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Kevin C. Dhuyvetter

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## Market versus formula-derived prices for segregated early-weaned pigs

### Abstract

A formula for deriving the price of segregated early-weaned (SEW) pigs using prices of grain, soybean meal, and market hog was estimated based on return on investment being equal for all three phases of production—farrowing, nursery, and finishing. The USDA- reported SEW pig prices were compared with formula-derived prices. The level of correlation between these two series was sensitive to how prices of grain, soybean meal, and market hog were chosen. Using expected prices in the formula resulted in SEW prices that were correlated strongly with reported market prices. Using hindsight cash prices in the formula resulted in SEW formula prices that were correlated weakly with reported prices. This approach may be appropriate with contractual relationships where the goal is to share profits and losses proportionately. Thus, the manner in which the formula is used (i.e., method of choosing prices) will depend on the risk attitudes of the buyer and seller, as well as the nature of their business relationship.; Swine Day, Manhattan, KS, November 16, 2000

### Keywords

Swine day, 2000; Kansas Agricultural Experiment Station contribution; no. 01-138-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 858; Swine; SEW prices; Formula prices; Marketing

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## MARKET VERSUS FORMULA-DERIVED PRICES FOR SEGREGATED EARLY-WEANED PIGS

K. C. Dhuyvetter<sup>1</sup>

### Summary

A formula for deriving the price of segregated early-weaned (SEW) pigs using prices of grain, soybean meal, and market hog was estimated based on return on investment being equal for all three phases of production—farrowing, nursery, and finishing. The USDA- reported SEW pig prices were compared with formula-derived prices. The level of correlation between these two series was sensitive to how prices of grain, soybean meal, and market hog were chosen. Using expected prices in the formula resulted in SEW prices that were correlated strongly with reported market prices. Using hindsight cash prices in the formula resulted in SEW formula prices that were correlated weakly with reported prices. This approach may be appropriate with contractual relationships where the goal is to share profits and losses proportionately. Thus, the manner in which the formula is used (i.e., method of choosing prices) will depend on the risk attitudes of the buyer and seller, as well as the nature of their business relationship.

(Key Words: SEW Prices, Formula Prices, Marketing.)

### Introduction

The decade of the 1990's saw many structural and technological changes in the swine industry. The practice of separating farrow-to-finish production into three distinct phases at multiple locations was one

such change. Producers also widely adopted the practice of weaning pigs at an early age. The practice of segregated early weaning (SEW) was developed because it produces healthier, more efficient pigs and helps maximize genetic potential of breeding stock. As SEW practices were adopted, a new problem emerged – what was the value of these pigs? By definition, SEW pigs are kept separate from other pigs. Thus, marketing them through traditional auction barns where buyers and sellers meet to “discover a price” was not a viable option.

Because no market price quote existed for SEW pigs and negotiating price for each transaction was costly and time-consuming, buyers and sellers looked for pricing formulas to place a value on these pigs. Numerous formulas were developed ranging from a flat price of \$30 to \$32 per head to more complex formulas where price is a function of prices for live (finished) hogs, corn, and soybean meal. For additional information on SEW formula prices see *Estimating the Value of Segregated Early Weaned Pigs* (K-State Res. and Ext. MF-2221) or *Pricing Early-Weaned Pigs* (NPPC).

In the fall of 1997, the U.S. Department of Agriculture (USDA) Agricultural Marketing Service (AMS) began collecting and publishing a weekly price report on weaned pigs and feeder pigs. The report attempts to exclude contract sales and deal with cash market trades only. The report lists high, low, and average prices by lot size (<250 head, 250-750 head, and >750 head) as well

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<sup>1</sup>Department of Agricultural Economics.

as a weekly composite price. The report can be accessed on the Internet at:

[http://www.ams.usda.gov/mnreports/NW\\_LS255.txt](http://www.ams.usda.gov/mnreports/NW_LS255.txt).

Now that price quotes for SEW pigs are publicly available, there may not be a need for a complex formula. In this case, a formula could simply be the USDA price quote for SEW pigs (perhaps with some local basis adjustment). However, not all buyers and sellers can use this approach, because somebody has to “discover” the price that is quoted by USDA. Additionally, even though prices change over time to reflect changing market conditions, one segment of the industry is often more or less profitable than another segment at any given time. In other words, profitability generally is not distributed equally across segments of the industry at a point in time. For example, producers selling SEW pigs sometimes realize higher returns than those buying SEW pigs and vice versa. However, producers that have long-term contractual relationships to buy and sell SEW pigs from each other may want a formula for valuing pigs that more closely reflects the actual costs and returns associated with the different phases of production (i.e., a “profit sharing” approach).

This study compared the prices for SEW pigs as reported by USDA with a formula-derived price, where the formula was based on equal returns to the different phases of production. Alternative methods for valuing input variables in the formula also were compared.

### Procedures

Projected budgets based on full economic costs were developed for the farrowing, nursery, and finishing phases of a commercial swine operation. The budget for the farrowing phase was based on a 1,200-sow operation marketing 19 10-lb pigs/sow/year. Nursery and finishing phase budgets were based on 1,200-head barns with average feed efficiency (lbs of feed per lb of gain) of 1.8 for the nursery phase and 3.1 for

the finishing phase. Pig selling weights were 10, 55, and 260 lbs for the farrowing, nursery, and finishing phases, respectively.

Using the budgets for each production phase, prices for 10-lb weaned pigs and 55-pound feeder pig were set at levels that made return on investment exactly equal for all three phases. This process was repeated using weekly prices of corn, soybean meal, and market hog from 1990-1999. This allowed formulas to be estimated where SEW (weaned) and feeder pig prices were functions of grain, soybean meal, and market hog prices. The following are the estimated formula prices for feeder and SEW pigs:

(1) SEW pig price:

$$\begin{aligned} & - 2.308 \\ & - (1.6489 * GRN) \\ & + (0.05683 * GRN^2) \\ & - (0.045570 * SBM) \\ & + (0.00007443 * SBM^2) \\ & + (0.9981 * LH) \\ & - (0.00335 * LH^2) \\ & = \text{Price of 10-lb. SEW pig, \$/head} \end{aligned}$$

(2) Feeder pig price:

$$\begin{aligned} & - 0.616 \\ & - (2.3343 * GRN) \\ & + (0.02558 * GRN^2) \\ & - (0.025723 * SBM) \\ & + (0.00002081 * SBM^2) \\ & + (1.1496 * LH) \\ & - (0.00122 * LH^2) \\ & = \text{Price of 55-lb. feeder pig, \$/head} \end{aligned}$$

where, GRN is grain price (\$/cwt), SBM is soybean meal price (\$/ton), and LH is market hog price (\$/cwt, carcass weight). Discussion hereafter pertains to the SEW pig formula).

Weekly composite market prices quoted by USDA-AMS from 11/97 to 6/00 were compared to formula-derived prices for SEW pigs to determine how well these two price series are correlated. The following alternative methods of choosing formula values for grain, soybean meal and market hog prices were considered:

1. Futures-based price expectations for GRN, SBM, and LH (SEW price is established when SEW pig is sold). This method values SEW pigs in “real-time.”
2. Observed cash prices for GRN, SBM, and LH (SEW price is established when market hog is sold). This method values SEW pigs in “hindsight.”

## Results and Discussion

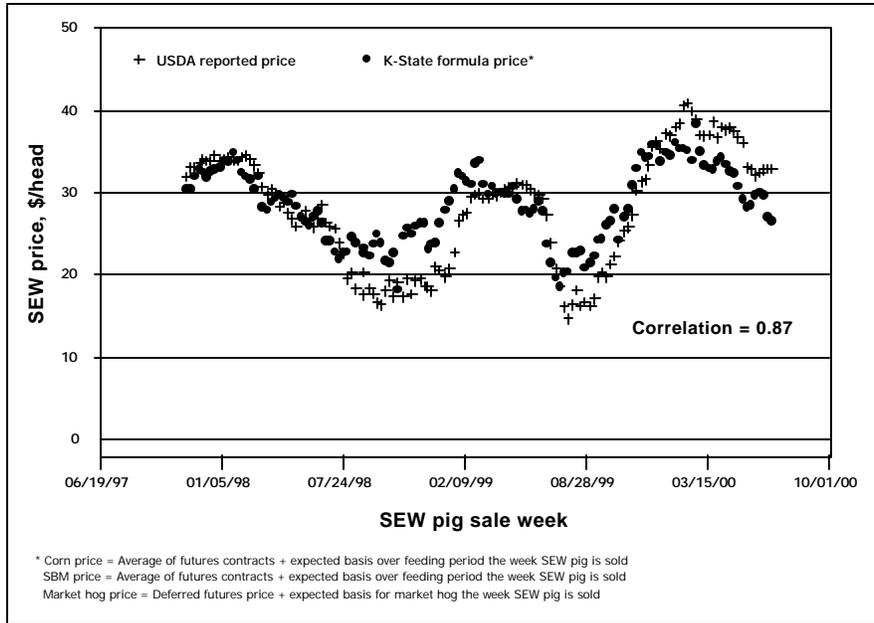
The SEW formula-derived prices calculated using futures-based price expectations (method 1) are compared to USDA quoted market prices in Figure 1. In this case, all variables in the formula (i.e., GRN, SBM, and LH) were expectations (futures prices adjusted for expected basis) at the time the SEW pig was sold. For example, LH is the expected price of a market hog at the end of the finishing phase, and GRN and SBM are the expected average prices for corn and soybean meal over the nursery and finishing phases. The SEW formula-derived price and the USDA-quoted market price have a correlation of 0.87, suggesting that they follow each other quite well. However, formula prices tend to be smoothed out compared to USDA-quoted prices. For example, the minimum USDA-reported price over this time period was \$14.66 per head compared to \$18.31 for the formula price. Likewise, the maximum reported price was \$40.93 per head compared to a maximum formula price of \$38.66. This difference suggests that market participants are more optimistic when prices are high and more pessimistic when prices are low.

The second method of choosing values for GRN, SBM, and LH to plug into the formula was to use observed cash prices for all three variables (i.e., the hindsight approach). Figure 2 compares the formula-derived prices with USDA-reported prices using this method. Here, GRN and SBM prices are the averages of the cash and soybean meal prices for 50 weeks prior to the market hog being sold as a proxy for average feed prices during the entire production process (i.e., from breeding to market), and LH is the cash price for the week when the market hog is sold. Using the formula in this manner results in SEW formula-derived

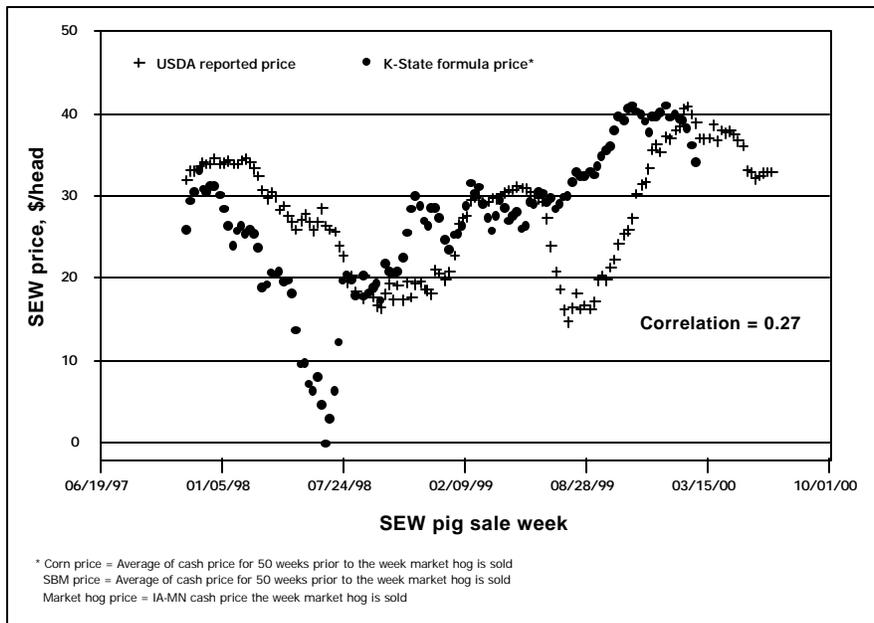
prices that are only weakly correlated with USDA-quoted prices (correlation = 0.27). This is not unexpected, because this approach estimates the price at which both parties (farmer and finisher) share returns proportionately, whereas the market price allows for one party to be more profitable than the other at any given point in time. A potential problem with using the formula in this manner (i.e., hindsight) is that the seller of the SEW pigs most likely would want to be paid when the pigs are delivered rather than wait until they are sold as market hogs. A possible solution to this problem would be to have an estimated payment when the pigs are delivered and then “settle up” once all prices are known. However, this would complicate the process somewhat.

Given the tremendous variability in the formula-derived SEW prices displayed in Figures 1 and 2, a logical question arises. Which price is the most appropriate? The answer to that question depends on why the formula is being used. First, if the formula is being used to “discover a price,” it may not even be needed now that a market price is quoted publicly. However, if the formula is being used to estimate what a reasonable spot price might be, then the approach used in Figure 1 (i.e., use of expected prices for GRN, SBM, and LH) appears to be reasonable. On the other hand, if the purpose of the formula is to arrive at a price for a long-term contractual relationship where the goal is to share returns between the buyer and seller proportionately, then the approach used in Figure 2 (i.e., use of observed prices for GRN, SBM, and LH) may be more appropriate. However, it is important to recognize that, in this case, the price determined at a given point in time may vary considerably from quoted market prices and also that this price is not known until the SEW pig has been finished.

Another consideration is the impact the different formula approaches have on the relative market risk to the different parties. Method 1 that used expected prices results in less risk for the farrower but more for the finisher. On the other hand, method 2 that used hindsight cash prices results in more risk to the farrower and less risk for the finisher. Thus, the risk attitudes of the buyer and seller as well as their business relationship may dictate which approach is used.



**Figure 1. Comparison of USDA Quoted SEW Prices to K-State Formula-Derived Prices (method 1 – grain, soybean meal, and market hog prices based on deferred futures prices adjusted for basis).**



**Figure 2. Comparison of USDA Quoted SEW Prices to K-State Formula-Derived Prices (method 2 – grain, soybean meal, and market hog prices based on hindsight cash prices).**