



Formula Pricing Hogs with Wholesale and Futures Markets

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Increasingly during the 1990s, hog prices have been based on carcass weight rather than live weight. In addition, formula pricing of hogs has increased significantly. Carcass merit pricing represents an effort to more nearly match price and value. Carcass merit pricing consists of a base price with premiums (discounts) for specified desirable (undesirable) carcass characteristics.

The purpose of this extension fact sheet is twofold: first, to identify two alternatives to the most common reference market for formula pricing hogs; second, to discuss an initial effort to show how the base price might be tied via formula to wholesale or futures market prices.

Formula Pricing Concerns for Price Discovery

Formula pricing is neither new nor unique to the hog industry. While formula pricing has several advantages, it creates potential problems for price discovery.

Formula pricing in hogs refers to determining a base price for a transaction using an external source for a reference price. The most common reference price in carcass merit programs for slaughter hogs is the Iowa-Southern Minnesota direct trade price for a given day and time (Hayenga et al). One problem with using reported market prices or price quotes as the external source is that on some days markets may be thinly or irregularly traded and reported prices might not accurately reflect true market conditions.

Two alternative reference markets for formula pricing in carcass merit programs are the wholesale pork market and hog futures market. The wholesale market represents prices meatpackers receive for the meat products they produce. Since those prices affect packer revenue, packers strive to sell meat for as high a price as possible. Thus, a key reason to tie the base price in formulas to wholesale prices is that the base price is then tied to a price packers have an incentive to keep as high as possible.

In contrast, packers have a natural, normal incentive to keep reported hog prices as low as possible. This practice keeps their input costs as low as possible. The boxed pork cutout value represents a broad group of pork products in the market. Thus, tying base prices to wholesale pork prices is believed to be less likely to result in market distortions than

base prices tied to reported hog prices. Also, the wholesale market is one marketing stage closer to the retail market, which is where consumers register their value preferences.

When considering wholesale prices as a reference for the base price, there are still issues to consider (Schroeder and Mintert). For example, forward contracting and formula pricing have become increasingly common in wholesale markets. This trend presents the same potential thin-market problem that was mentioned with hog markets. For some thinly traded cuts on some days, reported wholesale prices might inaccurately reflect market conditions. This problem is partially resolved by using a broad-based wholesale price, such as the boxed pork cutout value. Price reporting efforts should continue to collect as much wholesale market price data as possible.

Futures prices are a potential option because they promptly reveal new information, are a reasonable source of price expectations, provide readily available information, and are less likely to experience manipulation than thinly traded markets (Schroeder and Mintert). Futures prices are relatively inexpensive to use and substantial trading volume ensures they accurately represent market conditions.

Again, there are other issues to consider when using futures market prices as the external source for the base price (Schroeder and Mintert). The specifications for futures contracts, such as contract months, do not always match with cash market dates. Basis changes need to be taken into consideration when using futures prices as the reference market in a formula transaction. Another concern is that if the cash hog market disappears, the futures market for that commodity will collapse.

Cash-Wholesale, Cash-Futures Relationships

To use either wholesale prices or futures prices in the pork industry as an external reference for the base price, the relationships between markets must be examined. In one study (Butcher), weekly average prices from January 1989 to December 1998 were used. Data series were: (1) cash hog market—Iowa-Southern Minnesota direct trade price for barrows and gilts, #1-2, 230-240 pounds; (2) wholesale pork market—pork cutout value, #2, 175 pounds (185 pounds, 51-52% lean, after October 30, 1997); and (3) hog futures

market—live hog futures price for the nearby contract (lean hog futures prices after February 1997).

Ratios were computed between cash and wholesale prices and cash and futures market prices for hogs. Absolute price differences could be used and some might find them more appealing. Using absolute price differences in conjunction with the wholesale market represents a fixed margin for packers. That fixed margin would remain unchanged during periods when prices were high or low. With a ratio, however, the same ratio could apply whether prices were high or low, but packer margins could adjust to the periods of higher or lower prices.

Some ratios or absolute price differences might take into account by-products values. The hog wholesale market ratios used here do not include the by-products value packers receive. By-products revenue for packers tends to cover slaughter costs, processing costs, and their profit margin. Including by-products values with wholesale pork prices seemed to limit the incentive packers have for adding value to by-products and enhancing their net margins. Thus, only the ratio of hog price as a percentage of the boxed pork cutout value was used here.

One could argue that price differences, rather than ratios, should be used with futures markets because absolute differences are the basis. In this study, the ratio of hog price as a percentage of the lean hog futures market price was chosen in lieu of price differences to allow the absolute basis to vary in periods of higher or lower prices.

Figures 1 and 2 show how the ratios varied over the data period. The somewhat periodic movement of the ratios suggests a within-year seasonal pattern in each ratio series. The large change in the live-hog-to-futures ratio, shown in Figure 1, was due to the futures market contract change in February 1997. In Figure 2, the live-hog-to-pork-cutout ratio was considerably lower than usual during the two periods of abnormally low hog prices in late 1994 and 1998.

Using the Ratio for Formula Pricing

The following is an example of how each reference market might be used in a base price formula. Producer A agrees to market hogs to Packer B with the base price tied to the wholesale pork market. Historically (1989-98), the ratio between the live hog price and wholesale pork cutout value was 0.72. Thus, whatever the wholesale market is for the week hogs are slaughtered, the base price will be the pork cutout value times 0.72 (or 72%). So if the boxed pork cutout is \$75/cwt., the live hog price is \$54/cwt. ($\75×0.72).

A similar example can be given for using the futures market as a reference. Producer A agrees to market hogs to Packer B with the base price tied to the nearby lean hog futures market price. Historically (1989-98), the ratio between the cash and nearby futures market price (adjusted for the contract change) was 0.66. Thus, whatever the futures market is for the week hogs are slaughtered, the base price will be the futures market price times 0.66 (or 66%). So if the lean hog futures market closes at \$70/cwt., the live hog price is \$46.20/cwt. ($\70×0.66).

However, given that the ratios vary seasonally (as noted in Figures 1 and 2), a means of adjusting the ratio is necessary to balance the periods during the year when a fixed ratio would favor either the producer or packer.

Forecasting Price Ratios

For this study, a simple forecasting method was estimated to arrive at a series of ratios or percentages that potentially could be used in formula pricing (Butcher). These ratios are not likely to be used directly. The purpose here is to demonstrate some of what is necessary to consider when formula pricing live hogs with wholesale and futures markets. The discussion will indicate why this represents a process more than a final product.

Monthly average ratios were forecast based only on seasonality of the ratios. Data for 1989-93 were used to forecast ratios for 1994, which were then compared with the actual ratios for 1994. Data for 1990-94 were used to forecast the ratios for 1995, which were compared to actual ratios for 1995. A similar procedure of dropping the oldest year of data and adding the most recent year was used to forecast ratios for 1996, 1997, and 1998. Regression models accounted for changes in the reported data, such as weights and quality of hogs in the pork cutout and changes in futures market contracts.

Table 1 shows the forecasted vs. observed (actual) differences for each year. Both for cash-wholesale and cash-futures, the average differences appear relatively small in decimal terms. However, small differences between the forecasted and actual ratios can make a significant difference in the results when using the ratio in a formula. For example, using a cash-wholesale ratio of 0.7200 compared with 0.7655 with a boxed pork cutout of \$75 means the live hog price would be \$54/cwt. (using 0.7200) vs. \$57.41/cwt. (using 0.7655). Thus, small ratio differences mean relatively large price differences.

Figures 3 and 4 show plots of forecasted and observed ratios for 1994-98. If the forecasting model predicted perfectly, the forecasted-observed points on the graph would lie on the diagonal line. While some points are near the diagonal, others lie far from the diagonal, indicating poor forecasting results. During times when market conditions were abnormal, the forecasted vs. actual deviation was very wide. Two examples were just before and after the December 1994 market drop in live hog prices, similarly at the end of 1998.

Table 1: Forecasted vs. Actual Ratio Differences for Hogs^a

	Mean Difference	Standard Deviation	Minimum	Maximum
Cash vs. Wholesale				
1994	0.0455	0.0498	-0.0084	0.1450
1995	0.0120	0.0189	-0.0146	0.0417
1996	-0.0111	0.0187	-0.0412	0.0200
1997	0.0059	0.0221	-0.0224	0.0544
1998	0.1289	0.0763	0.0663	0.3133
Cash vs. Futures				
1994	0.0659	0.0348	0.0096	0.1442
1995	0.0110	0.0337	-0.0319	0.0548
1996	0.0199	0.0596	-0.0236	0.1992
1997	0.0742	0.0427	0.0207	0.1465
1998	0.0600	0.0607	-0.0137	0.2052

^a Differences are the actual ratio less the forecasted ratio

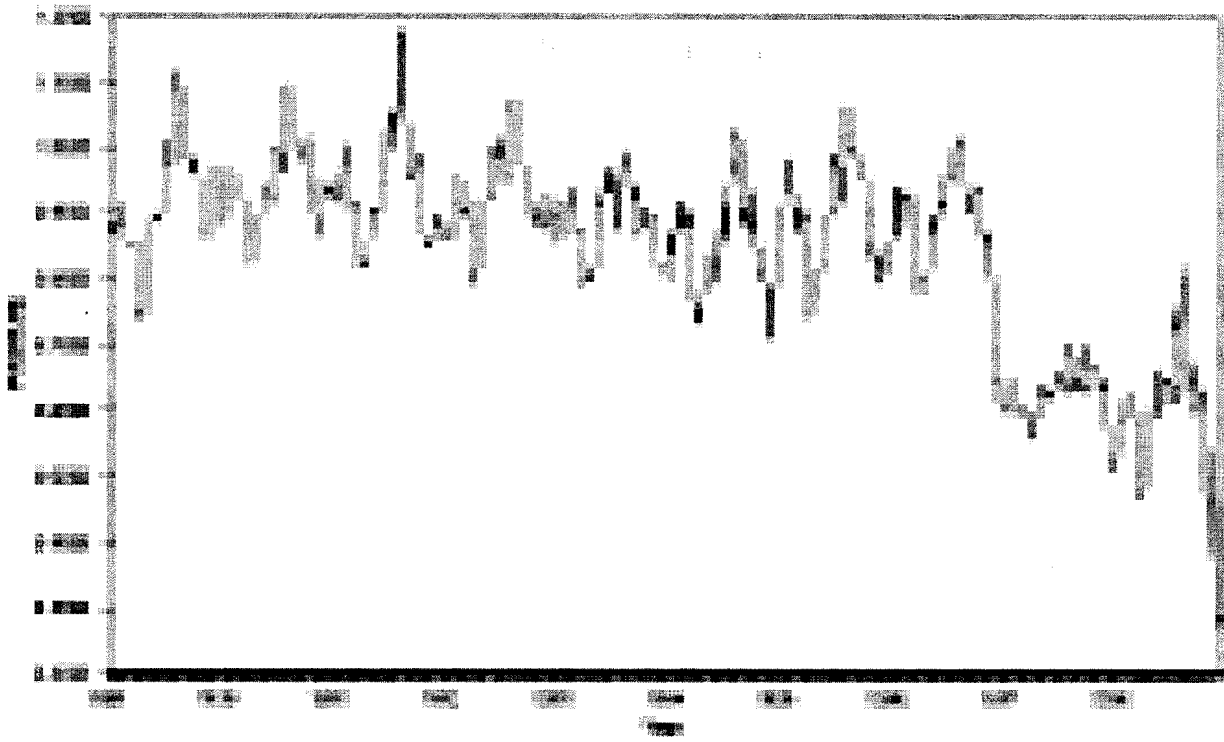


Figure 1: Ratio of Iowa-Southern Minnesota Live Hog Prices to Live Hog Futures Market Prices, 1989-1998

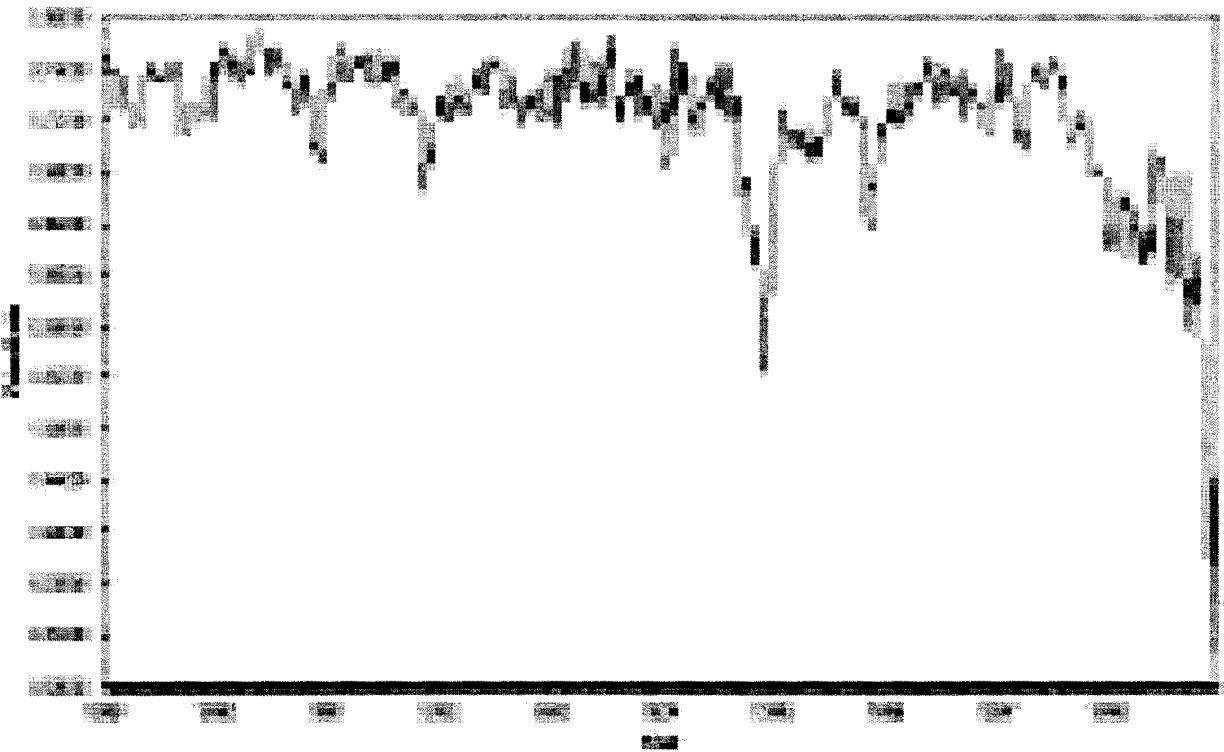


Figure 2: Ratio of Iowa-Southern Minnesota Live Hog Prices to Pork Cutout Values, 1989-1998

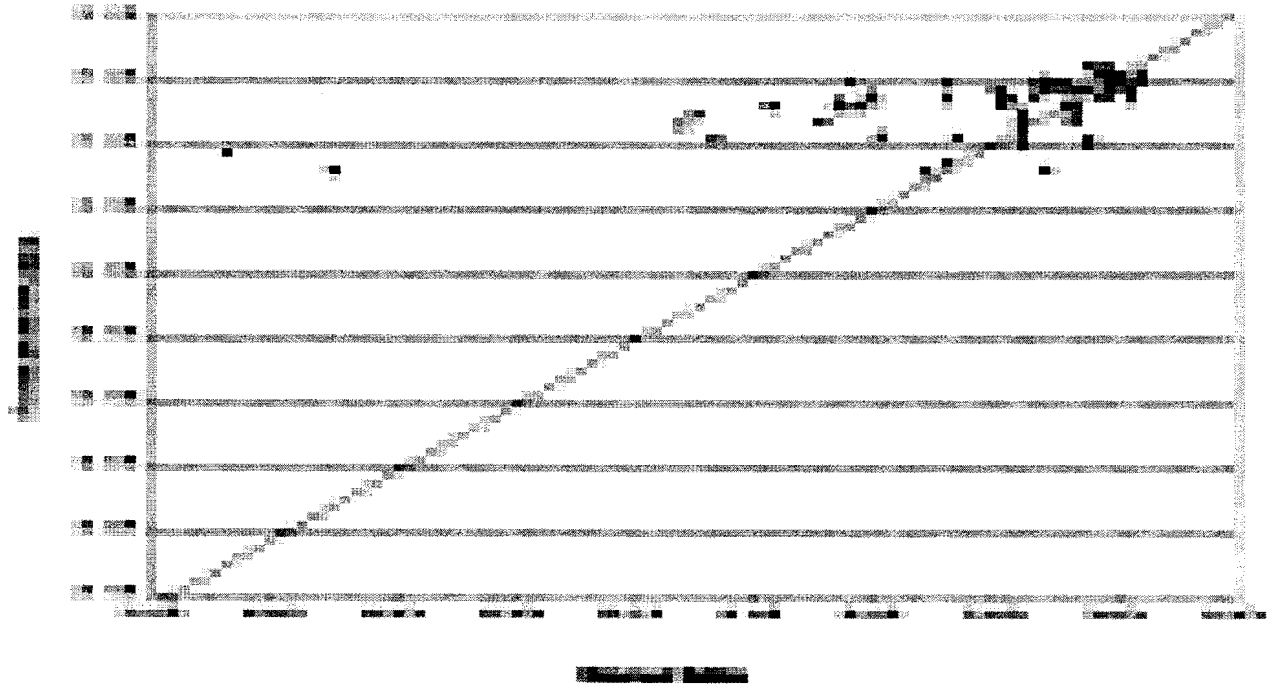


Figure 3: Forecasted vs. Observed Hog Cash-Wholesale Ratios

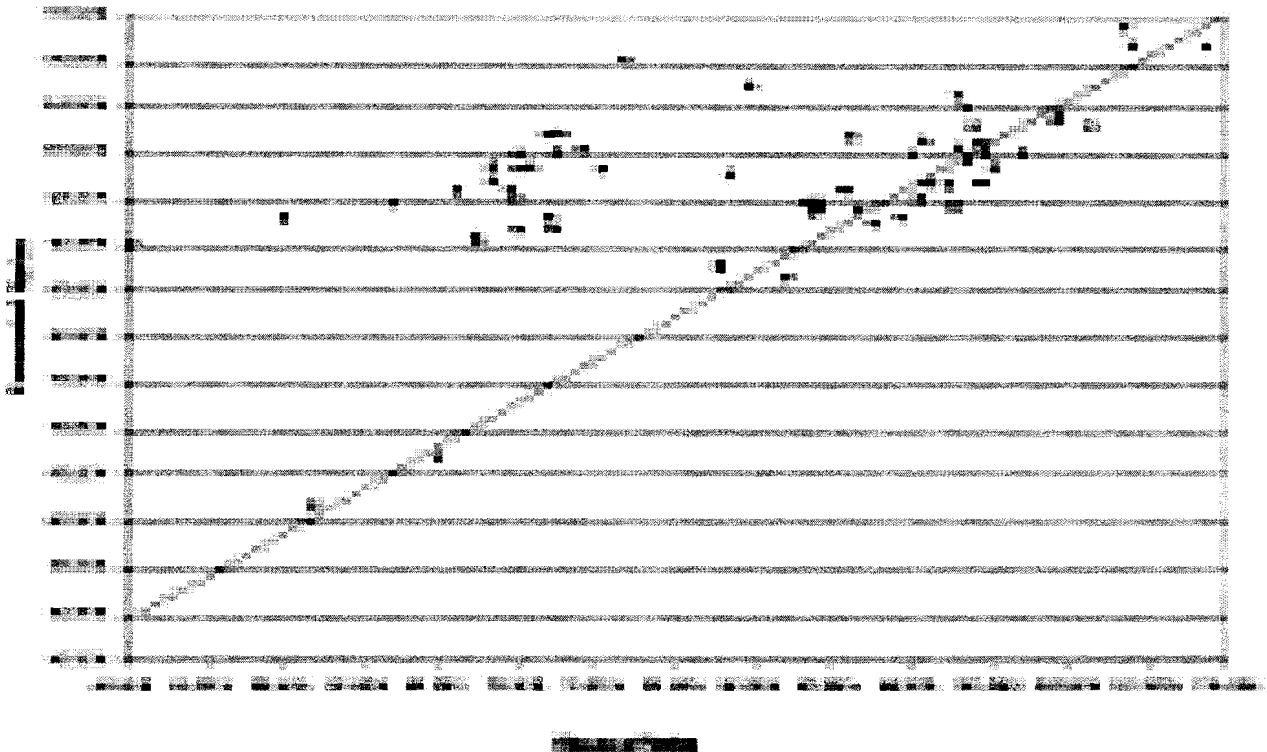


Figure 4: Forecasted vs. Observed Hog Cash-Futures Ratios

Discussion and Implications

The wholesale pork market and lean hog futures market could be argued from a conceptual viewpoint to be appropriate reference markets for formula base prices in carcass merit programs. Wholesale prices and futures market prices could potentially improve the use of formulas by using a base price that reflects market conditions in separate but related markets, thereby improving the price discovery process. Neither is a perfect solution to price discovery problems, but they represent potential alternatives. However, several points need to be mentioned and considered.

- The ratios computed in this study used live-weight hog prices. Since base prices are part of carcass merit systems, ratios for carcass-weight hog prices would be more appropriate.
 - Given the discussion earlier, price differences may be more appropriate than ratios when using the futures market as a reference.
 - Cash-wholesale price ratios were computed without potential adjustments. For example, wholesale cut-out values do not include reported prices for exported pork products. These exported products are higher valued cuts on average so the reported wholesale cutout values underestimate the true value of pork at the wholesale level. Buyers and sellers could negotiate an adjustment. For example, a ratio might be agreed upon (say 0.72 between hog prices and the wholesale boxed pork cutout), then adjusted for under-reporting the carcass value at the wholesale level. The ratio could be adjusted by a percentage (say 0.02 above the base ratio of 0.72, resulting in a ratio of 0.74). Or the wholesale cutout value could be adjusted before applying the ratio (say \$2/cwt. more than the reported cutout, then times the base ratio of 0.72).
 - No attempt was made to adjust cash-futures market ratios for differences between futures market contract specification for quality and base quality specifications in carcass merit pricing systems. Again, buyers and sellers would have to negotiate and agree on the adjustment.
- Earlier it was noted that results of this research would not likely be used in real formulas. One reason is because of the large differences in some cases between forecasted and actual ratios. Better forecasting models are needed. Besides simply adjusting for seasonality, the dynamics associated with the ratios themselves, and inclusion of other economic variables would likely improve the results. Other procedures than using a five-year period as the data period to estimate next year's ratios should be considered. Other periods of longer or shorter duration need to be examined. Also the procedure in this research forecasted monthly average ratios rather than weekly average ratios. The latter would likely be preferable in formula pricing base prices.

Summary and Conclusions

The primary objective of this extension facts was to discuss how wholesale and futures markets might be used in formula pricing base prices for carcass merit pricing systems. The move in this direction may have merit compared with current formula pricing methods. However, clearly more work is needed before buyers and sellers feel comfortable switching from formulas commonly used to alternatives discussed here.

References

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