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Does Analyst Coverage affect Bias and Information Content of Management Forecasts and are Results Comparable across Industries?

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Strictly as per the compliance and regulations of:

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I. Introduction

Many investors rely to a great extent on analyst input. Financial analysts are an integral part of the capital market. They provide earnings forecasts, buy/sell recommendations, and other recommendations to investors and brokers alike. Much of the information that analysts use in their analysis and recommendations is supplied directly by the individual firms (Lees, 1981). As in the case of mandatory disclosures, where financial data can vary greatly from firm to firm (i.e. use of estimates, aggregation of segments, use of accruals, etc.) voluntary disclosures between firms may vary as well. Analysts often step in and attempt to enhance the management disclosure with their own research and analysis in an effort to make the information more useful to the users.

Past research indicates that managers value analyst coverage (Cliff and Denis, 2004). Because of the important role analyst research plays in informing investors, many academic papers have focused attention on various issues surrounding analyst coverage. This study is similar to earlier research in that it investigates analyst coverage. It is substantially different in that it attempts to associate the degree of analyst coverage to bias and information content of voluntary forecasts. In addition, it assesses the effect of analyst coverage by industry, something that has been done to a much limited extent in prior research.

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II. Literature Review

Nichols (1989) and Schipper (1991) suggest that the behavior of analysts provides insight into the activities and beliefs of investors that cannot be observed directly. In addition, the effects of increased disclosures, and information surrounding these disclosures, are of interest to accounting professionals who are involved in attesting to firm financials, firm managers, and regulators. Benefits of such information described by the American Institute of Certified Public Accountants (AICPA) Special Committee on Financial Reporting (AICPA, 1993) include; reduced uncertainty, lower information asymmetry among market participants, fewer earnings surprises, and a greater investor following. Empirical research provides similar findings, including reduced estimation of risk (Barry and Brown, 1985), increased investor following (Merton, 1997), and reduced information asymmetry (Glosten and Milgrom, 1985).

The role of analyst coverage has often arisen in extant research with respect to its ability to enhance the information provided by firm disclosures (both mandatory and voluntary). Clement and Tse (2005) find that firms with a greater following of analysts also contain an increase in the accuracy of the analysts' forecasts. Brennan and Subrahmanyam (1995) find a positive association between analyst following and liquidity of the firm. Chung, Wood, and Wyhowski (1995) find a negative association between analyst coverage and information asymmetry. O'Brien and Bhushan (1990) find that analyst following reduces return volatility of the firm.

Prior research has also interjected behavioral characteristics regarding analyst coverage. Hong, Kubik, and Solomon (2000) find that firms with a greater number of analysts following are likely to contain less experienced analysts providing a forecast of the firm.

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This is confirmed by Trueman (1994) who finds that weaker analysts are more concerned about reputation and are more likely to herd with other analysts in following a firm. McNichols and O'Brien (1997), Rajan and Servaes (1998), Bradley, Jordan, and Ritter (2003), and Cliff and Denis (2004) all find evidence that analysts prefer to cover firms that they view favorably. Lang and Lundholm (1996) find that analysts are more likely to cover firms with more information disclosure policies. Fortin and Roth (2007) find that more analysts are attracted to larger firms as opposed to smaller firms.

Prior research along these lines has focused on forecast characteristics (forecast horizon, past accuracy, firm size, forecast frequency, number of firms). These include; Baginski and Hassell (1990), Mikhail, Walther, and Willis (1997), Clement (1999), Jacob, Lys, and Neale (2000), Brown (2001), Clement and Tse (2005), and others. Where past research has fallen short is in assessing the relationship of analyst coverage to results by industry. While some industries in the United States have been on the ascent (i.e., technology firms), others have been in decent (i.e., industrial firms), with a host of industries in between. Does analyst coverage make a difference given the industry which is being covered? Or are results consistent across industries? These are questions that might be helpful as we continue to unravel the analyst puzzle in the lineage of the wealth of research that exists on the topic. In answering these questions, the hope is to extend the prior research in an attempt to make that research more informative along industry lines, thereby providing greater information to the investor, manager and regulator.

III. Methods

a) *Hypotheses Overview*

All of the aforementioned empirical studies have a common characteristic, they find analyst coverage informative with respect to analysis of the management forecast. Many find the information leads to more accurate forecasts by management and, therefore, less management bias. A shortcoming that most of the prior studies have is that; 1. Most of these studies are limited in numbers of years analyzed, such as Chun, Wood, and Wyhowski (1995), Brennan and Subrahmanyam (1995), Roulston (2006), Lang and Lundholm (1996), and Fortin and Roth (2007). All of these researchers analyzed just one year in drawing conclusions. An exception is Clement and Tse (2005) who use 10 years of data in their research. 2. None of these past studies evaluate analyst coverage by major industry. The lack of such analysis leaves a void in descriptive empirical literature that must be filled in order to make the long line of analyst coverage studies more complete.

This study seeks to fill that void by providing an analysis that is more encompassing, that is, it consists of more firm forecasts and over a greater period of time. In addition, this study also assesses analyst coverage by industry in order to determine if overall results hold for specific industries. By making these enhancements to prior research, it is hoped that this study will further contribute to this line of literature by examining past results in greater length (time periods) and breadth (greater industry detail) and therefore provide enhanced information to all users of such information.

Hypotheses about Bias of Management Forecast (hypotheses 1 and 2) Many studies of voluntary management earnings forecasts do not find evidence of bias in voluntary disclosures (Baginski, Hassel and Waymire, 1994; Frankel, Mc Nichols and Wilson, 1995). Other studies indicate that bias may be related to the cycle of the economic period (Miller, 2009; Stunda, 2015). Still other studies show that as firms that release voluntary forecasts have greater analyst coverage, any bias that exists is reduced (Clement and Tse, 2005; Fortin and Roth, 2007). These studies of voluntary forecasts must be considered along with the earnings management literature. For instance, voluntary disclosures facilitate additional information to the investor at a lower acquisition cost (Lees, 1981; Diamond, 1985; Ajinkya and Gift, 1984). However, if only partial communication flows from management to investors and acquiring full information is costly, there exists asymmetric information and the potential for earnings management, and therefore bias, of the forecast (Anilowski, Feng, and Skinner, 2010).

If the same degree of earnings management (whether positive or negative) exists in both the forecast of earnings and actual earnings, the expectation is that there would be no difference in forecast error. If, however, the ability to perform earnings management is anticipated but not realized, some difference in forecast error would be present. If greater upward earnings management of the forecast occurs (or less actual earnings management), a negative forecast error should exist. If greater downward earnings management of the forecast occurs (or less actual earnings management), a positive forecast error should result. Thus, the first hypothesis tests for the existence of forecast error (i.e., bias) in the total sample of firms, inclusive of all industries. The null hypothesis tested is:

H1: Average management forecast error (actual EPS – management forecast of EPS) for all sample firms equals zero.

The above hypothesis serves as a baseline in order to assess subsequent analysis by industry. Applying the same logic as seen in hypothesis 1, attention is now turned to firms in specific industries, highlighted by their associated analyst coverage. It has been shown that some firms will draw greater analyst coverage (Fortin and Roth, 2007; Clement and Tse, 2005).Prior research is silent on whether similar findings hold true to specific industries. Applying the same test as in hypothesis 1, the following null hypothesis is provided:

H2: Average management forecast error (actual EPS – management forecast of EPS) for each industry in the sample equals zero.

The management forecasts of earnings must be related to actual earnings in order to determine if bias exists. McNichols (1989) analyzes bias through the determination of forecast error. Stated in statistical for, these hypotheses are represented in Equation 1 (see Appendix). In order to test hypotheses 1 and 2, firm voluntary forecasts were analyzed. Statistical analysis is performed on the samples in order to determine if the average forecast error is zero. McNichols (1989) and DeAngelo (1988) conducted a t-test on their respective samples in addition to a Wilcoxan signed rank test. Lehman (1975) reports that the Wilcoxan test has an efficiency of about 95% relative to a t-test for data that are normally distributed, and that the Wilcoxan test can be more efficient than the t-test for non-normal distributions. Therefore, this analysis consists of performing a t-test and a Wilcoxan signed rank test on the average cross-sectional differences between actual earnings per share and the management forecast of earnings per share.

Hypotheses about Information Content of Accounting Earnings and Management Forecasts (hypotheses 3 and 4)

If mandatory disclosures of earnings contain some degree of earnings management (Berry, 1995; Brown, 1996), then voluntary disclosures may possess the potential for such earnings management as well (Collins and DeAngelo, 1990; Baginski, Hassell, and Waymire, 1994). Investors may react to managed earnings in one of two ways; they may discount the information as additional noise, or they may view this information as enhancing the properties of the signal (i.e., in terms of amount or variance). Research during the past five decades has shown that accounting earnings possesses information content (Ball and Brown, 1968 and a wealth of other researchers). Current literature finds that the information content of earnings announcements can be different when dependent upon various circumstances (i.e. stock proxy contests, mergers and acquisitions, buyouts, Chapter 11 proceedings, analyst coverage etc.).

Roulstone (2003) and Clement and Tse (2005) find that the average firm is followed by 14-15 analysts. Their findings show that as analysts coverage increases there is an increased positive association with firm liquidity and accuracy. If investors interpret managed earnings forecasts as just additional noise, the market would discount this information. If, however, investors view the managed earnings forecast as a positive (or negative) signal form management, the market would not discount the information. The expectation for information content of management forecasts would revolve around these two notions. These alternative notions suggest the following null hypothesis:

H3: The information content of management forecasts is not significantly different for all firms as analyst coverage varies.

Applying the above notions result in the following hypothesis when analysis is conducted by industry, stated in the null form:

H4: The information content of management forecasts is not significantly different by industry as analyst coverage varies.

The purpose of these tests is to assess the relative information content of management earnings forecasts as analyst coverage increases by firm and industry. The model in Equation 2 (see Appendix) is used to evaluate information content:

Using the model in equation 2, two separate regressions are run, one for a sample where firm analyst coverage is assessed and another where industry analyst coverage is assessed. The coefficient a measures the intercept. The coefficient b_1 is the earnings response coefficient (ERC) for all firms in the respective sample. The coefficient b_2 represents the incremental ERC for forecasts made where less than 14 analysts are present. The coefficient b_3 represents the incremental ERC for forecast when greater than 14 analysts are present. The coefficients b_4, b_5, and b_6 are contributions to the ERC for all firms in the sample. To investigate the effects of the information content of management forecasts on ERC, there must be some control for variables shown by prior studies to be determinants of ERC. For this reason, the variables represented by coefficients b_4, b_5 and b_6 are included in the study.

Unexpected earnings (UE_i) is measured as the difference between the management earnings forecast (MF_i) and the security market participants' expectations for earnings proxied by consensus analyst following as per Investment Brokers Estimate Service (IBES) (EX_i). The unexpected earnings are scaled by the firm's stock price (P_i) 180 days prior to the forecast. This is illustrated in Equation 3 (see Appendix).

For each disclosure sample, an abnormal return (ARit) is generated for event days -1, 0, and +1, where day 0 is defined as the date of the forecast disclosure identified by the DJNRS. The market model is utilized along with the CRSP equally-weighted market index and regression parameters are estimated between days -290 and -91. Abnormal returns are then summed to calculate a cumulative abnormal return (CARit). Hypotheses 3 and 4 are tested by examining the coefficients associated with coverage of fewer than 14 analysts (b_2) and coverage of more than 14 analysts (b_3).

b) Data Sources

The sample consists of quarterly management forecast point estimates made between 2005-2014, a total of 10 years. 1) The management earnings forecast was recorded by the Dow Jones News Retrieval Service (DJNRS). 2) Security price data was available from the Center for Research on Security Prices (CRSP). 3) Earnings data was available from Compustat. 4) Analyst forecast information was available on the Institutional Brokers Estimate System (IBES). 5) The samples consist of firms which made at least one management earnings forecast in each sample period. Table 1(see Appendix) provides details on the samples by firm, while Table 2 (see Appendix) provides details on the samples by industry.

IV. Results

a) Tests of Forecast Bias

Tests of hypothesis 1 were conducted on the sample of all 4,996 firm forecasts made between the years 2005-2014. No distinction was made for industry membership. Table 3(see Appendix) indicates that the mean forecast error for forecasts is 0.06 with a p-value of .05. Using the distribution-free rank test, significance is observed at the .01 level. These results are consistent with the preponderance of extant earnings forecast literature that indicates that management forecasts tend to reflect more bad news in the forecast relative to actual earnings. As a result, hypotheses 1, which states that average management forecast error equals zero is rejected since the forecasts in the sample, on average, exhibit downward bias of the management forecast.

Tests of hypothesis 2 were conducted on the sample of 4,996 firm forecasts, disseminated by industry membership. Table 4 (see Appendix). Results indicate that for the three industries with the greatest analyst coverage, mean forecast error is extremely close to zero; Oil/Gas 0.008, Technology 0.002, and Healthcare 0.004. All of these findings have a respective p-value of .01. In addition, the results for these industries show the least variance as represented by standard deviation. For the remaining industries, results are consistent with previous findings that management forecasts tend to reflect more bad news relative to actual earnings with mean forecast errors of; Utilities 0.058, Real Estate 0.062, Transportation 0.070, Banking and Finance 0.060, and Industrials 0.061. These groups have a respective p-value of .05. Using the distribution-free rank test, significance is observed at the .01 level for all industries. As a result, hypothesis 2, which states that average management forecast error equals zero for each industry cannot be totally rejected outright since three industries approximate zero bias. Those industries are the ones with the highest analyst coverage.

b) Tests of Information Content

Hypothesis 3 first tests all firms in the sample and then assesses the information content of management forecasts by firms with coverage by fewer than 14 analysts, and then assesses the information content of management forecasts with coverage by greater than 14 analysts. Results are represented in Table 5 (see Appendix). As indicated in the table, the coefficient representing overall ERC for all firm forecasts (b_1) has a value of .12 with a p-value of .05. This is consistent with prior management forecast literature regarding information content. The coefficient representing management forecasts with coverage of fewer than 14 analysts (b_2) has a value of .02 with a p-value of .05, while the coefficient representing management forecasts with coverage of greater than 14 analysts (b_3) has a value of .19 with a p-value of .01. All other control variables are not significant at conventional levels. There seems to be some level of difference between the firms with high versus low analyst coverage. The firms with higher analyst following appear to possess more of an information-enhancing signal to investors and other users than do firms with a lower analyst following. Hypothesis 3, which states that the information content of the management forecasts across these samples is not significantly different must be rejected since high coverage firms indicate a difference in results.

Hypothesis 4 tests information content by industry. As can be seen from Table 6 (see Appendix), the industries that provide the greatest information-enhancing properties to investors and others from the perspective of conveying information via their management forecasts are the oil and gas industry (.18, p-value .01), the technology industry (.20, p-value .01, and the healthcare industry (.17, p-value .01). These three industries lead all others in having the greatest analyst following. In fact, the only other industries that convey an information-enhancing signal to investors are utilities (.02, p-value .10), and industrials (.03, p-value .05). All other industries have negative coefficients meaning that the management forecast is not an information-enhancing signal, but represents noisy information that may not be useful to investors or others. As a result of these findings, hypothesis 4, which suggests no difference in information content of the management forecast across industries, must be rejected.

V. Conclusion

This study provides empirical evidence regarding the bias of management forecasts and information content of management forecasts as the number of analyst coverage increases both by firm and industry. Past management forecast research focuses on a limited data set both from the perspective of years studied and forecasts analyzed. This study encompasses the most recent 10 years (2005-2014) and 4,996 management forecasts. This study also extends prior research by associating analyst coverage with both the potential bias and information content of the management forecast, by firm and industry, something that has yet been done.

Findings indicate that, on average, all management forecasts in the sample exhibit downward bias in the forecast. This is a result that many prior researchers have found. However, when an industry analysis was performed, the industries with the highest analyst coverage (i.e., oil and gas, technology, and healthcare) had minimal bias. In fact, the bias of the management forecast approached zero. In addition, the variance, represented by the standard deviation, was the smallest for these industries. All other industries observed contained negative bias results. Such industry analysis give a clearer picture of the impact that the quantity of analysts following firms in a certain industry might have on the quality of the forecast itself.

With respect to information content of the management forecast, firms with fewer than 14 analysts covering them were compared to firms with coverage of greater than 14 analysts. Findings suggest that firms with analysts exceeding 14 have an enhanced information signal to the investors and other interested parties than do firms with fewer than 14 analysts. When the analysis was conducted by industry, the results were again consistent. The industries with the highest analysts following (i.e., oil and gas, technology, and healthcare) possessed more of an information-enhancing signal to investors and other users than industries with a lower analyst following.

In total, results suggest that there is a potential benefit to stockholders, firm managers, and fund managers to view firms and industries that have greater coverage by financial analysts differently than firms that have less coverage.

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Appendix

Equation 1

$$\sum \frac{fe_i}{n} = 0$$

This equation describes how forecast error is determined:
Where: fe_i = forecast error of firm i (forecast error = actual eps – management forecast of eps), deflated by the firm's stock price 180 days prior to the forecast.

Equation 2

$$CARit = a + b_1UEit + b_2UEEit + b_3UECit + b_4MBit + b_5Bit + b_6MVit + eit$$

Where:
- CARit = Cumulative abnormal return forecast i, time t
- a = Intercept term
- UEit = Unexpected earnings for forecast i, time t
- UEEit = Unexpected earnings for forecast i, time t when fewer than 14 analysts present
- UECit = Unexpected earnings for forecast i, time t when greater than 14 analysts present
- MBit = Market to book value of equity as proxy for growth and persistence
- Bit = Market model slope coefficient as proxy for systematic risk
- MVit = Market value of equity as proxy for firm size
- eit = error term for forecast i, time t

This equation indicates the regression model that is used to assess the information content of the earnings forecasts for both firm and industry samples (i.e., H3 and H4). In addition to assessing those two specific periods, (i.e., b_2 and b_3 variables), an assessment is also made for total forecast samples (b_1 variable), and other variables that have shown significance in prior studies such as growth, risk and size (b_4, b_5, b_6 variables).

Equation 3

$$UE_i = \frac{(MF_i - EX_i)}{P_i}$$

This equation is used to assess unexpected earnings. Unexpected earnings is measured as the difference between the management forecast of earnings and the expected earnings level as determined by consensus analyst following per Investment Brokers Estimate Service. This value is then deflated by the firm's stock price 180 days prior to the forecast.

Table 1 : Quarterly Firm Point Forecasts by Firm

Year	Firm Forecasts	Analysts Covering
2005	504	3,667
2006	489	3,402
2007	517	4,119
2008	476	3,512
2009	530	4,227
2010	521	4,008
2011	482	3,519
2012	509	3,928
2013	473	3,632
2014	495	3,714
Total Forecasts	4,996	

Table 1 indicates the numbers of quarterly earnings forecasts made by U.S. firms from 2005 through 2014, as reported by IBES and the Dow Jones News Retrieval Service.

Table 2 : Quarterly Firm Point Forecasts by Industry

Year	Industry Forecasts	Analysts Covering
Oil/Gas	736	4,718
Utilities	450	3,414
Real estate	422	3,115
Transportation	399	2,987
Technology	1,049	5,002
Banking/Finance	699	3,452
Healthcare	789	4,229
Industrials	452	3,148
Total Forecasts	4,996	

Table 2 indicates the numbers of quarterly earnings forecasts made by U.S. industries from 2005 through 2014, as reported by IBES and the Dow Jones News Retrieval Service.

Table 3 : Average Management Forecast Error Deflated by Firm's Stock Price 180 Days Prior to Forecast

Model: $\frac{\sum fe_i}{n} = 0$

n forecasts (t-statistic)	Mean	Medium	Minimum	Maximum	Std. dev.
4,996	0.06	0.02 ***	-0.139	0.175	0.011 (2.27)**

** Significant at the .05 level (two-sided test).
*** Significant at the .01 level using the non-parametric sign-rank test.
fe_i = forecast error of firm i (actual eps – management forecast of eps)
n = sample of 4,996 firm forecasts during 2005-2014

Table 3 assesses the bias of voluntary earnings forecasts for all quarterly forecasts totaling 4,996, included in full sample, irrespective of industry membership.

Table 4 : Average Management Forecast Error by Industry Membership Deflated by Firm's Stock Price 180 Days Prior to Forecast

Model: $\frac{\sum fe_i}{n} = 0$

n forecasts / industry	Mean	Medium	Minimum	Maximum	Std. dev. (t-stat)
736 (Oil/Gas)	0.008	0.005***	-0.022	0.021	0.0003 (2.46)*
450 (Utilities)	0.058	0.031***	-0.147	0.195	0.0091 (2.24)**
422 (Real Estate)	0.062	0.043***	-0.138	0.201	0.0086 (2.21)**
399 (Transport.)	0.070	0.047***	-0.144	0.177	0.0097 (2.28)**
1,049(Technology)	0.006	0.002***	-0.011	0.014	0.0002 (2.57)*
699 (Bank/Fin.)	0.060	0.039***	-0.144	0.192	0.0081 (2.23)**
789 (Healthcare)	0.007	0.004***	-0.019	0.018	0.0004 (2.47)*
452 (industrials)	0.061	0.039***	-0.140	0.181	0.0088 (2.27)**
4,996 (Total)					

* Significant at the .01 level (two-sided test)

** Significant at the .05 level (two-sided test).

*** Significant at the .01 level using the non-parametric sign-rank test.

fe_i = forecast error of firm i (actual eps – management forecast of eps)

n = sample of 4,996 firm forecasts during 2005-2014

Table 4 assesses the bias of voluntary earnings forecasts for quarterly forecasts totaling 4,996, by industry membership.

Table 5 : Test of Information Content of Management Forecasts by Firm

Model: $CARit = a + b_1UEit + b_2UEEit + b_3UECit + b_4MBit + b_5Bit + b_6MVit + eit$

Where:
- CARit = Cumulative abnormal return forecast i, time t
- a = Intercept term
- UEit = Unexpected earnings for forecast i, time t
- UEEit = Unexpected earnings for forecast i, time t when fewer than 14 analysts present
- UECit = Unexpected earnings for forecast i, time t when greater than 14 analysts present
- MBit = Market to book value of equity as proxy for growth and persistence
- Bit = Market model slope coefficient as proxy for systematic risk
- MVit = Market value of equity as proxy for firm size
- eit = error term for forecast i, time t

Coefficients (t-statistics)

a	b1	b2	b3	b4	b5	b6	Adjusted R^2
0.16	0.12	0.02	0.19	0.09	-0.03	0.09	0.231
(.57)	(2.37)***	(2.33)***	(2.47)**	(0.21)	(-0.08)	(0.41)	

** Significance at the .01 level (two-sided test)

***Significant at the .05 level (two-sided test)

b_1 sample = 4,996 firm forecasts

b_2 sample = 2,918 firm forecasts

b_3 sample = 2,078 firm forecasts

Table 5 assess information content of management forecasts by full sample (b_1), sample of firm forecasts with fewer than 14 analysts covering (b_2), and sample of firms with greater than 14 analysts covering (b_3).

Table 6 : Test of Information Content of Management Forecasts by Industry

Model: $CAR_{it} = a + b_1UE0_{it} + b_2\ UEU_{it} + b_3UER_{it} + b_4UET_{it} + b_5UETech_{it} + b_6UEB_{it} + b_7UEH_{it} + b_8UEI_{it} + b_9MB_{it} + b_{10}B_{it} + b_{11}MV_{it} + e_{it}$

a	b_1	b_2	b_3	b_4	b_5	b_6	b_7	b_8	b_9	b_{10}	b_{11}	Adj. R^2
.03	.18	.02	-.07	-.15	.20	-10	.17	.03	.04	.11	.21	.257
(.29)	(2.44)[a]	(1.79)[c]	(1.95)[b]	(1.51)[c]	(2.57)[a]	(2.05)[b]	(2.52)[a]	(1.96)[b]	(.39)	(.72)	(.33)	

b_1 = information content for oil/gas firms (736 firm forecasts)
b_2 = information content for utility firms (450 firm forecasts)
b_3 = information content for real estate firms (422 firm forecasts)
b_4 = information content for transportation firms (399 firm forecasts)
b_5 = information content of technology firms (1,049 firms)
b_6 = information content for banking and finance firms (699 firm forecasts)
b_7 = information content for healthcare firms (789 firm forecasts)
b_8 = information content for industrial firms (452 firm forecasts)
b_9 = control variable for growth and persistence
b_{10} = control variable systematic risk
b_{11} = control variable firm size

a = significant at .01 level
b = significant at .05 level
c= significant at .10 level

n = sample of 4,996 firm forecasts during 2005-2014

Table 6 reflects the results of the assessment of information content by industry through the running of the regression formula above.

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