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## PRICE DISCOVERY AND BASIS RISK FOR LIVE HOGS

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### Summary

The short- and long-run daily price relationships between cash and futures markets for live hogs were examined over the 1975-89 period. Price discovery generally originates in the futures market with about 65% of new information being passed from the futures to the cash market. However, at times, especially during large price moves that are not necessarily anticipated in the futures market, the cash market price relies less on the futures market. The very short-term basis for hogs is fairly stable, with approximately 85% of yesterday's nearby-basis persisting today. Generally, little can be gained by speculating on basis from day to day. The farther from futures contract delivery they are, the more the futures and cash price diverge from each other, reflecting the fact that they represent different markets. Hedgers liquidating futures positions prior to the contract delivery month face larger basis risk than those liquidating positions in the contract month.

(Key Words: Marketing, Economics, Contract.)

### Introduction

A major role of futures markets is their contribution to price discovery. Price discovery in futures markets refers to the use of futures prices in determining cash market prices. That is, the futures price may serve as the market's expectation of the cash price in a subsequent delivery period. The share of price discovery originating in the futures market and the degree to which futures price changes are reflected in the cash market and vice-versa have important implications for hedgers using these markets.

The price discovery relationship between cash and futures prices is directly related to the basis (cash price minus futures price). The stability or predictability of the basis is critical for successful hedging. An unpredictable basis results in an unpredictable expected price from hedging. Therefore, determination of the stability and predictability of the short-run basis is important for judging the level of basis risk associated with hedging. Basis risk refers to the chances of unfavorable basis at the time a hedger liquidates a hedge. The objectives of this study were to determine the short-term price leadership roles and basis stability for live hog cash and futures prices.

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## **Procedures**

Daily cash and Chicago Mercantile Exchange (CME) futures market prices for hogs were collected over the 1975-89 period. Cash price data were daily slaughter hog prices from the Omaha market (midpoint of the daily range). Cash prices for different weight ranges of hogs during the period were used because of changing price reporting practices by the Agricultural Marketing Service (AMS) and to reflect changes in weights of the largest volume of hogs marketed. The weight ranges used were as follows: 1975-78, 200-220 lb; 1979-84, 200-230 lb; 1985-87, 210-240 lb; and 1988-89, 230-240 lb. The Omaha market was selected as the cash price location because of its fairly high volume and because it is a par delivery point for the CME's live hog futures contract. The analysis was performed using the nearby futures contract prices. The nearby contract period was defined as the 16th d of the previous contract month through the 15th d of the contract expiration month.

To evaluate the price discovery role of the live hog cash and futures markets and to obtain a measure of basis risk, a statistical procedure using regression analysis was used. The regression model essentially amounted to regressing the cash price on the futures price (and vice-versa) and examining the properties of the models. The analysis was conducted on each of the 15 yr (1975-89) separately to allow us to determine the degree of annual variation present in the cash-futures price relationship.

## **Results and Discussion**

Over all 15 yr, the regression estimates provided strong evidence that the futures price leads the cash price in reflecting new information. However, the magnitudes of price leadership varied from year to year, and no general trend was detected over the time period. The live hog futures price was found to discover price independently of the Omaha cash hog price. No definitive trend in the degree of cash price feedback to the futures price was detected.

Table 1 shows the percentages of market information (price discovery) originating in the futures market relative to the cash market. For example, in 1989, 71% of the new information entering the live hog markets originated in the futures market and was subsequently passed to the cash market. The remaining 29% (100%-71%) of new cash price information was determined independent of the futures market. With a few exceptions, at least 60% of the market information was discovered first in the live hog futures market and then transferred to the cash market. During 5 of the 15 yr (1975, 1978, 1980, 1981, and 1983), the Omaha cash hog price appeared to be discovering the majority of new information more rapidly than the live hog futures market (i.e., the percentage was less than 50). In 4 of these 5 yr (1978 perhaps as the exception), cash hog prices exhibited relatively large swings during the year. For example, in 1975, the Omaha cash hog price ranged from \$37/cwt to nearly \$65/cwt, a greater than 75% change in price. Similarly, during 1980 and 1983 the high to low range of hog cash prices exceeded \$22/cwt. Thus, during these years, the new information entering the market may well have originated in the cash market, because the futures market apparently did not anticipate the magnitude of price changes as rapidly as they occurred in the cash market.

**Table 1. Percentage of Daily Price Discovery Originating in the Live Hog Futures Market and Daily Omaha Basis Persistence (1975-89)**

Year	Percentage of live hog price discovery originating in the futures market	Percentage of Omaha basis persisting from day to day
1975	30	81
1976	64	81
1977	78	91
1978	39	81
1979	77	91
1980	28	88
1981	24	72
1982	100	100
1983	39	78
1984	65	85
1985	65	91
1986	81	83
1987	100	95
1988	100	100
1989	71	93
Average	64	87

Table 1 also shows the percentage of basis stability from day-to-day, which was generally 72% to 100% of the previous day's basis. Thus, the previous day's live hog cash to futures price basis persists and is similar to the current day's basis. In the very short-run, from day-to-day, little basis fluctuation occurs and the cash and futures prices do not necessarily converge rapidly. This suggests that there would be generally little gain for a hedger in speculating on day-to-day basis on the nearby contract. Likewise, it suggests that very short-term basis risk for hogs in Omaha, as measured by daily fluctuations in basis, is not large on average. An evaluation of the basis across a longer time period (i.e., over weeks rather than days) suggests that basis risk increases. As we examine the nearby contract basis from the expiration of the previous contract through the expiration of the nearby contract, basis risk becomes more important. Large price swings often occur in live hog markets within fairly short periods of time. For example, over the 1975-89 period, the average absolute value of the daily price change in the Omaha cash hog market was approximately \$.70/cwt. Accumulated across several days or weeks, during periods in which no delivery option is available on the futures market (i.e., during months that have no corresponding hog futures contract expiring), this price movement creates relatively large basis risk. Figure 1 shows the relationship between basis risk and weeks until futures contract expiration for 1989 (the remaining 14 yr have patterns similar to those of 1989). The plot indicates that the farther from contract expiration they are, the more the cash and futures prices tend to diverge from each other. Figure 1 suggests that hog producers liquidating hedges during non-contract months face nearly three times the basis risk of those who liquidate the hedge early in the contract delivery month.

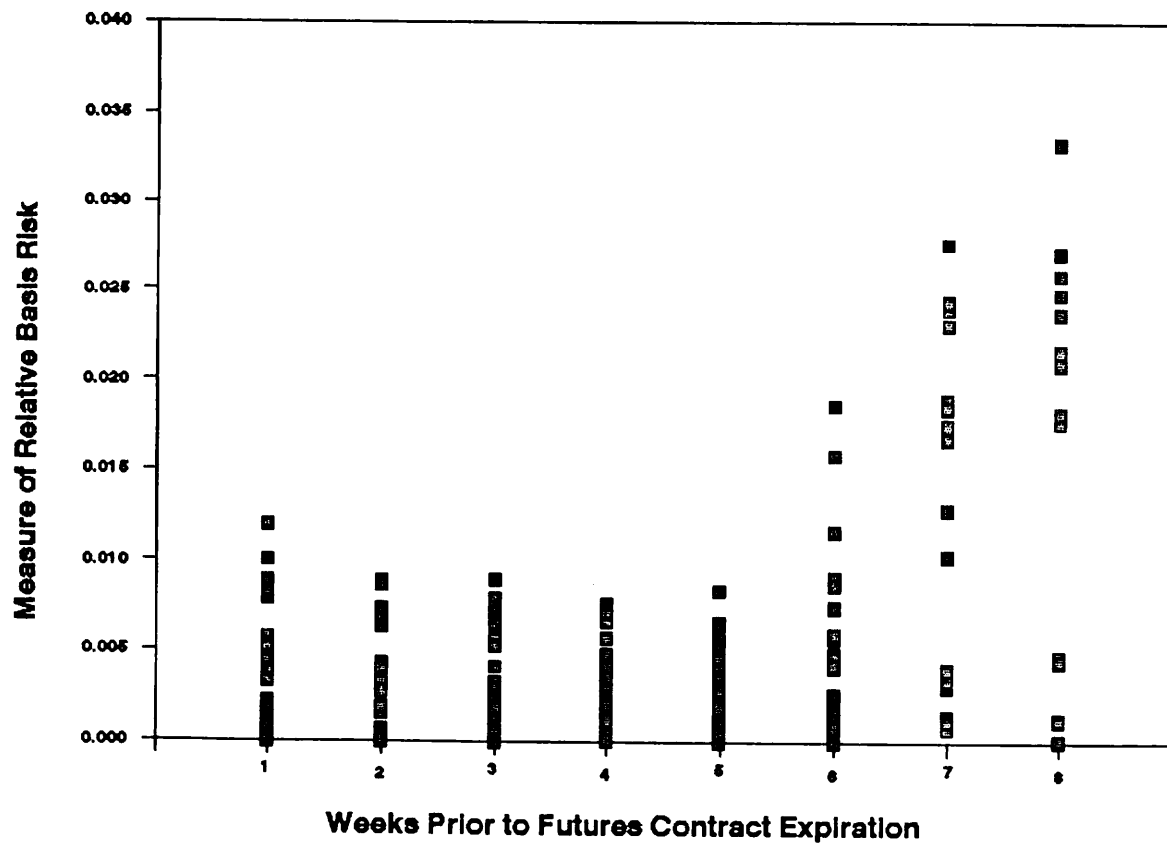


Figure 1. Relationship between daily basis variation and weeks to futures contract expiration, 1989.