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The relationship among live hog, carcass, and wholesale cut prices

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THE RELATIONSHIP AMONG LIVE HOG, CARCASS, AND WHOLESALE CUT PRICES

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Summary

This study examined the relationship between live and carcass prices and the seasonality of live, carcass, and wholesale cut prices. Results using Omaha live prices suggested a unidirectional relationship between live and carcass prices, with farm prices leading carcass prices by 3 weeks. In contrast, the results generated using live prices from the St. Joseph terminal market suggested a bidirectional relationship. Live and carcass prices from 1987 to 1992 were found to be highly correlated. The average monthly price spread between the Omaha live price and the USDA carcass price ranged from \$14.02 to \$23.18 cwt, with an average spread of \$17.53 cwt. The spread has changed only marginally from 1987 to 1992. Loin prices were found to follow the seasonal price pattern of live and carcass prices, except that they declined to a greater degree in October and November. Ham prices also followed the seasonal price trend of live and carcass prices, except that they increased to a greater extent during Thanksgiving and Christmas. The increased support of ham prices in the fall tended to offset the seasonal weakness in loin prices. Seasonality of spare rib prices was evident, with the high prices occurring during the outdoor cooking season (May, June, and July). Boston butt prices followed the seasonal pattern of live and carcass prices. (Key Words: Carcass Price, Live Price, Wholesale Price, and Seasonality.)

Introduction

As producers adopt lean value marketing strategies, they have increased interest in the relationship between live and carcass prices. Previous studies at Kansas State University have found that live prices unidirectionally cause retail and wholesale carcass prices. Furthermore, these previous studies have suggested that the farm price leads the carcass price by 3 to 5 weeks. However, as more pigs are purchased on a lean value basis and as data gathering technology improve, the lag time between live price and carcass price would be expected to disappear or at least decrease.

The seasonality of live prices for market hogs is well documented. Producers are aware that live prices peak during the summer and are lowest in the fall of the year. However, the seasonal patterns of carcass prices and resulting wholesale cut prices have not been well documented. Understanding the seasonal pattern of carcass and wholesale cut prices is important to producers selling on a lean value basis, because gross returns are directly dependent on fluctuations in carcass prices.

Therefore, the objectives of this study were 1) to determine the relationship between live hog and carcass prices and 2) to determine the seasonality of wholesale cut prices and their relationship to carcass and live hog prices.

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Procedures

This study used live hog, carcass, and wholesale cut prices. Live hog prices for this study were obtained for the Omaha and St. Joseph terminal markets from the United States Department of Agriculture, Agricultural Marketing Service (USDA, AMS). US#1 and US#2 carcass and wholesale cut prices were obtained from issues of the USDA Wholesale Price Sheet. The US #1 and US #2 carcass prices were averaged to obtain the carcass prices used in the analyses.

Weekly live and carcass prices for the 1987 to 1992 period were used to test for directional causality. The Granger causality test was used for this analysis involving first-differences of the data. Each price series (y) was regressed on lagged values of that price series and lagged values of the other price series of interest. Specifically, each live price was regressed on lagged values of that live price and lagged values of the carcass price. In addition, the carcass price was regressed on lagged carcass prices and lagged live prices. Separate results were generated for Omaha and St. Joseph.

An F-test was used to compare the reduced form (y regressed on lagged y) and the full models (y regressed on lagged x and lagged y) for the live price series. An F-test also was used to compare the reduced form and full models for carcass prices. Large F statistics indicate causality. Causality can take one of three forms. First, it can be unidirectional (i.e., only one F statistic is significant). Second, it can be bidirectional (i.e., both F statistics are significant). Third, there may be no relationship between variables. For this case, neither F statistic would be significant. The lags were selected using Akaike's Information Criteria (AIC) with the same lag for both x and y in the individual regressions.

Average monthly prices from January, 1987 to December, 1992 were reviewed to

determine seasonality in live, carcass, and wholesale cut prices. Seasonal trends were computed and analyzed using the mean monthly price for the 6-year period. For example, the average monthly prices for January of each year were summed and divided by six to determine the mean monthly price. Correlation analysis was conducted using procedures described by SAS (1988) to determine the relationship between live price, carcass price, and prices of each wholesale cut. Wholesale cuts used in the analysis included: loins, hams, butts, spareribs, bellies, trim 72% (trim that can be tested by the USDA to be 72% lean), trim 42% (trim that can be tested by the USDA to be 42% lean), and jowls. Picnics, pork fat, feet, and tails were not included in the wholesale cut analyses because of infrequency of price quotations for these cuts. Correlation analysis was also used to determine the relationship between weekly live, carcass, and wholesale cut prices in 1992.

Results and Discussion

Relationship between Live Prices and Carcass Prices. The Granger causality test results are reported in Table 1. The results differ between the two live price series. The results for Omaha indicate a unidirectional causation from farm to wholesale carcass. In addition, the Omaha results suggest that farm price changes led wholesale price changes by 3 weeks. The results with respect to Omaha live prices are similar to those obtained by previous research conducted at Kansas State University; however, the lag length is 1 week shorter.

The results using live prices for St. Joseph suggest a bidirectional relationship between live prices and wholesale prices. In other words, there is significant feedback between these two price series.

Thus, causality results from the two terminal markets are mixed or inconclusive. The Omaha results suggest that wholesale prices lag behind live prices by 3 weeks. In other words, live prices lagged 1, 2, and

3 weeks would be useful in comparisons between live and carcass prices. In contrast, the St. Joseph results suggest that lagged live prices are not needed in comparisons between live and carcass prices. For ease of understanding, we chose to compare contemporaneous live and carcass prices below. These comparisons would be consistent with the results for the St. Joseph terminal market.

Average monthly live prices for Omaha and St. Joseph were highly correlated ($P<.0001$; $r=.99$). This would be expected because the markets are in close proximity to each other. Also, buyers from the same plants compete for hogs at both of these terminal markets. The difference in the mean price between Omaha and St. Joseph was \$0.27 cwt. The mean Omaha price was \$48.36 cwt, and the mean at St. Joseph was \$48.09 cwt. Average monthly live prices for Omaha ranged from \$37.66 to \$63.54 cwt, with a standard deviation of \$6.62 cwt. St. Joseph's average monthly live price ranged from \$37.24 to \$62.65 cwt, with a standard deviation of \$6.65 cwt.

Average monthly Omaha live prices and USDA carcass prices showed a high correlation ($P<.0001$; $r=.98$; Figure 1). The price spread for the 6-year period between Omaha live and USDA carcass prices ranged from \$14.02 in January, 1989 to \$23.18 cwt in November, 1990. The average spread was \$17.53. The difference between live and carcass prices represents the amount the packer is paid for services. The spread has changed only marginally over the past 6 years, with carcass prices following the same seasonal pattern as live price. The maximum price received generally occurs during June and July, and the minimum price at the end of the year.

Average weekly live prices in 1992 for Omaha and St. Joseph also were highly correlated ($P<.0001$; $r=.99$). The mean price spread between Omaha and St. Joseph live prices was \$0.66 cwt. Weekly Omaha prices ranged from \$37.23 to \$49.85 cwt,

and St. Joseph prices ranged from \$36.88 to \$49.00 cwt. The standard deviations for Omaha and St. Joseph were \$3.04 and \$2.98 cwt, respectively.

The average 1992 weekly Omaha live and USDA carcass prices were highly correlated ($P<.0001$; $r=.97$). The price spread for the 1992 weekly Omaha live and USDA carcass prices ranged from \$14.47 to 18.61 cwt, with an average of \$16.17 cwt.

Seasonality of Wholesale Cut Prices.

Previous research at Kansas State University in 1993 indicated that loin and ham cuts were important determinants of carcass value. Loins and hams represented 40% of the carcass weight and 60% of the carcass value.

Seasonal trends in live hog, carcass, loin, and ham prices are depicted in Figure 2. Loin prices were highly correlated ($P<.0001$; $r=.85$) with carcass prices. Loin prices followed a similar seasonal pattern as carcass and live prices, except loin prices declined to a greater degree in October and November.

Ham prices were also correlated ($P<.0001$; $r=.65$) with carcass prices. However, the seasonal pattern for ham prices differed from that of loin prices. Ham prices did not increase as rapidly during the summer months and strengthened during the holiday buying season of Thanksgiving and Christmas. This increased support of ham prices in the fall tends to offset the seasonal weakness in loin prices.

The seasonality of spare ribs and Boston butts is shown in Figure 3. The enormous demand for spareribs during the summer outdoor cooking season is evident with the maximum seasonal price occurring during May, June, and July. Spare rib prices were correlated ($P<.0001$; $r=.51$) with carcass prices, but to a lesser degree than the other wholesale cuts. Boston butt price was highly correlated ($P<.0001$;

$r=.88$) with carcass price. The seasonal prices for butts follow a similar pattern to that of live hog and carcass prices. The seasonal price patterns for bellies, trim, and jowls also followed that pattern.

Table 1. Granger Causality Tests for Weekly Wholesale and Farm Pork Prices, 1987-1992

Farm Market	Null Hypothesis	Weekly Lags	F-Statistics ^a
Omaha:	Wholesale causes farm	4	1.947
	Farm causes wholesale	3	35.948*
St. Joseph:	Wholesale causes farm	5	3.981*
	Farm causes wholesale	3	24.461*

^aAn asterisk indicates statistical significance at $P<.05$.

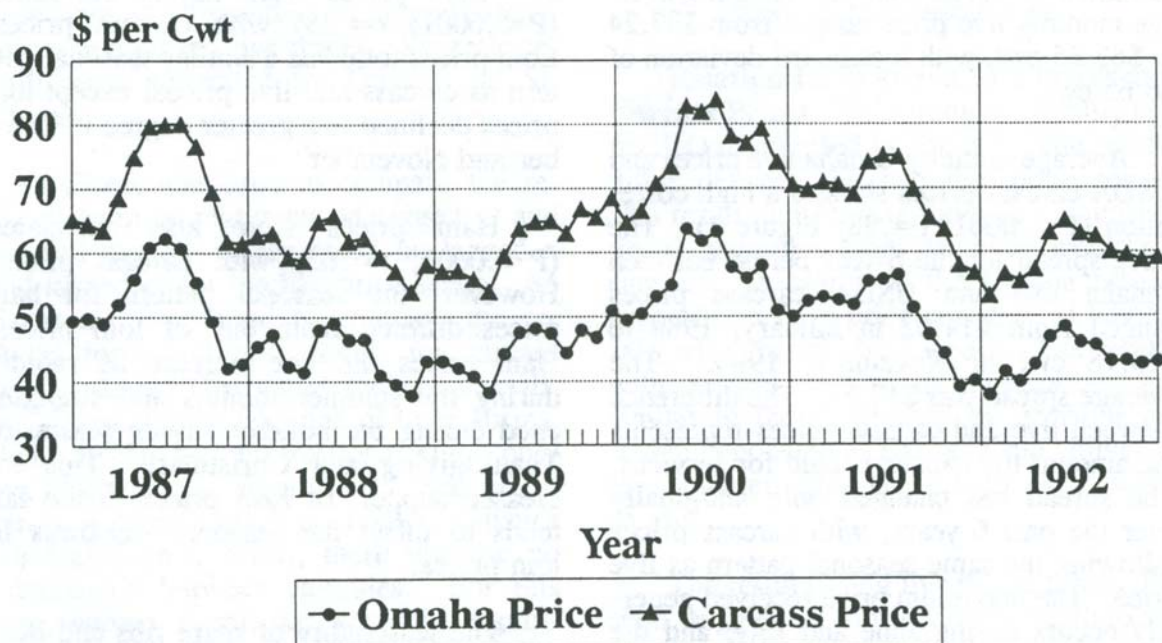


Figure 1. Monthly Omaha Live Prices and USDA Carcass Prices

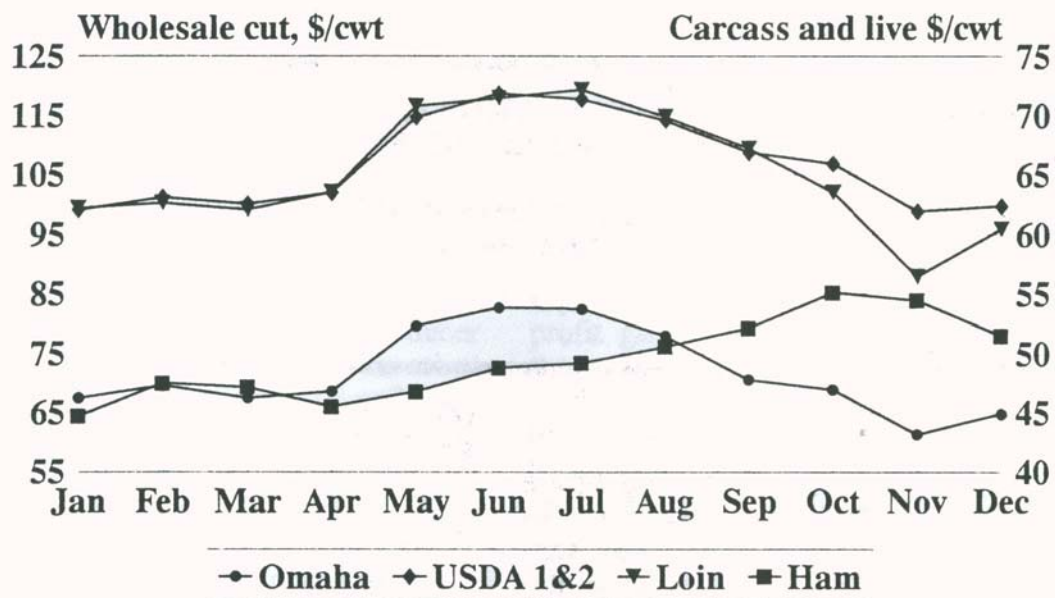


Figure 2. Seasonal Trends in Live Hog, Carcass, Loin, and Ham Prices

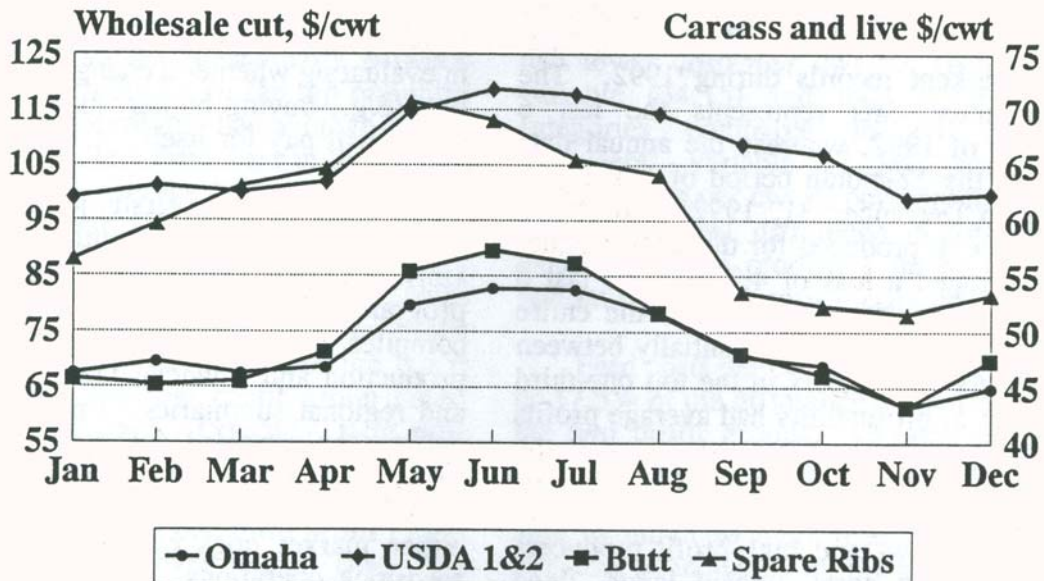


Figure 3. Seasonal Trends in Live Hog, Carcass, Butt, and Spare Ribs Prices