Do Investors Recognize Biases in Securities Analysts' Forecasts?

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Abstract

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This study presents direct evidence on the question whether investors recognize the widely documented biases in securities analysts' earnings forecasts. The internal rate of return implied by current stock price and consensus earnings forecasts is found to be correlated with indicators of bias in a manner consistent with investors discounting optimistic earnings forecasts at higher rates of return and less optimistic forecasts at lower rates of return. In a departure from studies of excess returns, the evidence in implied returns indicates that investors recognize the biases in analysts' earnings forecasts.

1. Introduction

A substantial literature investigating analysts' earnings forecasts supports the conclusion that they are biased. A more recent and growing body of research asserts that because investors fail to optimally process available information, they overweight analyst forecasts resulting in substantial mispricing of common stock. This assertion is based on evidence purporting to show the existence of profitable trading strategies formed on indicators of bias. However, on the question whether investors fail to recognize analyst bias, the evidence from realized returns is circumstantial and open to varying interpretation. By now, analyst biases have been extensively documented. Thus, without a compelling explanation of investors' inability to account for them in valuing common stock, the attribution of seemingly profitable trading strategies to deficiencies in investor judgment must be considered tenuous and needing additional corroborating evidence. The present study takes a new approach to the question whether investors fail to recognize analyst forecast bias and investigates the determinants of expected return in a recent cross section of U.S. public companies.

Clearly, from the perspective of financial market efficiency, the inability of investors to recognize analyst bias is troubling. But, is it true? If investors are able to recognize biases in analyst earnings forecasts, then in valuing stocks they will apply higher discount rates to forecasts they believe are biased upward (i.e., optimistic) and lower rates to those they believe are biased downward (pessimistic). It should be the case, then, that stock price relative to the consensus earnings forecast is correlated with indicators of bias. That is, for a given consensus forecast, stock price will be lower (higher) to the extent investors perceive the forecast to be optimistic (pessimistic). If investors are unable to recognize analyst bias (or, equivalently, if they believe analyst forecasts are unbiased), then stock price relative to the consensus forecast will be uncorrelated with indicators of bias. In this study, the relation of stock price to consensus forecast is measured by reverse engineering an equity valuation model to obtain the internal rate of return implied by current stock price and the consensus forecast. The implied return is found to be strongly correlated with indicators of bias in a fashion consistent with investors discounting optimistic (pessimistic) consensus forecasts at higher (lower) rates of return. Hence, in contrast to assertions made in previous studies, the results presented here support the view that equity investors are indeed capable of recognizing and adjusting for analyst bias. As a preliminary indication of this, the sample median implied return of stocks rated by analysts as Buy, Hold and Sell are 10.7%, 8.6% and 7.6%, respectively. Differences among them are highly statistically significant.

The rest of the paper is organized as follows. Section 2 reviews the literature on analyst earnings forecasts as well as attempts to model earnings forecast error and to profit therefrom. Against this backdrop, the contribution of the present study is articulated. The empirical methodology and data are described in section 3. Section 4 presents and discusses the findings, and section 5 summarizes and concludes.

2. Review of Literature

The literature on analysts' earnings and stock price forecasts indicates that long-range forecasts are optimistic, short-range forecasts are pessimistic, and forecasts generally do not fully reflect available information. Companies report earnings that on average fall short of consensus long-range forecasts (e.g., Abarbanell & Lehavy, 2003; Agrawal & Chen, 2006; Bradshaw et al., 2006; Brous, 1992; Brous & Kini, 1993; Butler & Lange, 1991; Dreman & Berry, 1995; Easterwood & Nutt, 1999; Francis & Philbrick, 1993; Fried & Givoly, 1982; Kang et al., 1994; Richardson et al., 2004), and stock prices tend not to reach analysts' long-range price targets (e.g., Cowen et al., 2006; Szakmary et al., 2008). Researchers attempting to understand the factors driving these biases have considered analysts' relationships with their employers, with the firms they cover, and with their investor clients. Forecast optimism has been attributed to the investment banking and trading activities of analysts' sell-side employers, to the tendency of analysts to cover firms about which they are optimistic, and to analysts' desire to appease company executives in order to maintain access to valuable information. Management guidance and analysts' desire to establish and maintain credibility with investor clients act to dampen analyst optimism (Cowen et al., 2006; Dugar & Nathan, 1995; Francis & Philbrick, 1993; Lin & McNichols, 1998; Ljungqvist et al., 2007; Michaely & Womack, 1999; Raedy et al., 2006; Richardson et al., 2004).

Apart from being biased, consensus earnings forecasts do not fully incorporate available information and are therefore inefficient. Forecast errors are correlated with prior forecast errors, past stock returns, and past earnings changes (Ali et al., 1992; Abarbanell and Bernard, 1992; Shane and Brous, 2001), and Cohen and Lys (2003) report that analysts underreact to prior information. Attempts to explain these inefficiencies have relied on the existence of defects in analysts' judgment. Conservatism bias, for example, is alleged to cloud analyst judgment. However, Raedy et al. (2006) provide a rational explanation for underreaction in terms of analyst credibility. For a forecast error of given magnitude, credibility is damaged when later information causes a forecast revision in the direction opposite the analyst's previous revision. Hence, analyst forecast inefficiency could arise from rational incentives as opposed to defective judgment.

A related stream of research seeks to model earnings forecast error in order to improve earnings forecasts. Laroque (2013), for example, models earnings forecast error in terms of lagged forecast error, lagged abnormal stock return, and lagged equity market value. Mohanram and Gode (2013) model forecast error in terms of lagged accruals, lagged sales growth, lagged analyst forecasts of long-term growth, lagged change in property, plant and equipment, lagged change in other total assets, lagged stock return, and the revision in analyst forecasts from the prior year. Easton and Monahan (2016) conclude that while these methods are effective in removing errors in earnings forecast levels, they are less effective in removing errors in forecasts of earnings changes.

Another related research stream seeks to identify profitable trading strategies by exploiting predictable earnings forecast error. Kothari et al. (2016) survey the literature on analysts' forecasts and asset pricing and conclude that investors only partially unravel the biases in analysts' forecasts resulting in predictable stock prices. Their conclusion is based on research demonstrating the ability to generate seemingly profitable trading strategies from predictable forecast error. So (2013), for example, addresses the question whether investors overweight analyst forecasts by examining the excess returns of portfolios constructed on the basis of predictable earnings forecast error. He models earnings on the basis of lagged company characteristics and sorts portfolios on the basis of the disparity between characteristic forecasts and analyst consensus forecasts. He finds that excess returns can be earned by purchasing stocks for which consensus forecasts are low vis-à-vis characteristic forecasts and selling those for which the opposite is true. Based on this, So (2013) concludes that "investors fail to fully undo predictable biases in analyst forecasts" (p.636). Consequently, investors overweight analyst forecasts resulting in "substantial valuation errors" (p.616). They pay too much for stocks for which analysts are optimistic and too little for those for which analysts are pessimistic. Da and Warachka (2011) report evidence of market inefficiency with respect to analysts' long-term growth forecasts. When the long-term forecast is well above the short-term forecast, both subsequent returns and subsequent revisions to long-run forecasts tend to be negative. The reverse is true when the long-run forecast is well below the short-run forecast. Da and Warachka (2011) conclude that the growth disparity is a "robust predictor" of abnormal return that can be attributed to "investor inattention" to long-term growth prospects.

The evidence from excess returns on the soundness of investor judgment is not conclusive. To begin, not all research finds that profitable strategies can be implemented from analyst bias. For example, Hughes, et al. (2008) conclude that "trading strategies based directly on the predictable component of forecast errors are not profitable" (p. 266). Moreover, Barber, et al. (2001) document high levels of trading required to capture the excess returns of strategies based on analyst recommendations. It is not clear from Da and Warachka (2011) and So (2013) that the returns they document are sufficient to cover transactions costs, which, in addition to bid-ask spreads, include the expense of borrowing securities and the uncertainties of maintaining short positions for extended periods. It is also not clear that these excess returns are sufficiently reliable to warrant devoting large sums to capturing them. Figure 3 in So (2013), for example, shows extended periods in which the strategy he documents would have generated low or negative excess returns, and Table 5 shows that the explanatory power of cross sectional regressions for excess return is quite low. Hence, it is not clear that these excess returns can be exploited at meaningful scale, and even if they can be, it is not clear that these inefficiencies continue to exist.

The present study takes a different approach to the question whether investors fail to recognize bias in analyst forecasts. The logic is straightforward. For a given consensus forecast, stock price will be lower to the extent investors perceive the consensus to be biased upward, and it will be higher to the extent investors perceive the consensus to be biased downward. As described in the following section, the relation between stock price and consensus forecast is expressed in terms of an implied rate of return, so that for a given consensus forecast, higher stock price implies lower rate of return. If investors fail to recognize analyst bias (or, equivalently, if they believe the consensus forecast to be unbiased) then there should be no correlation between implied return and indicators of bias. This study seeks to determine whether any such correlation exists in the data.

3. Methodology and Data

The research question concerns whether investors fail to unravel the widely documented biases and inefficiencies in analyst forecasts. Direct evidence is to be found in the internal rate of return implied by current stock price and analysts' consensus earnings forecasts (hereafter, implied return). Easton and Monahan (2016) explain that the justification for using the implied return to estimate expected return is twofold; realized returns are not reliable measures of expected return, and risk factors are either unknown or cannot be reliably forecast. Analysts' consensus earnings forecast is biased when it differs from the market's. It is biased upward (i.e., optimistic) when it exceeds the market forecast and biased downward (pessimistic) when it is below the market forecast. A stock's market price embeds the market forecast. To the extent that the consensus forecast differs from the market forecast, implied return differs from expected return. For the present study it is important to note that implied return embeds the difference, if any, between the market forecast and consensus forecast. If investors fail to recognize bias in analyst forecasts then implied return equals expected return and is uncorrelated with indicators of analyst bias. Alternatively, if investors do recognize analyst bias then implied return is correlated with indicators of bias. The null hypothesis that investors fail to recognize bias is tested in a cross-sectional regression analysis of the correlates of implied return.

Implied returns for individual stocks are computed by the procedure described in Easton (2004). The procedure reverse engineers a valuation model to compute the internal rate of return implied by current stock price and consensus EPS forecasts. It starts from a one-period valuation model:

$$p_0 = (1 + r)^{-1}(p_1 + d_1)$$

where $\mathbf{p}_0$ is current stock price, $\mathbf{p}_1$ and $\mathbf{d}_1$ are the expected stock price and dividend one year hence, and $\mathbf{r}$ is the rate at which investors discount future equity cash flows. By recursive substitution for future stock price:

$$p_0 = \frac{e_1}{r} + r^{-1}\sum_{t=1}^{\infty}(1+r)^{-t}agr_t$$

where $agr_t = e_{t+1} + rd_t - (1+r)e_t$, and e_t is earnings per share for year t that is forecast at $t = 0$. agr_t can be shown to equal the forecast change in residual income from t to t+1. Assuming constant growth in agr after a two-year forecast horizon,

$$p_0 = \frac{e_1}{r} + \frac{agr_1}{r(r - \Delta agr)}$$

where $\Delta agr = (agr_{t+1}/agr_t) - 1$ denotes the constant perpetual growth rate of agr after t = 2. Assuming further that $\Delta agr = 0$, then $p_0 = (e_2 + rd_2 - e_1)/r^2$, and **implied return (r)** is the solution to equation (1):

$$r^2 - r(d_2/p_0) - (e_2 - e_1)/p_0 = 0 \quad (1)$$

In equation (1), $\mathbf{e}_1$ and $\mathbf{e}_2$ denote consensus EPS forecasts for one year and two years ahead, and $d_2 = d_0(1 + r')^2$. $\mathbf{d}_0$ denotes trailing one-year dividend per share, and $\mathbf{r'}$ is the solution to (1) assuming dividends equal zero. Easton and Monahan (2016) review the literature employing this model.

For the sake of assessing the robustness of empirical results, implied return is also computed by the method in Peasnell, et al. (2018), which incorporates analysts' consensus long-term growth forecast in the implied return equation. In Peasnell et al. (2018), implied return (r) is the solution to the following:[1]

[1] This is equation (2) on p. 221 of Peasnell et al. (2018).

$$p_0 = \frac{e_1}{r} + \frac{agr_1}{r}\left[1 - \frac{\left(\frac{1+LTG}{1+r}\right)^4}{r - LTG}\right] + \left(\frac{agr_1(1+LTG)^4}{r^2(1+r)^5}\right)$$

where LTG is the consensus long-term (i.e., 3-5 year) growth forecast, and other variables are as defined previously.

In valuing stock, investors will discount the consensus earnings forecast at a higher (lower) rate when the consensus is thought to be optimistic (pessimistic). Hence, for a given consensus forecast, stock price will be lower (and implied return higher) when the consensus is biased up, and stock price will be higher (and implied return lower) when the consensus is biased down. To test the hypothesis that investors fail to recognize bias in analyst forecasts, determinants of implied return are investigated in cross-sectional regression. The base regression is given by equation (2):

$$r_i = \alpha_0 + \alpha_1 Rating_i + \alpha_2 Beta_i + \alpha_3 Vol_i + \alpha_4 Debt_i + \alpha_5 Size_i + \alpha_6 Own_i + \varepsilon_i \qquad (2)$$

Rating is analysts' consensus investment rating for each stock on a scale from 1 (strong sell) to 5 (strong buy). Peasnell, et al. (2018) show that investment rating and analysts' earnings forecasts are positively correlated. Hence, biases in earnings forecasts can be expected to translate into investment rating, so that, conversely, Rating can be assumed to be positively correlated with analyst bias. If investors fail to recognize analyst bias, the coefficient on Rating is not statistically different from zero. Under the alternative by which investors recognize and make adjustments for biased forecasts, the coefficient on Rating is positive.

To assess the robustness of results from equation (2), Rating is operationalized alternatively in discrete form as dummy variables Buy and Sell indicating, respectively, the top and bottom quartiles of the Rating distribution. Rating is further operationalized in terms of the residual from a regression model for investment rating motivated by Peasnell, et al. (2018). Consensus forecast bias is also measured in terms of analysts' long-term growth forecasts. These measures are described further below.

Remaining variables in equation (2) are control variables that on theoretical and/or empirical grounds appear to influence the cross section of stock returns. **Beta** measures the stock's sensitivity to a market index. As a measure of undiversifiable risk, its coefficient is expected to be positive. **Vol** denotes target price return volatility. It is calculated as the natural log of the ratio of analysts' highest target stock price to their lowest target price. It represents uncertainty about fundamental value, and its coefficient is expected to be positive. **Debt** is calculated as the ratio of net debt to trailing one-year EBITDA. As a measure of financial risk, its coefficient is expected to be positive. **Size** is measured as the natural log of market capitalization. As an inverse measure of risk, its coefficient is expected to be negative. **Own** is the proportion of shares outstanding held by institutions. Cowen et al. (2006) and Ljungqvist et al. (2007) find that analyst bias is tempered in the presence of institutional investors. Hence, the coefficient on Own is expected to be negative.

All data were downloaded from a Bloomberg terminal[2] on the following dates: October 23, 2018, November 2, 2018, November 8, 2018, December 10, 2018, January 16, 2019, February 4, 2019, February 11, 2019, February 13, 2019, February 20, 2019, February 25, 2019, March 11, 2019, March 18, 2019, April 1, 2019, April 8, 2019, and April 15, 2019. Because the main results of this study are confirmed for each of these dates in separate analyses, only the

[2] As of this writing, more than 300 universities integrate Bloomberg into their curricula: https://www.bloomberg.com/professional/expertise/universities/.

results from April 15, 2019 are reported. Results for non-reported dates are available on request.

The initial sample of 2,865 is the result of a screen for all firms that are members of the Russell 3000 index with a stock price at least equal to $1 per share and a ratio of stock price to book value greater than zero. After eliminating stocks with fiscal year end other than December 31, 2018 (555), firms in financial services (731), and firms lacking sufficient data for analysis (742), the sample size is reduced to 837. Summary statistics are presented in Table 1. Table 1 shows that the median firm has an implied return of 8.6%, a market cap of $4.3 billion, and is followed by 12 analysts with a consensus rating of 4.0 on a scale of 1 (strong sell) to 5 (strong buy). Hence, the median firm is recommended by analysts for addition to investment portfolios. The distribution of Rating is consistent with the widely recognized dearth of sell ratings issued by sell-side analysts. In subsequent analysis, the variable **Buy** takes a value of 1 for stocks with Rating of 4.4 or higher (the upper quartile) and 0 otherwise. The variable **Sell** takes a value of 1 for stocks with a Rating of 3.4 or lower (the lower quartile) and 0 otherwise.[3]

Table 1 here

Table 2 reports sample characteristics by Rating. Characteristics of the median Buy-rated firm show that analysts are optimistic about the prospects of the companies they recommend. For Buys, the consensus target price exceeds current stock price by 21.5%, EPS is forecast to increase by 21% from one year to two years in the future, and forecast long-term growth is 15%. These forecasts substantially exceed comparable figures for Holds and Sells. Investors, however, appear somewhat dubious. They are paying a median 16 times forward

[3] Results are robust to alternative percentile values used in the definitions of Buy and Sell.

EPS for Buys versus 18.2 for Holds and 19.2 for Sells. The median ratio of forward P/E to short-term growth (PEG) is 0.9 for Buys versus 1.4 and 1.8 for Holds and Sells, respectively. The median implied return for Buys exceeds that for Holds by 2.1 percentage points and that for Sells by 3.1 percentage points. In sum, the preliminary results reported in Table 2 suggest that investors consider analyst bias in their investment decisions.

Table 2 here

4. Empirical Results

Regression results for implied return as a function of analysts' consensus investment rating are presented in Table 3. In model (1), Rating is analysts' consensus investment rating on a scale from 1 (strong sell) to 5 (strong buy). In (2), Buy and Sell are dummy variables indicating the top and bottom quartiles, respectively, of the Rating distribution. In (3) and (4), Rating, Buy and Sell are defined as in (1) and (2) for the residuals of a regression model for Rating. This is described further below. All regressions include dummy variables indicating membership among 40 different industry groups. In each model, the null hypothesis can be rejected with a high degree of confidence. In model (1), the coefficient on Rating is positive and highly statistically significant at better than the .01 level. Hence, holding all other stock and firm characteristics constant, stocks with higher investment ratings have lower market prices and higher implied returns, which is consistent with the view that investors are able to distinguish analyst bias and factor it into their investment decisions. Consistent with this interpretation, model (2) shows that the coefficient on Buy is positive and that on Sell is negative, and both are highly statistically significant at better than .01. As evidence of the models' overall reliability, coefficients on all control variables in (1) and (2) are statistically significant with anticipated signs, and adjusted R^2 indicate good explanatory power for implied return. Hence, the effect of analyst bias on implied return is apparent even while controlling for a range of firm characteristics that are known on theoretical and/or empirical grounds to impact the cross section of return.

Estimated coefficients on Buy and Sell in model (2) indicate the average implied return of a buy-rated stock is 1.6 percentage points above that of a hold-rated stock, and the average implied return of a sell-rated stock is 1.3 percentage points below that of a hold-rated stock. Hence, the difference in implied return between buy-rated and sell-rated stocks is nearly 3 percentage points. At sample medians for consensus forecasts, the implied price of a buy-rated stock is more than $13 per share less than that of a sell-rated stock with the same dividend and forecast earnings. Clearly, investors appear to unravel analyst biases by applying higher discount rates to increasingly optimistic forecasts.

To assess the robustness of these inferences on Rating, regression analyses are repeated using the residuals from a regression model for Rating as a function of consensus short-term and long-term earnings growth forecasts, book return on equity, the ratio of book to market value, prior earnings forecast error, beta, stock price volatility, and market capitalization.[4] Columns (3) and (4) of Table 3 present these results. In (3) and (4), Rating, Buy and Sell are defined as in (1) and (2) for the residuals of a regression model for Rating. Confirming the above inference, coefficients on Rating, Buy and Sell are all highly significant with signs consistent with the view that investors unravel analyst biases.

[4] See equation (6a), page 227, in Peasnell, et al. (2018). These results are available on request.

Table 3 here

Analyst forecast bias is measured further in terms of long-term growth forecasts. Da and Warachka (2011) show that when the long-term growth forecast is well above the short-term forecast, both subsequent returns and subsequent revisions to long-term forecasts tend to be negative. The reverse is true when the long-term forecast is well below the short-term forecast. Consequently, it is reasonable to conclude that extreme values of the distribution of consensus long-term growth forecast might indicate analyst forecast bias. To assess this possibility, the base regression model equation (2) is augmented to include consensus long-term growth forecast to investigate the extent to which it is correlated with implied return. If forecast bias is reflected in analysts' long-term growth forecasts, then the coefficient on long-term growth will be positive. For each firm, long-term growth forecast is normalized by industry mean and standard deviation.[5] These results are presented in Table 4 where $\mathbf{LTG}$ denotes industry-normalized long-term growth.

Model (1) in Table 4 shows that implied return is positively correlated with industry-normalized long-term growth and that the correlation is highly statistically significant at the .01 level. In Model (2), LTG is discretized in dummy variables $\mathrm{LTG\ High}$ and $\mathrm{LTG\ Low}$ indicating, respectively, the top and bottom quartiles of the distribution of LTG. The coefficient on $\mathrm{LTG\ High}$ is positive and statistically significant at the .01 level, and the coefficient on $\mathrm{LTG\ Low}$ is negative and significant at the .05 level. Model (3) shows that the coefficients of LTG and Rating retain their signs and statistical significance when both are included as explanatory

[5]Results are robust to alternative transformations and to no transformation.

variables. Hence, it appears that long-term growth and investment rating capture independent dimensions of analyst bias. Model (4) shows that implied return is increasingly sensitive to investment rating in the context of extreme long-term growth forecasts. The coefficient on Rating x LTG High is positive and significant at the .01 level, which shows that investors increasingly discount analysts' short-term (i.e., one- and two-year ahead) earnings forecasts in the context of strong buy recommendation coupled with optimistic long-term growth forecast. The coefficient on Rating x LTG Low is negative and significant at the .10 level, which shows that investors discount analysts' short-term earnings forecasts at a lower rate when analysts' long-term growth forecasts are relatively conservative and when analysts are not pounding the table for investors to buy the shares. These results provide additional confirming evidence that investors recognize analyst forecast bias.

Table 4 Here

5. Conclusion

Although the biases and inefficiencies in securities analysts' forecasts are widely documented, a body of research asserts that investors do not take account of them in their valuation of common stock. The evidence presented in support of this claim is the apparent ability to generate profitable trading strategies based on indicators of analyst bias. This evidence, however, is not unequivocal. The abnormal returns that are said to be available from various trading strategies provide, at best, indirect evidence of defects in investor decision making. Additionally, it is not clear whether they continue to exist after their existence has been published. It is not clear that they are of sufficient magnitude to exceed the transactions costs that must be incurred to capture them or that they are sufficiently persistent to justify allocating meaningful sums to exploit them at scale. Apart from these issues concerning the quality of the evidence, a compelling theory of ongoing defects in investor decision making is lacking. Hence, the claim that investors do not consider analyst forecast biases in their decision making seems counterintuitive especially in light of the hunger for alpha that is evident in the investment community.

The present study takes a new approach to the question whether investors recognize biases in analyst forecasts. It investigates the determinants of the rate of return of common stock that is implied by current stock price and analysts' consensus earnings forecasts. If investors fail to recognize biases in consensus forecasts, then implied return will be uncorrelated with indicators of bias. The study finds that implied return is in fact highly correlated with indicators of bias in a manner consistent with investors discounting optimistic earnings forecasts at higher rates of return and pessimistic forecasts at lower rates of return. Hence, in contrast to the inferences reached in studies of realized returns, the present study concludes that investors do indeed appear to recognize the biases in analysts' forecasts.

References

Abarbanell, J. & Bernard, V. (1992). Test of analysts' overreaction/underreaction to earnings information as an explanation for anomalous stock price behavior. *The Journal of Finance*, 47(3), 1181-1207.

Abarbanell, J. & Lehavy, R. (2003). Biased forecasts or biased earnings? The role of reported earnings in explaining apparent bias and over/underreaction in analysts' earnings forecasts. *Journal of Accounting and Economics*, 36, 105-146.

Agrawal, A. & Chen, M. (2006). Analysts conflicts and research quality. American Law and Economics Association Annual Meetings.

Ali, A., Klein, A., & Rosenfeld, J. (1992). Analysts' use of information about permanent and transitory earnings components in forecasting annual EPS. *The Accounting Review*, 67(1), 183-198.

Barber, B., Lehavy, R., McNichols, M., & Trueman, B. (2001). Can investors profit from the prophets? security analyst recommendations and stock returns. *The Journal of Finance*, 56(2), 531-563.

Bradshaw, M. T., Richardson, S. A., & Sloan, R. G. (2006). The relation between corporate financing activities, analysts' forecasts and stock returns. *Journal of Accounting and Economics*, 42(1-2), 53-85.

Brous, P. A. (1992). Common stock offerings and earnings expectations: A test of the release of unfavorable information. *The Journal of Finance, 47*(4), 1517-1536.

Brous, P.A. & Kini, O. (1993). A reexamination of analysts' earnings forecasts for takeover targets. *Journal of Financial Economics*, 33(2), 201-225.

Butler, K. C., & Lang, L. H. P. (1991). The forecast accuracy of individual analysts: Evidence of systematic optimism and pessimism. *Journal of Accounting Research*, 29(1), 150.

Cohen, D. & Lys, T. (2003). A note on analysts' earnings forecast errors distribution. *Journal of Accounting and Economics*, 36, 147.

Cowen, A., Groysberg, B., & Healy, P. (2006). Which types of analyst firms are more optimistic? *Journal of Accounting and Economics*, 41, 119.

Da, Z. & Warachka, M. (2011). The disparity between long-term and short-term forecasted earnings growth. *Journal of Financial Economics*, 100(2), 424-442.

Dreman, D. N., & Berry, M. A. (1995). Analyst forecasting errors and their implications for security analysis. *Financial Analysts Journal*, 51(3), 30-41.

Dugar, A. & Nathan, S. (1995). The effect of investment banking relationships on financial analysts' earnings forecasts and investment recommendations. *Contemporary Accounting Research*, 12(1), 131.

Easterwood, J. C., & Nutt, S. R. (1999). Inefficiency in analysts' earnings forecasts: Systematic misreaction or systematic optimism? *The Journal of Finance*, 54(5), pp. 1777-1797.

Easton, P. (2004). PE ratios, PEG ratios, and estimating the implied expected rate of return on equity capital. *The Accounting Review*, 79(1), 73-95.

Easton, P. & Monahan, S. (2016). Review of recent research on improving earnings forecasts and evaluating accounting-based estimates of the expected rate of return on equity capital. *Abacus*, 52(1), 35-58.

Francis, J., & Philbrick, D. (1993). Analysts' decisions as products of a multi-task environment. *Journal of Accounting Research,* 31(2), 216.

Fried, D., & Givoly, D. (1982). Financial analysts' forecasts of earnings: A better surrogate for market expectations. *Journal of Accounting & Economics, 4*(2), 85.

Hughes, J., Liu, J., Su, W. (2008). On the relation between predictable market returns and predictable analyst forecast errors. *Review of Accounting Studies*, 13(2-3), 266-291.

Kang, S., O'Brien, J., & Sivaramakrishnan, K. (1994). Analysts' interim earnings forecasts: evidence on the forecasting process. *Journal of Accounting Research*, 32(1), 103-112.

Kothari, S.P., So, E. & Verdi, R. (2016), Analysts' Forecasts and Asset Pricing: A Survey (March 15, 2016). Available at SSRN: https://ssrn.com/abstract=2748072.

Larocque, S. (2013). Analysts' earnings forecast errors and cost of equity capital estimates. *Review of Accounting Studies*, 18(1), 135-166.

Lin, H. & McNichols, M. (1998). Underwriting relationships, analysts' earnings forecasts and investment recommendations. *Journal of Accounting and Economics*, 25, 101.

Ljungqvist, A., Marston, F., Starks, L., Wei, K., & Hong, Y. (2007). Conflicts of interest in sell-side research and the moderating role of institutional investors. *Journal of Financial Economics*, 85(2), 420.

Michaely, R. & Womack, K. (1999). Conflict of Interest and the Credibility of Underwriter Analyst Recommendations. *The Review of Financial Studies*, 12(4), 653.

Mohanram, P. & Gode, D. (2013). Removing predictable analyst forecast errors to improve implied cost of equity estimates. *Review of Accounting Studies*, 18(2), 443-478.

Peasnell, K., Yin, Y., & Lubberink, M. (2018). Analysts' stock recommendations, earnings growth and risk. *Accounting & Finance*, 58(1), 217-254.

Raedy, J., Shane, P., & Yang, Y. (2006). Horizon-Dependent Underreaction in Financial Analysts' Earnings Forecasts. *Contemporary Accounting Research*, 23(1), 291.

Richardson, S., Teoh, S., & Wysocki, P. (2004). The Walk-down to Beatable Analyst Forecasts: The Role of Equity Issuance and Insider Trading Incentives. *Contemporary Accounting Research*, 21(4), 885.

Shane, P. & Brous, P. (2001). Investor and (Value Line) Analyst Underreaction to Information about Future Earnings: The Corrective Role of Non-Earnings-Surprise Information. *Journal of Accounting Research*, 39(2), 387.

So, E. (2013). A new approach to predicting analyst forecast errors: do investors overweight analyst forecasts? *Journal of Financial Economics*, 108(3), 615-640.

Szakmary, A., Conover, C., & Lancaster, C. (2008). An examination of Value Line's long-term projections. *Journal of Banking & Finance*, 32(5), 820.

Table 1
Summary Statistics

The table reports summary statistics for N = 837 observations with non-missing data and fiscal year end December 31, 2018. *Implied return* is computed from equation (1). *Rating* is derived from analysts' investment recommendations measured on a scale from 1 (strong sell) to 5 (strong buy). *Number of analysts* is the count of analysts issuing forecasts. *Beta* is the slope coefficient from a regression of a stock's return to the S&P 500 index return . *Target price volatility* is the log ratio of analysts' highest target price to lowest target price. *Debt* is the ratio of net debt to trailing one-year EBITDA. *Institutional ownership* is the proportion of shares outstanding owned by institutions. *Market cap* is stock price times shares outstanding, in millions of dollars. *Price to forward EPS* is the ratio of current stock price to consensus EPS one year ahead. *Short-term EPS growth* is the forecast growth of EPS from year 1 to year 2: $e_2/e_1 - 1$. *Long-term growth* is analysts' consensus forecast of 3-5 year ahead growth.

	Mean	**Min**	**Q1**	**Median**	**Q3**	**Max**
Implied return	0.101	0.011	0.070	0.086	0.117	0.429
Rating	3.9	1.0	3.4	4.0	4.4	5.0
Number of analysts	14.0	1.0	7.0	12.0	19.0	50.0
Beta	1.03	0.24	0.89	1.03	1.17	2.05
Target price volatility	0.41	0.00	0.25	0.36	0.51	2.38
Debt	1.86	-175.0	0.40	2.01	3.59	63.82
Institutional ownership	0.62	0.09	0.55	0.64	0.72	0.94
Market cap ($ millions)	19,673	62	1,634	4,290	13,151	906,884
Price-to-forward EPS	25.6	2.8	13.0	18.2	25.6	573.2
Short-term EPS growth	0.29	0.00	0.09	0.13	0.24	21.10
Long-term growth	0.14	-0.27	0.07	0.11	0.16	1.82

Source: Bloomberg Finance L.P., accessed April 15, 2019.

Table 2
Sample Characteristics by Consensus Rating

The table reports median values by analysts' consensus rating. Buy- (Sell-) rated stocks are those in the top (bottom) quartile of the distribution of consensus ratings. *Implied return* is computed from equation (1). *Target price implied return* is the log ratio of consensus target price to current stock price. *Target price volatility* is the log ratio of analysts' highest target price to lowest target price. *Stock price volatility, 1 year trailing* is the standard deviation of daily proportionate stock price changes during the prior 260 trading days, annualized. *Stock price growth, 1 year trailing* is the log ratio of current stock price to stock price one year prior. *Market cap* is stock price times shares outstanding. *Institutional ownership* is the proportion of shares outstanding owned by institutions. *Number of analysts* is the count of analysts issuing forecasts. *Price to forward EPS* is the ratio of current stock price to consensus EPS one year ahead. *Short-term EPS growth* is the forecast growth of EPS from year 1 to year 2: $e_2/e_1 - 1$. *PEG* is 100 times the ratio of the forward PE to short-term EPS growth. *Long-term growth* is analysts' consensus 3-5 year ahead growth rate forecast.

		Rating	
	Sell	**Hold**	**Buy**
Implied return	0.076	0.086	0.107
Target price implied return	0.010	0.103	0.215
Target price volatility	0.382	0.373	0.310
Stock price volatility, 1 year trailing	0.311	0.329	0.381
Stock price growth, 1 year trailing	0.046	0.047	0.001
Market cap ($ millions)	3,555	5,490	2,906
Institutional ownership	0.63	0.64	0.63
Number of analysts	11	13	9
Price to forward EPS	19.2	18.2	16.0
Short-term EPS growth	0.10	0.14	0.21
PEG	1.8	1.4	0.9
Long-term growth	0.09	0.13	0.15
Number of firms	255	459	123

Source: Bloomberg Finance L.P., accessed April 15, 2019.

Table 3
Regression Results for Implied Return as a Function of Investment Rating

$$\mathbf{r_i = \alpha_0 + \alpha_1 Rating_i + \alpha_2 Beta_i + \alpha_3 Vol_i + \alpha_4 Debt_i + \alpha_5 Size_i + \alpha_6 Own_i + \varepsilon_i}$$

In model (1), Rating is analysts' consensus investment rating on a scale from 1 (strong sell) to 5 (strong buy). In model (2), Buy and Sell are dummy variables for the top and bottom quartiles, respectively, of the Rating distribution. In models (3) and (4), Rating, Buy and Sell are defined as in (1) and (2) for the residuals of a regression model for Rating. Beta is the slope coefficient from a regression of a stock's return to the S&P 500 index return . Vol is the log ratio of analysts' highest target price to lowest target price. Debt is the ratio of net debt to trailing one-year EBITDA. Size is the natural log of market capitalization in millions of dollars. Own is the proportion of shares outstanding owned by institutions. All regressions include dummy variables indicating membership among 40 different industry groups. Heteroscedasticity consistent standard errors in parentheses. ***,**,* indicate significance at the .01, .05, .10 levels in two-tailed tests.

	(1)	(2)	(3)	(4)
Constant	0.303***	0.351***	0.278***	0.279***
	(0.027)	(0.029)	(0.027)	(0.028)
Rating	0.015***		0.009***	
	(0.003)		(0.002)	
Buy		0.016***		0.007**
		(0.004)		(0.003)
Sell		-0.013***		-0.008***
		(0.003)		(0.003)
Beta	0.016*	0.017*	0.022***	0.022***
	(0.010)	(0.010)	(0.008)	(0.008)
Vol	0.034***	0.034***	0.024***	0.024***
	(0.007)	(0.007)	(0.006)	(0.006)
Debt	0.001*	0.001*	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Size	-0.012***	-0.011***	-0.008***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
Own	-0.034***	-0.032**	-0.032***	-0.033***
	(0.013)	(0.013)	(0.010)	(0.010)
N	837	837	672	672
adjusted R^2	.454	0.448	.432	.432

Table 4
Regression Results for Implied Return as a Function of Rating and Long-term Growth

$$\mathbf{r_i = \alpha_0 + \alpha_1 Rating_i + \alpha_2 LTG_i + \alpha_3 Beta_i + \alpha_4 Vol_i + \alpha_5 Debt_i + \alpha_6 Size_i + \alpha_7 Own_i + \varepsilon_i}$$

Rating is analysts' consensus investment rating on a scale from 1 (strong sell) to 5 (strong buy). LTG is analysts' consensus long-term earnings growth forecast normalized by industry mean and standard deviation. LTG High and LTG Low are dummy variables constructed on the basis of the distribution of industry-normalized LTG. Beta is the slope coefficient from a regression of a stock's return to the S&P 500 index return. Vol is the log ratio of analysts' highest target price to lowest target price. Debt is the ratio of net debt to trailing one-year EBITDA. Size is the natural log of market capitalization in millions of dollars. Own is the proportion of shares outstanding owned by institutions. All regressions include dummy variables indicating membership among 40 different industry groups. Heteroscedasticity consistent standard errors in parentheses. ***,**,* indicate significance at the .01, .05, .10 levels in two-tailed tests.

	(1)	(2)	(3)	(4)
Constant	0.279***	0.280***	0.263***	0.265***
	(0.027)	(0.027)	(0.027)	(0.027)
Rating			0.008***	0.007***
			(0.002)	(0.002)
LTG	0.007***		0.006***	
	(0.002)		(0.002)	
LTG High		0.012***		
		(0.003)		
LTG Low		-0.007**		
		(0.003)		
Rating x LTG High				0.0024***
				(0.0008)
Rating x LTG Low				-0.0014*
				(0.0008)
Beta	0.026***	0.025***	0.021**	0.020**
	(0.009)	(0.008)	(0.009)	(0.009)
Vol	0.023***	0.023***	0.028***	0.028***
	(0.006)	(0.006)	(0.006)	(0.006)
Debt	0.0004	0.0004	0.0004	0.0004
	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Size	-0.008***	-0.008***	-0.009***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)
Own	-0.031***	-0.032***	-0.031***	-0.031***
	(0.010)	(0.010)	(0.010)	(0.010)
N	687	687	687	687
adjusted R^2	.471	.474	.482	.483