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Source: *Journal of Accounting Research*, Vol. 29, No. 1 (Spring, 1991), pp. 150-156
Published by: Wiley on behalf of Accounting Research Center, Booth School of Business, University of Chicago
Stable URL: https://www.jstor.org/stable/2491033
Accessed: 01-10-2018 09:37 UTC

Journal of Accounting Research
Vol. 29 No. 1 Spring 1991
Printed in U.S.A.

Capsules and Comments

The Forecast Accuracy of Individual Analysts: Evidence of Systematic Optimism and Pessimism

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1. *Introduction*

O'Brien [1990] examines the annual earnings forecast accuracy of individual analysts reporting to the *Institutional Brokers Estimate System* (*IBES*) of Lynch, Jones and Ryan during July 1975–September 1982. Using a regression model which adjusts for average firm and year effects, O'Brien finds no evidence of differential forecast accuracy. Comparing individual analysts' earnings forecasts to median consensus forecasts during 1983–86, we also find no statistically significant evidence of differential analyst forecast accuracy.

Our result, however, does not mean that one analyst's forecasts are much like another's. We find that analysts are persistently optimistic or pessimistic relative to consensus forecasts. We examine this persistent behavior and its effect on measures of forecast accuracy over a sample

* Michigan State University; † New York University. We gratefully acknowledge the comments of Warren Bailey, Peter Bernstein, K. C. Chan, David Girard, Dorian Feldman, David Mayers, Patricia O'Brien, and John Schreiber on previous drafts of this manuscript and the assistance of Dale Berman and Karen Waldemar of Lynch, Jones and Ryan. Funding was provided by Bell Atlantic Corporation and Michigan State University.

period in which analyst forecasts consistently overestimate actual earnings.

Our sample consists of forecasts of annual earnings for 49 firms with December year-ends selected from the top 65 firms in the December 1986 *Fortune* index. Firms undergoing stock splits, stock dividends, or mergers are omitted. Individual analysts' forecasts of current-year primary earnings per share before extraordinary items (*IBES* field "*FY*1") and the analysts' self-reported forecast dates were provided by Lynch, Jones and Ryan for 30 of the 48 months during 1983–86. Forecasts reported to *IBES* on a diluted basis are changed to primary *EPS* according to the ratio of fully diluted *EPS* to primary *EPS* in *Compustat*. *Compustat* is also the source of earnings and share price data. Empirical results focus on the 9,120 forecasts of 186 analysts providing at least three earnings estimates in each sample year.

2. *Analyst Forecast Errors over the Sample Period*

Define an analyst's average annual forecast error as:

$$\sum_{k=1}^{N^{it}} (F_k^{it} - Y_k^{it})/P_k^{it-1}, \tag{1}$$

where N^{it} is the number of earnings forecasts made by analyst i during year t for any of the firms in the sample, F_k^{it} is analyst i's kth earnings forecast of year t annual primary earnings per share for a firm, Y_k^{it} is actual annual earnings corresponding to analyst i's kth earnings forecast during year t, and P_k^{it-1} is the year-end closing price in year $t - 1$ corresponding to the kth forecast of analyst i. N^{it} can include multiple forecasts from analyst i for a given firm and year. Forecast error (1) measures an individual analyst's average annual over- or underestimate of actual earnings. Dividing by share price yields forecasted and actual earnings/price ratios. Using beginning-of-year prices reduces the interaction between year t forecast errors in the numerator and price changes, and hence price, in the denominator.

Over long periods, there is usually little evidence of consistent forecast bias (e.g., Brown, Foster, and Noreen [1985]); but over our four-year sample period, at least 69% of individual analysts' average annual forecasts fell above average annual earnings (table 1). The mean forecast error divided by share price was .0161 while the mean level of earnings was .0593, when divided by 1986 year-end price.

3. *Persistence of Analyst Forecast Performance over Time*

We examine forecast accuracy and optimism/pessimism by comparing analysts' forecasts to median consensus forecasts. (Conclusions are the same based on comparisons with a mean consensus.) O'Brien [1988]

TABLE 1
*Average Annual Forecast Error Distributions**

		1983	1984	1985	1986	Average
Entire Sample of Firms:						
186 Analysts	Mean	0.0061	0.0131	0.0237	0.0214	0.0161
49 Firms	Standard Deviations	0.0141	0.0244	0.0292	0.0243	0.0230
9,120 Forecasts	Overestimates	69.9%	73.1%	83.9%	79.0%	76.5%
	Underestimates	30.1%	26.9%	16.1%	21.0%	23.5%
Firms with Low *Value Line* Earnings Predictability Rank (0–50):						
70 Analysts	Mean	0.0136	0.0216	0.0388	0.0153	0.0223
18 Firms	Standard Deviations	0.0223	0.0332	0.0481	0.0294	0.0333
2,232 Forecasts	Overestimates	71.4%	84.3%	82.9%	60.0%	74.6%
	Underestimates	28.6%	15.7%	17.1%	40.0%	25.4%
Firms with High *Value Line* Earnings Predictability Rank (51–100):						
134 Analysts	Mean	0.0027	0.0061	0.0149	0.0266	0.0126
31 Firms	Standard Deviations	0.0072	0.0195	0.0172	0.0227	0.0166
5,931 Forecasts	Overestimates	61.9%	65.7%	81.3%	91.0%	75.0%
	Underestimates	38.1%	34.3%	18.7%	9.0%	25.0%

* Average annual forecast error is calculated according to equation (1) for each analyst in each sample. Means and standard deviations are calculated across the individual analysts' average annual forecast errors. Overestimates (underestimates) represent the proportion of analysts with average annual forecasts falling above (below) average annual earnings.

finds that the most current forecast is at least as accurate as the mean or median of all available forecasts but that aggregating across current forecasts can further improve accuracy. Given O'Brien's results, we construct median consensus forecasts from at least three competing analysts (i.e., not including the analyst being examined) with forecast dates in the same month. Median estimates exhibit slightly greater forecast accuracy in our sample.

Define average annual relative forecast accuracy as:

$$\sum_{k=1}^{N^{it}} [|F_k^{it} - Y_k^{it}| - |C_k^{it} - Y_k^{it}|]/P_k^{it-1}, \tag{2}$$

where C_k^{it} is the median consensus forecast corresponding to F_k^{it}. This measure controls for the average predictability of both the firm and the time of forecast by subtracting the absolute magnitude of consensus forecast errors. Superior analysts are required to "beat the consensus" regardless of its accuracy. This approach differs in detail but not in spirit from that of O'Brien [1990].

Ideally, tests of forecast accuracy would control for higher moments of earnings predictability. For instance, analysts of firms with volatile earnings are likely to deviate from both the consensus estimate and actual earnings by a wider margin than those following less volatile firms. Comparing analyst forecast accuracy across disparate earnings realizations disproportionately weights the forecast accuracy of analysts following firms with hard to predict earnings. O'Brien's [1990] emphasis on industry samples controls for this effect.

To control for differences in earnings predictability, we dichotomize the sample according to *Value Line*'s earnings predictability ranking (0–50 = low and 51–100 = high predictability). This rank is related to the dispersion of analysts' beliefs. In table 1, the standard deviation of individual analysts' average annual forecast error is higher for analysts following firms of low earnings predictability than for analysts following firms of high earnings predictability. We run our statistical tests on the entire sample as well as on each earnings predictability class.

Define average annual relative forecast error as:

$$\sum_{k=1}^{N^{it}} (F_k^{it} - C_k^{it})/P_k^{it-1}. \tag{3}$$

This measures the magnitude and direction of an analyst's average annual disagreement with the consensus. Optimists consistently forecast above the consensus, while pessimists consistently forecast below.

Analysts are ranked in descending order according to (2) and (3) in each sample year. Consistently inferior or optimistic analysts should appear near the top of each year's rankings. Conversely, consistently superior or pessimistic analysts should appear near the bottom of each year's rankings. Table 2 provides the number of analysts consistently falling above (below) each of the top (bottom) five deciles.

Dichotomize analyst forecast performance into success S_t if an analyst ranks in the top D analysts from a sample of N analysts in year t and failure F_t otherwise. Then $P[S_t] = D/N$ and $P[F_t] = 1 - D/N$. Under the assumption that analyst forecast rankings are independent over time, the joint probability that a given analyst will rank in the top D analysts in each year is $P[S_1S_2S_3S_4] = (D/N)^4$. Note that once an analyst's rank is determined in a year, no other analyst may possess the same rank except in the case of a tie; therefore, there is dependence of analyst ranks within a single year.

We use a simulation approach to estimate the probability distribution. Let X be the number of analysts satisfying $S_1S_2S_3S_4$ in a given sample. We estimate the probability mass $P[X = c]$ on each point $X = c$ under the assumption that analyst forecast ranks are independent over time based on 5,000 trials as follows:

(1) Draw D observations *without replacement* from the N ranks.
(2) Independently repeat this random sampling for each of the four sample years.
(3) Count the number of analysts c that appear among the top D analysts in all four years. Increment the probability mass assigned to point $X = c$ by 1/5000.
(4) Repeat the above steps 5,000 times.

TABLE 2

*Number and Significance of Analysts Falling Above (Below) the Kth Decile in Each Year**

Decile	1	2	3	4	5
Entire Sample of Firms:					
Expected	0.02	0.30	1.51	4.76	11.63
Optimistic	1	2	3	6	17
	(0.02)	(0.04)	(0.17)	(0.31)	(0.05)
Pessimistic	1	6	7	11	25
	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)
Inferior	0	0	5	8	14
	(1.00)	(1.00)	(0.01)	(0.08)	(0.24)
Superior	0	2	3	8	15
	(1.00)	(0.04)	(0.17)	(0.08)	(0.15)
Firms with Low *Value Line* Earnings Predictability Rank:					
Expected	0.01	0.11	0.57	1.79	4.38
Optimistic	0	2	3	5	8
	(1.00)	(0.00)	(0.02)	(0.03)	(0.04)
Pessimistic	1	1	2	5	9
	(0.01)	(0.11)	(0.10)	(0.03)	(0.01)
Inferior	0	0	1	1	4
	(1.00)	(1.00)	(0.43)	(0.86)	(0.68)
Superior	0	0	1	2	3
	(1.00)	(1.00)	(0.43)	(0.55)	(0.86)
Firms with High *Value Line* Earnings Predictability Rank:					
Expected	0.01	0.21	1.09	3.43	8.38
Optimistic	0	0	2	5	14
	(1.00)	(1.00)	(0.30)	(0.22)	(0.02)
Pessimistic	1	3	7	8	18
	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
Inferior	0	1	3	5	10
	(1.00)	(0.18)	(0.08)	(0.22)	(0.31)
Superior	0	1	2	6	12
	(1.00)	(0.18)	(0.30)	(0.10)	(0.10)

* The number of analysts ranking in the top (optimistic or inferior analysts) or bottom (pessimistic or superior analysts) k deciles ($k = 1, \ldots, 5$) in each year of the sample period. Estimated probability values under the independence assumption from the Monte Carlo simulation appear in parentheses.

The only values of c with nonzero probability mass are $0 \leq c \leq D$. The resulting probability distribution provides a one-tailed test of:

$$P[X \geq c] = \sum_{i=c}^{D} P[X = i] = 1 - \sum_{i=0}^{c-1} P[X = i].$$

Probability values generated by this simulation stabilized at the 0.01 level after 4,000 iterations for every point $X = c$ in each of the 15 (3 samples $\times$ 5 decile thresholds) distributions estimated with the simulation procedure.

Probability values from this approximation procedure appear in table 2 for the top five deciles in each sample. Note that the fifth-decile probability values are more reliable than the probability values for deciles

1 through 4 because of the larger expected values. For the sample of 186 analysts, a difference of a single analyst at the first-decile level swings the probability value from 1.00, as in the case of inferior and superior analysts, to 0.02, as for optimistic and pessimistic analysts. While we report probability values for deciles 1 through 4, we base our conclusions solely on the fifth-decile results.

We find no statistically significant evidence ($\alpha = .05$) of persistent differential forecast accuracy at the fifth-decile threshold. In contrast, statistically significant evidence of persistent optimism and pessimism exists at the fifth-decile threshold in the entire sample and in both earnings predictability classes. A majority of observed values in the first four deciles are also greater than the expected number.

Our sample selection criteria result in a highly selected sample of long-surviving and relatively active analysts following large firms. The finding of persistent analyst optimism and pessimism is especially surprising in this sample. The earnings forecast behavior of less active analysts or of analysts following smaller firms may be different.

Pessimistic analysts should enjoy superior forecast accuracy because of the consistently positive observed forecast errors over our sample period. To examine the relation between analyst optimism/pessimism and relative forecast accuracy, we constructed 3×3 contingency tables of analysts' average rankings over all four years according to (2) and (3). Chi-square statistics based on these tables indicate that analysts' average optimism/pessimism is associated with lower/higher average forecast accuracy (significant at the .03 level) in the entire sample and in both earnings predictability classes.

Several characteristics of analysts' forecasts could influence the finding of persistent analyst forecast behavior. Just as analysts forecasting earnings for firms of low earnings predictability may have more variable forecast errors, analysts providing fewer forecasts per year or reporting forecasts earlier in the year may have more variable average annual forecast errors. Analysts' average number of forecasts per year and average time of forecast during the year (January = 1 and December = 12) were compared to the four-year average relative forecast accuracy (2) and relative forecast error (3) measures. Based on correlations and cross-tabulations, these analyst characteristics are statistically unrelated to relative forecast error and relative forecast accuracy.

4. Conclusion

Analysts in our sample persist over time in their optimism or pessimism relative to consensus earnings forecasts, for firms of both high and low earnings predictability. Individual analysts show little evidence of persistent differential forecast ability. We conclude that observed differences in forecast accuracy in our sample depend on the interaction of analyst optimism or pessimism with observed forecast errors and not on differential forecasting ability on the part of individual analysts.

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