floorpricing. Other strategies usually involve additional price risk and must be thoroughly evaluated and understood before undertaken.

Summary

Purchasing put options for price insurance is a way pork producers can use the options markets as a pricing alternative. This alternative should be carefully compared to all other pricing alternatives in light of the producer's objectives and risk bearing ability. Options purchased for price insurance provide a kind of "hybrid" market with characteristics of both doing nothing (cash market pricing) and hedging or forward contracting. That is, the producer who purchases an option for price insurance has some of the same downside price protection offered through a hedge or forward contract, as well as most of the upside price potential of being open to the cash market. On the other hand, options are not as protective against price declines as a hedge or forward contract, or as attractive as the open cash market if prices increase. In fact, option purchases will always be, at best, second to either of the other two pricing alternatives when evaluated after the fact. However, producers do not have the luxury of making pricing decision after-the-fact. Because of this, many producers may find a place in their pricing plans for the kind of "hybrid vigor" now offered through the option market.

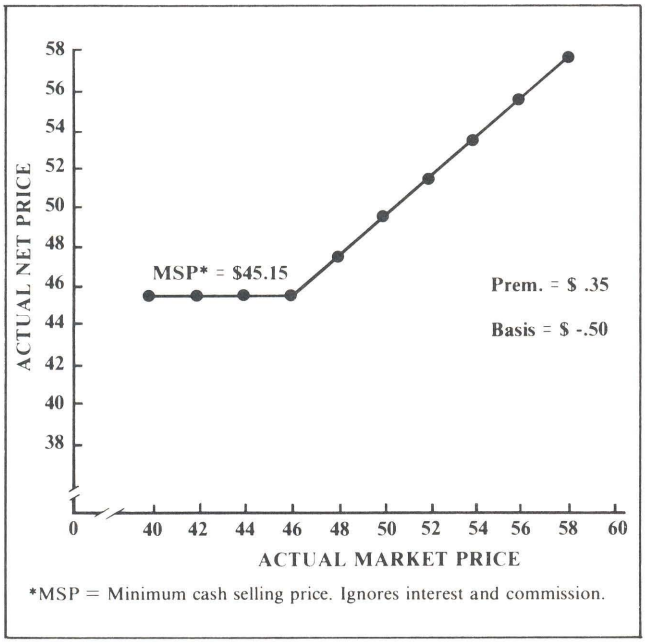


Figure 2. Possible outcomes when a $46 April hog put is purchased.

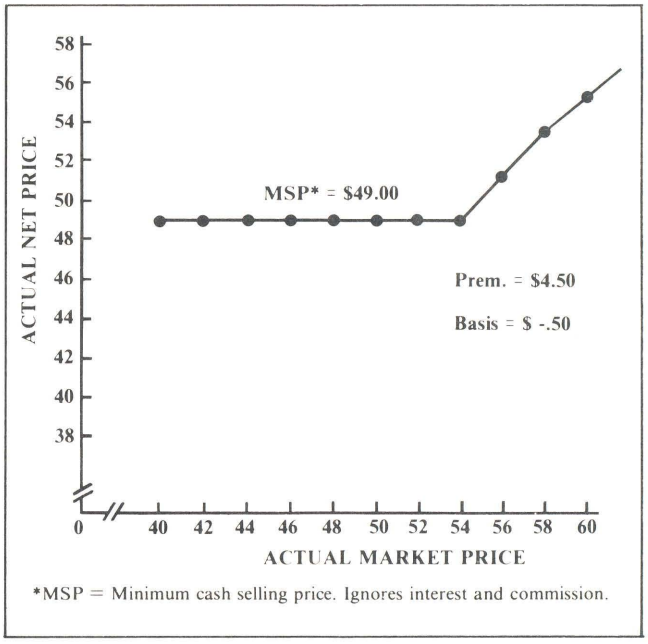


Figure 3. Possible outcomes when a $54 April hog put is purchased.

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