A Preview of the Usefulness of Placement Weight Data

by

Bailey Norwood and Ted C. Schroeder

A PREVIEW OF THE USEFULNESS OF PLACEMENT WEIGHT DATA

*Bailey Norwood and Ted C. Schroeder**

Knowing the number, timing, and weights of cattle placed on feed should be useful in forecasting beef supply. In 1996, the USDA began reporting cattle-on-feed placements in various weights groups. Placement weight data may improve beef supply forecasts because knowledge of placement weight distributions will provide information regarding expected slaughter timings. Currently, monthly USDA placement weight data are not numerically sufficient to derive and test statistical relationships between placement weights and slaughter. However, private data were collected to estimate placement weight data back to 1985. Placement weight data were estimated and used in various models to determine if they improve beef supply forecasts, fed-cattle price forecasts, and economic returns from using this information for selectively hedging. Use of placement weights improved beef supply forecasts only at a one-month horizon; it contributed nothing to price forecast accuracy or returns from selectively hedging. The futures price was the best fed-cattle price forecast among several tested. This suggests a better measure of placement weight data value is its impact on live-cattle futures prices, rather than price forecasting.

Introduction

Despite long-term efforts to produce accurate fed-cattle price forecasts, economists have found this a daunting task (Kastens, Schroeder, and Plain). However, cattle producers indicate that they rely on price forecasts for making production, market timing, and forward pricing decisions (Schroeder et al.). Recently, the USDA began reporting monthly steer and heifer placement on feed numbers by weight in the monthly *Cattle on Feed Report*. These placement weight data are expected to improve fed-cattle marketing projections, since cattle placed on feed at a particular weight will typically be fed a similar and relatively fixed number of days prior to slaughter. Fed-cattle marketings are the most important fed-cattle price determinant, therefore, improved ability to project marketings should also improve price forecasting accuracy. The objective of this study is to determine whether monthly fed-cattle placement weight distribution data can be used to improve fed-cattle price forecasting and cattle feeder and beef packer marketing decisions.

Bacon, Koontz, and Trapp concluded that monthly steer and heifer placement on feed weight distribution data are useful for forecasting monthly fed-cattle marketings. In 1996, the USDA began reporting feeder-cattle placement on feed numbers by various weight categories in the monthly seven-state *Cattle on Feed Report*. Because these USDA data have only been available for a short time, they are not sufficient to derive and test statistical relationships between placement weights and fed-cattle marketings. Therefore, this study uses private feeder-cattle placement weight data collected by Cattle Fax and Professional Cattle Consultants (PCC) to estimate the relationship between placement weights and fed-cattle price forecasts.

---

* Graduate Assistant and Professor, North Carolina State University and Kansas State University, respectively.

The value of placement weight data in forecasting monthly marketings can be determined by comparing out-of-sample fed-cattle price forecasts with and without placement weight data included in the model. Furthermore, the price forecasts should be compared to competing fed-cattle price forecasting techniques and judged by several criteria to determine the benefits of having placement weight data. Two marketings forecasting models are constructed for one- to six-month horizons; one uses aggregate placement data and the other uses placement weight distribution data. Out-of-sample marketing forecasts are conducted to compare the relative forecasting ability and for use in two econometric fed-cattle monthly price forecasting models.

Along with the econometric price forecasting models; an ARIMA, expert prediction, two futures price based, two composite, a naïve, and a random model are compared. Monthly out-of-sample point forecasts and 50% and 90% prediction intervals are simulated one- to six-months ahead from January 1994 through June, 1997. Performance of the point forecasts are judged by root-mean-squared error and the percent of price directions forecasted. Prediction intervals are judged by the percent of actual monthly prices contained within the expected interval. Also, the point forecasts and prediction intervals are used in a selective hedging simulation to determine the relative ability of placement weight data to generate profit-enhancing selective hedges for cattle feeders and beef packers.

Placement Weight Data

Prior to 1996, historical feeder cattle placement weight data were not publicly reported. Therefore, private data were used to estimate past placement weight data. These private estimates were provided by Professional Cattle Consultants and Cattle Fax. Both consultants survey their clients' monthly cattle placements on feed across various weight groups; these consultants indicated their samples each represent approximately 20-25% of U.S. placements. Cattle Fax provided their clients' percent of monthly placements weighing less than 600, 600-699, 700-799, and over 800 lbs. from 1985-1996. PCC provided total monthly placements and placements in those same weight groups from 1988 through June 1997 for their clients. When both private data sets were available, the percent of placements in each weight group were averaged, otherwise only the one available was used.

If PCC and Cattle Fax placement weight distribution data are similar to total placements reported by USDA for the 7-major cattle feeding states[1], these historical private data should be a reasonable proxy for what the USDA data would have been had it reported prior to 1996. By multiplying the percent of monthly placements in each weight group in the private data set by total placements for the 7-major cattle feeding states reported in the *USDA Cattle on Feed Report*, cattle placements in each weight group were estimated. During their short time period of overlap, the percent of placements in each weight group from the USDA and private data move together, as shown in Figure 1, for one weight group. This suggests the historical private data should be a valid proxy for USDA data.

The 7-major cattle feeding states are; AZ, CA, CO, IA, KS, NE, and TX

Without knowing placement weights, cattle placed on feed this month may remain on feed from two to eight months or longer. However, if placement weights are known better approximations can be made regarding the number of days cattle of each weight are expected to be on feed. Table 1 illustrates a summary of actual data of how many cattle of varying placement weights were on feed over an 11-year period in two large Kansas commercial feedyards. These data can be used to help predict timings of marketings, given placement weights.

Usefulness of Placement Weight Data in Forecasting Marketings

Bacon, Koontz, and Trapp explained marketings as a function of past placements, monthly dummy variables, and a time trend. A similar model is developed here. The first model uses aggregate placement variables four to seven months prior to represent past placements, the second model uses placement weight variables three to seven months prior. Marketings used in the estimation were total monthly marketings for the 7-major cattle feeding states. Results are similar to Bacon, Trapp, and Koontz in that placements lagged four and seven months are more significant than five- and six-month lags.

Standard errors using aggregate placement and placement weight data are not significantly different at any horizon. The models were re-estimated each month and used to conduct monthly out-of-sample fed-cattle marketings forecasts and 50% and 90% prediction intervals one- to six-months ahead for January 1994 through June 1997. The results go through August 1997, so a few forecasts are not analyzed. Tables 2 and 3 show the root-mean-squared errors (RMSE), percent marketings directions forecasted, and the percent of actual monthly marketings contained within the prediction intervals. The Ashley, Granger, and Schmalensee (AGS) test was used to discern significant differences in squared errors.[2]

One to four months ahead the model using placement weight data had smaller squared forecasting errors, but these differences were only statistically smaller one-month ahead. Similarly, placement weight data improved turning point frequency one to four months ahead. Neither models' prediction intervals were superior and both contained far less observations than they were constructed to. Placement weight data therefore improves marketings forecasts one-month ahead, but is not significantly different than aggregate placement data at longer horizons. Percent marketings directions forecasted is higher one- to four-months ahead and prediction intervals are not relatively better at describing the marketings probability distribution.

[2] For a discussion of the AGS test, see Ashley, Granger, and Schmalensee; and Irwin, Gerlow, and Liu

Usefulness of Placement Weight Data in Forecasting Fed-Cattle Prices

The primary use of placement weight data is to improve forecasts of fed-cattle prices, so even if it improves fed-cattle marketings forecasts, it may or may not improve price forecasts. Two econometric models were developed to test this. The first model (ECON1) explained price as a function of the quantity of beef supplied[3], a food marketing cost index, and a dummy variable for the second quarter. The second model (ECON2) used only the change in the quantity of beef supplied to explain the change in fed-cattle prices.[4] To forecast prices, the values of the explanatory variables were forecasted. An ARIMA model was employed to forecast the food marketing cost index and beef production components other than marketings. Forecasts were conducted using marketing forecasts from the placement weight data model and aggregate placement data model.

The econometric price forecasts were compared to other forecasting methods. One was expert prediction of an Extension Livestock Marketing Specialist at Kansas State University. Two futures price based models are also included; one was a regression of cash prices on past futures prices, and the other used the futures price as the point forecast and implied volatility from the Black-Scholes Option Pricing Model to obtain standard errors. An ARIMA model, naïve model (using the current cash price), and a randomly generated price from a normal distribution with a mean and variance calculated from monthly prices two years prior were also used. Finally, two composite models which were averages of the four econometric, ARIMA, and two futures price models were constructed. One was an average with equal weights and the other weighted each forecast by its past sum-of-squared errors (in- and out-of-sample). The fed-cattle price used was the monthly weighted average of weekly Western Kansas steer direct trade quotes in dollars per hundredweight.

Monthly point forecasts and 50% and 90% prediction intervals one- to six-months ahead were conducted for January 1994 through June 1997. Root-mean-squared errors for each model and horizon are in Table 3. The econometric models' squared errors differed little when using the two marketing forecasts. Placement weight data resulted in lower squared errors two to three months ahead in ECON1 and two to four months ahead in ECON2, respectively. AGS tests concluded squared errors using placement weight data were only significantly lower at a four-month horizon in ECON2. Neither types of placement data consistently improved the percent of price directions forecasted, and confidence intervals using both data types were virtually identical.

The futures price model using the futures price as the point forecast, ARIMA model, and composite model with equal weights were superior in terms of squared error, the futures price being the best. Table 4 shows the percent of price directions forecasted, and percent of actual monthly prices contained in each prediction interval. The futures price forecasted the most price

[3] Beef supply included marketings; cow, bull, stag, and calf slaughter; imports; and inventories, all in dressed weights.
[4] Other determinants of price such as; pork and poultry production, consumer income, and population were not included because they either had unexpected signs or were insignificant.

directions correctly ranging from 68% to 81% correct, with the ARIMA model and expert prediction also doing well. Producers may desire to make production and marketing decisions based on a range of possible fed-cattle prices, and would want to know which models best describe the fed-cattle price probability distribution. This can be measured by the performance of prediction intervals. The model with the best 50% (90%) prediction interval is the model with the smallest absolute difference between the percent of actual monthly prices it contained and 50% (90%). The ARIMA model is superior by this criteria.

Results may raise questions about the usefulness of placement weight data, or even the usefulness of any placement data since the best price forecasting models did not directly use marketings forecasts. However, the futures market responds significantly to unanticipated information regarding marketings and placements in the *USDA Cattle on Feed Report* (Biere, Grunewald, and McNulty; Dhuyvetter, Schroeder, and Parcell; and Hoffman). Since the futures price was the best point forecast, perhaps the value of placement weight data is in its effect on live-cattle futures prices.

Usefulness of Placement Weight Data in Generating Profit-Enhancing Selective Hedges

Solely determining whether placement weight data improves fed-cattle price forecast accuracy does not measure its value. Smaller errors, per se, are of no value; the ability of cattle feeders and packers to improve their economic position from them is. Thus, whether using placement weight data generates profit-enhancing selective hedges was evaluated. If selective hedges, using price forecasts which incorporate placement weight data as timing signals, generate relatively higher profits from futures market transactions, placement weight data will be deemed valuable as a marketing tool for cattle feeders and packers.

Separate selective hedging simulations were conducted for representative packers (long hedgers) and feeders (short hedgers). Using the monthly forecasts at all horizons; if the forecasted price at month t is lower (higher) than the average of the last five day's futures settlement price for the contract expiring at, or the month after t, minus (plus) transaction costs, the representative short (long) hedger sells (buys) a futures contract. The only transaction costs considered are brokerage fees of $75/contract. Simulations are conducted using forecasted prediction intervals, instead of the forecasted price, as timing signals as well. The representative traders were assumed to offset their contracts the month corresponding to the forecast horizon; the offsetting price was the average settlement price for days 10-15 of that month. The number of short and long hedges and total profits made from the futures transactions are shown in Table 5 for each model.

To interpret the simulation results, simulated profits from the futures transactions were regressed against dummy variables representing the forecasting method used, point estimate and 50% and 90% prediction interval market timing signals, selective short and long hedges, and forecast horizon. The regression parameter estimates, shown in Table 6, have many important implications. Horizon has no significant impact on futures profits. Using confidence intervals, instead of point estimates, as market timing signals do not improve returns, and neither selective short or long hedgers have an advantage over one another in generating positive returns.

Coefficients for each model show the models' relative performance in generating returns from selectively hedging. Econometric model ECON1 (using both aggregate placement and placement weight data), both composite models, and the ARIMA model were relatively superior in generating positive returns; the other models were not significantly different from zero. The coefficients in the ECON1 models using placement weight and aggregate placement data are not significantly different, implying placement weight data do not improve returns when used in econometric models. The ARIMA time-series model was superior in generating returns.

This simulation provides a test for the live-cattle-futures-market efficiency hypothesis. This hypothesis states that if the live-cattle-futures market is efficient, it should fully reflect all available and relevant information (Fama), i.e., one should not be able to speculate on the futures market and generate economic profits. Since the most profitable model was the ARIMA model, this study provides a weak, semi-strong, and strong form test. To test this hypothesis, a 90% confidence interval from the regression was constructed, conditional upon using an ARIMA point forecast as a timing signal for selective short hedges one- to six-months ahead.[5]

Although the most likely return is positive, the 90% confidence interval contains many negative returns, implying returns may be positive on average but are highly volatile. To test whether average returns are significantly positive, a 90% confidence interval for average returns using ARIMA point forecasts as timing signals for selective short and long hedges was constructed for each horizon. The results are ambiguous. When categorized by horizon, average profits are only significantly positive at a four-month horizon. When all horizons are considered, they are significantly positive. These results provide no conclusion regarding the live-cattle-futures-market-efficiency hypothesis. However, it does imply that when selectively hedging over all horizons, one would have earned positive average returns during the period studied. Selective hedgers should be cautious though, as the probability of receiving negative profits are substantial.

Conclusion

Using placement weight data, instead of aggregate placement data, in the marketings forecasting models in this study did little to improve marketing forecasts, and contributed nothing to price forecasts and selective hedges. This suggests that when USDA placement weight data become sufficient to incorporate into statistical models, they should be used in a different framework than this study. Perhaps the larger sample size of the USDA placement weight estimates--relative to the private data used in this study--or a better econometric fed-cattle price model will improve their usefulness, but this seems unlikely since time-series models and the futures price provide more accurate fed-cattle price forecasts.

---

[5] Results do not differ if confidence interval is conditional upon selective long hedges or one of the two confidence intervals.

The usefulness of placement weight data probably depends on its involvement in live-cattle-futures price formation. Although no definite conclusion regarding the live-cattle-futures-market efficiency hypothesis was reached--and previous studies have conflicting results--it persists as one of the best forecasts. If the futures market responds to unanticipated placement weight information in the *Cattle on Feed Report*, it will have positive value to producers and consumers. The value of placement weight data should be measured by its influence on live-cattle-futures-market prices, and not necessarily on its usefulness in forecasting models.

References

Albright, Martin L., M. R. Langemeier, J. R. Mintert, and T. C. Schroeder, "Cattle Feeding Profitability." Cooperative Extension Service, Kansas State University, Bulletin Number C-734, 1993.

Ashley, R., C.W.J. Granger, and R. Schmalensee, "Advertising and Aggregate Consumption: An Analysis of Causality." *Econometrica.* 48(1980):1149-1167.

Bacon, Kevin, S.R. Koontz, and J.N. Trapp, "Forecasting Short-Run Fed Cattle Slaughter," *NCR-134 Conference: Applied Commodity Price Analysis, Forecasting, and Market Risk Management.* B.W. Brorsen ed., Oklahoma State University. April 20-21, 1992.

Biere, Arlo W., Orlen Grunewald, and Mark S. McNulty, "Live Cattle Futures Response to Cattle on Feed Reports." *American Journal of Agricultural Economics.* 75(1993):131-137.

Cattle Fax, Englewood Colorado, personal communication.

Dhuyvetter, Kevin C., Ted C. Schroeder, and Joseph L. Parcell, "The Effect of USDA *Cattle on Feed* Reports on Feeder Cattle Futures Prices." Presented at the Western Agricultural Economics Association Meeting. Reno, NV, June, 1997.

Fama, E. "Efficient Capital Markets: A Review of Theory and Empirical Work." *Journal of Finance.* 25(1970):383-417.

Hoffman, George, " The Effect of Quarterly Livestock Reports on Cattle and Hog Prices." *North Central Journal of Agricultural Economics.* 2(1980):145-150.

Irwin, S.H., M.E. Gerlow, and T. Liu, "The Forecasting Performance of Livestock Futures Prices: A Comparison to USDA Expert Predictions." *The Journal of Futures Markets.* 14(1994):861-875.

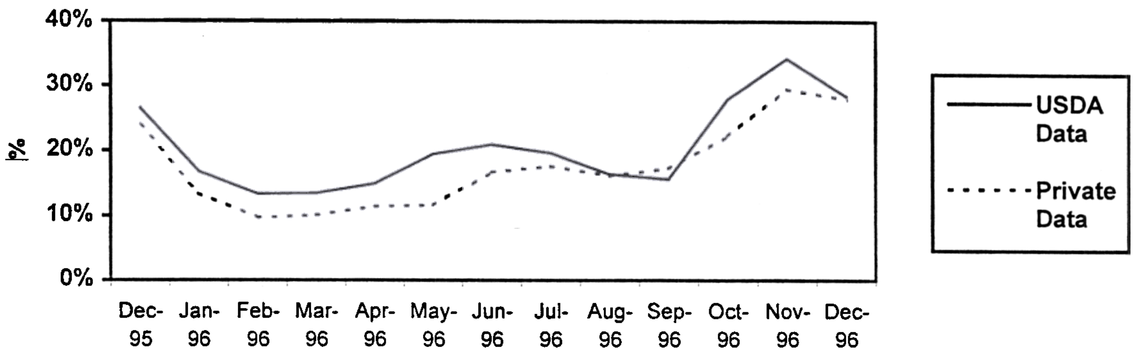
Kastens, T.L., T.C. Schroeder, and R. Plain, "Evaluation of Extension and USDA Price and Production Forecasts." *Journal of Agricultural and Resource Economics.*" In press.

Kolb, Robert W., *Futures, Options, and Swaps.* Kolb Publishing Company: Miami, Florida, 1994.

Professional Cattle Consultants, Weatherford Oklahoma, personal communication.

Schroeder, T.C., J.L. Parcell, T.L. Kastens, and K,C. Dhuyvetter, "Perceptions of Marketing Strategies: Producers vs. Extension Economists." *Journal of Agricultural and Resource Economics.*" In press.

Figure 1.
Percent of Total Placements Under 600 lbs. For 1996
In USDA Reports and Private Data Sets



Source: PCC, Cattle Fax, and *USDA Cattle on Feed Reports*.

Table 1.
Days on Feed For Selected Placement Weights Between January 1984 and December 1994

	600-699 lbs.		700-799 lbs.		800-899 lbs.	
	Average	Std. Dev	Average	Std. Dev	Average	Std. Dev
Days on Feed	150	20	129	17	119	15

Source: Albright et al.

Table 2.
Out-of-Sample Marketings Forecasting Results
January 1994-July 1997

	Forecast Horizon in Months					
	1	2	3	4	5	6
RMSE[a]	150(b)/140(c)	163/130	188/148	180/163	184/189	193/204
% Marketings Directions Forecasted	55%,60%	54%,66%	60%,70%	62%,70%	68%,66%	65%,59%
% Monthly Marketings Contained in 50% CI	26%,21%	10%,19%	17%,7%	18%,18%	23%,15%	5%,11%
% Monthly Marketings Contained in 90% CI	51%,49%	33%,52%	34%,44%	28%,33%	36%,31%	37%,37%

a) RMSE is # of head in thousands, differences in RMSE were only statistically significant one-month ahead
b) Using Aggregate Placement Data
c) Using Placement Weight Data

Table 3.
Root-Mean-Squared Error of Price Forecasting Models at One- to Six-Month Horizons
January 1994 - July 1997

	Forecast Horizon in Months					
	1[a,b]	2	3	4	5	6
Econometric Model (ECON1) With Aggregate Placement Data	4.62*(10)* *a,c,f*	7.03*(11)* *a,c*	7.37*(11)* *a,c,d,g,k*	7.47*(9,10)* *a,c,d,f,g,k*	6.81*(9)* *a,d,f,i,k*	6.86*(9)* *a,d,j,k*
Econometric Model (ECON2) With Aggregate Placement Data	2.46*(6)* *b,c,d,e,f,g,i,k*	4.39*(8)* b,c,d,e,g,h,i,j ,k	5.49*(8)* b,c,d,e,g,i,j	6.14*(7)* b,c,e,g,i,j	6.52(7) b,c,e,g,h,i,j	6.63*(7)* b,c,e,g,h,I,j
Econometric Model (ECON1) With Placement Weight Data	4.77*(11)* *c,a,b*	6.97*(10)* *c,a,b,d,k,f*	7.29*(10)* *c,a,b,d,k*	7.47*(9,10)* *c,a,b,d,j,k,f,g*	6.84*(10)* *c,b,d,i,j,k*	6.88*(10)* *c,b,d,i,j,k,f*
Econometric Model (ECON2) With Placement Weight Data	2.48*(7)* *d,b,e,h,i,j*	4.25*(7)* *d,b,g,c,i,j,f*	5.42*(7)* *d,a,b,g,c,i,j*	6.12*(8)* *d,a,g,c,i,j,f*	6.53*(8)* *d,a,g,,c,i,j,f*	6.64*(8)* *d,a,g,c,i,j,f*
ARIMA	2.40*(4)* *e,b,h,d,i,j,k*	3.63*(3)* *e,b,h,k,f*	4.29*(3)* *e,b,h,f*	4.62*(3)* *e,b,h,i*	4.90*(3)* *e,b,h*	5.05*(3)* *e,b,h*
Expert Prediction	2.75*(9)* *f,a,g,b*	4.00*(5)* *f,e,g,h,,c,d,I, k*	4.76*(5)* *f,g,e*	5.62*(5)* *f,a,g,c,d,i,k,f*	5.81*(5)* *f,a,b,g,d,i,k*	5.34*(4)* *f,c,k,d*
Futures Price Model One "regression of cash on futures price"	2.72*(8)* *g,b,f,j,i,d*	4.82*(9)* *g,b,d,k,f*	6.41*(9)* *g,a,b,d,k,f*	7.71*(11)* *g,a,b,d,k,f,c*	8.43*(11)* *g,b,d,k,f*	8.84*(11)* *g,b,d,k*
Futures Price Model Two "using futures price and Black-Scholes Model"	2.16*(2)* *h,b,e,d*	3.46*(2)* *h,b,e,k,f*	3.92*(2)* *h,e*	4.34*(1)* *h,e*	4.72*(1)* *h,e*	4.87*(2)* *h,b,e*
Composite Model With Equal Weights	2.41*(5)* *i,b,e,d,k,g*	3.04*(1)* i,b,d,j,k,f	3.87*(1)* i,b,d,k	4.53*(2)* i,b,d,k,f	4.73*(2)* i,a,b,c,d,k,f	4.73*(1)* i,b,c,d,k
Composite Model With Varying Weights	2.31*(3)* *j,i,d,k,g*	4.15*(6)* j,b,d,i,k,f	5.21*(6)* j,b,d,k	5.76*(6)* j,b,c,d,k	5.93*(6)* j,a,b,c,d,k	6.04*(7)* j,a,b,c,d,k
Naïve Model	2.01*(1)* *k,b,i,e,j*	3.67*(4)* *k,b,e,g,h,c,i,j*	4.56*(4)* *k,a,g,c,i,j*	5.08*(4)* *k,a,g,c,i,j,f*	5.52*(4)* *k,a,g,c,i,j,f*	5.61*(5)* *k,a,g,c,i,j,f,*
Random Model	11.13*(12)* *l,b*	11.26*(12)*	13.04*(12)*	14.24*(12)*	11.30*(12)*	13.34*(12)*

a) errors with same letters in column are not significantly different
b) number in parenthesis ranks errors from lowest to highest for each horizon

Table 4.
Percent Price Directions Forecasted and Percent of Actual Monthly Western Kansas Fed-Cattle Prices Contained in 50% and 90% Prediction Intervals

	Forecast Horizon in Months					
	1	2	3	4	5	6
Econometric Model	48.84%(a)	47.62%	48.78%	45.00%	51.28%	55.26%
(ECON1) With Aggregate	46.51%(b)	26.19%	26.83%	25.00%	28.21%	36.84%
Placement Data	97.67%(c)	69.05%	68.29%	70.00%	76.92%	78.95%
Econometric Model	58.14%	50.00%	48.78%	47.50%	61.54%	55.26%
(ECON2) With Aggregate	65.12%	30.95%	21.95%	27.50%	23.08%	21.05%
Placement Data	97.67%	78.57%	70.73%	57.50%	56.41%	50.00%
Econometric Model	53.49%	52.38%	48.78%	45.00%	51.28%	55.26%
(ECON1) With Placement	48.84%	21.43%	26.83%	25.00%	28.21%	36.84%
Weight Data	95.35%	64.29%	68.29%	70.00%	76.92%	81.58%
Econometric Model	60.47%	47.62%	46.34%	50.00%	58.97%	52.63%
(ECON2) With Placement	67.44%	30.95%	24.39%	30.00%	23.08%	21.05%
Weight Data	97.67%	80.95%	70.73%	57.50%	56.41%	52.63%
ARIMA	62.79%	66.67%	68.29%	77.50%	76.92%	76.32%
	53.49%	59.52%	53.66%	50.00%	51.28%	55.26%
	93.02%	85.71%	90.24%	92.50%	97.44%	97.37%
Expert Prediction	62.16%	71.79%	71.79%	68.42%	75.68%	75.00%
	37.21%	28.57%	26.83%	25.00%	15.38%	10.53%
	79.07%	69.05%	56.10%	47.50%	51.28%	36.84%
Futures Price Model One	62.79%	69.05%	63.41%	55.00%	51.28%	55.26%
"regression of cash on	44.19%	47.62%	39.02%	37.50%	25.64%	31.58%
futures price"	97.67%	80.95%	90.24%	85.00%	84.62%	81.58%
Futures Price Model Two	69.77%	80.95%	78.05%	67.50%	82.05%	78.95%
"using futures price and	34.88%	54.76%	63.41%	75.00%	76.92%	86.84%
Black-Scholes Model"	65.12%	80.95%	95.12%	95.00%	100.00%	97.37%
Composite Model With	62.79%	66.67%	60.98%	62.50%	64.10%	68.42%
Equal Weights	58.14%	45.24%	41.46%	32.50%	33.33%	34.21%
	95.35%	76.19%	75.61%	72.50%	69.23%	68.42%
Composite Model With	65.12%	66.67%	60.98%	60.00%	61.54%	63.16%
Varying Weights	55.81%	42.86%	39.02%	27.50%	28.21%	28.95%
	95.35%	76.19%	65.85%	67.50%	66.67%	57.89%
Naïve Model(d)	37.21%	42.86%	31.71%	42.50%	38.46%	44.74%
Random Model(d)	41.86%	54.76%	48.78%	37.50%	46.15%	42.11%

a) Percent of Price Directions Forecasted
b) Percent of Actual Monthly Prices Contained in 50% Confidence Intervals
c) Percent of Actual Monthly Prices Contained in 90% Confidence Intervals
d) No confidence intervals were calculated with Naïve or Random Model

Table 5.
Futures Market Transaction Profits From Selectively Short and Long Hedging Over All Horizons Using Various Price Forecasting Techniques as Market Timing Signals

	Market Timing Signal					
	Point Forecast		50% Prediction Interval		90% Prediction Interval	
	Short Hedges	Long Hedges	Short Hedges	Long Hedges	Short Hedges	Long Hedges
			per cwt			
Econometric Model (ECON1) With Aggregate Placement Data	$49.47 26[a]	$19.92 213	($0.14) 1	$64.72 140	$0.00 0	$38.71 14
Econometric Model (ECON2) With Aggregate Placement Data	($63.09) 135	($56.75) 99	($39.94) 72	($40.20) 57	($2.33) 2	($14.92) 13
Econometric Model (ECON1) With Placement Weight Data	$39.69 20	$15.58 217	($0.14) 1	$90.93 141	$0.00 0	$43.80 18
Econometric Model (ECON2) With Placement Weight Data	($48.87) 134	($47.79) 104	($37.24) 70	($42.82) 58	($2.33) 2	($12.16) 15
ARIMA	$64.86 138	$71.95 96	$26.89 36	$39.60 26	$0.34 2	$0.00 0
Expert Prediction	($64.30) 89	($83.63) 118	($10.88) 49	($48.57) 61	($26.62) 10	($9.59)
Futures Price Model One "regression of cash on futures price"	$0.00 0	($46.50) 243	$0.00 0	($22.30) 102	$0.00 0	$0.00 0
Composite Model With Equal Weights	$51.87 52	$44.92 174	$0.34 2	$36.54 82	$0.00 0	$0.90 4
Composite Model With Varying Weights	$45.29 65	$45.24 165	($1.83) 7	$5.13 91	$0.00 0	($2.22) 14
Naïve Model[b]	($44.99) 130	($37.11) 111				
Random Model	($2.70) 16	($40.31) 225	$26.99 25	$8.70 218	$1.33 22	($25.35) 218

a) number of hedges
b) no prediction intervals were used with naive model

Table 6.
Results of Selective Hedging Simulation Regression

Regression Coefficients With P-Values in Parenthesis			
Horizon	-.21597 (.182)	Econometric Model With Differenced Private Data	-.18515 (.565)
Horizon Squared	.02798 (.217)	Random Model	.23945 (.447)
50% Confidence Interval	.15748 (.216)	Naïve Model	-.00687 (.899)
90% Confidence Interval	.23464 (.213)	Composite Model With Varying Weights	.61671 (.067)
Selective Long Hedge	-.10045 (.472)	Composite Model With Equal Weights	.78860 (.022)
Econometric Model With Level Public Data	.89412 (.007)	Futures Price Model One	.18043 (.603)
Econometric Model With Difference Public Data	-.22434 (.486)	Expert Prediction	-.32782 (.295)
Econometric Model With Level Private Data	.83156 (.014)	ARIMA	1.0103 (.002)
R-Square = .0129	*Standard Error = 3.85*	*Degrees of Freedom = 4,725*	

Note: The intercept was dropped to include all dummy variables in the regression