BEEF PRICE HEDGING OPPORTUNITIES FOR
FOOD SERVICE INSTITUTIONS

By

Stephen E. Miller
Assistant Professor
Department of Agricultural and Rural Sociology
Clemson University
Clemson, South Carolina

The author investigates the effective-
ness of the fed cattle futures market as
a cross hedging medium for food service
institutions in the wholesale meat pur-
chasing process. Cross hedging strate-
gies appear to allow food service insti-
tutions to reduce the variability of
wholesale meat prices.

Introduction

Wholesale prices of dressed meat
have exhibited considerable variability
in recent years. For example, the Mid-
west price of top sirloin butts increased
by nearly 60% between February and April,
1978. Dramatic changes in other dressed
meat prices could also be cited. Such
variability can seriously complicate the
planning processes of both public and
private sector food service institutions.
Public sector institutions must often pre-
pare budgets for their next year's opera-
tions; unforeseen wholesale meat price
changes can wreak havoc upon those bud-
gets. Similarly, private sector institu-
tions face profit margin risks due to
variable wholesale meat prices.

Food service institutions may deal
with uncertain future wholesale meat
prices in several ways. These are:

1. Purchase meat only when needed,
   accepting the risks of variable
   prices over time.

2. Purchase meat in advance of actual
   requirements and store until needed.

3. Forward contract with a packer or
   meat broker for the future delivery
   of meat at a price fixed in advance.

4. Use futures markets to hedge anti-
   cipated meat purchases.

By purchasing and storing meat until
needed, an institution may assure itself
of a meat price. However, considerable
storage costs may be incurred, and extend-
ed storage may be technically impractical.
Also, the institution risks losses in
inventory value due to price declines
while the meat is in storage.

Forward contracting provides another
means of locking in a future price for
meat. This approach offers an advantage
over storage in that funds are not tied
up in meat inventories. However, the
institution may have difficulties in
locating packers and/or meat brokers will-
ing to engage in forward contracting.

The final alternative listed above
involves the use of futures markets as a

risk management tool. By definition, to hedge involves taking a position in a futures market equal and opposite to an existing or anticipated cash position. Commodity producers can use hedging to lock-in their output prices; merchandisers can hedge their anticipated commodity purchases. Hedging offers an advantage over forward contracting in that the hedger is not faced with the problem of locating packers and/or meat brokers willing to engage in forward contracting. Also, hedges may be lifted at any time should conditions warrant; forward contracts lack this flexibility.

Prospective hedgers of meat purchases, however, face a major problem in that direct hedging is possible only for pork bellies and imported lean beef; futures markets for other meats do not presently exist. Institutions desiring to hedge meats other than pork bellies and imported lean beef would have to cross hedge, where cross hedging is defined to be the hedging of cash positions in one commodity by using the futures market for a different commodity. Little is presently known about the usefulness of futures markets for cross hedging wholesale meat purchases.

The purpose of this paper is to investigate whether fed cattle futures offer food service institutions the opportunity to reduce their exposure to beef price risks by means of cross hedges. Fed cattle, rather than imported lean beef futures, are considered as the cross hedging medium owing to the historical low trading volume of the latter market. A possible consequence of this low trading volume is that hedgers might suffer from bulges and dips in futures prices when placing and lifting hedges, respectively. While the analysis is confined to selected beef prices, our approach should also be applicable to other beef prices; it may be generalized to evaluate live hog and pork belly futures as cross hedging media for pork prices. Subsequent sections provide discussions of methodology, empirical analysis, and conclusions.

Methodology

In order to carry out the analysis, the following assumptions are made. The food service institution may engage in both cash and futures market activities. The cash market activity involves the purchase at time t of meat in a competitive wholesale market and its transformation into a consumer good. The futures market activity involves the holding of futures contracts from time t-i to t. It is assumed that the quantity of beef to be purchased at time t is known at time t-i.

The quantity (cwt) of futures required to offset the quantity (cwt) of anticipated meat purchases is determined from a regression of the form

$$\hat{WP}_t = a + bFP_t \qquad (1)$$

where

$\hat{WP}_t$ = the predicted wholesale price/cwt of meat at time t;

FP_t = the price/cwt at time to for the futures contract maturing nearest to, but not before, time t;

a = The estimated regression intercept; and

b = the estimated regression slope.

This regression is estimated using historic data on concurrent wholesale meat prices and futures prices for contracts nearest maturity.

The estimated regression slope, b, indicates the estimated level of cross hedging which produces the minimum price risks in meat purchases. The minimum risk cross hedge is not necessarily optimal for the institution. Determination

of the optimal level would require knowledge of the institution's attitude toward risk, and is thus institution-specific. However, the minimum risk cross hedge provides a useful benchmark for comparison to risks encountered when there is no cross hedging.

To illustrate the mechanics of minimum risk cross hedging, suppose that the regression of meat prices on concurrent futures prices is given by $\widehat{WP}_t = 30 + 2FP_t$. Let the price of futures i months from maturity be \$75/cwt at time t-i. The food service firm would buy 2 cwt of futures for every cwt of meat to be purchased at time t. The target meat price would be $30 + 2(75) = \$180$. If futures have risen to \$80 at time t and the regression relationship holds exactly, the net price of meat is given by the meat price of \$190 $[30 + 2(80) = \$190]$ less the gain from futures of \$10 $[2(80) - 75) = \$10]$, or \$180. Of course, if the regression relationship does not hold exactly, the target price will not be obtained.

The data required for the estimation of minimum risk cross hedging levels, wholesale meat and futures prices, are readily available in secondary form. In the empirical analysis which follows, beef price variability with estimated minimum risk cross hedging versus no cross hedging is evaluated.

Empirical Analysis

In this section, dressed beef price variability with estimated minimum risk cross hedging is compared to the variability attending a purchasing strategy without cross hedging. It is assumed that the food service firm makes purchases of dressed beef on the last week of each month, and that the dressed beef quantities are predetermined. Cross hedges may be placed 3, 6, or 12 months prior to the dressed beef purchase dates.

The wholesale dressed beef prices (\$/cwt) used in the analysis are as follows:

Choice Steer Hinds (165-190 lbs)
  East Coast (CAF)
  Central U. S. (FOB)

Domestic Boneless Beef (.7 * 90% lean + .3 * 50% lean)
  East Coast (CAF)

Top Sirloin Butts (10-15 lbs)
  Central U. S. (FOB)

All wholesale prices are weekly averages reported by the Agricultural Marketing Service. Wednesday closing futures prices, rather than weekly averages, are used in order to economize on data collection. The futures prices are taken from Yearbooks of the Chicago Mercantile Exchange.[1]

Minimum risk cross hedging levels for dressed beef purchases at month t are estimated using information available at month t-i (i = 3, 6, and 12), when the cross hedges are placed. The estimates are the regression coefficients from regressions of dressed beef prices during the last week of the month on concurrent near term fed cattle futures prices, where the last observation is for month t-i. Based on previous evidence of seasonal differences in wholesale and live beef price relationships (Hacklander), quarterly intercept shifters (with January to March as the base period) are included as regressors.

December 30, 1970 was arbitrarily selected as the first observation in estimation. The initial sampling interval is comprised of 36 monthly observations, with the first estimated minimum risk cross hedges being placed in November, 1973. Subsequent estimates are based on sampling intervals from December 30, 1970 to t-i. Final cross hedges are lifted on May 30, 1979.[2]

The mean net prices/cwt of beef purchases at time t with cross hedging at estimated minimum risk levels and mean prices/cwt without cross hedging, along

with the corresponding variances of those purchasing strategies, are displayed in Table 1. These results motivate the following comments. In all instances, the variances with minimum risk cross hedging are less than the corresponding variances without cross hedging. The F-ratios indicate that the differences in variances with and without cross hedging are, with the exception of boneless beef hedged for 3 months, statistically significant at or below the 5% level. As might be expected, the reductions in variances from cross hedging are apparently greater for the primal cuts than for either boneless beef or top sirloin butts.

The reductions in variance attending cross hedging strategies are apparently not obtained at the expense of higher mean prices. Judging by t-tests at the 5% level, there are no significant differences in the mean prices with and without cross hedging. In brief, the cross hedging of wholesale beef prices with fed cattle futures appears to offer food service institutions would not face a tradeoff between reduced risks and higher mean prices.

Conclusions

Previous analyses of the effectiveness of livestock futures markets as hedging media have typically emphasized direct hedging strategies. In this paper, the effectiveness of the fed cattle futures market as a cross hedging medium is evaluated. Minimum risk cross hedging strategies appear to allow food service institutions to reduce the variability of wholesale prices for steer hinds, boneless beef and sirloin butts without increasing the mean net prices of those items.

These results indicate that cross hedging is apparently an effective risk management tool for food service institutions. Cross hedging, by reducing the price risks associated with "hand-to-mouth" purchases of meat, should allow

more effective planning upon the part of food service operators. By forward pricing anticipated meat purchases up to a year in advance of actual purchases, public sector institutions should be able to prepare more accurate budgets for their feeding operations. Private sector institutions should be able to reduce profit margin variability.

The apparent usefulness of fed cattle futures as a cross hedging medium also has implications for the potential success of futures markets in dressed beef products. Gray has argued that futures markets for products which may be successfully cross hedged may be redundant, and thus are unlikely to achieve sufficient trading volume to assure survival. The cross hedging alternative offered by fed cattle futures may partially explain the low trading volume of the imported beef futures market.

The analysis presented here could be extended in several ways. Other beef cuts could be added to the analysis, and the analysis could be expanded to include the cross hedging of wholesale pork prices with pork belly and/or live hog futures. Also, selective cross hedging strategies based on forecasts of dressed beef prices could be developed and evaluated. Should the requisite data be available, the results of cross hedging could be compared to purchase and storage, and forward contracting as alternative procurement strategies.

Footnotes

Technical Contribution No. 1825 of the South Carolina Agricultural Experiment Station.

[1]Dates on which wholesale prices were not reported are omitted from the analysis. On dates when futures were not traded due to holidays, etc., the closing prices on the nearest previous trading days are used. When a futures

Table 1.   Results of Purchasing Selected Dressed Beef Cuts With and Without Cross Hedging[a]

Strategy	# of Observations	Mean Cross Hedging Level	Mean Price ($/cwt.)	Variance ($/cwt.)^2	F-ratio
Choice Steer Hinds (East Coast)					
Hedged, i=3	54	1.41	84.92	60.21	1.95**
Not Hedged	54	--	85.58	117.47	
Hedged, i=6	51	1.41	84.98	44.02	2.81**
Not Hedged	51	--	85.77	123.79	
Hedged, i=12	43	1.40	84.27	42.09	3.20**
Not Hedged	43	--	86.66	134.83	
Choice Steer Hinds (Central U. S.)					
Hedged, i=3	45	1.46	81.48	50.19	2.71**
Not Hedged	45	--	82.66	136.17	
Hedged, i=6	42	1.45	81.47	56.87	2.56**
Not Hedged	42	--	82.75	145.87	
Hedged, i=12	34	1.43	79.41	34.13	4.79**
Not Hedged	34	--	83.82	163.58	
Boneless Beef (East Coast)					
Hedged, i=3	60	1.45	68.71	283.67	1.33
Not Hedged	60	--	69.74	377.82	
Hedged, i=6	57	1.44	67.51	205.90	1.93**
Not Hedged	57	--	69.73	396.45	
Hedged, i=12	49	1.43	68.28	172.85	2.49**
Not Hedged	49	--	71.77	430.75	
Top Sirloin Butts (Central U. S.)					
Hedged, i=3	63	2.51	155.57	417.04	1.61*
Not Hedged	63	--	157.78	672.56	
Hedged, i=6	60	2.52	154.14	369.34	1.90**
Not Hedged	60	--	157.97	702.84	
Hedged, i=12	52	2.49	151.14	398.82	1.88*
Not Hedged	52	--	158.90	750.68	

a.   * denotes significance at the 5% level.
    ** denotes significance at the 1% level.

contract maturing at time t had not traded by time 5-12, closing prices on the first trading days of those contracts are used. If contracts were not traded for more than 6 months, they are excluded from the analysis of cross hedging 12 months prior to purchase.

[2]Moving regressions of lengths of 24 and 36 months were considered as alternatives to the sampling intervals reported here. The results for the latter sampling intervals reported here. The results for the latter sampling intervals were clearly superior to the 24-month moving interval, but were only marginally superior to the 36-month moving interval.

References

Gray, R. W., "The Prospects for Trading in Live Hogs," in Futures Trading in Livestock--Origins and Concepts, Madison: Mimir Publishers, 1970.

Hacklander, D. D., Price Relationships Among Selected Wholesale Beef and Pork Cuts. Ph.D. dissertation, Michigan State University, 1971.

* * * * * * * * *