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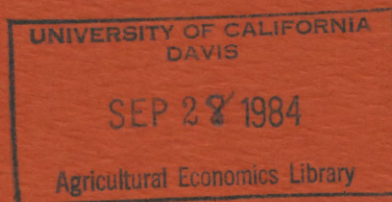
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THE IMPACT OF HOG AND PIG REPORTS
ON LIVE HOG FUTURES PRICES:
AN EVENT STUDY OF MARKET EFFICIENCY

by

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ABSTRACT

Behavior of hog futures prices around USDA hog and pig reports is examined. Price patterns indicate evidence of inefficient markets, but such inefficiency is attributed to inadequate information. Results support the need for more frequent hog and pig reports and/or reporting of breakdown into barrow and gilt slaughter.

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Price discovery in agricultural markets requires the incorporation of information in seeking a price which balances supply and demand. Market efficiency measures the ability of a market to register new information promptly and effectively. The general efficiency of futures markets has been examined.[1] The effectiveness of futures markets in preparing for, and reacting to, market reports has received little attention.

In a market efficiency context, there are two dimensions to the process of information registration. First, there is the speed and accuracy with which a market registers new information. The market must interpret new information and generate, quickly and effectively, a price which reflects the new information.

The success of the market in discovering the market clearing price is dependent upon the information set. The adequacy of the information set available to the market thus becomes a second important dimension of market efficiency.

Analysts recognize that the release of periodic USDA reports influences futures markets. Pearson and Houck, and Gorman examined the response of grain prices to the release of USDA production reports. In

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[1] See Kamara for a recent survey of this literature.

the livestock sector, the available work is limited to Miller's examination of the response of futures prices to specific kinds of information in USDA Hog and Pig Reports.

There is a need for research on how efficiently futures markets respond to new information and on the adequacy of the information set available to the markets. This paper examines the reaction of live hog futures prices to the quarterly release of USDA Hog and Pig Reports. The method employed is of the event-study type, a widely accepted and frequently used approach in the stock market literature (Chance).

DATA AND METHODS

The data used for analysis covered the period from March 1974 through December 1982. Thirty-six Hog and Pig Reports were released during that period. Live hog futures price changes for thirty-eight days surrounding each report were recorded.[2] Three futures contracts were examined for each of the Hog and Pig reports to allow an assessment of the ability of nearby, intermediate, and distant contracts to register the information contained in the reports. The contracts and reports were aligned as follows:

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[2]The thirty-eight price changes resulted from differencing the futures prices for the forty days surrounding the report. This actually provides eighteen price changes before the release of the report, one price change between the release date and the day following the report, and nineteen price changes following the release date. The selection of forty days was made to allow sufficient time before and after the report for information to be incorporated.

Report	Futures Contracts Analyzed
March	June, October, December
June	August, December, April
September	December, April, June
December	February, June, October

The Hog and Pig reports were classified as bullish, bearish, or neutral based on the ratio of actual farrowings to final farrowing intentions. For example, actual farrowings during December-February (from the March report) were related to final farrowing intentions for December-February (from the December report). Reports were classified as bullish (bearish) if the ratio of actual farrowings to farrowing intentions indicated at least a three percent decrease (increase) in actual farrowings compared to intentions. Reports with less than a three percent change were classified as neutral.

Two simple tests of market efficiency were conducted. A test of the martingale hypothesis required examining the means of the 38 price changes surrounding the reports.[3] The martingale hypothesis suggests that prices fully reflect all known information and the expected mean price change across the 38 changes would therefore be zero. The mean price change was significantly different from zero for only four of the 108 futures contracts examined. The martingale hypothesis is thus supported by the behavior of the live hog futures prices.

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[3] The "n" central observations are sometimes dropped in such an analysis to account for non-price related adjustments before and after reports. Based on the examination of plots of the price changes the means were computed deleting the five days before and after the report release dates, but there was no significant difference in the test results.

A second simple test of market efficiency is to examine the serial independence of successive price changes. The Ljung-Box Q-statistic measures the degree of autocorrelation present in a series by summing the successive estimated autocorrelation coefficients and correcting for degrees of freedom. Evidence of serial dependence was found in seven of the 108 contracts. Serial dependence in price changes around the release date of the reports would be expected if a report is a *surprise* and therefore contains new information. A series of price changes in the same direction would be required to adjust to a significant change in information.

Examination of the efficiency of the market in anticipating changes in farrowings required the selection of futures contracts consistent with the classification scheme. For the March report, the October live hog futures contract was selected since March to October approximates the farrow to finish time lag. The December, April and June contracts were selected to use with the June, September, and December reports, respectively. The data series studied for each report involved the average of the price changes for each of the thirty-eight days surrounding the report for bullish, bearish, and neutral reports, respectively. Means were generated for the average price changes 10 days prior to the report, 5 days prior to the report, 5 days after the report, and 10 days after the report for the bullish, bearish, and neutral reports.

Cumulative average price changes were computed. By accumulating the average price changes across the days before and after the re-

port, a graphical representation of price movement is obtained. The graphical patterns provide insight into the process of information registration by the futures contracts. For example, if the cumulative average price changes show a random pattern for the neutral reports, it can be concluded that the market incorporated the information correctly. The pattern of the cumulative average price change plot for the bullish (bearish) reports would be expected to be positively (negatively) sloped.[4]

The hypotheses regarding the slopes of the price change series for the bullish, bearish, and neutral reports were tested using regression analysis. Linear and quadratic time trend models were fitted to the pooled data series for bullish, bearish, and neutral reports. The quadratic component follows from the expected market reaction to new information. If a bullish (bearish) report contains new information, the market will react sharply in the period after the report is released and then stabilize at the new price level.

Plots of the cumulative price change series for bullish, bearish, and neutral reports were examined for each report. In addition to the regression analysis, the plots provide additional insight into the process of information registration. The individual report plots also allow an

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[4] This assumes that the information in the report is new information and is not registered in the market until after its release. Failure to find a slope in the price change series for bullish (bearish) reports would indicate the markets to have already incorporated the information.

assessment of the adequacy of information available to the market. If reports are frequently *surprises* and require sharp post-report price adjustments, there is reason to question the adequacy of the information available to the hog market.

EMPIRICAL RESULTS

The classification of the reports, the mean price changes for 5 and 10 days before and after the report, and the price change between the day the report is released and the following day are presented in Table 1. The most striking feature of the neutral reports is the incidence of large price changes on the first trading day following the release of the reports. Twelve of the ten *neutral* reports show limit moves of $1.50 per cwt. in response to the report.[5] The bearish reports also fail to show any recognizable pattern in mean price changes around the report. In general, the September and December reports tend to move downward in the period following the bearish reports. The March and June reports appear to remain at or near price levels prior to the report. The March and June reports may be more successful in attempts to incorporate bearish information prior to the report day.

The eight bullish reports display a more discernable pattern. Many of the price changes on the day following the report are limit moves. There are also sustained positive price adjustments following

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[5] It is important to recognize that other information in the reports can influence price movement. For example, a report classified as neutral in terms of the farrowings data could have unexpectedly large, or small, numbers of market hogs.

TABLE 1. MEAN PRICE CHANGES FOR FIVE AND TEN DAYS BEFORE AND AFTER RELEASE OF THE HOG
AND PIG REPORTS AND CLASSIFICATION OF REPORTS BASED ON RATIO OF ACTUAL
FARROWINGS TO FARROWING INTENTIONS, 1974 THROUGH 1982.

| Report | Contract | Prior to Release | | Post Release | | | Class |
		10 days	5 days	Report Day	5 days	10 days	
March	Oct 75	0.265	0.300	1.500	0.340	0.130	Bullish
March	Oct 78	-0.148	-0.436	1.500	0.996	0.540	Bullish
March	Oct 81	-0.330	-0.134	1.500	1.454	0.780	Bullish
March	Oct 82	0.247	0.284	1.500	0.610	0.315	Bullish
June	Dec 75	0.133	-0.040	1.330	-0.305	-0.198	Bullish
June	Dec 77	-0.048	0.020	1.500	0.545	-0.015	Bullish
September	Apr 79	0.268	0.405	1.025	0.330	0.393	Bullish
December	Jun 80	0.078	-0.370	0.320	0.414	-0.050	Bullish
March	Oct 76	0.235	0.210	-1.225	-0.295	0.088	Bearish
March	Oct 79	-0.090	-0.146	-1.500	-0.824	-0.490	Bearish
June	Dec 76	-0.173	-0.230	0.375	0.170	0.090	Bearish
September	Apr 76	0.315	0.410	-0.150	0.505	0.300	Bearish
September	Apr 78	0.063	-0.050	-0.650	-0.210	-0.185	Bearish
September	Apr 82	-0.045	-0.140	-1.500	-0.770	-0.385	Bearish
December	Jun 79	-0.215	-0.200	-1.500	-0.534	-0.140	Bearish
December	Jun 81	0.102	-0.016	-1.500	-1.214	-0.717	Bearish
March	Oct 74	-0.383	-0.180	-0.950	0.140	-0.038	Neutral
March	Oct 77	0.260	0.150	-1.500	-0.450	-0.025	Neutral
March	Oct 80	-0.138	-0.030	-1.500	-0.790	-0.530	Neutral
June	Dec 74	0.353	0.575	1.500	0.925	0.645	Neutral
June	Dec 78	-0.455	-0.500	1.500	0.816	0.423	Neutral
June	Dec 79	-0.043	-0.256	0.350	-0.254	0.018	Neutral
June	Dec 80	0.292	-0.100	1.500	0.380	0.300	Neutral
June	Dec 81	-0.175	-0.250	1.130	-0.530	-0.197	Neutral
June	Dec 82	0.172	0.330	1.500	0.226	0.003	Neutral
September	Apr 74	-0.288	-0.760	-1.500	0.550	0.525	Neutral
September	Apr 75	0.200	-0.260	0.850	-0.290	0.228	Neutral
September	Apr 77	-0.305	-0.200	-0.950	-0.550	-0.170	Neutral
September	Apr 80	0.172	-0.096	-1.500	-0.830	-0.420	Neutral
September	Apr 81	0.185	0.276	-1.500	-0.136	-0.273	Neutral
December	Jun 74	-0.050	-0.155	-1.425	0.490	0.468	Neutral
December	Jun 75	-0.093	-0.210	-1.450	-0.550	-0.325	Neutral
December	Jun 76	-0.083	0.075	-0.200	0.410	0.215	Neutral
December	Jun 77	0.170	0.240	1.500	0.465	0.193	Neutral
December	Jun 78	0.095	0.144	1.500	0.666	0.465	Neutral
December	Jun 82	-0.208	0.294	1.500	0.810	0.528	Neutral

the reports. The presence of sustained positive price changes following bullish reports suggests live hog futures markets are *information starved* prior to the reports.

Figure 1 presents a plot of the cumulative average price changes for bullish and bearish March Hog and Pig reports. The plot illustrates the randomness of price changes prior to the release of the report and the upward (downward) adjustment following the release of the 4 bullish (3 bearish) reports. (The neutral report showed no sustained move after the report day.) The major moves after the reports suggest inadequate information prior to release of the reports. Whether due to problems and uncertainty surrounding farrowings in the winter months or whether there are some other difficulties, 7 of the 10 March reports were *shocks* in terms of the surprise element. If, as it appears, the issue is one of the adequacy of information versus an ability to register that information, there is support for more and better publicly available information.

Regression analysis was used to further test the pattern in the cumulative average price changes. The data were pooled across all reports for each of the classifications. Linear and quadratic time trend models were fitted to the pooled series. Conceptually, the neutral reports should have a slope of zero, the bullish reports should have a positive slope, and the bearish reports should have a negative slope. Table 2 reports the results of the time trend estimations. As expected, the bullish reports exhibit a significant positive quadratic trend. The

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FIGURE 1. PLOT OF CUMMULATIVE AVERAGE PRICE CHANGES FOR BULLISH AND BEARISH MARCH HOG AND PIG REPORTS, 1974 THROUGH 1982.
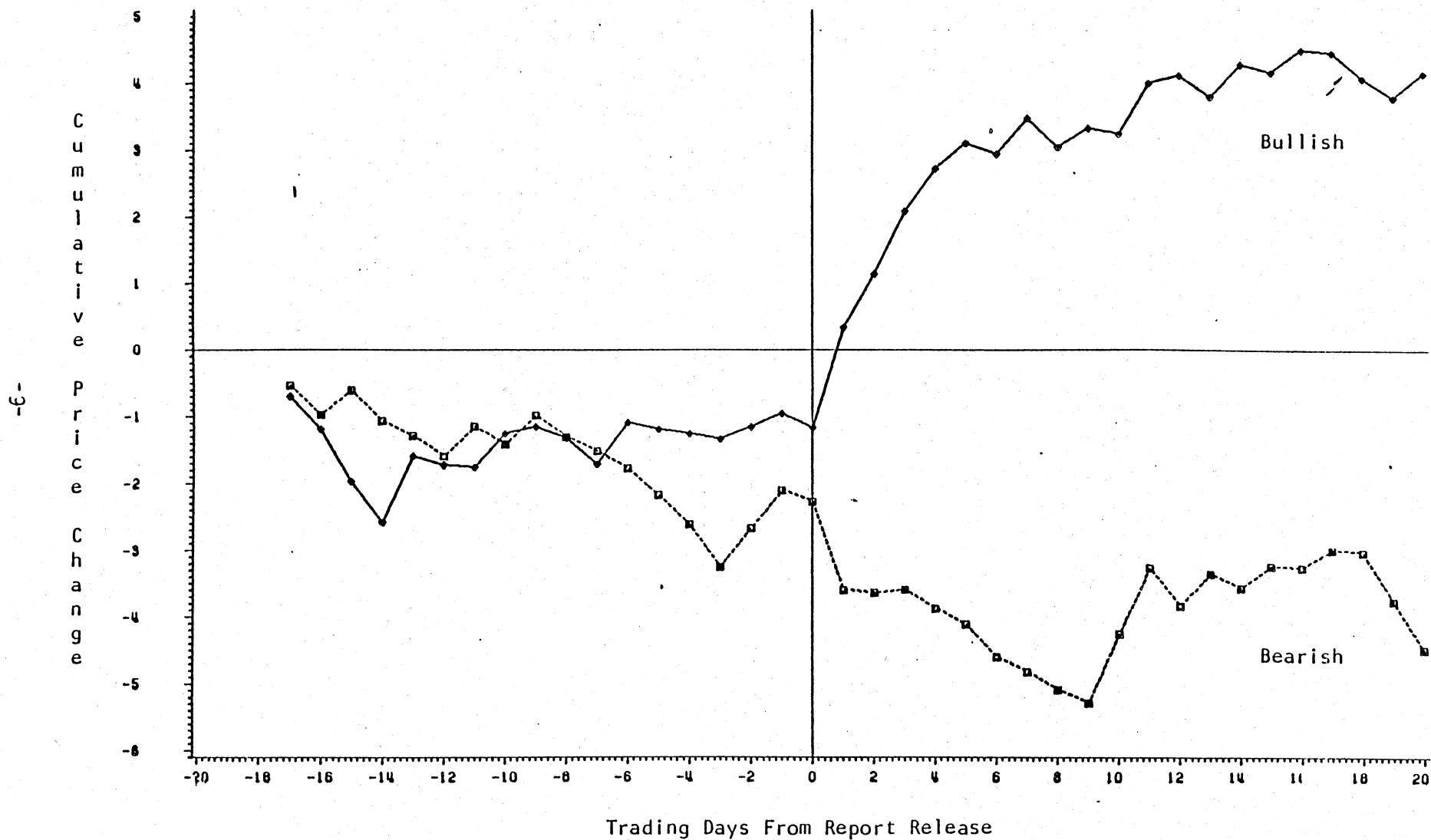
Trading Days From Report Release

TABLE 2. ESTIMATION OF LINEAR AND QUADRATIC TIME TRENDS IN
CUMULATIVE MEAN DAILY PRICE CHANGES BY REPORT
CLASSIFICATION ACROSS ALL REPORTS, SELECTED CONTRACTS. 1

Report Classification	Variable	Estimated Coefficient	P-value 2
BULLISH			
Linear Model	Intercept	.12483E+01	.0009
	Time	-.28654E-02	.1752
Quadratic Model	Intercept	-.49018	.3678
	Time	.31222E-01	.0002
	Time**2	-.11176E-03	.0001
BEARISH			
Linear Model	Intercept	.12672	.7295
	Time	-.84072E-02	.0001
Quadratic Model	Intercept	-.37193E+01	.0001
	Time	.67006E-01	.0001
	Time**2	-.24725E-04	.0001
NEUTRAL			
Linear Model	Intercept	-.23312E+01	.0001
	Time	.55809E-02	.0001
Quadratic Model	Intercept	.32542E+01	.0001
	Time	.13201E-01	.0001
	Time**2	-.10565E-04	.0047

1 The contracts examined are selected to represent a farrow to finish
time period from each report. The October contract is examined
against in the March report, the December contract against the June
report the April contract against the September, and the June against
the December.

2 The P-value is the significance level of the test of the null
hypothesis that the coefficient is equal to zero.

negative coefficient on the quadratic term supports the notion that the majority of the price adjustment occurs immediately after the report is released.

The bearish reports possess a significant linear downtrend as expected. The neutral reports exhibit positive linear and quadratic time trends, indicating that hog futures prices tend to adjust upward following the release of neutral reports. This result may indicate inefficiency in the live hog futures market, but further investigation with more detailed classification schemes is needed before final conclusions can be reached.

CONCLUDING REMARKS

Examination of the impact of quarterly Hog and Pig reports on live hog futures prices provides insight into the efficiency of the information registration process in the hog futures markets. Two simple tests of market efficiency were used to examine price changes for 38 days around the release of the reports. No significant evidence of inefficiency was found in a test of the martingale hypothesis. Limited evidence of dependent day-to-day price changes from autocorrelation analyses can be explained in terms of market reactions to the new information in reports which were a *surprise* to the market.

Mean price changes 10 days before and after and five days before and after the release of the reports indicates the market reacts sharply to bullish information. The market moves downward following bearish reports. Neutral reports are followed by small upward adjustments.

Possible reasons for the downward movements and more detailed classification schemes, involving more than just farrowings, need to be more thoroughly investigated.

The dramatic price adjustments after the bullish reports, and after both the bullish and bearish March reports, suggests live hog futures markets may be *information starved*, particularly following the winter months when there is much uncertainty about farrowings. Dramatic reactions occurred after seven of the 10 March reports.

Regression analysis revealed a significant positive quadratic trend in the cumulative average price changes for bullish and neutral reports. The bearish reports revealed a significant downward time trend, suggesting market adjustment is in the correct direction. Further examination will be necessary to permit more general conclusions regarding the ability of the market to register different types of information.

The event-study method shows promise for the analysis of the impact of periodic USDA reports on agricultural futures markets and for analysis of the relative adequacy of the information being published. Other contracts for live hogs should be examined and the method extended to other markets.

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