Implications of Risk Management in Swine Production: a Study of Hedging as a Tool to Provide Strategic Opportunity

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Background

The swine production and distribution industry is undergoing a change in both the structure of the industry and the scope of operations; vertical integration and industrialization are replacing the family farm in both the United States and Europe. The movement of the world toward free trade and countries exploiting comparative advantage and reducing self-sufficiency ratios is driving a need to be more efficient in production. As this process continues countries will take a more industrial approach to agricultural development, specializing in the production of commodities which are viewed to have the best chance to give an above average return or a strategic need and importing those which do not.

The new agricultural landscape will hold many implications for all of agriculture and particularly in the production of swine. One obvious result of the above changes for swine production will be the continued dominance of United States and Europe in exporting pork. As much of Asia struggles to try to establish a production base it will realize this effort is uneconomical. As a result the United States will see a reduction in the exportation of commodities related to feeding swine, but this reduction will be replaced by an increase in export demand, not for live animals, but in finished cuts and parts.

This type of structural change requires businesses to rethink their practices and develop a new understanding of ways to create value in a much more competitive environment. We will focus on the concept of risk management, the majority of the paper will focus on financial and price risk, and we will briefly discuss implications of significantly reducing this risk in the final section of this paper.

Hedging Analysis

In the past nine months the U.S. swine production industry has experienced a confluence of events illustrating why a sound risk management plan is required. In some cases, producers have an unprecedented opportunity for expansion, while for other producers 1999 will be the end to their participation in the swine industry.

To understand the differences between these two groups we need to understand the effects of a hedging program in good times and bad. Creating Shareholder Value: Turning Risk Management into a Competitive Advantage (Strongin Petsch 1998) does a very good job of quantifying the impact of a hedging program on the capital reserves of a corporation, and the effects of capital reserves on operating profits. This paper uses the framework of Strongin/Petsch to show that a hedging program can be effective in swine production. We will apply the results of this paper to the swine production industry as a whole, and a representative stylized swine producer.

We will analyze whether the industry uses its capital as effectively as possible. We will then show that a stylized producer that hedges will have more opportunity during down

times than producers who do not hedge or producers who hedge inconsistently (i.e. try to out trade the market).

The U.S. swine production industry contracted sixty-four percent of production in January 1999. In the Strongin/Petsch framework this amount of contracting implies the U.S. swine production industry is keeping capital reserves at a level that is greater than the volatility of the underlying commodity price risk. However this is not the case, in fact the industry does not keep adequate reserves to defend against short term price fluctuations, and therefore suffers more from price shocks than it would if it were properly capitalized. Because the industry as a whole does not use the capital it does have effectively, it suggests that further consolidation in U.S. swine production would be beneficial to producers.

Certainly, the amount of hedging in any particular organization varies and some organizations over hedge, while some organizations do not hedge at all. The implication of the industry estimate is only to show that the average swine producer in the U.S. does not hedge price risk to an optimal level. In examining the ability of producer with a consistently implemented hedging plan to take advantage of opportunities during adverse price shocks, we look at the results of a stylized U.S. swine producer.

Hedging Models

In our example, we assume a producer with seventy-five thousand sows producing one and one half million marketable hogs per year, we assume production and marketing are smoothed over time. If we assume hogs are marketed for an average price of forty dollars per hundred weight we have annual revenue of one hundred fifty six million dollars. We also assume hedging costs of one percent, a five-percent risk free rate of return, and an eleven-percent internal hurdle for the consideration of new projects. We have estimated the annual volatility of the price of hogs to be thirty percent.

Our assumptions produce the following results when applied to the model developed by Strongin/Patsch. The model suggests an optimal hedge ratio of 100% of hedgeable revenue. The hedge program could be designed in a number of ways; ours simply sold an amount of futures contracts equivalent to the amount of production one-year into the future. For example on January 1, 1999 the producer would sell the amount of February 2000 futures contracts that was equivalent to the amount of anticipated production. This program allows the producer to pick up the cost of carry in the market and results in almost always locking in a profitable price for production. By reducing earnings volatility the company has the ability to move capital from the low margin business of defending the price of production, to more profitable opportunities.

During a price shock the extra ninety two million dollars of capital freed by the hedging program would produce an increase in operating profits of four million dollars. More importantly, during a negative price shock the hedge would provide a stable price above

the cost of production. This is the most important result of the paper, once a consistent hedging program is established it allows management to focus on strategic opportunities. Defining the profitability of production allows business decisions to be made using logic, which is obviously more preferable than management being forced to react to price shocks at a time when the market will be least likely to provide reasonable solutions.

We now examine the same producer using a hedging program that is not consistently applied, we will model this using the trading recommendations of a market newsletter to provide the timing for the implementation of positions. We examine the period from October 1998 to March 1999; we choose this period because it was a particularly tough pricing environment for hog producers and will illustrate the power of consistently hedging in times of adverse price shocks. It also allows us to quantify the strategic advantage of additional cash flow in periods of adverse price shocks.

All of the conditions we set up in the Strongin/Petsch model are applied to this model. We also assume the producer markets hogs at a consistent rate with no adjustment to reflect market expectations, however we believe that relaxing this assumption would only exacerbate the results found in the market letter example. To hedge short term price risk the producer will enter into the futures market, using the nearest month of the Chicago Mercantile futures contract, and buy contracts when the newsletter is bullish and sell contracts when the market letter is bearish. The producer will transact the number of contracts that is exactly equivalent to the amount of production, so that the results of the hedging program can be applied one to one on the profitability level of production. We assume the hedge is bank financed and the cost of interest to meet margin calls is balanced by the interest paid on positions that are in the money.

The market letter results are weak when compared to the Strongin/Petsch model. The market letter generated a positive cash flow of one million dollars per year in additional operating profits, compared to the extra four million dollars generated by the more efficient use of capital in Strongin/Petsch. In this case the task of trading the market, not only carries a cost in time and managerial focus, but does not provide great results. We conclude that by only concentrating on short term hedging the producer does not significantly reduce price risk.

We also examine the same period assuming a producer with perfect insight into the price movement of the market. This assumption means the producer would seek price protection in the futures market when they knew the price would decline during the next week, and would buy futures when they knew the price would increase during the next week. All of the other assumptions of the above hedges still apply. We will use this model to understand the best performance a producer could generate.

The perfect foresight example generated an additional six and one half million dollars of operating profit per year. This is more than one and one half times the amount generated by the Strongin/Petsch model; however, the assumption of perfect foresight is a very tough assertion to defend. A better way to think about this result, the Strongin/Petsch

model captures two-thirds the result of perfect foresight without having to guess the direction of the market.

Results

The results of the hedges are summarized in the table below. Both hedging programs were cash flow positive, the difference between the hedging programs and the Strongin/Petsch results are due to the view of the hedging program's effect on capital reserves. To paraphrase Strongin and Petsch, to defend against short-term price fluctuations a company must maintain a capital reserve to deal with earnings volatility. Redeploying the reserve into more profitable business opportunities generates the extra profit in the Strongin/Petsch model.

	Hog Futures	Hedge Profit/Loss	Hedge Profit/Loss
	Nearest Contract Month	Market Letter	Perfect Foresight
03/29/99	$ 42.48	$ (78,713.94)	$ 16,009.62
03/22/99	$ 43.95	$ (61,370.19)	$ 78,713.94
03/15/99	$ 42.80	$ 38,689.90	$ 61,370.19
03/08/99	$ 42.08	$ (40,024.04)	$ 38,689.90
03/01/99	$ 42.83	$ (9,338.94)	$ 40,024.04
02/22/99	$ 43.00	$ (150,757.21)	$ 9,338.94
02/15/99	$ 45.83	$ 197,451.92	$ 150,757.21
02/08/99	$ 42.13	$ 69,375.00	$ 197,451.92
02/01/99	$ 43.43	$ (128,076.92)	$ 69,375.00
01/25/99	$ 41.03	$ 140,084.13	$ 128,076.92
01/18/99	$ 43.65	$ (197,451.92)	$ 140,084.13
01/11/99	$ 39.95	$ 146,754.81	$ 197,451.92
01/04/99	$ 37.20	$ 242,812.50	$ 146,754.81
12/28/98	$ 32.65	$ 84,050.48	$ 242,812.50
12/21/98	$ 31.08	$ 90,721.15	$ 84,050.48
12/14/98	$ 29.38	$ (436,262.02)	$ 90,721.15
12/07/98	$ 21.20	$ 321,526.44	$ 436,262.02
11/30/98	$ 27.23	$ (38,689.90)	$ 321,526.44
11/23/98	$ 27.95	$ (105,396.63)	$ 38,689.90
11/16/98	$ 29.93	$ 174,771.63	$ 105,396.63
11/09/98	$ 33.20	$ 141,418.27	$ 174,771.63
11/02/98	$ 35.85	$ 82,716.35	$ 141,418.27
10/26/98	$ 37.40	$ 165,432.69	$ 82,716.35
10/19/98	$ 40.50	$ (72,043.27)	$ 165,432.69
10/12/98	$ 41.85	$ (53,365.38)	$ 72,043.27
10/05/98	$ 42.85	$ 36,021.63	$ 53,365.38
Total Profit or Loss		$ 560,336.54	$ 3,283,305.29

Implications

As important as the results are, there are more implications for swine producers than simply an increased bottom line. By viewing the company as a portfolio of risks, the company can decide which types of risk it would like to take, and which the company would like to hedge in the market. The development of financial engineering allows many different types of risk to be hedged, allowing a company to create a risk profile that matches its core strengths or exposing itself to risks with the best risk/reward ratio. By establishing a risk management platform the company can then adjust to market conditions by adding or subtracting risk when and where management believes it is prudent. The ability to increase or decrease the level of risk gives management the ability to maximize the profitability of the company by exploiting the risks present in the market.

The ability to partner is based upon a strategic need and the ability to trust the opposite party, a consistent hedging plan affects both areas. By creating a risk profile clearly identifying strategic risks and eliminating nonproductive risk, a producer can more clearly identify opportunities with the most strategic value. The ability to trust a consistently hedged partner is also enhanced because the behavior of a producer can be more easily anticipated if not under financial pressure.

The table below illustrates the above point. When the results of the hedging program are added to the cash sales, (approximated by the nearby futures price) we can see that even though the short-term hedges were positive in cash flow by themselves they were not enough to make the production of swine profitable over the time period we studied. We also calculated the results of a program consisting of selling swine on the spot market (the do nothing column). An interesting result arises, when compared on a business profitability level the market letter hedge and the not hedging at all do not have dramatically different results, suggesting it is almost better not to hedge than hedge inconsistently. By establishing a consistent hedging program that values production at a level above the cost of production, the producer is able to know what he will receive for production and focus planning and capital reserves on strategic opportunities.

	Hog Futures Nearest Contract Month	*Market Letter Total Profit/Loss*	*Perfect Foresight Total Profit/Loss*	*Do Nothing*	*Consistent Hedge*
03/29/99	$ 42.48	$ (643,088.94)	$ (548,365.38)	$ (564,375.00)	$ 353,812.50
03/22/99	$ 43.95	$ (515,120.19)	$ (375,036.06)	$ (453,750.00)	$ 353,812.50
03/15/99	$ 42.80	$ (501,310.10)	$ (478,629.81)	$ (540,000.00)	$ 353,812.50
03/08/99	$ 42.08	$ (634,399.04)	$ (555,685.10)	$ (594,375.00)	$ 353,812.50
03/01/99	$ 42.83	$ (547,463.94)	$ (498,100.96)	$ (538,125.00)	$ 353,812.50
02/22/99	$ 43.00	$ (675,757.21)	$ (515,661.06)	$ (525,000.00)	$ 378,894.23
02/15/99	$ 45.83	$ (115,673.08)	$ (162,367.79)	$ (313,125.00)	$ 378,894.23
02/08/99	$ 42.13	$ (521,250.00)	$ (393,173.08)	$ (590,625.00)	$ 378,894.23
02/01/99	$ 43.43	$ (621,201.92)	$ (423,750.00)	$ (493,125.00)	$ 378,894.23
01/25/99	$ 41.03	$ (533,040.87)	$ (545,048.08)	$ (673,125.00)	$ 416,250.00
01/18/99	$ 43.65	$ (673,701.92)	$ (336,165.87)	$ (476,250.00)	$ 416,250.00
01/11/99	$ 39.95	$ (606,995.19)	$ (556,298.08)	$ (753,750.00)	$ 416,250.00
01/04/99	$ 37.20	$ (717,187.50)	$ (813,245.19)	$ (960,000.00)	$ 416,250.00
12/28/98	$ 32.65	$ (1,217,199.52)	$ (1,058,437.50)	$ (1,301,250.00)	$ 293,509.62
12/21/98	$ 31.08	$ (1,328,653.85)	$ (1,335,324.52)	$ (1,419,375.00)	$ 293,509.62
12/14/98	$ 29.38	$ (1,983,137.02)	$ (1,456,153.85)	$ (1,546,875.00)	$ 293,509.62
12/07/98	$ 21.20	$ (1,838,473.56)	$ (1,723,737.98)	$ (2,160,000.00)	$ 293,509.62
11/30/98	$ 27.23	$ (1,746,814.90)	$ (1,386,598.56)	$ (1,708,125.00)	$ 194,783.65
11/23/98	$ 27.95	$ (1,759,146.63)	$ (1,615,060.10)	$ (1,653,750.00)	$ 194,783.65
11/16/98	$ 29.93	$ (1,330,853.37)	$ (1,400,228.37)	$ (1,505,625.00)	$ 194,783.65
11/09/98	$ 33.20	$ (1,118,581.73)	$ (1,085,228.37)	$ (1,260,000.00)	$ 194,783.65
11/02/98	$ 35.85	$ (978,533.65)	$ (919,831.73)	$ (1,061,250.00)	$ 194,783.65
10/26/98	$ 37.40	$ (779,567.31)	$ (862,283.65)	$ (945,000.00)	$ 138,750.00
10/19/98	$ 40.50	$ (784,543.27)	$ (547,067.31)	$ (712,500.00)	$ 138,750.00
10/12/98	$ 41.85	$ (664,615.38)	$ (539,206.73)	$ (611,250.00)	$ 138,750.00
10/05/98	$ 42.85	$ (500,228.37)	$ (482,884.62)	$ (536,250.00)	$ 138,750.00
Total Profit or Loss		$ (23,336,538.46)	$ (20,613,569.71)	$(23,896,875.00)	$ 7,652,596.15

Because the industry does not use its capital effectively and will benefit from consolidation an obvious implication for strategic opportunity, would be expansion. For example, a producer may have a proprietary production procedure allowing it to gain a strategic advantage in the production of swine. This procedure should allow the producer to expand by acquiring producers which are less efficient, however, this strategy could be backfire if the company does not implement an effective hedging program to deal with the increased short-term risk of price exposure as the hog production numbers increase. Once this risk is eliminated the producer would enjoy the benefits of efficient production, and expansion, without having to increase capital reserves to defend the price of production. In fact, the increase in production coupled with hedging could provide a platform to increase capital with which to make more acquisitions.

Another strategic opportunity that is becoming more important is the use of contracts between packers and producers. This provides a constant hedge without the requirement of participation in the futures markets. As consolidation continues in the production industry this type of contract will reward the producer for the increase in size, and provide a constant supply of swine to the packer from a trusted source. This is very

similar to the type of industry structure found in many mature industries, and it benefits both parties by providing a stable environment where they can concentrate on strategic opportunities and issues affecting the pork industry.

Contracting between the producer and the packer is the first step towards integrating consumer demands into the pork production system. If the entire distribution channel could partner more effectively the industry could concentrate on critical consumer issues such as traceability and accountability and their relationship to food safety. The ability to concentrate on adding value and not defending price will allow the industry to satisfy the consumer and continue to grow as a healthy mature industry.