A Comparison of Investors’ and Analysts’ Efficiency in Incorporating Accounting Information*

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ABSTRACT

In this study, we compare the relative efficiency of investors and sell-side analysts in incorporating various accounting information. Our results indicate that the equity value estimates inferred from the analysts’ earnings forecasts are more biased than the stock prices in interpreting stock price momentum, accruals, and past sales growth, while the former is less biased than the latter in interpreting the growth in long-term net operating assets. Combining the evidence, we conclude that sell-side analysts are generally less efficient than investors in incorporating certain accounting information. Thus, sell-side analysts need to mitigate their bias in interpreting certain accounting information to enhance market efficiency by providing investors with a good benchmark for their earnings expectation.

JEL Classification: G14, M41.

Keywords: Investors’ Efficiency, Analysts’ Efficiency, Equity Valuation.
I. INTRODUCTION

This study simultaneously compares the relative efficiency of investors and sell-side analysts in incorporating a comprehensive list of accounting information, which is frequently cited as the inefficiency indicators for investors and/or analysts in prior literature.

Since an efficient capital market is the necessary condition for the economically efficient allocation of resources among firms, there have been ongoing debates over market efficiency. Prior academic literature suggests that following accounting related variables can predict future stock returns, which is considered evidence of investors’ inefficiency; stock price momentum (Jegadeesh and Titman 1993), earnings surprises (Bernard and Thomas 1990), accruals (Sloan 1996), growth in long-term net operating assets (Fairfield et al. 2003), and past sales growth (Lakonishok et al. 1994).

Because sell-side analysts are the most prominent information intermediaries in the stock market, prior studies examine the analysts’ efficiency in incorporating such accounting information into their earnings forecasts. They document evidence of analysts’ inefficiency as follows: analysts’ under-reaction to stock price momentum (Mendenhall 1991) and earnings surprises (Abarbanell 1991), and analysts’ over-reaction to accruals (Bradshaw et al. 2001) and past sales growth (Frankel and Lee 1998).

The evidence that both investors and sell-side analysts may react inefficiently to public accounting information naturally leads to the comparison of their relative

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1 In an efficient capital market, the reactions of investors to new information are expected to be immediate and thus the stock prices are assumed to be equal to the intrinsic values on any given point of time. In an inefficient capital market, by contrast, investors may overreact or underreact to new information, and hence it will take a long time for investors to correct their mispricing of stocks, which leads to the misallocation of funds among competing stocks.

2 Although stock price momentum is not directly linked to any specific set of accounting information, we assume that stock price momentum may capture some sub-sets of accounting information.

3 To our knowledge, no prior research documents analysts’ inefficiency in incorporating the growth in long-term net operating assets into their earnings forecasts.
efficiency. Given that analysts’ earnings forecasts have a large influence upon the formation of investors’ earnings expectations, it is worthwhile to examine whether analysts’ earnings forecasts either facilitate or impede investors’ more accurate interpretation of accounting information.4

In such a comparison, prior academic studies examine a limited set of inefficiency phenomena in isolation and show mixed results. While some studies report that analysts are more efficient than investors in incorporating earnings surprises (Abarbanell and Bernard 1992) and accruals (Elgers et al. 2003), other studies reach the opposite conclusion in terms of earnings surprises (Liu 2003) and accruals (Kang and Yoo 2007). Furthermore, the relative efficiency in terms of other well-known inefficiency phenomena, regarding stock price momentum, growth in long-term net operating assets, and past sales growth, is not investigated in prior research.

In this study, we examine the relative efficiency of investors and sell-side analysts for a comprehensive list of inefficiency phenomena by comparing the bias of equity value estimates inferred from analysts’ earnings forecasts with the bias of stock prices. If the analysts’ earnings forecasts are more (less) biased than investors’ earnings expectations, the equity value estimates inferred from analysts’ earnings forecasts should be more (less) biased than the stock prices. In contrast with prior academic research that examines only one inefficiency phenomenon at a time, we simultaneously analyze a comprehensive list of inefficiency phenomena.5 Since each

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4 For example, if analysts incorporate their private information into their earnings forecasts, analysts’ earnings forecasts will be able to mitigate the investors’ inefficiency in incorporating accounting information. To the contrary, if analysts simply repackage and re-transmit the information already contained in stock prices, they will be unable to mitigate the investors’ inefficiency.

5 While Liu and Su (2006) consider a comprehensive list of inefficiency phenomena, they examine these phenomena mainly to forecast analysts’ forecast errors. In addition, while Kang and Yoo (2007) use similar empirical methodology as ours, they focus on the relative efficiency only in incorporating accruals.
of inefficiency phenomena may be correlated with each other, our simultaneous analysis allows us to analyze more correctly the relative efficiency in each of inefficiency phenomena.

We find that the equity value estimates inferred from analysts’ earnings forecasts are more biased than stock prices in interpreting stock price momentum, accruals, and past sales growth, while the former is less biased than the latter in interpreting the growth in long-term net operating assets. Thus, we conclude that sell-side analysts are generally less efficient than investors in incorporating accounting information, except the growth in long-term net operating assets. That is, analysts may not be able to mitigate investors’ bias in interpreting certain accounting information by providing analysts’ earnings forecasts as a benchmark for investors’ earnings expectations.

This study helps sell-side analysts to make more accurate earnings forecasts by mitigating their bias in interpretation of public accounting information. This study also enhances investors’ understanding of the usefulness or limitation of analysts’ earnings forecasts for their more efficient investment decision.

The remainder of this paper is organized as follows. Section 2 presents a brief review of the related academic literature. Section 3 describes our research design and sample selection procedure. Section 4 presents the empirical results. Section 5 concludes.

2. LITERATURE REVIEW

This study is closely related to the literature on investors’ efficiency, analysts’ efficiency, and the comparison of efficiency between these two groups.

Although the disputes about the hypothesis of market efficiency have by no means died away, it is a general belief that the hypothesis of market efficiency is so
overly simplified that it fails to capture the richness of market pricing dynamics and to take fully into account the process of price discovery. It seems to be the case that stock price convergence toward the intrinsic value is brought about via continuous interactions among noise traders and information arbitrageurs. This process requires time and effort, and is only achieved at substantial cost to society (Lee 2001).

Evidence against the hypothesis of investors’ efficiency is mounting. For example, Jegadeesh and Titman (1993) suggest that stocks with high stock returns over the past year tend to continue to show high stock returns over the following three to six months. Bernard and Thomas (1990) conclude that stock prices respond to earnings news for a few months after the earnings announcement. Sloan (1996) finds that investors make systematic errors when assessing the implications of current accruals on future earnings. Fairfield et al. (2003) suggest that the accrual anomaly is a subset of a broader anomaly related to the investors’ difficulty in valuing the growth in long-term net operating assets, and find that positive abnormal stock returns can be generated from a trading strategy based on the growth in long-term net operating assets as well as on accruals. Lakonishok et al. (1994) find that firms with higher (lower) past sales growth earn lower (higher) subsequent stock returns. These studies seem to pose a formidable challenge to the hypothesis of investors’ efficiency.

Given the crucial role played by sell-side analysts as information intermediaries in stock market, a large amount of academic literature has been devoted to the efficiency of analysts’ earnings forecasts, one summary measure provided by analysts. A number of studies suggest that analysts do not fully incorporate all relevant accounting information into their earnings forecasts (e.g., Abarbanell and Bushee 1997). In particular, several studies document analysts’ inefficiency in interpreting well-known indicators of investors’ inefficiency. Lys and Sohn (1990) and Abarbanell
(1991) conclude that analysts’ earnings forecasts do not fully incorporate the information in past stock returns. Mendenhall (1991) reports that analysts under-react to current earnings news in that future analysts’ earnings forecasts errors are positively correlated with current forecasts errors. Bradshaw et al. (2001) find that analysts do not incorporate into their earnings forecasts the predictable subsequent earnings decreases (increases) associated with high (low) level of accruals. Frankel and Lee (1998) document analysts’ over-reaction to past sales growth.

The evidence that both investors and sell-side analysts react inefficiently to public accounting information naturally leads to the comparisons of their relative efficiency. The findings of prior research are mixed. For example, focusing on earnings surprises as an inefficiency indicator, Abarbanell and Bernard (1992) conclude that analysts are more efficient than investors because the post-earnings-announcement drift cannot be fully explained by analysts’ under-reaction. However, contrary to their study, Liu (2003) suggests that investors are more efficient and react more rapidly to earnings news than analysts. Elgers et al. (2003) conclude that analysts’ earnings forecasts are less biased than investors’ earnings expectation in interpreting accruals. However, Kang and Yoo (2007) report an opposite result. Besides these mixed results, the relative efficiency in terms of other well-known inefficiency phenomena regarding stock price momentum, the growth in long-term net operating assets and past sales growth is not investigated at all in prior literature.

In sum, prior studies examine the relative efficiency between investors and sell-side analysts in incorporating a limited set of inefficiency indicators in isolation, showing mixed results. Therefore, the following remains an open empirical question: can analysts’ earnings forecasts guide investors to mitigate their biases in simultaneous interpretation of a comprehensive list of accounting information?
3. RESEARCH DESIGN

3.1 Empirical Model

Our empirical model can be explained by the viewpoint of prior studies that have considered the ratio of equity value estimates inferred from analysts’ earnings forecasts to stock price (hereafter $V/P$ ratio) to be an indicator of analysts’ earnings forecasts about investors’ mispricing (Frankel and Lee 1998; Ali et al. 2003). That is, a lower (higher) level of the $V/P$ ratio may indicate that the current stock price is overstated (understated). More specifically, if analysts’ earnings forecasts are less biased than investors’ earnings expectations in interpreting certain accounting information, the equity value estimate inferred from analysts’ earnings forecasts should be less biased than the stock prices in incorporating such accounting information. If this is the case, a lower (higher) level of the $V/P$ ratio will indicate the investors’ overpricing (underpricing) of certain accounting information. Thus, the $V/P$ ratio should be negatively (positively) correlated with the accounting information that investors overprice (underprice). To the contrary, if analysts’ earnings forecasts are more biased than investors’ earnings expectations in interpreting certain accounting information, the $V/P$ ratio will send out a contrary signal about the investors’ mispricing of such accounting information. In such a case, the $V/P$ ratio will be positively (negatively) correlated with accounting information that investors overprice (underprice).

From this reasoning, we draw the main framework of our empirical specification as follows:

$$
\left(\frac{V}{P}\right)_t = \alpha + \sum_{i=1}^{k} (\beta_i \times IEl_{it}) + \epsilon_t
$$

(1)
where \( V_t \) is the equity value estimate inferred from analysts’ earnings forecasts at time \( t \); \( P_t \) is the stock price at time \( t \); \( IEI_{it} \) is the most recent year’s \( i^{th} \) inefficiency indicator at time \( t \); and \( \varepsilon_t \) is error term at time \( t \).

In Equation (1), \( \beta_i \) indicates the signal of the analysts’ earnings forecasts regarding the investors’ bias in interpreting \( i^{th} \) inefficiency indicator. If both analysts and investors are known to under-react to the information contained in an inefficiency indicator (e.g., stock price momentum and quarterly earnings surprises), a negative (positive) \( \beta_i \) will imply that analysts (investors) under-react to a larger extent, meaning that analysts (investors) are more biased. Similarly, if both analysts and investors are known to over-react to the information contained in an inefficiency indicator (e.g., accruals, the growth in long-term net operating assets, and past sales growth), a positive (negative) \( \beta_i \) will imply that analysts (investors) over-react to a larger extent, meaning that analysts (investors) are more biased. Therefore, if analysts react to a particular inefficiency indicator in the same direction as investor, a significantly negative (positive) \( \beta_i \) on the under-reaction (over-reaction) variable can be interpreted as the evidence that analysts are more biased than investors in their reaction to the news contained in the variable.

More specifically, we estimate our regression model based on Equation (1) as follows:

\[
V / P = \alpha + \beta_1 \text{MOMENTUM} + \beta_2 \text{SUE} + \beta_3 \text{ACC} + \beta_4 \text{GrLTNOA} + \beta_5 \text{SG}
+ \beta_6 \text{BETA} + \beta_7 \ln(\text{SIZE}) + \beta_8 \ln(\text{B/M}) + \beta_9 \text{E/P} + \beta_{10} \text{D/M}
+ \beta_{11} \text{IDRISK} + \beta_{12} \text{OIVOL} + \beta_{13} \text{EFDEV} + \varepsilon
\]

(2)

where \( V/P \) is the equity value estimates inferred from analysts’ earnings forecasts divided by stock price.

The variables of our interest are stock price momentum (\( \text{MOMENTUM} \); Jegadeesh and Titman 1993), quarterly earnings surprises (\( \text{SUE} \); Bernard and Thomas
1990), accruals (\textit{ACC}; Sloan 1996), the growth in long-term net operating assets (\textit{GrLTNOA}; Fairfield et al. 2003), and past sales growth (\textit{SG}; Lakonishok et al. 1994). These five variables are frequently cited as being associated with future stock returns as inefficiency indicators. Prior studies on these market inefficiency phenomena document that stock price momentum and earnings surprises are generally under-reacted by investors, while the remaining three variables are over-reacted by investors. In addition, prior studies on analysts’ inefficiency generally find that analysts react to these inefficiency indicators in the same direction as investors do. That is, analysts under-react to past stock returns (Mendenhall 1991) and earnings surprises (Abarbanell 1991), whereas they over-react to accruals (Bradshaw et al. 2001) and past sales growth (Frankel and Lee 1998). Thus, a significant negative (positive) $\hat{\beta}$ on the under-reaction (over-reaction) variable would imply that analysts are more biased than investors in interpreting the information contained in the variable.

The remaining independent variables, frequently cited as risk proxies, are included to address the potential omitted-variable problem: market beta (\textit{BETA}; Fama and French 1993), size (\textit{SIZE}; Amihud and Mendelson 1986), book-to-market ratio (\textit{B/M}; Fama and French 1993), current earnings to price multiple (\textit{E/P}; Basu 1977), debt-to-market ratio (\textit{D/M}; Modigliani and Miller 1958), idiosyncratic risks (\textit{IDRISK}; Malkiel and Xu 1997), operating income volatility (\textit{OIVOL}; Barth et al. 1999), and analysts’ earnings forecasts dispersion (\textit{EFDEV}; Botosan and Plumlee 2005). Since our equity value estimates inferred from analysts’ earnings forecasts may not fully reflect potential risk factors via the calculation of the cost of equity capital, the addition of these variables can mitigate the potential omitted-variable problem in the regression of the \textit{V/P} ratio. See the Appendix I for the definition and measurement of the independent variables.
To calculate the $V/P$ ratio, we infer the equity value estimate from analysts’ earnings forecasts by using four representative implementations of earnings-based valuation models in prior research: three implementations of the residual income valuation model (RIV model; Ohlson 1995) and an implementation of the Ohlson-Juettner-Nauroth model (OJ model; Ohlson and Juettner-Nauroth 2005). Since it is not clear which implementation of the valuation models is superior, we take the average of the equity value estimates derived from those four implementations of the RIV and OJ models, which may address the potential measurement error problem. The Appendix II provides a detailed discussion of the four implementations of valuation models.

3.2 Sample Selection

We collect data from three sources: accounting numbers from COMPUSTAT; stock price, analysts’ earnings forecasts, and industry identification codes from I/B/E/S; and stock returns from CRSP. As of April of each year, we select firm-years that satisfy the following criteria: (1) financial statement data, such as book value of equity and asset, are available from COMPUSTAT; (2) stock price, analysts’ earnings forecasts, industry identification codes, and number of shares are available from I/B/E/S; (3) stock return data for the calculation of market beta are available from CRSP; (4) book value of equity is positive; (5) stock price is greater than or equal to $2; (6) analysts’ earnings forecasts are non-negative; (7) the equity value estimates are positive; (8) non-financial firms; (9) fiscal-year-ends are consistent between adjacent years. The fifth criterion mitigates the effects of outliers. The sixth criterion is necessary for the implementation of the OJ model (Gode and Mohanram 2003). The seventh criterion avoids negative equity value estimates. The ninth criterion avoids
spurious annual accounting variables. To mitigate the effects of outliers, regression variables are winsorized at 1% and 99%. The resulting final sample includes 23,639 observations of 3,682 distinct firms between 1984 and 2004.

4. EMPIRICAL RESULTS

4.1 Descriptive Statistics and Univariate Correlations

Table 1 reports the summary statistics of the variables used in this study.

[ Insert Table 1 about here ]

In Table 1, we note that the mean of the \( V/P \) ratio (1.063) is close to the unit, while untabulated results show that the means of the \( V/P \) ratios for some empirical implementations are far from the unit. Thus, our method of taking average of the equity values estimated from the four implementations may have reduced potential measurement errors to some extent. However, our analysis does not require the average \( V/P \) ratio to be the unit because we are interested in the cross-sectional association between the \( V/P \) ratio and inefficiency indicators in a relative efficiency comparison of investors and analysts.\(^6\)

Inspecting analysts’ earnings forecasts errors (\( FERR \)), we find that sell-side analysts are optimistic judging from the positive mean (1.2% of stock price). In addition, the median (0.5% of stock price) and the other percentile statistics suggest that analysts’ earnings forecasts errors are skewed. Past stock returns (\( MOMENTUM \)), quarterly earnings surprises (\( SUE \)), the growth in long-term net operating assets (\( GrLTNOA \)), and past sales growth (\( SG \)) are on average positive, while accruals (\( ACC \)) are on average negative. The distributions of these main variables as well as the other risk proxies are generally consistent with prior literature.

\(^6\) More specifically, the average bias of \( V/P \) ratio is controlled for by the intercept term in multivariate regression.
Table 2 reports Pearson correlations between main variables.

[ Insert Table 2 about here ]

First, the \( V/P \) ratio is negatively (positively) correlated with under-reaction (over-reaction) indicators, such as \( MOMENTUM \) and \( SUE \) (\( ACC \), \( GrLTNOA \), and \( SG \)), which is consistent with the hypothesis that analysts are more biased than investors in interpreting those inefficiency indicators. Second, the \( V/P \) ratio is significantly associated with risk proxies (except \( IDRISK \)), which supports the need to control for these risk proxies to avoid the potential omitted-variable problem. Third, analysts’ earnings forecasts errors are negatively (positively) correlated with under-reaction (over-reaction) indicators, which is consistent with prior literature on that analysts fail to fully incorporate such accounting information into their earnings forecasts.\(^7\) Fourth, one-year-ahead stock returns (\( RET1 \)) are negatively correlated with over-reaction indicators, which is consistent with the expectation that stocks are over-valued for these over-reaction indicators. However, \( RET1 \) are negatively (insignificantly) correlated with \( MOMENTUM \) (\( SUE \)), which is not consistent with prior literature suggesting that investors under-react to these inefficiency indicators. Fifth, the inefficiency indicators are significantly correlated with each other (and with risk proxies), which supports our motivation for a simultaneous comparison to analyze more correctly the relative efficiency between investors and analysts in terms of each of inefficiency phenomena.

In the next sub-section, we perform multivariate regression analyses to address the potential omitted-variable problem in an univariate correlation analysis of Table 2.

\(^7\) Since we measure \( FERR \) as analysts’ earnings forecasts less actual earnings, scaled by stock price, the signs of correlations are opposite to those of stock returns. While most of these correlations are documented in prior literature, our finding that analysts over-react to the growth in long-term net operating assets is new.
4.2 Multivariate Regression Results

Before comparing the relative efficiency of investors and analysts based on the Equation (2), we first test whether their inefficiency reported in prior studies can be found in our sample as well.

When conducting all subsequent regression tests, we replace the independent variables by their scaled decile values. This scaled decile transformation facilitates the interpretation of the coefficients. More specifically, the half of the coefficient of inefficiency indicator means the average bias of current stock prices (or the average bias of analysts’ earnings forecasts scaled by stock prices, or the average relative bias of the equity value estimates inferred from analysts’ earnings forecasts to the bias of stock prices), when firms are included within the extreme deciles of the inefficiency indicator. In addition, we use the Kemsley and Nissim (2002)’s technique to calculate the coefficient estimates and associated t-statistics in order to control for both autocorrelation and cross-sectional correlation in error terms, while we report the “Fama-MacBeth” t-statistics (Fama and MacBeth 1973) as well.

First, to test the hypothesis of investors’ efficiency, we run the regression of future stock returns for following Equation (3). The coefficients on under-reaction variables (MOMENTUM and SUE) are expected to be positive and those on over-reaction variables (ACC, GrLTNOA, and SG) are expected to be negative:

\[
\text{RET}(1, 2, or 3) = \alpha_0 + \alpha_1 \text{MOMENTUM} + \alpha_2 \text{SUE} + \alpha_3 \text{ACC} + \alpha_4 \text{GrLTNOA} + \alpha_5 \text{SG} + \alpha_6 \text{BETA} + \alpha_7 \ln(\text{SIZE}) + \alpha_8 \ln(\text{B / M}) + \alpha_9 E / P + \alpha_{10} D / M + \alpha_{11} \text{IDRISK} + \alpha_{12} \text{OIVOL} + \alpha_{13} \text{EFDEV} + \varepsilon
\]

(3)

Table 3 provides the results of the investors’ efficiency test. The three columns of the table present the regression results of Equation (3) when future stock returns for one, two, and three years ahead are used as the dependent variables, respectively.

[ Insert Table 3 about here ]
Focusing on the regression of one-year-ahead stock returns, the coefficient on \textit{MOMENTUM} is significantly positive and the coefficients on \textit{ACC} and \textit{GrLTNOA} are significantly negative, which is consistent with our expectation.\footnote{Focusing on the regression of one-year-ahead stock returns, the coefficient magnitudes for \textit{MOMENTUM}, \textit{ACC}, and \textit{GrLTNOA} are 0.072, 0.071 and 0.043 respectively. This result implies that for firms within extreme inefficiency indicators, stock prices are biased by 3.6%, 3.6%, and 2.2% of the current stock prices for each of inefficiency indicators, respectively. This figure can be interpreted as being economically significant.} To the contrary, the coefficients on \textit{SUE} and \textit{SG} are not statistically significant.\footnote{One possible reason is that the other inefficiency indicators may capture the information contents of these two inefficiency indicators. The other possibility is that the investors’ misinterpretation of these two pieces of accounting information may be recently attenuated. Lastly, it could be the case that there is a potential sample selection bias toward larger firms in our sample due to our necessary requirements of analysts’ followings.} This result implies that the investors are inefficient at least in incorporating \textit{MOMENTUM}, \textit{ACC} and \textit{GrLTNOA} in our sample.

Next, to test the hypothesis of analysts’ efficiency, we run the regression of analysts’ earnings forecast errors for following Equation (4) with the same independent variables as in Equation (3). The coefficients on analysts’ under-reaction variables (\textit{MOMENTUM} and \textit{SUE}) are expected to be negative and those on over-reaction variables (\textit{ACC}, \textit{GrLTNOA}, and \textit{SG}) are expected to be positive:

\[
FERR = \alpha_0 + \alpha_{MOMENTUM} + \alpha_{SUE} + \alpha_{ACC} + \alpha_{GrLTNOA} + \alpha_{SG} + \alpha_8 \ln(B / M) + \alpha_9 E / P + \alpha_{10} D / M
+ \alpha_{11} IDRISK + \alpha_{12} OIVOL + \alpha_{13} EFDEV + \varepsilon \tag{4}
\]

Table 4 provides the result of analysts’ efficiency test. This table presents the regression results of Equation (4) when analysts’ one-year-ahead earnings forecast error is used as a dependent variable.

[ Insert Table 4 about here ]

As expected, analysts’ earnings forecasts errors are negatively associated with \textit{MOMENTUM} and are positively associated with \textit{ACC}, \textit{GrLTNOA}, and \textit{SG}. However,
analysts’ earnings forecasts errors are again insignificantly associated with SUE, as in the investors’ efficiency test.

In sum, Tables 3 and 4 suggest that both investors and analysts under-react (over-react) to MOMENTUM (ACC and GrLTNOA), while only analysts over-react to SG. However, both investors and analysts are not biased in interpreting SUE in our sample.

Table 5 presents our main regression results based on Equation (2) for the simultaneous comparison of efficiency between investors and analysts in terms of various accounting information.

[ Insert Table 5 about here ]

Note from Section 3.1 that a negative (positive) coefficient on the under-reaction (over-reaction) variable indicates that analysts are more biased than investors in their reaction to the information contained in the corresponding variables. Several findings are noteworthy.

First, focusing on the under-reaction variables, we find that the coefficient on MOMENTUM is significantly negative. This result indicates that the equity value estimates inferred from analysts’ earnings forecasts are more biased than the stock prices in the interpretation of past stock returns. On the other hand, the coefficient on SUE is insignificant, which is not a surprising result given our findings in Tables 3 and 4 that both investors and analysts might not be biased in reacting to earnings surprises in our sample.

Second, shifting to the over-reaction variables, we find that the coefficients on ACC and SG are significantly positive. These findings imply that analysts over-react more than investors to the information contained in accruals and past sale growth. To the contrary, the coefficient on GrLTNOA is significantly negative, a result indicating
that investors are more biased than analysts in interpreting the growth in long-term net operating assets.\textsuperscript{10}

Combining the evidence, we suggest that analysts are more biased than investors in processing certain accounting information, such as stock price momentum, accruals, and past sales growth, while analysts are less biased than investors in interpreting the growth in long-term net operating assets. Indeed, investors seem to understand the inefficiency in analysts’ earnings forecasts for certain accounting information. Thus, investors may not be able to mitigate their mispricings of certain accounting information by fixating on analysts’ earnings forecasts. If investors were to fixate on analysts’ earnings forecasts, their mispricing of certain accounting information would only be exacerbated.

5. CONCLUSION

In this study, we compare simultaneously the relative efficiency between investors and sell-side analysts in interpreting a comprehensive list of accounting information, which are frequently cited as inefficiency indicators. Our analysis indicates that the equity value estimates inferred from analysts’ earnings forecasts are more biased than stock prices in terms of stock price momentum, accruals, and past sales growth, while the former is less biased than the latter in terms of the growth in long-term net operating assets. Combining the evidence, we conclude that analysts are generally more biased than investors in interpreting certain accounting information. Our findings imply that investors may not be able to mitigate their mispricing of certain accounting variables by fixating on analysts’ earnings forecasts. This is

\textsuperscript{10} Table 5 reports that the coefficient magnitudes for $MOMENTUM$, $ACC$, $GrLTNOA$, and $SG$ are 0.086, 0.016, 0.026, and 0.074, respectively. This result implies that for firms within extreme inefficiency indicators, the equity value estimates inferred from analysts’ earnings forecasts are more (less) biased than stock prices by 4.3% of current stock price for $MOMENTUM$, 0.8% for $ACC$, and 3.7% for $SG$ (1.3% for $GrLTNOA$). These figures can be interpreted as being economically significant.
consistent with the intuition that the market participants have more incentives than analysts to react more efficiently to news (Liu 2003). Future research may examine more sources of the difference in efficiency between investors and sell-side analysts. Furthermore, future research may investigate in detail why analysts are less efficient than investors in incorporating certain accounting information, while they are not in other accounting information.
REFERENCES


Appendix I: Variable Measurements

In this Appendix I, we present how to measure the variables used in the following tables in alphabetical order.

**ACC**: total accruals, measured as the change in non-cash current assets less the change in current liability (exclusive of short-term debt and taxes payable) less depreciation expense, scaled by average total assets.

**BETA**: the systematic risks estimated by regressing at least 30 up to 60 prior monthly stock returns against the corresponding market returns.

**ln(B/M)**: the logarithmic value of the book value of equity divided by its market value of equity.

**D/M**: the debt divided by the market value of equity.

**EFDEV**: the standard deviation of the analysts’ one-year-ahead earnings forecasts scaled by the absolute mean of those forecasts.

**E/P**: earnings per share before extraordinary items (reported in I/B/E/S) divided by stock price.

**FERR**: analysts’ earnings forecasts errors, which is measured as analysts’ one-year-ahead earnings forecasts minus actual earnings scaled by stock price.

**GrLTNOA**: the growth in long-term net operating assets, scaled by average total assets. See Fairfield et al. (2003) pp. 357-359 for detailed definitions.

**IDRISK**: the variance of residuals from the regressions of **BETA** estimation.

**MOMENTUM**: the stock returns during the prior twelve months.

**OIvol**: the standard deviation of operating income before depreciation in at least past two up to five years, scaled by average total assets.

**RET1(2 or 3)**: One-year-ahead (two- or three-year-ahead) annual stock returns.

**SG**: the annual growth rate of net sales, which is measured as annual sales change scaled by beginning total assets.

**ln(SIZE)**: the logarithmic value of market value of equity.

**SUE**: the standardized unexpected quarterly earnings, which is equal to the current fourth-quarter’s actual earnings minus the previous fourth-quarter’s actual earnings divided by the standard deviation of the unexpected quarterly earnings over the previous seven quarters.

**V/P**: the equity value estimates using analysts’ earnings forecasts divided by stock price. We use the average of the four equity value estimates based on three different implementations of RIV model and an implementation of OJ model as the equity value estimates using analysts’ earnings forecasts. See the Appendix II for the details.
Appendix II: Implementation of Valuation Models

For the RIV model, we consider three implementations in order to accommodate different assumptions about terminal value calculations. The first-type RIV model (RIV1) assumes that the return on equity (ROE) trends linearly from the level implied by analysts’ earnings forecasts for five years ahead to the industry median ROE by the 12th year and thereafter the residual incomes are constant in perpetuity (e.g., Lee et al. 1999; Gebhardt et al. 2001; and Liu et al. 2002):\(^\text{11}\)

\[
V_i(RIV1) = bv_t + \sum_{s=1}^{5} E_t[eps_{t+s} - r_t \times bv_{t+s-1}] \left( \frac{1}{1 + r_t} \right)^s \\
+ \sum_{s=0}^{11} E_t[(ROE_{t+s} - r_t) \times bv_{t+s}] \left( \frac{1}{1 + r_t} \right)^s + E_t[(ROE_{t+12} - r_t) \times bv_{t+11}] \left( \frac{1}{1 + r_t} \right)^{11} \\
\text{(5)}
\]

where \(bv_t\) is the book value of equity per share at time \(t\); \(eps_t\) is the earnings per share during time \(t\); \(r_t\) is the cost of equity capital at time \(t\); and \(ROE_t\) is the return on equity during time \(t\).

The second-type RIV model (RIV2) assumes that the residual incomes remain constant beyond five years ahead (e.g., Frankel and Lee 1998; Lee et al. 1999; Liu et al. 2002; Ali et al. 2003):

\[
V_i(RIV2) = bv_t + \sum_{s=1}^{5} E_t[eps_{t+s} - r_t \times bv_{t+s-1}] \left( \frac{1}{1 + r_t} \right)^s + \frac{E_t[eps_{t+5} - r_t \times bv_{t+4}]}{r_t \times (1 + r_t)^5} \\
\text{(6)}
\]

The third-type RIV model (RIV3) assumes that the residual incomes grow after five years ahead at the rate of the long-term inflation rate \((g_t)\), measured as risk-free rate less 3 percent (e.g., Claus and Thomas 2001):

\[
V_i(RIV3) = bv_t + \sum_{s=1}^{5} E_t[eps_{t+s} - r_t \times bv_{t+s-1}] \left( \frac{1}{1 + r_t} \right)^s + \frac{E_t[eps_{t+5} - r_t \times bv_{t+4} \times (1 + g_t)]}{(r_t - g_t) \times (1 + r_t)^5} \\
\text{(7)}
\]

\(^{11}\) Following Liu et al. (2002), we compute analysts’ three-year-ahead earnings forecasts by multiplying their two-year-ahead earnings forecasts by their five-year earnings-growth forecasts. We compute four- and five-year-ahead forecasts in a similar manner.
When implementing the OJ model, we use analysts’ earnings forecasts to calculate the abnormal earnings growth up to five years ahead. Unlike the RIV model, the OJ model obtains equity values without referring to future book values of equity as follows:

\[
V_t(OJ) = \frac{\text{eps}_{t+1}}{r_t} + \sum_{s=2}^{4} \frac{E_t[\text{eps}_{t+s} + r_t \times \text{dps}_{t+s-1} - (1 + r_t) \times \text{eps}_{t+s-1}]}{r_t \times (1 + r_t)^{s-1}} \\
+ \frac{E_t[\text{eps}_{t+5} + r_t \times \text{dps}_{t+4} - (1 + r_t) \times \text{eps}_{t+4}]}{r_t \times (1 + r_t)^{3} (r_t - \gamma_t + 1)}
\]  

(8)

where \(\text{dps}_t\) is the dividend per share during time \(t\); and \((\gamma - 1)\) is set to the risk-free rate less 3 percent as in Gode and Mohanram (2003).

For all of the above empirical variations of the RIV and OJ models, we estimate the future dividend-payout ratio by dividing actual dividends by earnings for the most recent year (or by analysts’ one-year-ahead earnings forecasts for firms with negative earnings). Following Liu et al. (2002), we estimate the cost of equity capital based on the Capital Asset Pricing Model (CAPM). We use at least 30 prior monthly stock returns to estimate betas. The resulting beta estimates are used in conjunction with realized 10-year treasury-bill rates as risk-free rates and a 5 percent market risk premium. To mitigate the effect of extreme beta estimates, we use the median decile beta when calculating the cost of equity capital. Lastly, we set negative terminal values to zero.

---

12 While Gode and Mohanram (2003) implement the OJ model by calculating the future abnormal earnings growth up to two years ahead, we do so up to five years ahead to fully impound analysts’ forecasts of five-year earnings-growth. Ohlson and Juettner-Nauroth (2005) and Jorgensen et al. (2008) also support the idea of extending the terminal periods beyond two years ahead.
Table 1. Descriptive Statistics

This table presents the distributions of the main variables. See the Appendix I for the definitions of variables. In our empirical tests we use the log of \( SIZE \) and \( B/M \), but for descriptive purposes we present raw values in the table.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Observations</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>5%</th>
<th>10%</th>
<th>25%</th>
<th>Median</th>
<th>75%</th>
<th>90%</th>
<th>95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V/P )</td>
<td>23639</td>
<td>1.063</td>
<td>0.772</td>
<td>0.342</td>
<td>0.431</td>
<td>0.594</td>
<td>0.836</td>
<td>1.238</td>
<td>1.977</td>
<td>2.653</td>
</tr>
<tr>
<td>( FERR )</td>
<td>19553</td>
<td>0.012</td>
<td>0.030</td>
<td>-0.018</td>
<td>-0.009</td>
<td>-0.002</td>
<td>0.005</td>
<td>0.019</td>
<td>0.040</td>
<td>0.063</td>
</tr>
<tr>
<td>( MOMENTUM )</td>
<td>23639</td>
<td>0.190</td>
<td>0.487</td>
<td>-0.433</td>
<td>-0.312</td>
<td>-0.107</td>
<td>0.114</td>
<td>0.373</td>
<td>0.734</td>
<td>1.070</td>
</tr>
<tr>
<td>( SUE )</td>
<td>23639</td>
<td>0.422</td>
<td>3.393</td>
<td>-4.343</td>
<td>-2.169</td>
<td>-0.466</td>
<td>0.483</td>
<td>1.891</td>
<td>3.476</td>
<td>4.938</td>
</tr>
<tr>
<td>( ACC )</td>
<td>23639</td>
<td>-0.029</td>
<td>0.074</td>
<td>-0.138</td>
<td>-0.108</td>
<td>-0.069</td>
<td>-0.035</td>
<td>0.005</td>
<td>0.061</td>
<td>0.108</td>
</tr>
<tr>
<td>( GrLTNOA )</td>
<td>23639</td>
<td>0.112</td>
<td>0.123</td>
<td>-0.018</td>
<td>0.011</td>
<td>0.042</td>
<td>0.083</td>
<td>0.147</td>
<td>0.257</td>
<td>0.361</td>
</tr>
<tr>
<td>( SG )</td>
<td>23639</td>
<td>0.193</td>
<td>0.301</td>
<td>-0.130</td>
<td>-0.051</td>
<td>0.024</td>
<td>0.118</td>
<td>0.279</td>
<td>0.533</td>
<td>0.784</td>
</tr>
<tr>
<td>( BETA )</td>
<td>23639</td>
<td>1.094</td>
<td>0.611</td>
<td>0.195</td>
<td>0.361</td>
<td>0.681</td>
<td>1.043</td>
<td>1.424</td>
<td>1.882</td>
<td>2.221</td>
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<tr>
<td>( SIZE )</td>
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<td>2821</td>
<td>7134</td>
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<td>207</td>
<td>619</td>
<td>2006</td>
<td>6205</td>
<td>12632</td>
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<tr>
<td>( B/M )</td>
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<td>0.331</td>
<td>0.113</td>
<td>0.162</td>
<td>0.271</td>
<td>0.434</td>
<td>0.656</td>
<td>0.913</td>
<td>1.134</td>
</tr>
<tr>
<td>( E/P )</td>
<td>23639</td>
<td>0.051</td>
<td>0.039</td>
<td>-0.006</td>
<td>0.014</td>
<td>0.033</td>
<td>0.052</td>
<td>0.071</td>
<td>0.093</td>
<td>0.112</td>
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<td>( D/M )</td>
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<td>0.488</td>
<td>0</td>
<td>0</td>
<td>0.036</td>
<td>0.177</td>
<td>0.464</td>
<td>0.923</td>
<td>1.336</td>
</tr>
<tr>
<td>( IDRISK )</td>
<td>23639</td>
<td>0.014</td>
<td>0.014</td>
<td>0.002</td>
<td>0.003</td>
<td>0.005</td>
<td>0.010</td>
<td>0.018</td>
<td>0.031</td>
<td>0.042</td>
</tr>
<tr>
<td>( OIVOL )</td>
<td>23639</td>
<td>0.047</td>
<td>0.035</td>
<td>0.010</td>
<td>0.014</td>
<td>0.023</td>
<td>0.038</td>
<td>0.060</td>
<td>0.091</td>
<td>0.119</td>
</tr>
<tr>
<td>( EFDEV )</td>
<td>23639</td>
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<td>0.199</td>
<td>0.000</td>
<td>0.010</td>
<td>0.021</td>
<td>0.042</td>
<td>0.095</td>
<td>0.222</td>
<td>0.392</td>
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Table 2. Correlations between Main Variables

This table presents the Pearson correlations between the key variables. See the Appendix I for the definitions of all variables. Bold numbers indicate significance levels at 5% or higher.

<table>
<thead>
<tr>
<th>Variable</th>
<th>V/P</th>
<th>FERR</th>
<th>MOMENTUM</th>
<th>SUE</th>
<th>ACC</th>
<th>GrLTNOA</th>
<th>SG</th>
<th>BETA</th>
<th>ln(SIZE)</th>
<th>ln(B/M)</th>
<th>E/P</th>
<th>D/M</th>
<th>IDRISK</th>
<th>OIVOL</th>
<th>EFDEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Observations</td>
<td>23639</td>
<td>19553</td>
<td>23639</td>
<td>23639</td>
<td>23639</td>
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</tr>
<tr>
<td>MOMENTUM</td>
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<td>-0.189</td>
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<tr>
<td>SUE</td>
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<td>-0.042</td>
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<td>ACC</td>
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<td>GrLTNOA</td>
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<td>0.038</td>
<td>-0.012</td>
<td>0.058</td>
<td>0.042</td>
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</tr>
<tr>
<td>SG</td>
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<td>0.050</td>
<td>0.078</td>
<td>0.177</td>
<td>0.405</td>
<td>0.359</td>
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<tr>
<td>BETA</td>
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<td>0.087</td>
<td>0.036</td>
<td>0.030</td>
<td>0.075</td>
<td>0.029</td>
<td>0.157</td>
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<td></td>
</tr>
<tr>
<td>ln(SIZE)</td>
<td>-0.141</td>
<td>-0.166</td>
<td>0.111</td>
<td>0.060</td>
<td>-0.126</td>
<td>-0.024</td>
<td>-0.120</td>
<td>-0.116</td>
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<tr>
<td>ln(B/M)</td>
<td>0.237</td>
<td>0.186</td>
<td>-0.421</td>
<td>-0.209</td>
<td>-0.034</td>
<td>-0.085</td>
<td>-0.224</td>
<td>-0.120</td>
<td>-0.398</td>
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<tr>
<td>E/P</td>
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<td>-0.252</td>
<td>0.041</td>
<td>0.149</td>
<td>0.035</td>
<td>0.063</td>
<td>0.196</td>
<td>-0.026</td>
<td>0.282</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D/M</td>
<td>0.234</td>
<td>0.134</td>
<td>-0.178</td>
<td>-0.157</td>
<td>-0.036</td>
<td>-0.008</td>
<td>-0.131</td>
<td>-0.172</td>
<td>-0.138</td>
<td>0.466</td>
<td>0.139</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>IDRISK</td>
<td>0.009</td>
<td>0.038</td>
<td>0.129</td>
<td>0.003</td>
<td>0.059</td>
<td>0.079</td>
<td>0.209</td>
<td>0.439</td>
<td>-0.262</td>
<td>-0.136</td>
<td>-0.225</td>
<td>-0.108</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OIVOL</td>
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<td>0.056</td>
<td>0.106</td>
<td>0.123</td>
<td>0.078</td>
<td>0.144</td>
<td>0.320</td>
<td>0.340</td>
<td>-0.149</td>
<td>-0.359</td>
<td>-0.186</td>
<td>-0.292</td>
<td>0.449</td>
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</tr>
<tr>
<td>EFDEV</td>
<td>-0.047</td>
<td>0.225</td>
<td>-0.145</td>
<td>-0.150</td>
<td>-0.096</td>
<td>-0.011</td>
<td>-0.098</td>
<td>0.121</td>
<td>-0.186</td>
<td>0.217</td>
<td>-0.295</td>
<td>0.189</td>
<td>0.151</td>
<td>0.106</td>
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</tr>
<tr>
<td>RET1</td>
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<td>-0.212</td>
<td>-0.054</td>
<td>0.005</td>
<td>-0.065</td>
<td>-0.054</td>
<td>-0.035</td>
<td>-0.018</td>
<td>-0.004</td>
<td>0.055</td>
<td>0.067</td>
<td>0.021</td>
<td>-0.041</td>
<td>-0.026</td>
<td>-0.025</td>
</tr>
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</table>
Table 3. Test of Investors’ Efficiency

This table presents the cross-sectional year-by-year regressions of the stock returns as of the end of April. Each column presents the result of the regression when stock returns are the one-, two-, and three-year-ahead annual stock returns. The regression equation is as follows:

\[
RET_{1,2,3} = \alpha_0 + \alpha_1MOMENTUM + \alpha_2SUE + \alpha_3ACC + \alpha_4GrLTNOA + \alpha_5SG \\
+ \alpha_6BETA + \alpha_7\ln(SIZE) + \alpha_8\ln(B/M) + \alpha_9E/P + \alpha_{10}D/M \\
+ \alpha_{11}IDRISK + \alpha_{12}OIVOL + \alpha_{13}EFDEV + \varepsilon
\]

See the Appendix I for the definitions of all variables. All variables except RET are replaced by their scaled decile values. The coefficients presented are the means of the annual regressions. The t-stat. is the t-statistic calculated from the time-series standard errors of the annually estimated coefficients as in Fama and MacBeth (1973). The Adj. t-stat. is the t-statistic adjusted for autocorrelation as in Kemsley and Nissim (2002). Adj. R² is the average adjusted R² of the annual regressions.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>one-year-ahead stock return (RET1)</th>
<th>two-year-ahead stock return (RET2)</th>
<th>three-year-ahead stock return (RET3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERCEPT</td>
<td>0.143</td>
<td>3.81</td>
<td>5.30</td>
</tr>
<tr>
<td>MOMENTUM</td>
<td>0.072</td>
<td>2.86</td>
<td>3.53</td>
</tr>
<tr>
<td>SUE</td>
<td>-0.009</td>
<td>-0.68</td>
<td>-1.06</td>
</tr>
<tr>
<td>ACC</td>
<td>-0.071</td>
<td>-7.42</td>
<td>-7.20</td>
</tr>
<tr>
<td>GrLTNOA</td>
<td>-0.043</td>
<td>-3.09</td>
<td>-6.07</td>
</tr>
<tr>
<td>SG</td>
<td>0.005</td>
<td>0.28</td>
<td>0.26</td>
</tr>
<tr>
<td>BETA</td>
<td>-0.030</td>
<td>-1.27</td>
<td>-1.37</td>
</tr>
<tr>
<td>ln(SIZE)</td>
<td>0.018</td>
<td>0.59</td>
<td>0.56</td>
</tr>
<tr>
<td>ln(B/M)</td>
<td>0.037</td>
<td>2.16</td>
<td>2.12</td>
</tr>
<tr>
<td>E/P</td>
<td>0.024</td>
<td>1.38</td>
<td>1.41</td>
</tr>
<tr>
<td>D/M</td>
<td>-0.026</td>
<td>-0.98</td>
<td>-0.90</td>
</tr>
<tr>
<td>IDRISK</td>
<td>0.020</td>
<td>0.54</td>
<td>0.77</td>
</tr>
<tr>
<td>OIVOL</td>
<td>0.005</td>
<td>0.30</td>
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<tr>
<td>EFDEV</td>
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<td>-2.11</td>
</tr>
<tr>
<td>Adj. R²</td>
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<td>N. of Years</td>
<td>20</td>
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</tr>
<tr>
<td>N. of Sample</td>
<td>21424</td>
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<td></td>
</tr>
</tbody>
</table>
Table 4. Test of Sell-Side Analysts’ Efficiency

This table presents the cross-sectional year-by-year regressions of the analysts’ earnings forecast errors as of the end of April. The regression equation is as follows:

\[
FERR = \alpha_0 + \alpha_1 \text{MOMENTUM} + \alpha_2 \text{SUE} + \alpha_3 \text{ACC} + \alpha_4 \text{GrLTNOA} + \alpha_5 \text{SG} \\
+ \alpha_6 \text{BETA} + \alpha_7 \ln(\text{SIZE}) + \alpha_8 \ln(\text{B} / \text{M}) + \alpha_9 \text{E} / \text{P} + \alpha_{10} \text{D} / \text{M} \\
+ \alpha_{11} \text{IDRISK} + \alpha_{12} \text{OIVOL} + \alpha_{13} \text{EFDEV} + \varepsilon
\]

See the Appendix I for the definitions of all variables. All variables except \( FERR \) are replaced by their scaled decile values. The coefficients presented are the means of the annual regressions. The t-stat. is the t-statistic calculated from the time-series standard errors of the annually estimated coefficients as in Fama and MacBeth (1973). The Adj. t-stat. is the t-statistic adjusted for autocorrelation as in Kemsley and Nissim (2002). Adj. R^2 is the average adjusted R^2 of the annual regressions.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-stat.</th>
<th>Adj. t-stat.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERCEPT</td>
<td>0.004</td>
<td>1.73</td>
<td>2.20</td>
</tr>
<tr>
<td>MOMENTUM</td>
<td>-0.020</td>
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<td>-10.04</td>
</tr>
<tr>
<td>SUE</td>
<td>0.001</td>
<td>1.13</td>
<td>0.98</td>
</tr>
<tr>
<td>ACC</td>
<td>0.004</td>
<td>4.08</td>
<td>4.90</td>
</tr>
<tr>
<td>GrLTNOA</td>
<td>0.002</td>
<td>2.38</td>
<td>3.19</td>
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<td>SG</td>
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<td>BETA</td>
<td>0.003</td>
<td>2.54</td>
<td>3.04</td>
</tr>
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<td>ln(SIZE)</td>
<td>-0.004</td>
<td>-2.00</td>
<td>-1.90</td>
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<tr>
<td>ln(B/M)</td>
<td>0.006</td>
<td>2.32</td>
<td>1.84</td>
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<tr>
<td>E/P</td>
<td>0.001</td>
<td>0.64</td>
<td>0.67</td>
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<tr>
<td>D/M</td>
<td>0.006</td>
<td>6.76</td>
<td>7.27</td>
</tr>
<tr>
<td>IDRISK</td>
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<td>1.89</td>
<td>1.74</td>
</tr>
<tr>
<td>OIVOL</td>
<td>0.006</td>
<td>4.22</td>
<td>3.68</td>
</tr>
<tr>
<td>EFDEV</td>
<td>0.009</td>
<td>6.55</td>
<td>8.48</td>
</tr>
<tr>
<td>Adj. R^2</td>
<td></td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>N. of Years</td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>N. of Sample</td>
<td></td>
<td>19553</td>
<td></td>
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</table>
Table 5. Efficiency Comparisons between Investors and Sell-Side Analysts

This table presents the cross-sectional year-by-year regressions of the \( V/P \) ratios as of the end of April. The regression equation is as follows.

\[
V / P = \alpha_0 + \alpha_1 \text{MOMENTUM} + \alpha_2 \text{SUE} + \alpha_3 \text{ACC} + \alpha_4 \text{GrLTNOA} + \alpha_5 \text{SG} \\
+ \alpha_6 \text{BETA} + \alpha_7 \ln(\text{SIZE}) + \alpha_8 \ln(\text{B/M}) + \alpha_9 \text{E/P} + \alpha_{10} \text{D/M} \\
+ \alpha_{11} \text{IDRISK} + \alpha_{12} \text{OIVOL} + \alpha_{13} \text{EFDEV} + \epsilon
\]

See the Appendix I for the definitions of all variables. All variables except the \( V/P \) ratio are replaced by their scaled decile values. The coefficients presented are the means of the annual regressions. The t-stat. is the t-statistic calculated from the time-series standard errors of the annually estimated coefficients as in Fama and MacBeth (1973). The Adj. t-stat. is the t-statistic adjusted for autocorrelation as in Kemsley and Nissim (2002). Adj. \( R^2 \) is the average adjusted \( R^2 \) of the annual regressions.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-stat.</th>
<th>Adj. t-stat.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERCEPT</td>
<td>0.616</td>
<td>23.93</td>
<td>11.85</td>
</tr>
<tr>
<td>MOMENTUM</td>
<td>-0.086</td>
<td>-5.95</td>
<td>-4.70</td>
</tr>
<tr>
<td>SUE</td>
<td>0.007</td>
<td>1.57</td>
<td>1.56</td>
</tr>
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<td>ACC</td>
<td>0.016</td>
<td>3.25</td>
<td>2.49</td>
</tr>
<tr>
<td>GrLTNOA</td>
<td>-0.026</td>
<td>-5.04</td>
<td>-4.21</td>
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<tr>
<td>SG</td>
<td>0.074</td>
<td>12.45</td>
<td>9.30</td>
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<tr>
<td>BETA</td>
<td>-0.700</td>
<td>-26.63</td>
<td>-11.29</td>
</tr>
<tr>
<td>ln(SIZE)</td>
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<td>-9.78</td>
<td>-4.49</td>
</tr>
<tr>
<td>ln(B/M)</td>
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<td>4.24</td>
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<td>16.75</td>
<td>12.18</td>
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<tr>
<td>D/M</td>
<td>0.099</td>
<td>11.86</td>
<td>6.13</td>
</tr>
<tr>
<td>IDRISK</td>
<td>0.121</td>
<td>10.56</td>
<td>5.42</td>
</tr>
<tr>
<td>OIVOL</td>
<td>0.057</td>
<td>7.15</td>
<td>3.19</td>
</tr>
<tr>
<td>EFDEV</td>
<td>-0.003</td>
<td>-0.36</td>
<td>-0.27</td>
</tr>
</tbody>
</table>

Adj. \( R^2 \) | 0.67
N. of Years   | 21
N. of Sample  | 23639