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THE INFLUENCE OF FUTURES TRADING ON CASH CATTLE PRICE VARIATIONS

The increased trading and price movements on the commodity futures market over the past year have rekindled arguments as to the effects of futures trading on cash prices. The historical image, as documented by past Congressional hearings, has been that speculation on the futures market causes greater cash price variability than would otherwise be the case. The futures market has been blamed for the high level of wheat prices as well as low potato prices (12, p. 270). Congressional attitude reached a low point in 1958 when onion trading was banned, but in recent years a favorable view has become more widely held (6, p. 290). Suddenly, high agricultural prices in 1973 brought the controversy back into focus. Our area of interest in this paper is to examine the live beef cattle futures contract and its effect on the variability of cash cattle prices.

Most of the literature containing empirical evidence on the influence of futures trading on cash prices has been related to onions and potatoes.¹ Holbrook Working found that "futures trading in onions substantially reduced the amount of variation in spot prices of onions" (13, pp. 3-31). R. W. Gray found that futures trading reduced the range in seasonal onion prices, and that the range increased again after futures trading was banned (3, pp. 273-76). Most recently, A. C. Johnson presented a comprehensive analysis of onion price performance from 1930 to 1968, an inclusive period that started with no futures trading, followed by active futures trading, and ended with nine crop years of no trading. After looking at year-to-year, within-season, seasonal, and within-month price changes, he concluded that "there was no significant shift in price performance in the cash onion market during the entire period" (7, p. iii).

Empirical evidence on potatoes suggests that futures trading has not influenced annual price levels (2, pp. 666-72), and has had a stabilizing influence on annual price variability because the forward market has helped stabilize acres planted (4, pp. 97-121). W. G. Tomek and Gray further demonstrate how an individual potato grower can reduce his annual price variability through a specific hedging program (11, pp. 372-80). Finally, in a note on wheat futures, Tomek

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¹ See 12, pp. 269-72; 6, pp. 289-95; and 5, pp. 85-96 for general reviews of futures markets and price variability. See 8, pp. 5-8 for a review of the literature earlier than what is discussed here which pertains to the impacts of futures trading.

concludes that seasonal variation of wheat prices decreased after the introduction of the futures market (10, pp. 109-13).

M. J. Powers has conducted the only known empirical investigation of the impact of futures trading on continuously produced, semi- or non-storable commodities (9, pp. 460-64). Using the variate difference method of analysis which divides a time series into a systematic component and a random component, he found a reduction in the random element of weekly cash price variability for pork bellies and cattle after the introduction of futures trading. But his method of analysis leaves some problems as to interpretation and defining of these components. It is our purpose here to extend this area of work, but to concentrate just on cattle. We want to examine and compare annual, monthly, and weekly variability in the cash price of cattle for a period of eight years prior to futures trading and eight years during active futures trading.²

THEORETICAL EXPECTATIONS

The theoretical literature pertaining to what influence futures trading is expected to have on cash price variability is mostly related to seasonally produced, storable commodities. Presumably, if the futures market acts as a guide for production decisions, stable forward prices can stabilize production, thereby reducing annual variation. Available evidence suggests that futures prices have less year-to-year variability than cash prices (12, p. 271).

The logic for futures trading to reduce the variability of seasonal price fluctuations is straightforward. Speculators are willing to assume ownership of grain at harvest, creating higher prices and storing more than would otherwise be the case if producers had to assume the risks. Their storing more will tend to keep prices from rising as high as they would have otherwise later in the season. Thus, theoretically, speculators can smooth out seasonal price fluctuations, or reduce the seasonal price range.

The influence of futures trading on short-run cash price variations is less clear and subject to controversy. Short-run price variations can be stabilized if the market is liquid and there is an adequate demand by speculators. However, just the opposite situation could lead to increased price variability. The important trade-off points between speculators, liquidity, demand, and short-run price volatility are difficult to determine (12, pp. 271-22; 6, pp. 292-95).

The theoretical underpinnings concerning the influence of futures trading on cash price variability for continuously produced, non-storable commodities are even less developed than that above.³ It is also more difficult for the futures market to act as a production guide for cattle than for field crops because the biological reproduction lags are longer than the duration of any one futures contract. However, the market can guide feedlot operators in their decision making of when and how many cattle to feed. Since fattening cattle on a feedlot will put beef on

² Powers used four years of data prior to futures trading, and four years with futures trading.

³ A recent development in this area is contained in Anne Peck's Ph.D. dissertation (8). She develops theoretical models for both inventory and non-inventory carrying markets, focusing on the impact of the producer's utilization of futures markets and points out that most investigations in the area have been of a short-term (within-year) nature, and none has examined the producer's role or impact. She also examines empirically the potential impact of producer's utilization of futures markets on the long-run stability of onions.

the market faster than alternative fattening processes, responses to forward prices rather than current prices could potentially reduce annual cash price ranges and variability. This, however, is not a very strong argument. Whether the futures market reduces cash price variability for livestock probably depends mostly upon such factors as liquidity and the demand for contracts, as discussed above.

Nevertheless, Powers presents an effective argument that existence of the futures market generates more information which is of a higher quality, disseminated faster and to more people than would otherwise be the case (9, p. 464):

The result should be more informed decision making and prices that are more closely representative of basic supply and demand conditions; prices whose random element is less than it would be without futures trading; price messages that are more sharply defined and less distorted by noise or the random element.

On logical grounds, the existence of speculators through the futures market theoretically should dampen price fluctuations for any type of commodity, whether they be annual, seasonal, or short-run prices. If speculators possess a "better than average forecasting skill," and there are a sufficient number in the market, they should moderate price fluctuations by buying and selling such that rising prices would be compressed and falling prices would be cushioned. In addition, speculators in the futures market are presumably more willing to assume risks in inventory ownership, buying at higher prices than would, say, processors, and selling at lower prices subsequently than would other market participants, thereby creating a smaller range of cash price variations than would otherwise occur. Thus, we hypothesize that futures trading in live beef cattle will decrease the variability of cash prices in cattle.⁴

We now turn to our empirical investigation of measuring the differences in annual, monthly, and weekly cash price variability before and during futures trading in live beef cattle. We recognize that to fully isolate the effects of speculation from other factors that could influence price variability, it is necessary to have a more complete model of price behavior than we present, but our analysis will at least indicate some trends. It is possible that other technological changes in communication, transportation, and marketing play a role in generating our empirical results, but these advances are more difficult to distinguish, and it is our opinion that the introduction of futures trading is the most dramatic structural change that has occurred in livestock marketing in the last fifteen years.⁵

EMPIRICAL RESULTS

Data

Futures trading for live beef cattle on the Chicago Mercantile Exchange commenced on November 30, 1964 with four contracts deliverable in 1965. Consequently, eight years prior to futures trading, 1957 through 1964, and eight subsequent years, 1965 through 1972, were selected as periods for analysis.

⁴ See Johnson (7, p. 11) for some additional arguments as to why the existence of the futures market may alter cash price performance.

⁵ See 8, p. 7, for a review of the earlier literature pertaining to this problem of isolating the impact of futures trading on cash prices.

TABLE 1.—VARIANCE OF ANNUAL, MONTHLY, AND WEEKLY
CASH PRICES AROUND EIGHT-YEAR AVERAGE PRICES
FOR 1957-64 AND 1965-72, CHICAGO AND OMAHA
(Dollars per hundredweight)

Years	Chicago	Omaha
	Annual	
1957-64	2.99	2.89
1965-72	1.79	1.87
	Monthly	
1957-64	4.80	4.93
1965-72	2.03 ^a	3.25 ^a
	Weekly	
1957-64	4.69	4.50
1965-72	2.79 ^a	2.93 ^a

^a Variability decreased significantly from 1957-64 to 1965-72.

There were two cash price series observed during each period. They are the Chicago and Omaha cash prices for choice beef cattle, 1100 to 1300 pounds.⁶ Both Chicago and Omaha are delivery points for livestock futures contracts, so any effects the futures market has on cash prices should be noticeable at these markets.

The prices collected from these points were deflated by the Index of Prices Received by Farmers (1957-59 = 100), in order to remove the effects of general economic forces. Observed then was the variability of annual, monthly, and weekly cash prices at each market in each period.

Annual Cash Price Variability

Annual cash price variability was measured by computing the variance of the eight annual mean prices around the eight-year average price. Table 1 shows these variances. Using the F test, we found no significant difference in annual cash price variability, at Omaha or Chicago, between the two time periods.

Monthly Cash Price Variability

To measure monthly cash price variability we calculated the variance of the 96 monthly average prices around the eight-year average price, and these are shown in Table 1. Here, cash price variability decreased significantly from period 1, before futures, to period 2, during futures trading, at both Chicago and Omaha.

Also, the variance of the monthly average around the annual average was computed for each year. From these, Pearson's coefficient of variation (1, p. 107) was derived and an average for each eight-year period was obtained. Table 2 shows that average monthly cash price variability decreased 1.1 percentage points at Chicago and 1.0 percentage points at Omaha from period 1 to period 2.

Average coefficients of variation for delivery months and non-delivery months

⁶ Illinois direct prices were used as a substitute for Chicago for 1970-72 because of the closing of the Chicago market. All data were obtained from the U.S. Department of Agriculture, Economic Research Service (USDA, ERS), weekly *Livestock, Meat and Wool Market News*.

TABLE 2.—AVERAGE COEFFICIENTS OF VARIATION
AROUND THE ANNUAL MEAN PRICE

Years	Chicago	Omaha
	Monthly	
1957-64	.050	.054
1965-72	.039	.044
	Weekly	
1957-64	.060	.068
1965-72	.053	.048

were also compiled and are shown in Table 3.⁷ These coefficients were obtained by computing the variance of, say, May's prices around May's eight-year average price. From this, coefficients of variation were calculated and the averages for delivery, non-delivery, and all months derived for each period and each market.

These data show that although there is a definite decrease in cash price variability after the introduction of a futures market, there does not appear to be a consistent pattern as to the differences in average coefficients of variation between delivery and non-delivery months.

Weekly Cash Price Variability

Basically, the same methods of determining monthly cash price variability were used in computing weekly cash price variability. Using the variance of the weekly average price around the eight-year average price, Table 1 shows a significant decrease in variability occurred after the livestock futures market was introduced.

Average coefficients of variation of weekly prices around the annual average (Table 2) show a decrease of 0.7 percentage points at Chicago and 2.0 percentage points at Omaha from period 1 to period 2. However, Table 3 shows that the average coefficients of variation for weekly prices for delivery and non-delivery months generated our largest differences. There is an overall decrease of 3.0 percentage points at Chicago and 3.6 percentage points at Omaha from period 1 to period 2. In delivery months the difference between periods 1 and 2 is 4.3 per-

TABLE 3.—AVERAGE COEFFICIENTS OF VARIATION AROUND
THE EIGHT-YEAR MONTHLY MEAN PRICE

Years	Delivery months		Non-delivery months		All months	
	Chicago	Omaha	Chicago	Omaha	Chicago	Omaha
	Monthly					
1957-64	.078	.070	.081	.064	.079	.067
1965-72	.065	.059	.068	.049	.066	.054
	Weekly					
1957-64	.093	.086	.091	.089	.092	.088
1965-72	.050	.042	.073	.065	.062	.052

⁷ Delivery months are February, April, June, August, October, and December.

centage points at Chicago and 4.4 percentage points at Omaha, whereas in non-delivery months the decrease is 1.8 percentage points and 2.4 percentage points, respectively. The lower coefficients of variation for delivery months than for non-delivery months in 1965-72 is interesting given the adjustments the market makes to align cash and futures prices at delivery. Unfortunately, none of these differences can be tested for significance.

CONCLUSIONS

This short note demonstrates that from the period of 1957 through 1964 to the period of 1965 through 1972, annual variability of cash cattle prices fell, but not significantly, while monthly and weekly variability were significantly reduced. These periods correspond to the years just prior to, and subsequent to, the introduction of the live beef cattle futures contract. One cannot conclude unequivocally from our model that the reduction in variability is entirely due to the futures market. A more complete model would be needed. However, examination of our data year-by-year does show a sharp change in the coefficients of variation beginning in 1965, and in our opinion the futures contract for beef cattle represents the single most significant structural change in livestock marketing at that time.

To explain the reduction in variability, we must rely on the arguments presented previously. That is, the futures market potentially improves market information, reduces transaction costs, and reduces marketing costs by providing transference of risk and facilitating response to anticipated market conditions. Consequently, the performance of cash prices could be modified. We argued previously that these modifications would be a reduction in price variability.

The lack of a change in annual variability may imply that the futures market has had little influence on the behavior of livestock breeders or long-run decision making. This is as expected, given the length of the contracts and reproductive characteristics of cattle. Finally, despite these implications, it is recognized that cash prices are a result of current demand-supply market conditions, and that the potential influence of futures trading can only be indirect through influencing the environment within which the cash cattle market functions. Nevertheless, weekly and monthly variations are significantly reduced.

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