RURAL ECONOMY

Pork Risk Management Strategies for the
Alberta Hog Industry

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Project Report 00-03
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Project Report

Department of Rural Economy
Faculty of Agriculture & Forestry,
and Home Economics
University of Alberta
Edmonton, Canada

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The authors are, respectively, former Associate Professor and Associate Professor, Department of Rural Economy, University of Alberta, Edmonton, Alberta.

EXECUTIVE SUMMARY

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FRANK NOVAK
JAMES UNTERSHULTZ
DONALD BRESEE

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Introduction

The structure of the Alberta hog industry has changed drastically over the past several decades. Historically, Alberta hog production was mainly comprised of many small and privately owned operations. Most hog farms continue to be privately owned and operated but the structure of Alberta's hog industry has trended towards larger scale production. Prior to the 1970's, hog production was relatively inefficient in its use of resources compared to current production efficiency (Toma, 1996). Genetic improvement programs and research on hog growth and feed requirement characteristics were largely undeveloped. As a result hogs were less efficient in feed conversion efficiency and took more days to reach finishing weight. The hog industry in Alberta has become highly focused on efficiency, with hog genetics displaying huge gains in reliable growth performance and feed conversions due to intensive research. These gains in hog growth and feed efficiency allow producers to know with greater certainty the growth performance they will get from the animals produced in their herds.

Improvements in the knowledge of genetics, growth performance and feed requirements of hogs has been accompanied by impressive gains in hog production technology and facilities. Hog farms, prior to the 1970's, required more labor and resources to produce a finished hog. Improvements in farm housing technology, medicinal knowledge, farrowing technology, and feeding technology have allowed a single unit of labor to produce more finished product than previously possible. Studies have indicated that returns to scale, increases in the demand for pork, technological advances being made in hog production, low feed costs, a solid swine industry infrastructure, relatively easy access to capital, and the progressive and cooperative nature of hog producers have led to the pork industry becoming more intensive and competitive (Dial and Morrison, 1996). Thirty years ago, a hog farm housing fifty sows was considered large in size; today single production units can house several thousand sows. This has led to a huge expansion in hog farm capacities and correspondingly large gains in production efficiency. The strides made in hog production knowledge and capabilities have resulted in a significant restructuring of the Alberta hog industry in terms of farm sizes and numbers. The number of hog farms reporting hog production has decreased dramatically over the last four decades while the number of pigs per farm has increased over this time period. The Alberta hog industry has been very dynamic in its structure over the last four decades, and it seems that this trend will continue.

Despite the improvements in hog production techniques, hog producers in Alberta have historically faced several challenging time periods when marketing their hogs. This is largely due to the volatile nature of the Alberta hog market, which is a major source of risk to Alberta hog producers and can seriously affect the income stability of enterprises producing hogs. This volatility is caused by a high elasticity of supply coupled with a low elasticity of demand in North America (Novak et al., 1992). It is important that hog producers identify the sources of risk in

hog production and deal with those risks to remain in operation. Failure to manage price risk can result in significant losses and affect the operation's ability to meet its financial responsibilities. This therefore necessitates a marketing program, which allows for price risk to be managed in order to meet financial responsibilities.

This study explores several different risk management strategies in terms of their ability to reduce the price risk faced by hog producers while maintaining average returns.Marketing tools such as forward contracts, futures contracts and options contracts are available to hog producers for the purpose of stabilizing hog farm incomes and reducing income variability. This study explored the potential benefits or shortcomings of using hog market-based derivative contracts for the purpose of price risk management from the beginning of 1981 to the end of 1995. The objective of this study was to investigate the effectiveness of using different derivative contracts, such as hedging with futures contracts and window contracting, in reducing price risk. Any results at the farm level have direct application for pork marketing organizations.

Types of Risk

Hog producers face two main types of business risk: production risk and price risk (Bauer, 1988). Production risk is associated with the variability in the quantity or quality of the good being produced. This risk is caused by unpredicted changes in factors influencing production such as mortality rates, morbidity rates and feed conversions. Production risk can be managed through improvements in husbandry skills and technological improvements in production.

Price risk is the risk associated with the variability of returns to an operation due to unpredicted changes in output or input prices. Price risk can be managed through the use several different investment strategies such as diversification into other activities or investments, or investing in market derivatives (Brealy et al., 1992).

Risk is measured in this study in two ways:

1. Mean returns and standard deviation of returns and
2. Loss associated with each group of

Risk Management Instruments

Risk management instruments available to pork producers for the purpose of stabilizing hog farm income and reducing income variability are Futures contracts, Options contracts, Forward contracts and Window contracts.

Futures Contracts

A futures contract is a market-traded instrument that can be used to manage price risk. It is a legally binding agreement between two parties to exchange an asset of defined quality and quantity (or its cash value) at a specific date and location in the future for a pre-determined price. Selling or going short a futures contract gives an investor the obligation to deliver the asset at a future date under terms of the contract. Buying or going long a futures contract gives an investor the obligation to purchase the asset at a future date under terms of the contract. Although a futures contract is a contract to buy or sell a commodity at the maturity date of the contract, these contracts are typically offset to avoid the physical exchange of goods. A short position in the futures market can be offset by going long a corresponding number of futures contracts, liquidating the investor from any position in the futures market. Conversely, a long position in the futures market can be offset by selling a corresponding number of futures contracts. The gain or loss from trading a futures contract is the difference between the selling and buying price of the contract multiplied by the quantity of commodity traded in the contract. The gain or loss from trading a futures contract is the difference between the selling and buying price of the contract

multiplied by the quantity of commodity traded in the contract. Alberta managers using futures contracts for lean hogs on the Chicago Mercantile Exchange are still exposed to basis risk and exchange rate risk.

Option Contracts

Option contracts are market-traded instruments, which give the holder the right but not the obligation to buy or sell a futures contract for a specific price. An option to sell a futures contract is a put option and an option to buy a futures contract is a call option.

Two general types of option contracts exist. European options are options that cannot be exercised prior to maturity of the option contract, while American options can be exercised prior to maturity of the option contract. Most options traded in public market are American.

Forward Contracts

A forward contract is a legally binding contractual agreement between a buyer and seller to exchange a specified quantity and quality of commodity for a specified price at a particular time and location in the future. Unlike futures contracts, forward contracts are privately negotiated, not standardized, are not subject to margin calls as gains or losses accrue, have only one delivery date, are settled only at the delivery date of the contract and delivery almost always occurs (Hull, 1995).

Window Contracts

A window contract establishes a price floor and ceiling for the duration of the contract. A 50/50 sharing agreement splits gains or losses equally between the producer and provider of the contract when prices are outside of the window. A no sharing agreement provides full price protection when prices are outside of the window. When market prices at delivery are within the window, the producer receives the current index 100 cash price multiplied by the premium received for hogs above or below the index price. When market prices are below the contract floor price, the producer either receives the average of the two prices in a 50/50 sharing agreement or receives the window floor with a no sharing agreement. When market prices exceed the ceiling price in the contract, the producer either receives the average of the two prices in a 50/50 sharing agreement or receives the window ceiling in a no sharing agreement. Index premiums are then multiplied to the resulting price. This results in a mechanism in which producers forego opportunities to fully realize high market prices above the ceiling price in exchange for partial or complete protection from market prices lower than the contract floor price.

Methodology

A typical 350-sow farrow to finish hog operation was simulated in order to produce return calculations under various marketing strategies for the period 1981 to 1995. Although this farm represented a typical farrow to finish enterprise (Perkins, 1996; Shaw, 1996), it was not specifically any one enterprise. The operation was hypothesized to exist in the Red Deer area, with feed grains and other inputs being purchased from that region. Sows were assumed to produce 19.6 marketed pigs per year. The sows farrowed 2.23 times per year and produced 10 surviving piglets per litter. This translated to 15 farrowings per week and 150 pigs born alive per week. After death losses of 10, 1 and 1.5 percent at different stages of production, approximately 132 of the original 150 pigs were available to be sold at finish. A pen of pigs therefore comprised all of the pigs born in the same week and this study followed each pen of pigs from birth to finish. The piglets were weaned at three weeks (7 kilograms), with veterinary and medical care being given at weaning. Once the pigs were weaned, they were fed in five different stages on three different rations. The first two stages of pigs were fed a starter ration. Starter 1 pigs were fed

from 7 to 15 kilograms, comprising four weeks of feeding. Starter 2 pigs were also fed a starter ration from 15 to 20 kilograms during that time. Grower pigs were fed a grower ration for seven weeks from 20 to 50 kilograms. Finisher 1 pigs were fed a finisher ration for three weeks from 50 to 70 kilograms. Finisher 2 pigs were also fed a finisher ration from 70 to 107 kilograms, which took six weeks. Rates of grain and feed conversions were adjusted to accurately reflect performance at each stage of growth.

A pen of pigs thus needed a total of 175 days to achieve market weight from the day of birth. Accounting for weaning at three weeks of age resulted in pigs requiring 154 days on feed to reach market weight. The hogs were assumed to dress out at 80 percent, with a 58 percent lean yield. This resulted in marketed hogs indexing at 1.07 times the Alberta Index 100 hog price. The breeding stock was comprised of boars and breeding sows, with replacement stock being purchased rather than obtained from within the operation. These animals were assigned static feed intake requirements, which did not change over the period of the study. Annual ownership costs were calculated assuming that the farm was amortized over twenty years at ten percent. A capital requirement of 3,000 dollars per sow and zero salvage value after twenty years generated a gross value of buildings and equipment at the beginning of the study of 1,050,000 dollars. A land purchase of 60,000 dollars, also amortized over twenty years at ten percent interest, was made at the beginning of the study. The breeding stocks were assumed to exist at the beginning of the study with no debt existing on the herd. Costs were assigned to each pen of pigs for each week from farrow to finish according to prevailing input prices at the time. Labor requirements, breeding stock purchases, labor, trucking and all other costs were allocated among pens accordingly. The pigs were immediately marketed upon the achievement of finishing weight. Different risk management strategies were simulated to evaluate risk. These included cash marketing and using various strategies with futures, options and other derivatives.

Results

Cash Marketing

The cash marketing simulation reproduced the returns that would have been realized from the simulated hog farm-marketing hogs at the Alberta cash price. The costs and revenues incurred by the simulated hog farm when operating from 1981 to 1995 are displayed below (Table 1). Each pen of hogs was sold 25 weeks after farrowing on the Alberta cash market.

Large losses were recorded in late 1988, early 1989 late 1991, early 1992, late 1994 and early 1995, all between the months of October and May and were focused most heavily in the winter months. The largest real net revenue occurred in 1986 and was $116.86 per head, while the largest loss of 46.98 dollars per head occurred in 1988. This results in a range of real net returns of $163.84 per head.

The real net revenues from cash marketing were extremely variable over the time period being analyzed. In many cases, large losses or large gains can be attributed to the volatile nature of hog, feed prices and hog price seasonally. The results of the cash simulation show that hog production was profitable in the long run (positive mean real net revenue) but exhibited a large standard deviation of real net revenues (Table 1). Larger standard deviations indicate greater risk.

Table 1. Cash Marketing Real Net Revenues in 1995 Dollars - Dollars per Head (1981-1995)

Strategy	Mean	Standard Deviation	Max. Loss	Max. Profit	< -20 $/head	< -40 $/head	% Losing Pens
Cash Marketing	19.72	32.94	46.98	116.86	54	7	25.7

Routine Hedging

Routinely hedging production involved selling a CME live hogs futures contract each week when a pen of hogs were farrowed and holding that contract until the hogs were sold, at which time the futures position was liquidated. In this study it was assumed that the quantity in one CME live hogs contract exactly matched the total quantity of hogs sold per week. It was assumed that no initial margins, margin calls or brokerage fees were incurred by the hedger. All 758 pens of hogs were hedged in the routine hedging strategy.

The routine hedging revenue distribution is narrower in dispersion than the cash marketing return distribution, indicating variability of returns is reduced when routinely hedging production. The narrowing of the distribution, however, was due to fewer large profits rather than fewer large losses. The results indicate that the standard deviation of returns was lowered with routine hedging, so was the mean of returns (Table 2). The maximum loss, occurring in January of 1984, actually increased with routine hedging due to locking in a loss and a widening of the basis on that hedge. The maximum profit decreased with the routine hedging strategy, indicating that hedging production results in the producer foregoing opportunities to gain from upward moves in the cash market. The high frequency of real losses greater than 20 and 40 dollars per head indicate that the routine hedging strategy did not truncate the lower end of the return distribution, which is desired with a risk management strategy. In fact, routinely hedging production instead truncated the upper end of the distribution, with many fewer pens resulting in profits over 90 dollars per head compared to cash marketing.

Table 2. Routine Hedging Real Net Revenues - Dollars per Head (1981-1995)

Strategy	Mean	Standard Deviation	Max. Loss	Max. Profit	< -20 $/head	< -40 $/head	%Losing Pens	% Pens Hedged
Routine Hedging	15.18	26.32	51.78	90.97	66	6	28.9	100

Routine hedging illustrates the potential for very large margin calls being issued to one routinely hedging hogs. In many cases the margin calls exceed 30 real dollars per hog marketed, and the maximum potential margin call found in this simulation was 96.50 real dollars per head. Considering this simulated operation markets approximately 132 hogs per week, margin requirements could reach as high as 12,738 real dollars for one pen, placing large demands on cash flow during those periods.

Selective Hedging

Selective hedging was simulated to evaluate the potential for improving the risk and return tradeoff compared to cash marketing and routine hedging. The mechanics of selective hedges are identical to routine hedging. The difference between selective hedging and routine hedging is that selective hedging involves hedging production at any time during the production period and only when it is forecasted to be profitable, whereas routine hedging involves hedging every pen of hogs at the same stage of production. Selective hedging is therefore a much more flexible marketing strategy compared to routine hedging because if the futures market is not at a favorable price or the futures market price is expected to increase, the producer does not have to hedge

production. The decision to hedge was made through the use of moving averages and forecasted profit offered by the futures market.

Two different selective hedges were analyzed in this study. Each selective hedge required each of the two following conditions be met to hedge production. Forecasted profit (forward price minus projected break-even price) offered by futures market equaled or exceeded a target amount and declining ten day moving average crossing fifteen day moving average. If the longer moving average exceeded the shorter moving average and the predicted net profit exceeded a target amount, a hedge was placed. In all cases, hedges placed were held until sale of the physical pen of hogs. No hedging was performed with four or fewer weeks to sale time. It was assumed that the additional benefits of hedging closer than four weeks to delivery would not outweigh the transactions costs (although transactions costs are not included in any of the hedging results). Profits were forecasted daily from farrowing to four weeks prior to sale. Several variables were forecasted to evaluate whether the futures market is offering a predicted profit greater than a target amount. These include exchange rate, total cost and the basis.

Two types of selective hedges were examined. They were:

- 5-10-15 Selective Hedge = hedge if Production Period of Net Profit per Hog (PNP) > 5 Canadian dollars per pound live weight (13.95 dollars per kilogram dresses) and 15 day moving average > 10 day moving average
- 10-10-15 Selective Hedge = hedge if PNP > 10 Canadian dollars per pound live weight (27.90 dollars per kilogram dressed) and 15 day moving average > 10 day moving average.

The two selective hedging strategies resulted in the real net revenue figures in Table 3. Up to a maximum of 758 pens of hogs could be hedged with these strategies.

Table 3. Selective Hedging of Real Net Revenues - Dollars per Head (1981-1995)

Strategy	Mean	Standard Deviation	Max. Loss	Max. Profit	< -20 $/head	< -40 $/head	%Losing Pens	% Pens Hedged
5-10-15 Selective Hedge	21.11	30.55	46.98	116.86	50	7	24.1	43
10-10-15 Selective Hedge	21.71	31.05	46.98	116.86	51	7	23.9	36

Although a higher mean and lower standard deviation of real net revenue was realized for several different selective hedges compared to cash marketing, periods of large losses occurred with both selective hedges (Table 3). In addition, improvements in the mean and standard deviation of returns were slight which is similar to the selective hedging results of Brandt (1985) and Gore and Leuthold (1993). The maximum loss and maximum gain under each selective hedging regime was identical to the largest loss when cash marketing and no reduction in the number of losses over 20 and 40 dollars per head were realized with the selective strategies. A slight reduction in the percentage of losing pens was observed.

As was expected, the 5-10-15 selective hedge resulted in more hedges being placed than the 10-10-15 selective hedge. This was because the 5-10-15 selective hedge required a smaller target profit than the 10-10-15 strategy to hedge. The 5-10-15 strategy hedged 43% of the pens and the 10-10-15 strategy hedged 36% of the pens (out of 758 pens marketed).

4. Forward Contracting

The results from selectively hedging hogs were positive in terms of an improvement in the mean and standard deviation of real net revenues, but the problem of experiencing large losses was not eliminated. In many cases this was due to either basis risk being experienced with hedged pens or unhedged pens being exposed to an unfavorable cash market. Basis risk and price risk are eliminated with forward contracting, therefore it was hypothesized that routinely forward contracting production would result in a higher mean return, a lower variability of returns and a reduction in the frequency of large losses. Because the strategy was routinely executed, no pens were exposed to the cash market. Only routine forward contracting was performed. Routinely forward contracting production involved selling each pen of hogs at farrowing for the forward price on that day, adjusted for premiums.

Routine forward contracting locks in the basis at farrowing. In this case, the basis locked in was the forecasted basis. Locking in the basis eliminates any potential for a widening of the basis over the production period, resulting in zero basis risk to the producer. The party offering the forward contract consequently accepts all basis risk, which cannot be eliminated through hedging. In return for accepting the basis risk, the party offering the forward contract receives a guaranteed supply of hogs. The results of routinely forward contracting all 758 pens of hogs is presented in table 4.

Table 4. Routine Forward Contracting Real Net Revenues - Dollars per Head (1981-1995)

Strategy	Mean	Standard Deviation	Max. Loss	Max. Profit	< -20 $/head	< -40 $/head	%Losing Pens	% Pens Contracted
Routine Forward Contracting	14.53	24.80	31.56	83.81	38	0	32.5	-

5. Window Contracting

Simulation of marketing strategies such as routine hedging, selective hedging and forward contracting revealed that although certain strategies can increase mean returns and reduce income variability, a relatively large number of significant losses can still occur. As a result, window contracts were simulated to discover if these contracts can be used to maintain mean returns, reduce variability of returns and reduce or eliminate large losses compared to the other marketing strategies.

This study simulated several different types of window contracts developed on one of two criteria. The first group of window contracts involved establishing a window based on a confidence interval around the forecasted price at sale time, using the lower bounds of the interval to establish the window floor. The second group of window contracts were established using the projected break-even price at sale time minus a target profit amount to establish the window floor price at farrowing. The Chicago Mercantile Exchange live hogs futures contract and Canadian dollar futures contracts were used in conjunction with a modified version of Black's (1976) option pricing model developed by Wei (1994) to establish both groups of windows. Canadian dollar futures contracts are traded on the Chicago Mercantile Exchange and the contracts are traded on four delivery months; March, June, September and December.

Routine Window Contracting Using Confidence Intervals to Set Windows

The first step in establishing a price window involved choosing a window floor price. Using a confidence interval approach incorporates what percent of the time one would expect the floor price to be below the Canadianized futures price at contract maturity. Three widths of confidence intervals were arbitrarily chosen. These confidence intervals were of 25%, 50% and 75% in level

of confidence. The ceiling price of the window was also determined.

Price windows established using a 25% and 50% confidence about the Canadianized hog futures price follow the general appearance as the 75% confidence interval. The difference between the three types of window contracts is the width of the windows. The ceiling and floor price of a window generated with a 25% or 50% confidence interval more closely bound the forward price than the ceiling and floor price established with a 75% confidence interval.

Table 5. Maximum and Minimum Window Widths (1981-1995)

	25% Window	50% Window	75% Window
Maximum Window Width ($/kg)	0.34	0.62	0.99
Minimum Window Width ($/kg)))dressed)	0.04	0.09	0.15

Once the price windows were established, the returns that would have been realized from routinely window contracting hogs were simulated using 25%, 50% and 75% confidence intervals to establish the window floors. The routine window contract involved the producer accepting the terms of the window contract at farrowing each week, regardless of the prices offered in the window contract. Each new window was updated weekly according to the live hog and Canada dollar spot and futures prices, volatilities and interest rate parameters prevailing each week. Gains or losses from window contracting were either shared equally between the producer and writer of the contract or not shared at all, resulting in two different versions of risk sharing being simulated. In all cases, the producer received premiums for marketing hogs indexing at 107.

All 758 pens of hogs were contracted with each window contracting strategy. The results from routinely contracting each pen of pigs for 175 days (birth to finish), using windows established with one of three different confidence intervals were as follows:

Table 6. Routine Window Contracting Real Net Revenues-Dollars per Head (1981-1995)

Strategy	Mean	Standard Deviation	Max. Loss	Max. Profit	< -20 $/head	< -40 $/head	% Losing Pens	% Window Contracts Taken
Routine 25% Window (S)	17.26	25.80	38.46	88.29	31	0	26.6	100
Routine 50% Window (S)	17.56	26.97	43.08	94.99	37	3	25.3	100
Routine 75% Window (S)	18.10	28.64	46.59	104.29	46	4	25.2	100
Routine 25% Window (NS)	14.82	23.26	33.98	87.20	30	0	29.4	100
Routine 50% Window (NS)	15.40	23.69	39.78	88.94	24	0	27.8	100
Routine 75% Window (NS)	16.49	25.75	46.59	103.21	32	3	26.6	100

*Note: S = gains or losses shared equally between producer and contract provider
NS = gains or losses not shared between producer and contract provider

Table 6 illustrates the returns found through the various window contracting strategies. The means of real net revenues were reduced with the window contracting strategies compared to the cash marketing results. Not sharing gains or losses, compared to a 50/50 sharing agreement,

decreased both the mean and standard deviation of revenues. It also decreased the maximum loss, maximum profit and frequency of losses greater than 20 dollars per head.

Routine Window Contracting Using Projected Break-even Price to Set Windows

The second group of window contracts evaluated were those established using the projected break-even price at sale time minus some target amount to establish the window floor price at farrowing. A minimum price contract developed to substitute for the window contract when the offered window contract was inverted. The minimum price contract involved the producer paying the writer of the contract premium equal to the put price found with a strike price, which guarantees the producer a cash floor price. In the case where the producer purchased a minimum price contract instead of a window contract, the producer received a net price at sale time. Several variations of the break-even window contracts were simulated, with the producer taking a minimum price contract during times when the break-even window contract was inverted. Each strategy was simulated with producers either sharing or not sharing with the contract provider in times of gains or losses when a break-even window contract was taken.

The targets below the projected break-even price were arbitrarily set at 0, 0.03, 0.05 and 0.10 dollars per pound live weight. All of the strategies simulated in this section involved the contract provider guaranteeing the projected basis in the contract taken by the producer. The strategies simulated were Routine Break-even/Minimum Price Contract (BE/MPC (S, LF)), Routine BE/MPC (S), Routine BE/MPC (NS, LF), Routine BE/MPC (NS), Routine BE-0.03/MPC (S, LF), Routine BE-0.05/MPC (S, LF), Routine BE-0.10/MPC (S, LF), Routine MPC and Routine MPC (LF). The results from simulating the various break-even and minimum price contracting strategies are presented in Table 7.

Table 7. Routine Window Contracting (Minimum Price Strategy) Real Net Revenues - Dollars per Head (1981-1995)

Strategy	Mean	Standard Deviation	Max. Loss	Max. Profit	< -20 $/head	< -40 $/head	% Losing Pens	%Window Not Inverted
Routine BE/MPC (S)	16.75	27.86	27.80	103.43	17	0	30.1	41
Routine BE/MPC (S, LF)	16.86	26.70	28.36	103.08	23	0	26.6	41
Routine BE/MPC (NS)	16.64	26.44	27.80	100.38	14	0	29.8	41
Routine BE/MPC (NS, LF)	16.75	25.20	28.36	99.97	23	0	26.3	41
Routine BE-.03/MPC(S, LF)	15.73	26.99	29.52	106.29	30	0	35.0	60
Routine BE-.05/MPC (S, LF)	15.36	27.91	30.29	107.82	34	0	35.9	68
Routine BE-0.10/MPC (S, LF)	16.14	29.29	33.12	109.55	79	0	30.1	90
Routine MPC	17.28	28.91	27.80	113.08	14	0	29.8	-
Routine MPC (LF)	17.39	27.81	28.36	112.25	23	0	26.3	-

LF=locked feed cost at start of feeding period.

The break-even window contracting strategies also resulted in lower mean returns per head than cash marketing. The minimum price contracting strategies only slightly decreased mean returns. Developing window contracts on a forecasted break-even cost rather than a confidence interval did have the effect of reducing large losses more effectively.

3. Selective Window Contracting Using Projected Break-even Price to Set Windows

A selective window contracting strategy was simulated to evaluate the effectiveness of waiting for a non-inverted window contract to appear.

Three types of window were simulated under both a 50/50 sharing and no sharing agreement. The 52 week rolling average basis forecast and the break-even price forecast remained static as in the selective hedging model, while the exchange rate forecast was updated weekly using the spot exchange rate. The three window contracts simulated set a window floor price at 0, 0.05 and 0.10 dollars per pound live weight below the projected break-even price.

The results from the selective window contracting strategies are demonstrated in the following table. The results from the selective window contracting strategies show that these strategies would not be beneficial to a producer (Table 8). Selective window strategies with a floor price equal to the projected break-even price have higher mean net revenues and maximum profits and slightly lower standard deviations of revenues than the BE/MPC strategies. The selective strategies also appear to provide little disaster insurance to the producer.

Table 8. Selective Window Contracting Real Net Revenues - Dollars per Head (1981-1995)

Strategy	Mean	Standard Deviation	Max. Loss	Max. Profit	< -20 $/head	< -40 $/head	% Losing Pens	%Window Not Inverted
Selective BE Window (S)	18.55	27.33	46.98	113.34	47	6	21.8	59
Selective BE-.05 Window (S)	17.44	27.12	46.59	113.34	34	3	24.3	82
Selective BE-.10 Window (S)	17.24	29.18	46.39	113.34	41	2	28.6	95
Selective BE Window (NS)	17.38	24.40	46.98	113.34	42	6	20.1	59
Selective BE-.05 Window (NS)	15.17	23.76	46.59	113.34	26	3	21.0	82
Selective BE-.10 Window (NS)	14.76	27.19	46.39	113.34	28	2	34.0	95

Case Study of Select Marketing Strategies from 1990 to 1995

Although one marketing strategy may appear to be superior to another strategy when examined over a fixed length in time, one must remember that the effectiveness of these strategies are subject to the time period being examined. The returns from select marketing strategies from 1990 to 1995 are also presented. Results vary between time periods.

Table 9. Comparison of Real Net Revenues - Dollars per Head (1990-1995)

Strategy	Mean	Standard Deviation	Max. Loss	Max. Profit	< -20 $/head	< -40 $/head	% Losing Pens
Cash Marketing (1981-1995)	19.72	32.94	46.98	116.86	54	7	25.7
Cash Marketing	8.85	16.89	35.48	53.24	17	0	26.5
Routine Hedging	4.01	15.70	38.99	49.18	26	0	37.4
5-10-15 Selective Hedge	10.28	18.13	35.48	55.32	17	0	26.2
10-10-15 Selective Hedge	10.62	18.43	35.48	55.32	17	0	26.5
Routine Forward Contracting	1.39	15.04	31.56	45.21	22	0	47.3
Routine MPC	3.71	13.76	27.80	38.54	9	0	40.6
Routine 50% Window (NS)	5.26	13.23	24.47	31.71	6	0	37.1
Routine BE/MPC (NS)	3.70	13.69	27.80	38.54	9	0	40.6
Selective BE Window (NS)	7.30	14.78	35.48	53.24	17	0	25.9

Summary and Conclusions

This study simulated and evaluated several different types of marketing strategies from 1981 to 1995 and 1990 to 1995. The various types of strategies analyzed included cash marketing, routine and selective hedging, routine forward contracting, routine window contracting using either a confidence interval or a projected break-even cost to set the window floor, routine minimum price contracting and selective window contracting.

No one marketing strategy stood out as superior in all measurement criteria; increased mean revenues, lowered the standard deviation of revenues, reduced the frequency of large losses and reduced the maximum loss in absolute value. There are two main reasons as to why this was so. In several circumstances, such as the periods of late 1988, early 1989 and late 1994, early 1995 feed prices sharply increased while hog prices sharply declined. Some marketing strategies allowed for the hog price to be somewhat controlled, but did not provide protection on the input side, that is feed prices. Other strategies that used window contracting or minimum price contracting did allow for the eventual price received to cover the projected break-even price, but were expensive in doing so due to the cost of price insurance.

Routinely or selectively hedging production do not appear to be viable marketing strategies to producers concerned with experiencing large losses, although both selective hedging strategies resulted in higher mean net revenues over cash marketing (Table 3). The period of losses in 1992 were reduced with routine hedging because feed prices were not at a level that severely reduced profitability. Routinely hedging production, however, resulted in some basis risk and large losses in earlier years, as well as large potential margin calls in some periods. Selective hedging did slightly increase mean revenues and decrease the standard deviation of revenues but did not reduce the maximum loss or frequency of large losses compared to cash marketing, due to hogs being left unhedged during critical time periods and basis risk on some hedges.

Routine forward contracting eliminated basis risk and reduced some of the large losses observed from the selective hedging and selective window contracting strategies, but mean returns were also reduced. This could potentially be due to a risk premium existing in deferred live hog futures contracts, which lowered the price received compared to a situation where no risk

premium existed. Once again high feed prices during certain time periods reduced the profitability of such a marketing program.

Window contracts developed using confidence intervals eliminated basis risk to the producer but provided mixed results depending on the type of window simulated. All window-contracting strategies resulted in a lower mean and standard deviation of returns compared to cash marketing. Contracts using a 75% confidence interval to set the floor price were often too wide, while contracts using a 25% confidence interval and no sharing were often too narrow. Contracts using a 50% confidence interval to establish the floor price seemed to provide the most acceptable balance between downside protection and ability to gain from upward market moves.

Reducing the floor below the projected break-even price (BE-0.03/MPC, BE-0.05/MPC, BE-0.10/MPC) reduced the effectiveness of these windows in controlling the number of large losses experienced by the producer because price protection occurred at a level that was too low. The effect of sharing versus not sharing was small though, because the floor price was set at a level high enough to cover projected break-even costs. None of the BE/MPC strategies performed poorly from 1981 to 1995, regardless of whether they shared or did not share gains and losses, and whether costs were locked in or not. They all reduced the standard deviation of returns and truncated the lower end of the revenue distribution. The minimum price contracting strategy worked well in controlling the frequency of large losses, while not limiting the upside price potential. These strategies also eliminated any basis risk to the producer.

Selective window contracting, with the floor price set at the projected break-even price, attempts to eliminate expensive price insurance by not buying minimum price contracts and instead waiting for a non-inverted window to appear. These strategies did not effectively reduce a number of the large losses experienced with other marketing strategies.

Fluctuating hog and feed prices in Alberta pose a serious marketing challenge to producers. Simulations show that cash marketing returns were highly variable from 1981 to 1995, with many periods of large losses over that time. The routine 50% window contracting strategy, with no sharing of gains or losses, can be used by hog producers to eliminate some of this price risk. This strategy was shown to eliminate many of the large losses seen with cash marketing and decrease the variability of returns with a slight sacrifice being made in terms of average returns. The BE/MPC (NS) and MPC strategies were superior to the 50% window (NS) strategy from 1981 to 1995, but were outperformed by the 50% window (NS) strategy from 1990 to 1995. This was due to the high cost of the minimum price contracts guaranteeing a projected break-even price paying off over the longer time period but not paying off from 1990 to 1995. As a result, this study indicates that routinely taking a window contract using a 50% confidence interval to set the floor price, and not sharing gains or losses outside of the window, is optimal in terms of reducing risk to the producer.

One limitation of this study is that, although short-term window contracts were at the time of the study available to Manitoba hog producers, they were not available to Alberta producers. However, this study provides a framework in which to develop short-term window contracts that are fair to both the contract provider and producer. Recent changes now allow Alberta producers to sell hogs directly to buyers, which gives producers the opportunity to negotiate new derivative instruments with these buyers.

Another limitation of this study is that production risk was not incorporated into the simulated hog farm. Certain farms may have significant production risk, lowering their abilities to meet

window contract specifications. This may drastically change the effectiveness of the window contracting strategies. Therefore, producers should carefully consider their production consistency and risk before incorporating such a strategy. Marketing organization or processors can also use these results to evaluate their potential risk from offering various risk management tools. They need to balance the guarantee of supply versus some of the price risk they accept. Future research could examine processor issues more closely.

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Abstract

This study simulated and evaluated several different types of marketing strategies from 1981 to 1995 and 1990 to 1995 in the Alberta pork industry. The various types of strategies analyzed included cash marketing, routine and selective hedging, routine forward contracting, routine window contracting using either a confidence interval or a projected break-even cost to set the window floor, routine minimum price contracting and selective window contracting. No one marketing strategy stood out as superior in all measurement criteria; increased mean revenues, lowered the standard deviation of revenues, reduced the frequency of large losses and reduced the maximum loss in absolute value. There are two main reasons as to why this was so. In several circumstances, such as the periods of late 1988, early 1989 and late 1994, early 1995 feed prices sharply increased while hog prices sharply declined. Some marketing strategies allowed for the hog price to be somewhat controlled, but did not provide protection on the input side, that is feed prices. Other strategies that used window contracting or minimum price contracting did allow for the eventual price received to cover the projected break-even price, but were expensive in doing so due to the cost of price insurance. This study provides a framework in which to develop short-term window contracts that are fair to both the contract provider and pork producer.

LIST OF PUBLICATIONS ARISING FROM THE PROJECT.

Unterschultz, James, Frank Novak, Donald Bresee and Stephen Koontz.1998. Design, Pricing, and Returns of Short-Term Hog Marketing Window Contracts. The Journal of Futures Markets, Vol 18, No. 6 pp.723-742.