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This study extends the above research and assesses forecast accuracy for eight distinct industries during the period 2010-2015 from the perspectives of:

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This study extends the above research and assesses forecast accuracy for eight distinct industries during the period 2010-2015 from the perspectives of:

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Results indicate than when analyst forecasts are assessed over distinct forecast horizons of 5, 60 and 120 days, greatest forecast accuracy is achieved during the 5 day forecast horizon, and the 5 day forecast horizon is significantly different from the other forecast horizons observed.

With respect to comparison of forecast accuracy by industry, firms in the Technology, Healthcare, Banking/ Finance, and Oil/Gas industries have an absolute forecast error less than those in the other industries sampled.

When attention turns to comparison of forecast accuracy within industries, the same industries, namely, Technology, Healthcare, Banking/Finance, and Oil/Gas, were observed to contain analysts who were significantly above their specific industry average, while the remaining industries of Utilities, Real Estate, Transportation, and Industrials were observed to contain analysts who were significantly below their specific industry average.

I. Introduction

The issue of differential earnings forecast accuracy among financial analysts is an important one from the perspectives of market-based accounting research, and also the investor. Most prior studies utilizing analyst forecasts as proxies for the market's earnings expectation are based on averages of all available forecasts. Logically, it would seem that if some analysts are more accurate than others, and if the market is aware of this, the earnings expectation should assign higher weights to forecasts of those analysts who are deemed to be better forecasters.

Financial news coverage suggests that there are above average financial analysts. For example, *Institutional Investor's* annual "All American Research Team," and the *Wall Street Journal*, reference financial analysts who are rated above average by money managers on a variety of criteria, including forecast accuracy. Analyst services (i.e. IBES) are known to have useful aggregate characteristics. Dimson and Marsh (1984), Elton, Gruber and Grossman (1986), and Brown, Richardson, and Trzcinka (1988) find that investment strategies constructed from aggregate analyst earnings forecasts can be used to the investor's benefit. The primary use of analyst earnings forecasts in academic studies is to provide a proxy for the market expectation of future earnings. Forecast aggregations, such as a mean or median of multiple analysts, are often used for this purpose. These proxies assume that analysts have approximately the same forecasting ability, so the identity of the individual forecaster is ignored in deriving the consensus forecast.

If some analysts are consistently superior (or inferior) forecasters, then the market's knowledge of those forecasters' ability can be used to improve accuracy of the consensus measure. Improvements in consensus forecasts are therefore possible if the market can assess superior (or inferior) forecasters by their related forecast accuracy over time. Because most analysts identify themselves with certain firms in specific industries, it may be possible that those superior (or inferior) forecasters may have the potential of residing in specific industries. Obrien (1990) assessed a sample of financial analysts across nine industries during the period 1975-1982. The study finds that no significant differences in financial analyst accuracy exists. This view is opposite that of Sinha, Brown and Das (1997) which finds significant differences in financial analyst' accuracy, primarily in the Utilities industry.

As previously noted, academic research, along with some investors, utilize proxies for future earnings. These proxies consist of aggregate forecasts by analysts. If it could be substantiated that there exists superior (or inferior) analysts, in terms of accuracy, greater weight may be assigned to the forecasts of these analysts in order to produce a more accurate consensus forecast. By the same token, if it can be shown that analysts in certain industries possess these qualities, the perception, along with the quality of the consensus forecast for that industry might change as well. The purpose of this paper is to examine the forecast accuracy of analysts over time and by industry group in an effort to measure forecast accuracy and assess its impact on the aggregate forecast by industry type.

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II. Literature Review

Obrien (1990) conducted a comprehensive analysis of forecast accuracy among financial analysts in nine industries during the period 1975-1982. The conclusion of this study is that significant differences in the earnings forecast accuracy of financial analysts do not exist. This runs contrary to literature published in such notable investment periodicals such as the *Institutional Investor* and the *Wall Street Journal*, which have over the years not only asserted that there are differences in financial analysts, but have recognized those who are considered superior analysts. Other extant studies such as Richards (1976), Brown and Rozeff (1980), Obrien (1987), Coggin and Hunter (1989), Butler and Lang (1991), and Stickel (1992) also support the Obrien (1990) finding that supports the absence of analysts who possess the ability to generate more accurate forecasts over time.

Sinha, Brown, and Das (1997) re-examine this issue of forecast accuracy among financial analysts during the period 1984-1990, consistent of the fourteen largest industries at the time. Contrary to previous research, the authors find that significant differences do exist in financial analysts' forecasts, primarily centered in the Utilities industry. They show that previous research failed to find differences due to inadequate control for recency in the forecast issued by the analyst. Prior studies such as Crich field, Dyckman, and Lakonishok (1978), Obrien (1988), and Brown (1991) have documented that forecast recency has a positive relationship to forecast accuracy. Failure to control for forecast recency may alter the results of the tests, making it difficult to account for any differences in forecast accuracy.

Sinha, Brown and Das (1997) define a superior (inferior) analyst as one having a smaller (larger) forecast error in earnings per share forecast. This association is contingent on the firm, year, and forecast recency of the analyst. The authors replicate the analysis of Obrien (1990) but control for forecast recency using two approaches: an estimated general least squares estimation procedure, and a matched-pair design.

Both the Obrien (1990) study and the Sinha, Brown, and Das (1997) study assess the characteristics of analyst forecasts during decades when the U.S. economy was structured slightly differently (i.e. 1970s through the 1990s). Deutsch (2016) finds that since the since the 2008 recession, the industries that drive growth in the U.S. are not necessarily the ones which drove it to the same extent prior to the recession. For instance, since 2010, four primary industries have led the way in job growth, investment and revenue in America. Those industries are; Healthcare, Technological Services, Banking/Finance, and Oil/Gas. At the same time, there are industries which have shown a precipitous drop in the same categories. Those industries are; Industrials, Utilities, Transportation, and Real Estate. Previous studies which undertake to study the accuracy of analyst forecast do so during time periods which may be described as less relevant to the current economy and investor mind set. Also, these prior studies, which include multiple industries do not distinguish which industries (if any) might possess superior (or inferior) analysts.

This study will attempt to extend the Sinha, Brown and Das (1997) study by assessing the more current time frame of 2010-2015 and by analyzing any significant differences in forecast accuracy across industry. In doing so, it is hoped that the study will provide a more relevant and contemporary look at an issue that has been the focus of academic research for more than four decades.

III. Hypotheses Development

In their analysis of forecast accuracy, Sinha, Brown, and Das (1997) utilize a matched-pair design in which the forecast accuracy of the same analyst is measured over varying forecast horizons. For example, an analyst would make a forecast 120 days from the firm's earnings release and this would be regarded as a 120 day horizon. The same analyst makes another forecast for the same firm 60 days from the earnings release date and this is a 60 day horizon. Then the analyst provides a third forecast of the same firm 30 days prior to earnings release. This is a 30 day horizon. Mean forecast errors are then summed for the analysts by industry and year in order to determine if accuracy varies across horizon. The Sinha, Brown, and Das (1997) study utilizes 14 industries from the period 1984-1990 to assess accuracy by forecast horizon. This study will attempt to extend this analysis by answering three specific questions:

1. Does the accuracy of the individual analysts change as the forecast horizon changes?
2. Do analysts in some industries possess greater accuracy than those in other industries?
3. Are there any differences in the accuracy of the analysts within an individual industry?

The first research question gives rise to the first hypothesis, stated in the null form:

H1: There is no significant difference in analyst forecast accuracy over forecast horizon.

The second research question gives rise to the second hypothesis, also stated in the null form:

H2: There is no significant difference in forecast accuracy of analysts across industries.

Lastly, the third research question is addressed by the third hypothesis, stated in the null form:

H3: There is no significant difference in the forecast accuracy of the analysts within an individual industry.

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a) Sample

The sample selection consists of analysts' point forecasts of annual earnings per share (EPS) for a given firm and time period. Forecasts are derived from the Institutional Brokers Estimate System (IBES) for the period 2010-2015. Consistent with Obrien (1990) and Sinha, Brown, and Das (1997), three samples are derived with forecast horizons of 5, 60 and 120 trading days. The selected analyst forecast is the one closest to one of the above forecast horizons. Only analysts who forecast in three of the six year test period are included in the sample. The source for the firms' actual reported EPS is COMPUSTAT. The samples in the study represent firms in eight predominant industries; Utilities, Real Estate, Transportation, Industrials, Technology, Healthcare, Oil/Gas, Banking/Finance.

Table 1 provides each sample representation by: 1. Industry. 2. Number of forecasts. 3. Number of analysts generating the forecasts. 4. Number of firms represented.

Table 1 : Sample Summary

Forecast Period 2010-2015

Industry	Descriptor	5 Day Horizon	60 Day Horizon	120DayHorizon
Utilities	Forecasts	2,750	1,080	410
	Analysts	27	24	18
	Firms	18	18	17
Real Estate	Forecasts	602	518	399
	Analysts	19	17	15
	Firms	15	15	14
Transportation	Forecasts	1,802	1,501	1,287
	Analysts	30	27	22
	Firms	21	21	20
Industrials	Forecasts	1,419	1,197	1,019
	Analysts	74	74	74
	Firms	65	65	65
Technology	Forecasts	3,041	2,996	2,847
	Analysts	102	98	84
	Firms	86	85	79
Healthcare	Forecasts	1,977	1,842	1,701
	Analysts	69	58	50
	Firms	57	55	49
Oil/Gas	Forecasts	1,208	1,199	1,044
	Analysts	62	62	61
	Firms	46	46	44
Banking/Finance	Forecasts	1,381	1,299	1,201
	Analysts	57	57	57
	Firms	48	47	46
TOTAL	Forecasts	14,180	11,632	9,908
	Analysts	440	417	381
	Firms	356	352	334

As indicated in Table 1, the sample for the 5 day forecast horizon consists of 14,180 total forecasts, representing 440 analysts and 356 firms. For the 60 day forecast horizon, there are 11,632 forecasts, representing 417 analysts and 352 firms. The 120 day forecast horizon consists of 9,908 forecasts, representing 381 analysts and 334 firms. Consistent with prior studies, as the forecast horizon increases, the number of forecasts diminish.

b) Test of Hypotheses and Results

Test of Hypothesis 1-test of forecast accuracy over forecast horizon

In assessing forecast accuracy by horizon, the model consistent with Obrien (1990) is used:

$$|eijt| = |Rjt - Fijt| \quad (1)$$

Where: subscripts i, j, t denote analyst, firm and year, respectively

R_{jt} is the j firm's reported EPS in year t

F_{ijt} is the forecast of EPS by analyst i for firm j in year t

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|eijt| is the absolute error of the analyst given the firm and year

Utilizing a pooled, cross-sectional analysis over the study period of 2010-2015 and incorporating all analyst forecasts, Table 2 presents results of forecast accuracy by all industries for forecast horizons of 5, 60, and 120 days.

Table 2 : Absolute forecast error by forecast horizon, 2010-2015

Model: |eijt| = |Rjt – Fijt|

	5 day Horizon			60 Day Horizon			120 day Horizon		
Forecasts	|eijt|	F	Prob.	|eijt|	F	Prob.	|eijt|	F	Prob.
14,180	.21	1.78	0.00						
11,632				.81	0.42	1.00			
9,908							.90	0.69	0.88

As can be seen from the table, as the forecast horizon grows, so does the absolute forecast error for all combined industries. Table 2 presents F statistics for each horizon group incorporating all analyst forecasts across all eight industries for the years 2010-2015. Results indicate significance for the 5 day horizon alone, indicating that absolute forecast errors are significant for that forecast horizon alone. Greatest forecast accuracy is achieved during the 5 day forecast horizon, and the 5 day forecast horizon is significantly different from the other forecast horizons observed.

Based upon these findings, hypothesis 1, which states that there is no significant difference in analyst forecast accuracy over forecast horizon, must be rejected.

Test of Hypothesis 2- test of forecast accuracy across industries

The above analysis is now extended by incorporating the effects of specific industries in the model. Obrien (1990) and Sinha, Brown and Das (1997) fail to find significant differences in analyst forecasts when analysis includes varying industries. This study incorporates more forecasts with specific focus on industries which have led the way in growth in recent years (i.e., Healthcare, Technological Services, Banking/Finance, and Oil/Gas.), and also industries which have historically been growth leaders but have recently declined in growth (i.e., Industrials, Utilities, Transportation, and Real Estate).

Again, utilizing a pooled, cross-sectional analysis over the study period of 2010-2015 and incorporating all analyst forecasts, Table 3 presents results of forecast accuracy by selected industries for forecast horizons of 5, 60, and 120 days.

Table 3 : Absolute forecast error by industry, 2010-2015

Model: |eijt| = |Rjt – Fijt|

	5 day Horizon			60 Day Horizon			120 day Horizon		
Industry	|eijt|	F	Prob.	|eijt|	F	Prob.	|eijt|	F	Prob.
Utilities	.85	0.52	1.19	1.01	0.63	1.01	1.28	0.69	1.21
Real Estate	.77	0.37	1.00	.81	0.42	1.00	.99	0.44	1.00
Transport.	.54	0.98	0.76	.62	0.68	0.80	.91	0.69	0.88
Industrials	.98	0.57	0.91	1.21	0.57	0.90	1.39	0.57	0.90
Technology	.15	1.45	0.00	.17	1.45	0.00	.18	1.45	0.00
Healthcare	.21	1.78	0.00	.23	1.79	0.00	.25	1.80	0.00
Bank/Fin.	.38	0.59	0.34	.44	0.62	0.33	.59	0.61	0.39
Oil/Gas	.20	1.66	0.00	.22	1.68	0.00	.25	1.68	0.00

As can be seen from the table, as the forecast horizon grows, so does the absolute forecast error for every industry. Greatest forecast accuracy is again achieved during the 5 day forecast horizon. Firms in the Technology, Healthcare, Banking and Finance, and Oil and Gas industries have an absolute forecast error less than those in the other industries sampled. Also, F statistics are significant for forecast errors associated with Technology, Healthcare, and Oil/Gas firms, across forecast horizon. These are results that are not manifested in prior studies and results could indicate that firms in these industry are more closely followed by analysts.

Based upon these findings, hypothesis 2, which states that there is no significant difference in analyst forecast accuracy across industry, must be rejected.

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Test of Hypothesis 3-Test for forecast accuracy within individual industries

Control for recency

Analysts make their annual earnings forecast on different calendar dates. These forecasts are updated as additional information becomes available (Stickel, 1990). Therefore, a more recent forecast will contain additional earnings-relevant information (Jennings, 1987). The enhanced information set associated with the more recent forecast suggests that forecasts made closer to the forthcoming earnings announcement dates will be more accurate than forecasts made further from the announcement dates. Failure to adequately control for recency may lead to erroneous dependency on the particular forecast (Brown, Foster and Noreen, 1985). In addressing the methodology of this study, control for forecast recency becomes an important issue.

Data on individual analysts' EPS forecasts were obtained from IBES. Actual reported EPS were obtained from COMPUSTAT. The COMPUSTAT quarterly industrial file is utilized as the source for earnings announcement dates in order to determine forecast recency, relative to the earnings release. An analysis is then made to identify above average and below average analysts by industry and forecast horizon. In each forecast horizon sample, recency is controlled by including only those analysts who made forecasts between 5 and 180 calendar days prior to the annual earnings announcement date. If an analyst made more than one forecast for a given firm/year during this period, the most recent forecast was selected. Similar to Sinha, Brown, and Das (1997), an additional requirement is imposed of at least four unique analyst forecasts to ensure proper categorization of the analysts into above/below average groups.

An analyst is classified as above average if his/her pooled forecast error over the study period is less than the 25th percentile on the firm's absolute forecast error distribution. The analyst is classified as below average if his/her forecast error over the study period is greater than the 75th percentile on the firm's absolute forecast error distribution. Those analysts falling between these two percentiles are designated as average.

Test metrics

Consistent with the methodology of Sinha, Brown, and Das (1997), the following model is used to assess forecast accuracy among analysts:

$$rapfe_{ijt} = |R_{jt} - F_{mjt})/R_{jt}|*100 - |R_{jt} - F_{ijt})/R_{jt}|*100 \quad (2)$$

Where: subscripts i, j, t denote analyst, firm and year, respectively

R_{jt} is the j firm's reported EPS in year t

F_{ijt} is the forecast of EPS by analyst i for firm j in year t

F_{mjt} is the forecast of the average analyst for the firm in question

$rapfe_{ijt}$ is each analyst's relative absolute percentage forecast error, which is calculated as the absolute percentage forecast error of the average analyst minus that of the above average analyst. For below average analysts, the order of the two terms on the right hand side are reversed.

A pooled, cross-sectional analysis is performed over the study period 2010-2015 and incorporating all analyst forecasts, and all three time horizons, by industry. Table 4 indicates the results of the analysis.

Table 4 : Analyst accuracy by industry, 2010-2015

Model: $rapfe_{ijt} = |R_{jt} - F_{mjt})/R_{jt}|*100 - |R_{jt} - F_{ijt})/R_{jt}|*100$

Panel A- Above Average Analysts

Industry	Avg. Mean	t-test	Prob.
Utilities	1.43	0.59	-
Real Estate	1.98	0.34	-
Transportation	1.22	0.22	-
Industrials	2.03	2.19	0.10
Technology	0.55	1.67	0.01
Healthcare	0.98	1.71	0.01
Bank/Finance	1.01	1.89	0.05
Oil/Gas	0.41	1.66	0.01

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Panel B- Below Average Analysts

Industry	Avg. Mean	t-test	Prob.
Utilities	0.77	2.06	0.10
Real Estate	1.12	1.72	0.01
Transportation	0.98	1.66	0.01
Industrials	1.35	2.12	0.10
Technology	0.44	0.76	-
Healthcare	0.62	0.29	-
Bank/Finance	0.58	0.41	-
Oil/Gas	0.39	0.12	-

Panel A of Table 4 provides results for above average analysts. The average mean absolute forecast error for this group of analysts is smaller for the following industries: Technology; Healthcare; Banking/Finance; and Oil/Gas. Using a t-test, one-tailed significance at conventional levels is attained for the above industries. The only other industry significant at conventional levels in the "above average" group is the industry group Industrials, with a p-value of .10. These results indicate that the above industries possess analysts who are significantly above average from the others in the same industry. With respect to the industries comprising Utilities, Real Estate, and Transportation, there is no significant difference between above average analysts and the average analysts within those industries.

Panel B of Table 4 provides results for below average analysts. The average mean absolute forecast error for this group is larger for the following industries: Utilities; Real Estate; Transportation; and Industrials. Using a t-test, one-tailed significance at conventional levels is attained for the above industries. Significance at conventional levels was not noted for the remaining industries analyzed. These results indicate that the above industries possess analysts who are significantly below average from others in the same industry.

Based upon the above findings, hypothesis 3, which states that there is no significant difference in analyst forecast accuracy within industry, must be rejected. These are results not found in prior studies of analyst forecast accuracy. It is not known why certain industries might contain analysts who forecast above or below average for their particular industry. One factor, as it relates to above average forecasts, may be the exposure and/or dominance of the industry. Above average forecasters appear to be contained in industries that are currently spurring growth. As a result, those industries may be attracting superior analysts. Conversely, with respect to below average forecasts, these seem to be contained in industries which have had significant growth in past years but have recently diminished in growth and prominence. It would be easy to conclude that the best analysts are leaving these industries for those on the rise, but this connection cannot be affirmed in this study.

IV. Conclusions

Prior research into the accuracy of analyst forecasts has spanned several decades. Obrien (1990) conducted a comprehensive analysis of forecast accuracy among financial analysts in nine industries during the period 1975-1982. The conclusion of this study was that significant differences in the earnings forecast accuracy of financial analysts do not exist. Sinha, Brown, and Das (1997) re-examine this issue of forecast accuracy among financial analysts during the period 1984-1990, consistent of the fourteen largest industries at the time. Contrary to previous research, the authors find that significant differences do exist in financial analysts' forecasts, primarily centered in the Utilities industry.

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Results indicate than when analyst forecasts are assessed over distinct forecast horizons of 5, 60 and 120 days, greatest forecast accuracy is achieved during the 5 day forecast horizon, and the 5 day forecast horizon is significantly different from the other forecast horizons observed.

With respect to comparison of forecast accuracy by industry, firms in the Technology, Healthcare, Banking and Finance, and Oil and Gas industries have an absolute forecast error less than those in the other industries sampled. These results could indicate that firms in these industry are more closely followed by analysts.

When attention turns to comparison of forecast accuracy within industries, the same industries, namely, Technology, Healthcare, Banking and Finance, and Oil and Gas, were observed to contain analysts which were significantly above their specific industry average, while the remaining industries of Utilities, Real Estate, Transportation, and Industrials were observed to contain

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analysts which were significantly below their specific industry average.

These are results not found in prior studies of analyst forecast accuracy. It is not known why certain industries might contain analysts who forecast above or below average for their particular industry. One factor may be the exposure and/or dominance of the industry. All four industry possessing above average analysts are industries which are currently leading the way in growth, while the other four industries in the study have significantly declined in growth rate over recent years. For this reason, growth industries may be attracting more of a following by perhaps superior analysts, although that dimension was not explored in this study.

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