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Evaluating Forecast Accuracy of Cattle on Feed Pre-Release Estimates

Kevin Dhuyvetter and Ted Schroeder*

Forecasts of variables (cattle on feed, placements, and marketings) that are released in the USDA *Cattle on Feed* (*COF*) report by 36 private industry analysts and the composite forecast were evaluated along with the forecasts from an autoregressive model. In terms of relative forecast accuracy, a composite forecast was superior to individual analysts which were superior to autoregressive model forecasts. The majority of individual analysts provided statistically similar forecasts. However, some analysts' forecasts were superior and others were inferior. Also, some analysts have a comparative advantage in which variable(s) they forecast. Several analysts provided extreme (high or low) forecasts more often than randomly expected. This may be done to draw attention to their firm because extreme forecasts typically were relatively inaccurate.

Introduction

Numerous private consulting firms spend time and resources predicting USDA *Cattle on Feed* (*COF*) report estimates, as well as other production and marketing reports, prior to their release. Often times these firms develop pre-release estimates as much as two to three weeks ahead of the actual report release date. Such firms provide pre-release estimates as a service to actual and/or potential clients to help them make trading, marketing, and production decisions. In addition, publication of pre-release estimates provides publicity for these firms.

Bridge (formerly Knight-Ridder) surveys market analysts and major retail commodity firms for their forecasts of the information contained in the USDA *COF* report and publishes a pre-release estimate several days prior to the release of the report. The pre-release report contains the forecasts of each analyst participating in the survey, a high-low range, and a composite forecast for each variable (cattle on feed, placements, and marketings) where the composite is the average of the individual analysts excluding the high and the low. Values most commonly quoted from the Bridge pre-release report are the high-low range and the composite forecast. This may be because the composite forecast is perceived to be the most accurate, or because of the difficulty of determining which individual analysts are the most accurate. Additionally, it may be that an analyst is very accurate one month, but less so the next month. In other words, individual analyst forecast errors may be random over time and thus users of this information tend to rely on the industry average as opposed to any one individual.

The primary objective of this study is to determine how accurately private industry analysts forecast data contained in the monthly USDA *Cattle on Feed* report. Specifically, an objective is to determine if some analysts are superior relative to other analysts, the industry

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composite forecast, or an alternative forecast. A second objective is to determine if analysts providing superior forecasts do so for all variables forecasted (i.e., cattle on feed, placements, and marketings) or if they have a comparative advantage in forecasting a specific variable. A third objective is to determine if some analysts provide extreme forecasts, either high or low, more often than randomly expected relative to other firms.

Previous Research

A number of studies have examined the quality and characteristics of individual analysts' forecasts. Batchelor and Dua (1990a) tested whether individuals forecasting macroeconomic variables tended to be consistently optimistic or pessimistic. They hypothesized that individual forecasters may use a strategy of differentiating themselves by acquiring a reputation as an extremist. They concluded forecasters were consistently either optimistic or pessimistic indicating their forecasts tended to be biased. They also tested whether individual forecasters specialized (i.e., forecasted one variable relatively well at the expense of another variable). They concluded there was little evidence that macroeconomic forecasters developed a comparative advantage in forecasting specific variables. Results of Batchelor and Dua (1990a) suggest that pooling forecasts is valuable because it tends to cancel individual biases towards optimism or pessimism which is consistent with what others have found (e.g., Brandt and Bessler; Kastens, Schroeder, and Plain; Laster, Bennett, and Geoum).

Kastens, Schroeder, and Plain evaluated the accuracy of price and production forecasts from Extension economists responding to the annual outlook survey held in conjunction with the American Agricultural Economics Association annual meeting. Composite forecasts were more accurate than forecasts from any one individual, where the composite forecast was the average of all the individual forecasts.

Colling and Irwin tested average industry survey estimates of breeding and market hog inventories (forecasts of information contained in the USDA *Hogs and Pigs* report) for unbiasedness, efficiency, and forecast performance. Composite industry forecasts were unbiased and efficient. The survey data provided more accurate forecasts than an autoregressive model.

Grunewald, McNulty, and Biere analyzed market analysts' composite forecasts of cattle on feed, placements, and marketings (information contained in the *COF* report) for rationality by conducting unbiasedness, efficiency, and forecast performance tests. Industry composite forecasts for cattle on feed, placements, and marketings were unbiased, but marketings and placements forecasts were inefficient as they did not use all available information. Industry forecasts were superior to an autoregressive model in terms of forecast accuracy. They tested the forecasts of 27 individual analysts' forecasts for unbiasedness, efficiency, and forecast performance from January 1980 through December 1989. Based on mean square forecast errors, all analysts performed better than an autoregressive model and, in all cases except two, forecast errors were highest for cattle on feed and lowest for marketings.

DeCanio argued that statistical data about markets are almost always aggregated which results in the rational behavior of some possibly masking the suboptimal behavior of others. This would also apply when considering the rationality of individual analysts forecasts versus a composite forecast. There have been a large number of studies that have concluded that individual forecasters are biased and thus not rational (e.g., Ehrbeck and Waldmann; Figlewski and Wachtel; McNees). Laster, Bennett and Geoum developed a model in which forecasters' wages were based on their accuracy and their ability to generate publicity for their firms. They showed that even in a case where all forecasters have identical information and identical incentives, forecasters maximizing their wages may deliberately produce biased projections. Thus, they concluded that an individual forecaster may exhibit "rational bias." Laster, Bennett, and Geoum suggested that when Muth was describing a notion of rational expectations he was referring to the aggregate and not the expectations of each individual. They suggested that forecasts should exhibit rational expectations in the aggregate but not necessarily at the individual level.

Given the findings of Laster, Bennett, and Geoum, the rationality of individual forecasters from a market perspective may not be that important. However, knowing the characteristics of individual analyst's forecasts is useful if it allows one to identify "superior" forecasters or construct a better composite compared to a simple average.

Data

Several weeks prior to the release of the monthly USDA *Cattle on Feed* (*COF*) report, Bridge surveys private industry livestock market analysts and major retail commodity firms for their forecasts of the data contained in the report (i.e., cattle on feed, placements, and marketings). Industry analysts' forecasts are made in terms of percent of the previous year values rather than in number of head. For example, if the industry composite forecast for marketings is 106, the industry is forecasting marketings to be 6 percent higher than the year ago level.[1] Bridge reports these pre-release estimates several days prior to the release of the USDA report. The pre-release estimates reported by Bridge, give the industry composite forecast, the high-low range as well as the forecasts of the individual analysts participating in the survey.

The number of private analysts participating in the survey varies from month to month. During January 1981 through July 1998 (211 months), the composite forecast was obtained for 209 months and individual analyst forecasts were obtained for 178 months.[2] Of the 178 months where individual analyst forecasts were available, the number of analysts participating in the survey ranged from a low of 10 to a high of 28 and averaged slightly over 17. During these 178 months, there were a total of 72 different analysts that participated in the survey with the number of forecasts provided ranging from 1 to 161. Several analysts participated in the survey only once while one analyst participated in the survey 161 months out of the 178 total. In analyzing the forecasts of the individual analysts, only those analysts having a minimum of 24 forecasts

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[1] The Bridge pre-release report does not indicate the year ago value. Thus, it is unknown what individual analysts are using when they provide their forecast (i.e., last years' reported value, a revised value, or some expectation of a future revised value).

[2] An attempt was made to obtain missing observations by contacting Bridge and several private industry analysts. While these contacts helped fill in some of the missing data, there were still 33 months where the pre-release survey containing individual analysts' forecasts could not be located.

were considered. Analysts do not always participate in the survey in consecutive months. Also, of the 36 analysts having a minimum of 24 forecasts no two analysts made forecasts for exactly the same time periods.[3]

Analysis of Industry Forecasts

Forecasts of the individual analysts, the composite forecast, and an alternative forecast are tested for forecast performance. Additionally, the forecasts are analyzed to determine whether some analysts are superior (inferior) to others and whether analysts tend to have a comparative advantage (i.e., specialize) in forecasting a certain variable(s). Finally, analysts' forecasts are analyzed to determine if some analysts provide extreme (high or low) forecasts more often than would be expected at random.

Forecast Performance Testing

The forecasts of the individual analysts and the composite are compared to an alternative forecast. Following Grunewald, McNulty and Biere, an alternative forecast used for comparison purposes is based on an autoregressive model. The autoregressive forecast models for cattle on feed, placements, and marketings are defined as,

$$\begin{aligned}
COF_t^{AR} &= \hat{\beta}_0 + \hat{\beta}_1 COF_{t-} + \hat{\beta}_2 COF_{t-12} + \hat{\beta}_3 PLC_{t-1} \\
&\quad + \hat{\beta}_4 PLC_{t-12} + \hat{\beta}_5 MKT_{t-1} + \hat{\beta}_6 MKT_{t-12}\,, \\
PLC_t^{AR} &= \hat{\alpha}_0 + \hat{\alpha}_1 COF_{t-1} + \hat{\alpha}_2 COF_{t-12} + \hat{\alpha}_3 PLC_{t-1} \\
&\quad + \hat{\alpha}_4 PLC_{t-12} + \hat{\alpha}_5 MKT_{t-1} + \hat{\alpha}_6 MKT_{t-12}\,, \\
MKT_t^{AR} &= \hat{\gamma}_0 + \hat{\gamma}_1 COF_{t-1} + \hat{\gamma}_2 COF_{t-12} + \hat{\gamma}_3 PLC_{t-1} \\
&\quad + \hat{\gamma}_4 PLC_{t-12} + \hat{\gamma}_5 MKT_{t-1} + \hat{\gamma}_6 MKT_{t-12}\,,
\end{aligned} \tag{3}$$

where COF^{AR}, PLT^{AR}, and MKT^{AR} are autoregressive forecasts for cattle on feed, placements, and marketings, respectively, and the parameters are estimated from the 36 most recent observations prior to the period for which the forecast is made.[4]

Individual analyst forecasts are tested for forecast performance by comparing mean square forecast errors with those of the composite forecasts as well as the autoregressive models. Forecast errors are the difference between the values for percent of year ago reported in the

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[3] Of the 14 analysts providing forecasts for the most recent *Cattle on Feed* report considered here (July 1998), 12 of them have had more than 24 forecasts.

[4] Autoregressive models with various other lagged variables were considered, but none performed as well as equations (1), (2), and (3) in terms of mean square forecast error.

USDA *Cattle on Feed* report and the specific forecast and are defined as,

$$Forecast\ Error1_{jit} = (USDA_{jt} - ANALYST_{jit})\ , \tag{4}$$

$$Forecast\ Error2_{jt} = (USDA_{jt} - AUTOREGRESSIVE_{jt})\ , \tag{5}$$

$$Forecast\ Error3_{jt} = (USDA_{jt} - COMPOSITE_{jt})\ , \tag{6}$$

where *USDA* refers to the USDA reported value, *ANALYST* refers to the individual analyst forecast, *AUTOREGRESSIVE* refers to the autoregressive forecast, *COMPOSITE* refers to the industry composite forecast, and i, j, and t are indices for individual analyst, forecast variable – cattle on feed (*COF*), placements (*PLC*) and marketings (*MKT*), and time, respectively. Mean square forecast error for the individual analysts is calculated as,

$$MSE1_{ji} = \frac{1}{T}\sum_{t=1}^{T} Forecast\ Error1_{jit}^{2}\ , \tag{7}$$

where $MSE1_{ji}$ is the mean square forecast error for forecast variable j (j = *COF, PLC,* and *MKT*) and analyst i, T is the total number of forecasts made by analyst i, and $Forecast\ Error1_{jit}$ is from equation (4). Similar equations were estimated for the forecast errors associated with the autoregressive forecast error (i.e., $MSE2_{ji}$) and composite forecast error (i.e., $MSE3_{ji}$).

Mean square forecast errors of *COF, PLC,* and *MKT* for the individual analysts, the composite, and the autoregressive models are given in table 1. The mean square forecast errors for placements are consistently higher than for either cattle on feed or marketings regardless of the forecast method. Intuitively, this makes sense as there is less information available pertaining to placements as compared to cattle on feed and marketings. Based on the mean square forecast error, the forecast of cattle on feed has been more accurate than the forecast of marketings. This is somewhat surprising because the information pertaining to the number of fed cattle marketed is reported on a daily basis. Grunewald, McNulty and Biere reported that the mean square forecast error was highest for cattle on feed which was considerably higher than that of marketings and slightly higher than that of placements.[5]

Comparing the mean square forecast error of the composite forecasts (*MSE3*) with those of the individual analysts (*MSE1*) over the same time periods in table 1 reveals that the composite forecast had a lower mean square forecast error 105 times out of a possible 108 (analyst 10 had a lower MSE for cattle on feed and marketings and analyst 58 had a lower MSE for marketings). Comparing the mean square forecast error of the individual analysts, including the composite – analyst 78, (*MSE1*) with those of the autoregressive forecasts (*MSE2*) reveals that the mean square forecast error from the autoregressive models was higher in every case except one – analyst 62 for marketings.

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[5] Mean square forecast errors were calculated using data from January 1981 to December 1989 in an attempt to replicate the results of Grunewald, McNulty, and Biere. The mean square forecast error was still considerably higher for placements than either cattle on feed or marketings. Why their results could not be roughly replicated is not apparent.

The Ashley, Granger and Schmalensee (AGS) test was conducted to statistically test for differences in the mean square forecast errors of the individual analysts with the mean square forecast errors of the composite forecast.[6] At the five percent level, the null hypothesis that the mean square forecast error of the composite forecast is equal to the mean square forecast error of the individual analyst was rejected 21, 21, and 27 times (out of 36 total) for cattle on feed, placements, and marketings, respectively, suggesting the composite forecast is generally superior to individual analysts' forecasts. This result is consistent with previous research suggesting composite forecasts are superior to those of individuals.

The mean square forecast errors of the alternative forecast, here an autoregressive model, were considerably higher than those of the individuals and the composite (table 1). The AGS test was conducted to compare the mean square forecast errors of the autoregressive model with the mean square forecast errors of the individual analysts' forecasts. Rejecting the null hypothesis indicates that the mean square forecast error of the individual analyst is significantly lower than the mean square forecast error of the autoregressive model. At the five percent level, the mean square forecast errors from the individual forecasts were significantly lower than the mean square forecast errors of the autoregressive model 30, 34, and 36 times for cattle on feed, placements, and marketings, respectively. The mean square forecast errors of the composite forecasts for placements and marketings were significantly lower than those from the autoregressive models but the test is inconclusive for the cattle on feed forecast. Results of the AGS test generally support that the composite forecasts are superior to the individual analysts' forecasts which in turn are superior to the forecasts of the autoregressive models.

Superiority and Specialization of Individual Analysts

In addition to comparing individual analysts' forecasts with a composite forecast or an autoregressive forecast, knowing how individual analysts compare to each other is useful. For example, if certain individuals provide forecasts with superior accuracy, relative to other analysts then users of this information may want to seek out those superior analysts. On the other hand, if few analysts (or none) can distinguish their forecasting ability from other analysts, then users of these forecasts should concentrate on the composite forecast rather than individual analysts. Similarly, knowing if individual analysts specialize in forecasting a certain variable is also useful for users of these forecasts.

To compare the forecasts of different analysts a test needs to be constructed that accounts for the differing forecast periods. For example, it may be that an analyst with relatively few forecasts made these forecasts during time periods when all analysts were relatively accurate; whereas, analysts with more forecasts would also have observations during the more "difficult" forecasting time periods. One method to compare the relative accuracy of the individual analysts' forecasts is to stack all of the data (i.e., panel data) and estimate a fixed effects regression model (Greene). To compare the individual analysts forecasts while accounting for time, the following fixed effects models were estimated,

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[6] For a detailed explanation of the AGS test see Bessler and Brandt or Bradshaw and Orden.

$$COFabserr_{it} \quad \beta_i AD_i + \alpha_t TD_t + e \tag{8}$$

$$PLCabserr_{it} \quad \beta_i AD_i + \alpha_t TD_t + e_{it} , \tag{9}$$

$$MKTabserr_{it} = \beta_i AD_i + \alpha_t TD_t + e_{it} , \tag{10}$$

where, *COFabserr*, *PLCabserr*, and *MKTabserr* refer to the absolute forecast error associated with cattle on feed, placements, and marketings, respectively; *AD* is a binary variable for each analyst (less a default); *TD* is a binary variable for each month (less a default); *e* is an error term; *i* and *t* are indices for individual analyst (including the composite – 37 total) and month of forecast (209 total), respectively; and β and α are parameters to be estimated. The test for a significant difference in forecast ability between analysts is based on the null hypothesis, H_0: $\beta_i = 0$, versus the alternative, H_A: $\beta_i < 0$ or $\beta_i > 0$, $i = 1, \ldots , 37$ (excluding default analyst). If the null hypothesis is rejected based on a *t*-test, the forecast of analyst *i* is significantly better (worse) than the forecast of the default analyst.

In order to test the forecast errors of each analyst against all other analysts, equations (8), (9), and (10) were estimated 37 times systematically changing the default analyst each time (i.e., a regression was run with each analyst serving as the default).[7] The number of times the forecast error of an individual analyst was significantly better or worse than all other analysts are reported in table 2. The maximum number of times an individual analyst could be significantly better (worse) than other analysts is 36. Thus, the reported values in table 2 can be divided by 36 to get the percent of analysts a particular analyst was significantly better (worse) than.

The majority of the time the absolute forecast errors of the individual analysts do not significantly differ from each other. For example, 42 percent (93 of 222) of the analysts' forecasts errors were never significantly better or worse than the forecast errors of other analysts. Two-thirds of the time (67%), the absolute error of the analysts' forecasts were significantly better or worse than other analysts two or less times out of a possible 36. The composite forecast (analyst 78) was significantly better than 14, 13, and 17 individual analysts for cattle on feed, placements, and marketings, respectively, and never significantly worse. This further confirms previous research suggesting that a composite forecast is superior to forecasts from individuals.

Several analysts stick out as being particularly good, or bad, relative to the other analysts. For example, forecast errors of analyst 10 are significantly better than 13, 5, and 9 other analysts for cattle on feed, placements, and marketings, respectively. Similarly, forecast errors for analyst 31 are significantly better than 13, 5, and 6 other analysts for cattle on feed, placements, and marketings, respectively. On the other hand, analysts 32 and 61 were significantly worse than other analysts a number of times and rarely significantly better.

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[7] Individual regression results are not reported to save space. There were 2922 observations associated with each equation and the R^2 values were 0.51, 0.64, and 0.54 for *COFabserr*, *PLCabserr*, and *MKTabserr*, respectively. A number of the monthly binary variables were significantly different from the default (July 1998) providing evidence that forecast accuracy varies by time.

Several analysts were consistently better, or worse, for one variable but not others. For example, analyst 24 was significantly better than 15 other analysts with regards to cattle on feed but not much different than other analysts with regards to placements and significantly worse than 8 analysts at marketings. Analyst 28 did poorly with cattle on feed forecasts but average for placements and marketings. Analyst 69 did poorly for cattle on feed and marketings but average for placements. This suggests that some analysts tend to specialize or have a comparative advantage in what they forecast.

Another way to account for time period when forecasts are made is to normalize analysts' forecast errors by examining how errors deviate from the composite forecast error for the same time period and then compare these deviations of the individual analysts rather than the errors themselves. Thus, to compare analysts with each other, given that they have different forecast periods, the following variables were defined:

$$COFscore_{it} = \text{abs}(COFerr1_{it}) - \text{abs}(COFerr3_t)\ , \tag{11}$$

$$PLCscore_{it} = \text{abs}(PLCerr1_{it}) - \text{abs}(PLCerr3_t)\ ,$$

$$MKTscore_{it} = \text{abs}(MKTerr1_{it}) - \text{abs}(MKTerr3_t)\ , \tag{13}$$

where, *COF*, *PLC*, and *MKT* refer to cattle on feed, placements, and marketings, respectively; *err1* refers to the forecast error of an individual analyst; *err3* refers to the error associated with the composite forecast; abs indicates absolute value of the respective error; and i and t are indices for individual analyst and monthly forecast ($t = 1, \ldots$ n), respectively. Unlike the mean square forecast errors reported in table 1, these "score" values are invariant to forecast period thereby allowing individual analysts to be compared. The mean values for *COFscore*, *PLCscore*, and *MKTscore* are reported for each analyst in table 3. Given the way these variables are defined, an analyst with a low score is a more accurate forecaster than an analyst with a high score.

To further compare individual analysts' forecasting ability, the forecast accuracy scores given in table 3 were ranked from lowest to highest (i.e., analyst with lowest mean score was assigned a 1, analyst with second lowest score was assigned a 2, and so on for all 37 analysts). The rankings of the *COFscore*, *PLCscore*, and *MKTscore* variables (reported in table 3) are plotted against each other to visually examine relationships that exist. Figure 1 shows the relationship between *COFscore* and *PLCscore* for the different analysts. The relative accuracy of forecasts for cattle on feed and placements are similar for analyst numbers that fall close to the 45 degree line. For example, the composite forecast (number 78) had a *COFscore* rank of 4 and a *PLCscore* rank of 4 and thus falls directly on the 45 degree line. Analysts in the lower left corner of the figure were relatively accurate with regards to forecasting both cattle on feed and placements. Likewise, analysts in the upper right corner of the figure were relatively inaccurate at forecasting both cattle on feed and placements.

The majority of the analysts are fairly close to the 45 degree line indicating they forecast cattle on feed and placements with similar accuracy – either relatively accurately or relatively inaccurately. However, there are several notable exceptions. Analysts 71 and 66 had the best rank for placements but were considerably worse for cattle on feed. Similarly, analyst 24 was relatively accurate predicting cattle on feed but relatively poor for placements.

Figures 2 and 3 show similar information comparing *COFscore* ranks with *MKTscore* ranks (figure 2) and *PLCscore* ranks with *MKTscore* ranks (figure 3). These figures reveal several analysts that tend to be superior or inferior relative to other analysts. Analysts 10 and 78 (composite forecast) are accurate for all three forecast variables; whereas, analysts 32 and 61 have inaccurate forecasts of all three variables. Analysts 24, 58, and 71 appear to specialize in what they forecast. For example, analyst 24 is a good forecaster of cattle on feed but poor for placements and marketings. Similarly, analyst 58 appears to specialize in forecasting marketings and analyst 71 excels in forecasting placements. While the ranking scores presented in figures 1, 2, and 3 are nonparametric, this information reinforces that there are analysts that provide superior (inferior) forecasts and also some analysts specialize in what they forecast.

Extremism of Individual Analysts' Forecasts

Forecasters have been shown to differentiate themselves by being either consistently optimistic or pessimistic (Batchelor and Dua, 1990b). Laster, Bennett, and Geoum suggested that forecasters may provide extreme forecasts as a means of generating publicity for their firm. Thus, in addition to knowing the relative accuracy of the analysts, users of Bridge pre-release estimates of the *Cattle on Feed* report may want to know if certain analysts tend to provide extreme forecasts, either optimistic or pessimistic, relative to other analysts.

To determine if an individual analyst tends to provide extreme forecasts, a criteria needs to be established as to what constitutes an extreme forecast. For this analysis extreme high and extreme low forecasts were defined according to:

$$\begin{aligned} &\text{if} \quad Forecast_{ijt} > Composite\ forecast_{jt} + (Critical\ value_t \times STD_{jt}) \\ &\text{then} \quad Forecast_{ijt} = Extreme\ high\ , \end{aligned} \tag{14}$$

$$\begin{aligned} &\text{if} \quad Forecast_{ijt} < Composite\ forecast_{jt} - (Critical\ value_t \times STD_{jt}) \\ &\text{then} \quad Forecast_{ijt} = Extreme\ low\ , \end{aligned} \tag{15}$$

where, *Forecast* is the forecast of the individual analyst, *Composite forecast* is the composite forecast as reported by Bridge, *Critical value* is the critical value from a Student's *t* distribution associated with a significance level of five percent and the number of forecasts made for a particular month, *STD* is the standard deviation of the forecasts for a particular month, and *i*, *j*, and *t* are indices for individual analyst, forecast variable (i.e., cattle on feed, placements, and marketings), and forecast month, respectively. *Extreme high* and *Extreme low* are binary variables that are equal to 1 if the forecast is extreme and 0 otherwise.

If an analyst does not consistently provide extreme forecasts and forecasts are normally distributed, then we would expect approximately 90 percent of an individual analyst's forecasts to fall in a range of the composite forecast ± (critical value x standard deviation).[8] Therefore, if

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[8] The word approximate is used because this analysis is using the composite forecast as opposed to the true average. The composite value reported by Bridge is an olympic average (i.e., the high and low have been thrown out). The standard deviation of forecasts used here includes all analysts.

an analyst has more than 10 percent of his forecasts identified as being extreme this is evidence that he consistently, as opposed to randomly, provides extreme forecasts. Furthermore, if more than five percent of an individual analyst's forecasts are extreme high (extreme low) this is evidence that this analyst consistently over predicts (under predicts) a particular forecast variable.

Table 4 reports the percent of times analysts' forecasts for cattle on feed, placements, and marketings were classified as being extreme based on the criteria in equations (17) and (18).[9] Several analysts consistently offer extreme forecasts, either high, low or both, for one or more of the forecast variables. For example, analyst 28 provides extreme high and low cattle on feed forecasts considerably more often than would be expected if the forecasts were random while his forecasts for placements and marketings are extreme only slightly more often than expected. Similarly, analyst 62 tends to be extreme with regards to forecasting marketings, both high and low, but not with regards to cattle on feed and placements. While these two analysts' forecasts tended to be extremely high and low for certain variables, other analysts were consistently either extreme high or extreme low. For example, the forecasts of analyst 50 for all three variables were extreme low more often than would be expected but about what would be expected for extreme high forecasts. The analyst that "sticks out" the most is analyst 69. This analyst provided extreme high forecasts for cattle on feed and placements considerably more often than would be expected and seldom provided extreme low forecasts. Analyst 10, who was quite accurate for all three forecast variables (table 3), seldom provided extreme high or low forecasts.

By comparing the relative forecast accuracy scores reported in table 3 with the percent of forecasts that were classified as extreme for each analyst (table 4), relationships between extremism and accuracy can be identified. The relationship between relative forecast accuracy and the percent of times an analyst provides extreme forecasts is negative.[10] The relationship between forecast accuracy and extreme forecasts for a couple of individual analysts are worth pointing out. Analyst 69 who provided extreme forecasts the highest percentage of time for cattle on feed and placements was not necessarily the poorest forecaster, especially for placements. In contrast, this same analyst had the second worst accuracy score for marketings forecasts – the only variable for which his forecasts were not extreme. Of the analysts that would be classified as being the best based on the results in table 2 (e.g., analysts 10, 31, 52, 66), only one – analyst 52 – provided extreme forecasts more often than would be expected. This one analyst is an example of a firm that apparently knows when to be extreme and thus their extreme forecasts may not be intended to differentiate themselves but rather they may have superior information to other firms.

This analysis confirms that some analysts tend to provide extreme forecasts which differentiates them from other analysts. Perhaps some analysts provide extreme forecasts to draw

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[9] Of the 2713 total forecasts by all analysts made for each variable, 4.4, 3.9, and 4.2 percent were classified to be extremely high forecasts for cattle on feed, placements, and marketings, respectively. Similarly, 3.4, 3.6, and 3.9 percent of the forecasts were classified to be extremely low for cattle on feed, placements, and marketings, respectively.

[10] The correlation between forecast scores (high score implies inaccurate forecast) and percent of extreme forecasts is 0.48, 0.40, and 0.37 for cattle on feed, placements, and marketings, respectively.

attention; whereas, others may posses superior information. This analysis suggests that, as expected, those analysts that consistently provide extreme forecasts, as a general rule, are not as accurate as those analysts that are not extremists.

Summary and Conclusions

Forecasts from individual analysts and the composite forecast in the Bridge pre-release survey of information contained in the USDA *Cattle on Feed* (*COF*) report were analyzed for forecast performance and compared with forecasts from an autoregressive model. The mean square forecast error (MSE) was calculated for each forecast variable (i.e., cattle on feed, placements, and marketings) from each analyst, the composite forecast, and an autoregressive model forecast. The MSE was highest for placements and lowest for cattle on feed. The composite forecast had the lowest MSE 105 out of 108 times when compared to the individual analysts. Similarly, individual analysts had lower MSE than the autoregressive model in every case except one. Based on the AGS test, the composite MSE was significantly lower than 21, 21, and 27 of the 36 analysts' MSE for cattle on feed, placements, and marketings, respectively. This finding is consistent with previous research suggesting composite forecasts are superior to forecasts from individuals. The MSE for individuals was significantly lower than the MSE from the autoregressive forecast 30, 34, and 36 times out of 37 for cattle on feed, placements, and marketings, respectively. When adjusted for similar forecast time periods, the composite forecast was significantly superior to 14, 13, and 17 of the analysts for cattle on feed, placements, and marketings, respectively, and never significantly worse.

Forecasts from individual analysts were examined to determine if some analysts are superior to others and if they specialize in what they forecast. Knowing this information may help users of the Bridge pre-release report develop their own composite forecasts. Comparing individual analysts reveals that the majority of analysts' forecasts do not differ significantly from each other; however, some analysts are superior to others and also some analysts specialize in what they forecast. While knowing that some analysts are superior or specialize in what they forecast can be useful information, identifying these analysts in real time may be difficult.

Another characteristic of analysts is that some provide extreme (either high or low) forecasts more often than randomly expected. This might be done to draw attention to themselves or because it is what they actually believe. Several analysts provided extreme high *and* low forecasts more often than would randomly be expected while others tended to provide *either* extreme high or extreme low forecasts. This suggests that some analysts may be trying to differentiate themselves from other analysts by providing extreme forecasts. One analyst provided extreme forecasts more often than randomly expected and was more accurate than other analysts on average. Thus, as expected, those analysts that provide extreme forecasts, as a general rule, are not as accurate as analysts that are not extremists.

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Table 1. Mean Square Forecast Errors of Variables in USDA *Cattle on Feed* Report.[a]

		Individual Analyst			Autoregressive Model			Composite		
Analyst	N	*COF*	*PLC*	*MKT*	*COF*	*PLC*	*MKT*	*COF*	*PLC*	*MKT*
1	25	3.49	50.53	8.69	4.74	78.45	25.28	2.78	42.01	6.41
6	35	3.51	49.17	8.43	6.94	126.37	39.47	2.04	34.04	6.50
8	90	3.12	55.23	8.57	6.52	108.90	25.51	2.09	36.43	7.19
9	57	2.07	44.88	6.98	6.68	115.30	31.84	1.82	36.12	6.12
10	36	2.92	56.82	7.87	7.72	141.85	31.89	2.95	53.97	8.20
13	152	2.45	46.04	8.45	6.71	126.91	24.89	2.03	39.53	7.15
22	148	3.84	53.52	11.60	6.43	117.45	25.04	2.15	38.28	7.83
23	82	3.09	44.21	8.10	5.93	107.85	24.33	2.18	40.66	6.12
24	29	2.19	50.48	14.42	4.71	84.75	28.35	1.85	24.40	6.83
26	161	3.19	66.54	10.71	6.79	125.96	26.64	2.04	38.19	7.67
28	90	4.94	47.38	11.36	7.25	126.97	23.36	2.19	36.92	7.86
29	43	2.82	56.86	9.44	7.40	123.23	38.39	2.30	43.88	7.18
30	32	3.18	43.39	10.02	6.94	133.27	24.60	2.14	39.33	6.62
31	30	2.55	37.12	7.94	4.35	81.07	25.40	2.05	30.40	7.33
32	105	4.53	55.55	12.56	7.40	124.37	23.97	2.15	35.43	7.69
37	51	2.10	41.61	10.12	7.85	133.70	17.94	1.76	32.69	8.24
38	25	2.21	53.73	15.17	5.99	137.28	35.93	1.74	46.36	8.25
41	34	2.79	54.51	7.51	5.54	114.42	25.53	2.24	45.45	6.09
42	115	2.70	49.69	9.36	6.71	118.72	28.11	1.96	37.05	7.25
46	110	2.49	44.70	8.52	7.67	128.83	24.65	2.31	40.58	6.96
47	134	3.09	58.82	12.24	6.13	123.21	21.82	2.09	40.28	7.00
48	52	3.02	62.73	10.15	8.69	154.69	20.17	2.05	39.79	7.54
49	73	3.18	45.81	12.24	7.65	135.89	20.82	1.93	36.66	8.30
50	43	3.45	55.32	9.29	5.16	110.68	23.75	2.22	43.00	6.21
51	66	2.87	46.72	8.31	5.98	88.04	31.15	2.07	38.57	7.73
52	155	2.15	42.13	11.21	6.27	122.64	23.74	2.08	37.76	7.31
55	116	2.37	41.43	9.91	6.71	128.54	20.68	2.04	37.16	6.82
58	47	2.83	61.55	6.25	7.07	117.80	34.05	1.99	38.63	6.30
60	119	2.85	50.81	9.57	6.58	125.69	23.06	2.24	39.83	8.17
61	82	4.06	70.68	12.43	6.90	131.80	19.13	2.10	38.97	6.79
62	30	2.05	42.04	12.09	9.98	161.20	10.26	1.82	30.67	7.46
66	67	2.71	36.22	8.89	7.17	134.88	19.36	1.81	35.57	6.54
69	50	3.70	39.88	14.54	6.36	111.16	24.91	1.98	32.99	7.97
70	61	2.83	39.02	10.39	7.20	136.26	18.87	1.86	34.42	7.18
71	24	4.23	51.94	12.93	5.04	119.19	36.51	2.09	51.80	8.41
73	144	2.76	48.21	8.71	6.75	131.62	24.35	2.08	38.09	7.58
78[b]	209	2.34	41.53	8.32	7.09	132.04	27.93	2.34	41.53	8.32

[a] *COF* = Cattle on feed, *PLC* = Placements, *MKT* = Marketings.

[b] Analyst 78 is the composite forecast; thus, MSE of individual analyst 78 = MSE of composite forecast.

Table 2. Frequency of Times an Individual Analyst's Absolute Forecast Error is Significantly Better or Worse than Other Analysts' Absolute Forecast Error at the Five Percent Significance Level.[a]

		COFabserr		*PLCabser*		*MKTabserr*		Net
Analyst	N	Better	Worse	Better	Worse	Better	Worse	Better[b]
1	25	2	0	0	0	0	0	2
6	35	0	12	0	2	0	1	-15
8	90	2	5	0	5	1	1	-8
9	57	4	0	4	0	2	0	10
10	36	13	0	5	0	9	0	27
13	152	8	0	6	0	2	1	15
22	148	1	18	1	4	1	2	-21
23	82	4	0	9	0	1	1	13
24	29	15	0	0	2	0	8	5
26	161	2	9	0	25	1	1	-32
28	90	0	32	1	2	2	0	-31
29	43	2	0	0	2	1	0	1
30	32	7	0	5	0	1	0	13
31	30	13	0	5	0	6	0	24
32	105	0	28	0	19	0	16	-63
37	51	8	0	4	0	2	0	14
38	25	0	1	0	0	0	4	-5
41	34	7	0	4	0	6	0	17
42	115	3	0	1	4	2	1	1
46	110	8	0	5	0	2	0	15
47	134	2	6	1	3	0	8	-14
48	52	2	0	0	11	2	0	-7
49	73	2	5	1	0	1	1	-2
50	43	3	0	4	0	2	0	9
51	66	2	5	4	0	1	0	2
52	155	13	0	8	0	1	2	20
55	116	9	0	5	0	1	1	14
58	47	1	5	0	19	4	0	-19
60	119	7	0	4	0	5	0	16
61	82	1	16	0	19	0	6	-40
62	30	2	0	0	0	0	0	2
66	67	4	0	13	0	4	0	21
69	50	1	12	1	0	0	27	-37
70	61	2	2	5	0	1	0	6
71	24	0	12	4	0	0	2	-10
73	144	4	0	4	0	5	0	13
78[c]	209	14	0	13	0	17	0	44

[a] The number of times the forecast error score of an individual analyst was significantly better or worse than the 36 other individual analysts (including the composite) based on a *t*-test from estimating equations (8) - (10).

[b] Net better equals the sum of significantly better less the sum significantly worse for an individual analyst.

[c] Analyst 78 is the composite forecast

Table 3. Means and Ranks of Individual Analyst Forecast Error Scores.[a]

		COFscore		*PLCscore*		*MKTscore*	
Analyst	N	Mean	Rank	Mean	Rank	Mean	Rank
1	25	0.128	17	0.728	22	0.352	17
6	35	0.374	32	1.031	30	0.437	24
8	90	0.244	24	1.032	31	0.382	19
9	57	0.070	10	0.372	13	0.174	6
10	36	-0.075	1	0.025	5	-0.108	1
13	152	0.097	13	0.265	6	0.294	14
22	148	0.413	34	0.926	28	0.476	27
23	82	0.121	15	-0.009	3	0.351	16
24	29	-0.055	2	1.590	34	1.103	37
26	161	0.280	28	1.645	37	0.424	22
28	90	0.670	37	0.814	25	0.374	18
29	43	0.084	11	0.809	24	0.256	11
30	32	0.069	9	0.294	7	0.413	20
31	30	-0.003	3	0.303	10	0.130	4
32	105	0.515	36	1.448	33	0.710	35
37	51	0.041	6	0.494	15	0.253	10
38	25	0.284	29	0.780	23	0.632	33
41	34	0.091	12	0.453	14	0.176	7
42	115	0.140	18	0.904	27	0.289	13
46	110	0.066	8	0.295	8	0.263	12
47	134	0.260	26	0.865	26	0.628	32
48	52	0.235	22	1.421	32	0.419	21
49	73	0.275	27	0.710	21	0.515	28
50	43	0.191	20	0.530	17	0.426	23
51	66	0.236	23	0.503	16	0.226	9
52	155	0.023	5	0.299	9	0.474	26
55	116	0.062	7	0.333	11	0.471	25
58	47	0.255	25	1.623	36	0.021	3
60	119	0.120	14	0.565	18	0.208	8
61	82	0.426	35	1.598	35	0.707	34
62	30	0.160	19	0.960	29	0.627	31
66	67	0.193	21	-0.037	1	0.339	15
69	50	0.350	31	0.652	20	1.030	36
70	61	0.308	30	0.349	12	0.620	30
71	24	0.404	33	-0.021	2	0.571	29
73	144	0.126	16	0.569	19	0.173	5

[a] Forecast error scores are calculated using equations (11) - (13).

Table 4. Percent of Times an Individual Analyst's Forecast is Extreme.[a]

		Extreme High[b]			Extreme Low[b]			Extreme High or Low[c]		
Analyst	N	COF	PLC	MKT	COF	PLC	MKT	COF	PLC	MKT
1	25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	35	0.0	0.0	0.0	5.7	0.0	0.0	5.7	0.0	0.0
8	90	3.3	5.6	4.4	2.2	3.3	0.0	5.6	8.9	4.4
9	57	1.8	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0
10	36	2.8	2.8	0.0	0.0	2.8	2.8	2.8	5.6	2.8
13	152	2.6	2.6	2.0	2.0	2.0	2.6	4.6	4.6	4.6
22	148	8.8	3.4	6.8	6.1	3.4	6.1	14.9	6.8	12.8
23	82	1.2	1.2	3.7	2.4	3.7	2.4	3.7	4.9	6.1
24	29	6.9	10.3	3.4	6.9	3.4	3.4	13.8	13.8	6.9
26	161	1.9	4.3	5.6	6.2	10.6	3.7	8.1	14.9	9.3
28	90	15.6	6.7	8.9	12.2	4.4	6.7	27.8	11.1	15.6
29	43	2.3	4.7	9.3	2.3	2.3	2.3	4.7	7.0	11.6
30	32	3.1	3.1	6.3	6.3	0.0	6.3	9.4	3.1	12.5
31	30	0.0	0.0	0.0	3.3	3.3	0.0	3.3	3.3	0.0
32	105	4.8	5.7	11.4	6.7	8.6	4.8	11.4	14.3	16.2
37	51	9.8	7.8	2.0	2.0	5.9	0.0	11.8	13.7	2.0
38	25	0.0	0.0	4.0	8.0	4.0	16.0	8.0	4.0	20.0
41	34	2.9	0.0	0.0	0.0	0.0	5.9	2.9	0.0	5.9
42	115	3.5	3.5	1.7	1.7	1.7	2.6	5.2	5.2	4.3
46	110	0.9	5.5	2.7	1.8	3.6	1.8	2.7	9.1	4.5
47	134	4.5	3.0	6.0	1.5	3.7	9.7	6.0	6.7	15.7
48	52	0.0	0.0	3.8	1.9	11.5	1.9	1.9	11.5	5.8
49	73	4.1	0.0	1.4	0.0	1.4	1.4	4.1	1.4	2.7
50	43	4.7	2.3	7.0	9.3	9.3	9.3	14.0	11.6	16.3
51	66	3.0	3.0	6.1	4.5	4.5	0.0	7.6	7.6	6.1
52	155	9.7	8.4	5.8	5.8	5.8	13.5	15.5	14.2	19.4
55	116	0.0	0.9	2.6	0.0	0.9	0.9	0.0	1.7	3.4
58	47	4.3	4.3	2.1	2.1	2.1	2.1	6.4	6.4	4.3
60	119	0.8	0.8	0.8	0.0	0.0	0.8	0.8	0.8	1.7
61	82	2.4	7.3	3.7	3.7	7.3	2.4	6.1	14.6	6.1
62	30	6.7	0.0	10.0	3.3	3.3	16.7	10.0	3.3	26.7
66	67	7.5	3.0	3.0	0.0	1.5	3.0	7.5	4.5	6.0
69	50	34.0	24.0	4.0	2.0	0.0	0.0	36.0	24.0	4.0
70	61	0.0	1.6	3.3	3.3	0.0	3.3	3.3	1.6	6.6
71	24	0.0	0.0	8.3	16.7	4.2	4.2	16.7	4.2	12.5
73	144	1.4	4.2	3.5	1.4	1.4	2.8	2.8	5.6	6.3

[a] An individual analyst's forecast is deemed to be extreme according to the criteria outlined in equations (14) and (15) and is based on a significance level of five percent. COF refers to cattle on feed forecasts, PLC refers to placements forecasts, and MKT refers to marketings forecasts.

[b] Percentages greater than five suggests that an analyst provides extreme forecasts more often than randomly expected.

[c] Percentages greater than ten suggests that an analyst provides extreme forecasts more often than randomly expected.

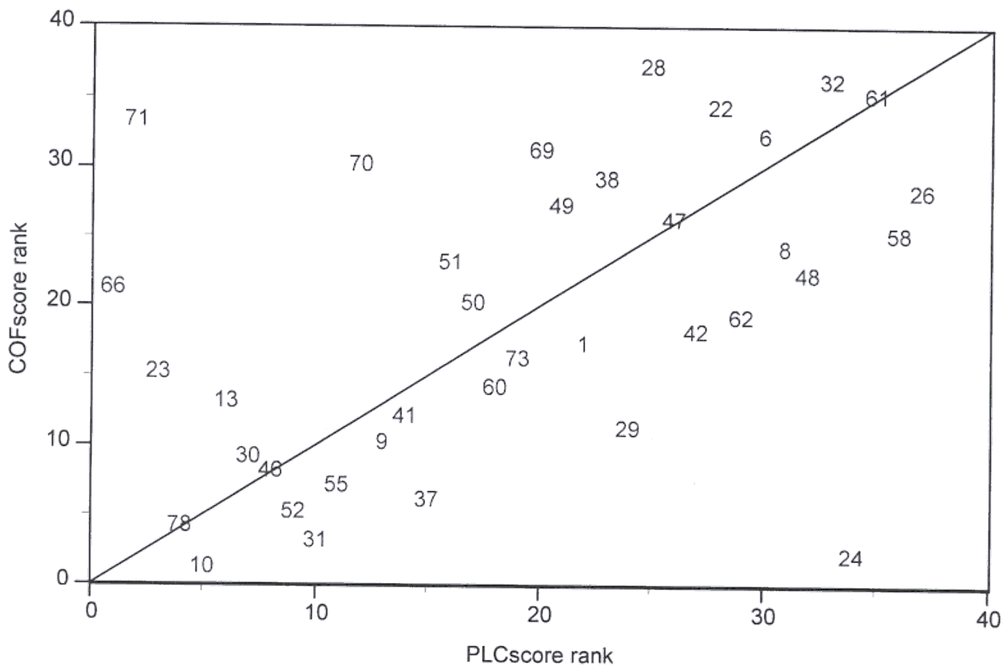

Figure 1. Comparison of Individual Analysts Ability to Forecast Cattle on Feed vs. Placements (individual points represent the relative rankings of each of the analysts).

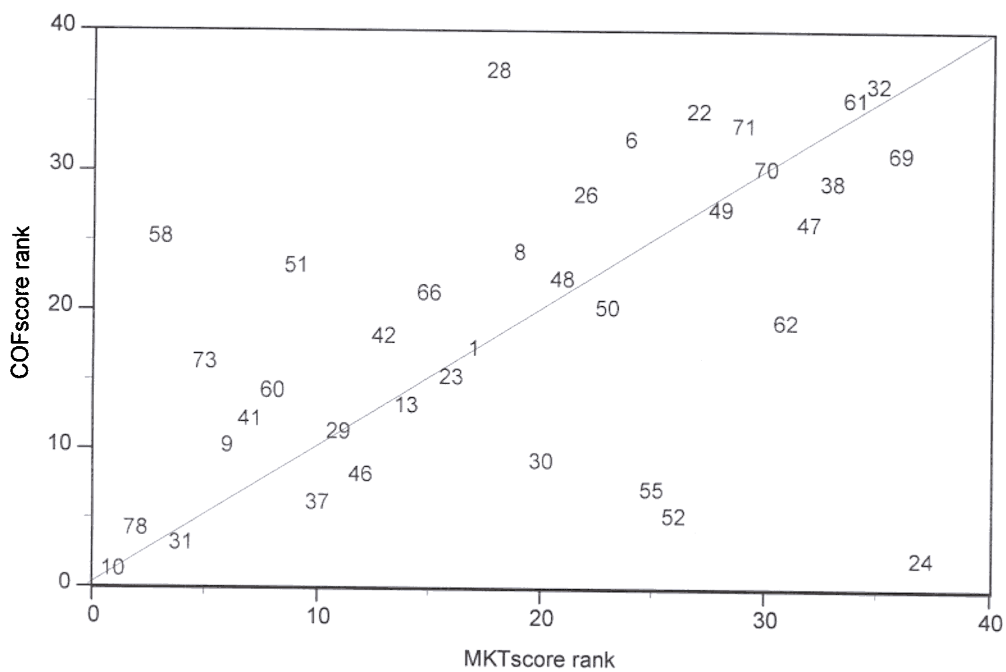

Figure 2. Comparison of Individual Analysts Ability to Forecast Cattle on Feed vs. Marketings (individual points represent the relative rankings of each of the analysts).

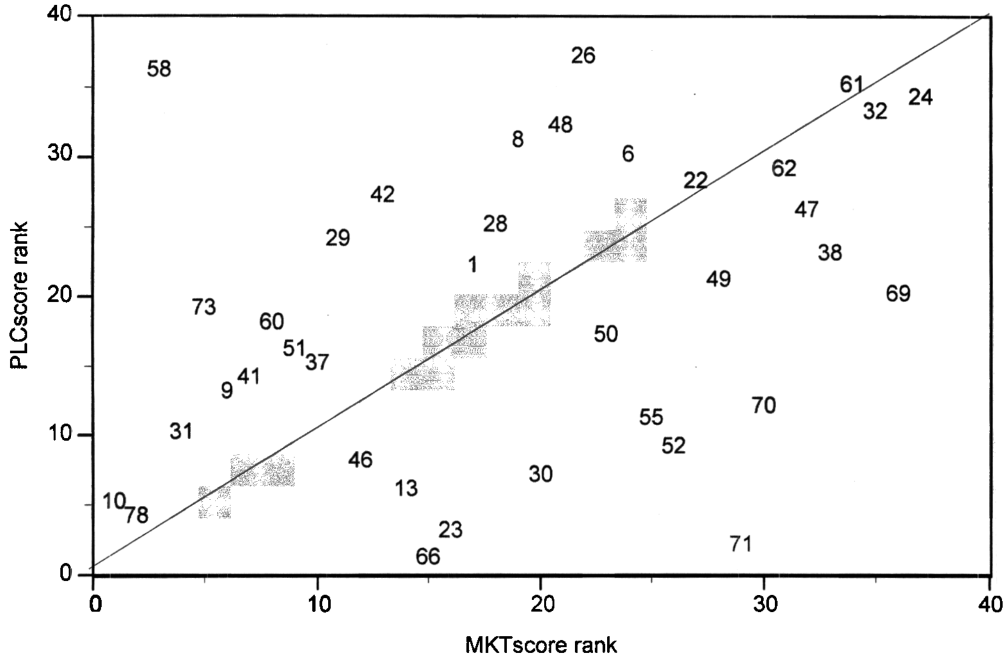

Figure 3. Comparison of Individual Analysts Ability to Forecast Placements vs. Marketings (individual points represent the relative rankings of each of the analysts).