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Analyst Coverage and Stock Returns

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Abstract This study investigates the association between risk-adjusted returns and analyst coverage. We find that stocks with better risk-adjusted returns attract more analysts to provide research reports for investors. By following companies with better risk-adjusted returns, an analyst may be able to save time and effort in collecting and processing information. The empirical results indicate that earnings forecasts are more accurate for firms with better risk-adjusted stock returns. Moreover, we found that an analyst is more likely to pay more attention for stocks with better risk-adjusted returns and revise earnings forecasts more frequently for them. The results suggest that risk-adjusted returns of stocks have impacts on analysts' performance.

Keywords: *risk-adjusted returns, analyst performance, analyst coverage, forecast accuracy, revision Rrequency*

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1. Introduction

As underlined by Michaely and Womack [42], proximity between a firm and an analyst would improve the quality of research report produced by analysts. Financial analysts provide their services to help investors to understand relevant and accurate information. Prior studies suggest that the value of analysts' activities in the market stems from two sources: one is analysts' skill at interpreting public information, the other is their ability to collect and process private information [22]. Risk-adjusted stock returns to individual security indicate that whether the investors are compensated adequately for the amount of risk they take. Moreover, Frankel, Kothari and Weber [23] indicate that regulators and other market participants view analysts' activities as increasing the information efficiency of security prices because of their expertise and knowledge in firm valuation. By following companies with more information, an analyst may be able to save time and effort in collecting and processing information [44,45], thus, affect the performance of analyst.

Due to resource restrictions, such as manpower and time, analysts will weigh the opportunity costs and benefits to decide whether the stock should be included. The study of Hayes [27] indicates that trading commission is one of important benefits for analysts. Therefore, McNichols and O'Brien [41] provide evidence that an analyst tends to cover stocks which will perform better in the future. Under efficient hypothesis, however, it isn't easy to determine which one is profitable stock in the future. One strategy for analysts is to include the winner stock in previous year in their research portfolio and release more positive news to attract hesitant investors, such as stocks with better risk-adjusted returns, to earn more commission. Thus, this study examines whether a stock with better risk-adjusted returns will attract more analysts.

This study investigate how risk-adjusted returns influence an analyst's coverage decisions and the quality of his research report. Specifically, we examine how risk-adjusted returns of stocks influences analysts' decision to follow a firm. This study also examines the effect of a stock's risk-adjusted returns on three common analysts' performance of earnings forecast: the accuracy, optimistic bias, and analyst effort. The risk-adjusted returns we use is Jensen's alpha [35] estimated from risk factors model documented by Fama and French [21] and Carhart [10].

Empirical results show that a stock with better risk-adjusted return is more likely to attract more analysts to provide research reports for investors, which in turn resulting more information regarding the stock is released in capital market. From the aforementioned results, an analyst may be able to save time and effort in collecting and processing information by following stocks with better risk-adjusted returns. Therefore, we also find that earnings forecasts are more accurate for firms with better risk-adjusted returns. Analysts' earnings forecasts are more optimistic with firm with better risk-adjusted returns and revise earnings forecasts more frequently for them. Moreover, we found that an analyst is more likely to pay more attention for stocks with better risk-adjusted returns and revise earnings forecasts more frequently for them.

This study contributes to extant literatures by providing additional factor that will influence analysts' coverage decision and the performance of earnings forecast. This study help investors understand the strategy analysts adopt, which in turn helps investors make proper investment decision. This study also provides evidence to show the value of analyst to reduce the information asymmetry between underlying stocks and investors.

The remains of this study are organized as follows: section 2 reviews related literatures and develops hypotheses in this study, section 3 describes research design, section 4 and 5 are empirical results and conclusion respectively.

2. Literature Review and Hypothesis Development

This section provides related research regarding risk-adjustment stock returns, analyst coverage and analysts' performance.

2.1. Risk-Adjustment Stock Returns

When two securities or portfolios generating the same return, naturally investors will question themselves whether this two are the same. Problem that may occur is how to determine which of the two a better investment is. Investors must consider whether the return is sufficient to compensate for the risk taken. Hence, there should be an evaluation to the securities or portfolio performance measures in terms of risk and return together.

Risk-adjusted return is a measure to find how much return an investment will provide given the level of risk associated with it. The academic literature on evaluating returns and risk exposure has evolved from simple Sharpe ratio comparisons to Jensen's [35] alpha using a single risk factor, to the Fama and French [21] three-factor model, and Carhart [10] which added momentum as the fourth factor. A study focused on the ability of several risk-adjusted performance measures documented by Kothari and Warner [37] such as Jensen's alpha and the Sharpe ratio, to identify investment skills expresses the performance measure as a function of the forecasting skills of the portfolio manager, the standard deviation of returns, and the risk aversion of the investor.

Risk-adjusted performance measures have increased great importance in this recent year. The reason is because investors needed an effective tool to evaluate the respective performance of the various funds compared to the risk taken by the fund managers to choose the right option for capital allocation [47]. Another reason related to Basel II regulatory framework, which requires financial institutions to hold a certain amount of equity as a cushion against unexpected losses for each risky position taken [20].

In the area of Capital Assets Pricing Model (CAPM) analysis, Jensen [35] had presented ratio as an additional performance measurement which calculates the excess returns on a portfolio, stock or index across time. The Jensen's measurement is commonly used in studies measuring risk-adjusted performance on historical prices, assuming that investors already hold diversified portfolios. The major issue is the exposure to systematic risk and it shows the average excess return per unit of systematic risk [25]. A positive value shows that the indexes are producing a specific level of return for its level of risk. This ratio known as Jensen's alpha.

An explanation to elaborate the meaning of Jensen's alpha on risk-adjusted return were documented by Gorman and Weigand [24] that Jensen's alpha of asset *i* for the period measured represents the return of asset *i* more than return that expected, after asset's exposure to the risk factors. A positive value of alpha indicates that the asset or portfolio (and most importantly, the manager of the portfolio) performed abnormally well based upon the risk exposure to the various systematic factors.

Risk-adjustment measures how much of the portfolio's rate of return is referring to the manager's ability to distribute above-average returns, adjusted for market risk. The higher the ratio, the better the risk-adjusted returns. A portfolio with a consistently positive excess return will have a positive alpha, while a portfolio with a consistently negative excess return will have a negative alpha. Related to this information, financial analysts could interpret this as valuable information for their forecasts.

To consider risk-adjustment measures of any two funds will influence to the knowledge about which fund that perform better according to this risk-adjusted measure. As one example, Jensen's alpha will allow analysts' to get a quick feel for a fund's risk-adjusted performance relative to the benchmark. A negative Jensen's alpha indicates underperformance and the performance heading the opposite way when the Jensen's alpha is positive. In theory an investment manager exhibits a positive Jensen's alpha if he or she has superior stock picking or market timing in excess of the benchmark, while a passive or index tracking fund would not generate any positive Jensen's alpha.

2.2. Analyst Performance

Security analysts play an important role in the capital market. As information intermediaries, security analysts provide three main quantitative outputs for investors: earnings forecasts, stock recommendations, and target prices [22]. Those activities are valuable and informative to investors since they help investors to reach their strategic investment decisions. Performance of analyst is generally come based on the analyst ability and their works to generate forecast from resources of information that they get. The source of information may vary; analysts should be more diligent related to their forecast. Analyst activity and their performance have been documented by Frankel et al., [23] that analyst expertise and knowledge in firm valuation increase the information efficiency of security prices. Analysts significantly diverge in their effort when making earnings forecasts. Naturally, as all other things being equal, analysts who spent higher effort can provide more accurate forecasts than those who do not.

Previous study documented that analysts typically following stocks for which they have a preference, and analysts are encouraged to provide optimistic forecasts to attract investors to purchase shares [38,41]. Furthermore, Walther and Willis [46] found there is relationship between investor expectation and analyst performance. They explain analyst's performance through optimistic reaction and forecast accuracy based on investor expectation. These findings found that analysts are affected by investor sentiment, which suggest that analyst will tend to react in more optimistic regarding investor expectation, which imply to gain more attraction from investors.

To produce more accurate forecast, naturally analysts will put more effort on securities that they covered. One effort can be captured through analyst forecast revision frequency. Study by Jacob, Lys and Neale [33], about analysts forecast effort and analysts forecast frequency which they define forecast frequency as the number of earnings forecasts that an analyst issues for a specific firm in a specific year, assuming that analysts with a higher forecast frequency devote more forecast effort to a specific firm. As discussion by Livnat and Zhang [39] explained the extent that prompts revisions are more likely to reflect analysts' information interpretation role. Those studies imply that analyst performance through analyst forecast revision frequency as proxy for analyst effort will explain the analyst performance and their reports quality.

Following study by Hope et al., [31] that documented that more specific risks information will have greater impact on analysts (and also investors). This study aims to find relationship between performance of analysts' and the influence of risk-adjusted returns, some measurement had attracted our attention which there is possibility that risk-adjusted returns will improve analyst decision to follow the firms. Moreover, this influence also likely affect forecast accuracy, optimism and forecast revision.

Forecast Accuracy

The literature frequently uses forecast accuracy, which is the absolute distance between the forecast and realized earnings, to measure analysts' performance. As example, Gu and Wu [26] show that accuracy is one of the most important aspects of analyst forecast performance. Prior research also finds that analyst who have more accurate forecast tend to have greater ability to move prices [28,32] and better career outcomes (e.g., [30]).

Certain arguments related to analyst experience and analysts forecast accuracy directed to the depth of information that analyst gathered from firm that they follow. Chan and Hameed [11] have made conclusion related to analyst coverage to stock return synchronicity, even though they implicitly assumed that security analysts are homogeneous, about their skill during information production process, but they clearly stated that security analysts have different human capital endowments and many of them specialize in specific firms and their abilities in the production of firm-specific information result may different across analysts'.

Bradshaw [8] stated that analysts' information consists of commonly available information in the past and private information processing by analysts themselves. Analysts are professionals making their living doing securities research. Many analysts are specialized in particular industries and firms, resulting in highly industry-specific and firm-specific knowledge. Analysts prepare detailed research reports on stocks they follow, which incorporate not only analyses of the company's published financial information but also discussions with management and industry sources, including customers and suppliers. Analysts increasingly process their own earnings definitions and measurements that are different from those from standard financial reports.

Clement, Koonce and Lopez [14] have confirmed the previous study [33,43] regarding the ability of analysts to learn from their prior experiences. Their results found that the feedback analysts receive from general and firm-specific experiences are not particularly useful to their performance. They showed that between an analyst's prior experiences and the current task at hand should be match each other for those experiences to influence performance. Analysts can learn from task-specific experience, also training and repetition is important in the kinds of tasks to which an analyst is exposed. Furthermore, they conclude that analyst with high innate ability are more welcomed by the brokerage house since they have more accurate forecasting performance. This explained that analysts' reputation came after analysts produce more accurate forecast. Because analysts' ability and reliable information that they could proceed, more brokerage house will use their service.

Related to investor expectation, optimism and forecast accuracy, Walther and Willis [46] separate investor expectations into the fundamental (FUND) and sentiment (SENT) components and found that analysts appear to be the most accurate when the fundamental component is the highest and the most optimistic and the most inaccurate when the sentiment component is the highest. When SENT is high and thus the underlying economics do not justify the high investor expectations, analysts are the most optimistic and the least accurate. When FUND is high and thus investor expectations are supported by underlying economics, analysts are not more or less optimistic but are the most accurate.

Study by Agrawal and Chen [3] related to forecast accuracy and Investment Bank (IB) or brokerage conflict and found that there is no evidence that the accuracy or bias in individual analysts' quarterly EPS forecasts is related to the magnitude of their IB or brokerage conflicts, after controlling for forecast age, firm resources, analyst experience and analyst workload. The result also holds for technology stocks and during the late-1990s stock market boom, settings in which analysts may have faced particularly severe conflicts. This results imply that, analyst keep themselves neat and clear during producing forecast and try to be accurate since try to not bias on their forecast. One possible reason is, even though there is conflict on IB or brokerage they try to keep their reputation on track and not influenced by the conflict, which consistent with finding by Jackson [32] and Hilary and Hsu [28].

Those studies imply that analyst with their specific ability within firm and their work and experience with information will help analysts' to have more accurate forecasting rather than analyst who do not have that kind of ability and experience. Analyst may have same method to make forecast, but again experience and due diligence is still a straight red line that divide between analysts. Analyst will explore all information that they may found, especially all information related to firm-specific, because it will increase their experience and later will improve their accuracy in forecasting. Forecast accuracy also related with analysts' future career, which imply analyst less likely to be demoted to less prestigious brokerage houses if they consistently produce accurate forecast [28,30].

Analyst Optimism

There are a large number of studies that present evidence that analyst forecasts are optimism. Brown [9] reports significantly decreasing forecasting errors over time and an optimistic bias is evident for almost the entire investigated period, fourth-quarter 1983 through second quarter 1996. Chopra [12] further investigates the time trend in the accuracy and optimism of financial analysts. The time period we use is somewhat different than the period used by Brown [9], from 1985 through 1997. Since

1993 the quality of analyst forecasts seems to have improved. Chopra [12] argues that analysts are always optimistic, but in case of a rapidly growing economy the optimism decrease whereas the optimism increases in case of a downturn in the economy. A study about analyst's reaction documented by Easterwood and Nutt [19] found that analysts both underreact to negative information and overreact to positive information. The findings combine and conclude the previous by Abarbanell and Bernard [1] and DeBondt and Thaler [17].

Study by Ang and Ciccone [5] found that firms having highly dispersed forecasts tend to have forecasts that are optimistic. Furthermore, they stated that firms with high dispersion should be the firms disappointing investors. Thus, these firms should have lower returns. Recent study related to analyst optimism documented by Malmendier and Shantikumar [40] that affiliated analysts firmly choose to display optimism about the firms they cover in one outlet for investment advice, namely recommendations, which are consumed most directly by small investors. They abstain from doing so in another outlet, earnings forecasts, which are consumed most directly by large investors.

2.3. Hypothesis

From aforementioned literatures, risk-adjustment could be interpreted as positive information by analysts'. This information also inferred as specific information from the firms since it related with firm managerial ability to control risk premium and also explain how the company beat the benchmark. Based on literature studies, we propose our hypothesis regarding the influence of risk-adjustment stocks returns to analyst performance as follow:

Study by De Groot and Plantinga [18] stated that risk-adjusted performance measures are frequently used to rank investment opportunities. For example, ranking mutual funds is a popular tool in assisting investors with their investment choices, and these rankings are often based on risk-adjusted performance measures. Firm with better risk-adjusted returns can be recognized by analysts' as firm with positive news which also implies opportunity in invests. This hypothesis will test the influence of risk-adjusted returns on analyst coverage. Analysts' tend to follow the firms that have better risk-adjusted returns. As specific information of the firm, positive alpha which implies that stocks "beat the market", intuitively risk-adjusted returns have influence to make analysts' decision to follow firms.

Hypothesis 1: Firm with better risk-adjusted returns attracts more analysts to follow the firm.

Analysts' tend to follow the firms with better returns which provide more information regarding the firm. The increase of information help investors and other analysts understand more regarding the firm. Analyst's accuracy increases with the amount of information. Specifically, analysts tend to use more information to improve their forecast accuracy and analyst from bigger brokerage house will produce more accurate forecast [3,7,14,33,43]. Hence, the first hypothesis is as follows:

Hypothesis 2: Analysts that follow firms with better risk-adjusted stock returns have more accurate forecast

Related to financial analysts' reaction to information, Easterwood and Nutt [19] argue that financial analysts' underreact to negative information, while they overreact to positive information and are systematically optimistic concerning the implication of new information. Study by Cowen, Groysberg and Healy [16] found that analysts also tend to react more optimistic and to produce more optimist reports which are quite effective in generating retail trading volume and also to attract more investor. This result also documented by Agrawal and Chen [2,3] and Malmendier and Shanthikumar [40] which show that analysts aim to please company management, generate corporate finance business and to induce investors to purchase stock which reflected to investors that perform naively to follow optimistic recommendations by analysts. We propose our third hyphothesis regarding analyst optimistic reaction and risk-adjusted returns:

Hypothesis 3: Analysts that follow firms with better risk-adjusted stock returns react in optimistic with their forecast

3. Research Design

3.1. Define Alpha

Risk-adjusted is a concept that refines returns on an asset or investment in relation to the amount of risk that the asset or investment took on. Risk-adjusted returns are applied to individual securities and investment funds and portfolios. The risk-adjusted returns can help investor to determine the highest possible return for the least possible risk.

To measure the risk-adjusted returns, there are three common methods that commonly used, which is the market model, Fama-French three factor model and Carhart four factor model. The market model uses statistical methods to predict the appropriate risk-adjusted return of an asset based on the concept that riskier assets should have higher expected returns than less risky assets. If an asset's return is even higher than the risk-adjusted return, that asset is said to have "positive alpha" or "abnormal returns". Jensen [35] developed the measurement when he investigated mutual funds and its risk-adjusted rate of return. The measurement has as many other models within the finance area its roots in the CAPM model. Despite the measurements age it is today frequently used when valuating actively managed funds or mutual funds. It is commonly known as Jensen's Alpha. The Jensen's Alpha is an absolute measure of performance. It is given by the annualized return of the fund, deducted the yield of an investment without risk minus the return of the benchmark multiplied by the fund's beta during the same period.

$$\alpha_p = r_p - [r_f + \beta_p \left(r_m - r_f \right)] \quad \text{(i)}$$

Where r_p is expected total portfolio return, r_f is risk free rate, β_p is beta of the portfolio and r_m is expected market returns.

The validity of this measure depends crucially on the hypothesis that the beta of the fund is stationary, i.e. that the manager of the fund does not adapt his/her portfolio's weight according to his/her expectation on the future market variations. The validity of this hypothesis has to be tested before focusing on the value of this indicator.

Fama and French [21] designed a model following the basic capital assets pricing model (CAPM) which only used market risk as variable to measure the excess return and adding two more variables, market capitalization and value where can reflect the portfolio exposure of two classes asset. their observation that two classes of stocks have tended to do better than the market as a whole. The intercept in this model is referred to as Fama-French three factor alpha.

$$r_{it} - r_{ft} = \alpha + \beta_1 \left(r_{mt} - r_{ft} \right) + \beta_2 SMB + \beta_3 HML + \epsilon_{it} \quad \text{(ii)}$$

Where $\left(r_{mt} - r_{ft} \right)$ is market factor return, *SMB* is small firm minus big firm (size factor return), *HML* is book-to-market factor return. And *β1, β2, β3,* are market beta, size beta, book-to-market beta.

Carhart four-factor model is an extension of the Fama-French three-factor model including a momentum factor, also known in the industry as the MOM factor (monthly momentum). Momentum in a stock is described as the tendency for the stock price to continue rising if it is going up and to continue declining if it is going down. The MOM can be calculated by subtracting the equal weighted average of the highest performing firms from the equal weighed average of the lowest performing firms, lagged one month [10]. A stock is showing momentum if its prior 12-month average of returns is positive. Similar to the three factor model, momentum factor is defined by self-financing portfolio of (long positive momentum) + (short negative momentum). The intercept in this model is referred to as Carhart four factor alpha.

The approach of risk-adjusted in this research is to calculate the intercept (alpha) from the four-factor alpha. As performance attribution model, the four-factor model captures the risk and return characteristics of four elementary equity investment strategies, which is market sensitivity, small versus large market capitalization stocks, value versus growth stocks, momentum versus contrarian stocks, and represent as:

$$\begin{aligned} r_{it} - r_{ft} = \alpha + \beta_1 \left(r_{mt} - r_{ft} \right) + \beta_2 SMB \\ + \beta_3 HML + \beta_4 UMD + \epsilon_{it} \end{aligned} \quad \text{(iii)}$$

where, $R - R_f$ is firm excess return, $R_m - R_f$ is market factor returns, *SMB* is small firm minus big firm (size factor return), *HML* is book-to-market factor return and *UMD* is momentum factor return. And *β1, β2, β3, β4* are market beta, size beta, book-to-market beta and momentum beta, respectively. Meanwhile, *α* is risk-adjusted return, which is the return after controlling for general market movements and other risk factor exposures. It is also measure the ability of manager to generate return by stock selection beyond the reward for taking risk.

3.2. Measuring Alpha Influences on Analyst Performance

After I calculate α (alpha) from Jensen's model, Fama-French three factor model and Carhart four factor model then I included to the models to measure the influence of α on analyst following the firm. On this model, I compute number of analysts that follow a firm in each year as dependent variable and regress it with *α* that calculated before and control variables. The model:

$$\begin{aligned} NAFL_{jt} = \beta_0 + \beta_1 ALPHA_{jt-1} + \beta_2 LOGSIZE_{jt} \\ + \beta_3 ROA_{jt-1} + \beta_4 STDV_{jt-1} + \beta_5 NUMB_{jt} \\ + \beta_6 INST_{jt} + \beta_7 LOGVOL_{jt} + \varepsilon_{jt} \end{aligned} \quad \text{(iv)}$$

Where $NAFL_{jt}$ is number of analysts' that follow firm *j* on time t. $LOGSIZE_{jt}$ is logarithmic form of firm size, ROA_{jt-1} is Return on Asset in previous year. $STDV_{\mathbf{jt-t}}$ is standard deviation of firm monthly stock returns from the prior year as a measure of information uncertainty. $NUMB_{\mathbf{it}}$ is number of firms that being follow by analyst *i* on time *t*. $INST_{\mathbf{jt}}$ is share of institutional holding of firm *i* on time *t*. $LOGVOL_{\mathbf{jt}}$ is logarithmic form of trading volume.

For measuring the influence of risk-adjustment on analyst performance, we follow Clement [13] to constructed the following model:

$$\begin{aligned} & PMAFE_{ijt} \\ & = \alpha + \beta_1 ALPHA_{j\mathbf{t-1}} + \beta_2 LOGSIZE_{jt} \\ & \quad + \beta_3 GEXP_{it} + \beta_4 \, FIRMEXP_{it} + \beta_5 \, ROA_{jt-1} \\ & \quad + \beta_6 \, STDV_{jt-1} + \beta_7 PMAFE_{ijt-1} + \beta_8 NUMB_{it} \\ & \quad + \beta_9 TOP10_{it} + \beta_{10} OPIN_{jt} + \beta_{11} SD_{jt} \\ & \quad + \beta_{12} CHGEPS_{jt} + \beta_{13} CHGAUDIT_{jt} + \varepsilon_{\mathbf{ijt}}. \end{aligned} \quad \text{(v)}$$

We compute $PMAFE_{ijt}$ following Clement [13] to measure analysts' forecast performance. The approach of $PMAFE_{ijt}$ is by comparing absolute forecast error of the other analyst following the same stock during the same period. PMAFE calculated as:

$$PMAFE_{ijt} = DAFE_{ijt} \, / \, \overline{AFE}_{jt} \quad \text{(vi)}$$

where $DAFE_{ijt} = AFE_{ijt} - \overline{AFE}_{jt}$, AFE_{ijt} is the absolute forecast error for analyst *i*'s forecast of firm *j* for year *t*, and $\overline{AFE}_{jt}$ is the mean absolute forecast error for firm *j* for year *t*. Clement [13] finds that controlling for firm-year effects increases the likelihood of identifying systematic differences in analyst's forecast accuracy relative to a model that controls for firm fixed effects and year fixed effects. Firm-year effects result from factors that make a firm's earnings easier or more difficult to predict in certain years than others. Examples of events that may give rise to firm-year effects are voluntary management disclosures, mergers and strikes. PMAFE controls for firm-year effects by subtracting from the absolute forecast error its related firm-year mean. PMAFE can be interpreted as analyst *i*'s fractional forecast error relative to the average of the analyst's absolute forecast errors for firm *j* at year *t*. Negative values of PMAFE represent better than average performance while positive values of PMAFE represent worse than average performance. $LOGSIZE_{jt}$ is logarithmic form of firm size, $GEXP_{it}$ is general forecasting experience, which number of years that analysts *i* supply forecast, $FEXP_{it-1}$ is analysts' firm-specific experience which number of years that analyst *i* supply forecast for firm *j*, ROA_{jt-1} is Return on Asset in previous year, $STDV_{jt-1}$ is standard deviation of firm monthly stock returns from the prior year as a measure of information uncertainty, $PMAFE_{ijt-1}$ is the forecast error from the previous year, $NUMB_{jt}$ is number of firm(s) followed by analyst *i* in year *t*,, $TOP10_{ijt}$ is dummy variable with value of 1 if analyst *i* works at a top decile broker (in terms of number of employees) in year *t* and 0 otherwise, $OPIN_{jt}$ is dummy variable which is equal 1 if analyst announce opinion for firm *j* on time *t* and 0 otherwise. SD_{jt} is standard deviation of forecast error of firm *j* on time *t*, $CHGEPS_{jt}$ is dispersion of earning per share which is the different between earning per share of firm *j* on time *t* minus earning per share on *t-1*, $CHGAUDIT_{jt}$ is dummy variable which is equal 1 if firm *j* having the change in auditing method in time *t* and 0 otherwise.

For measuring analyst optimism, we adopt similar approach to Jacob et al., [33], Clement [13], Hong and Kubik [30] and Cowen et al., [16] by comparing the accuracy and optimism of a specific analyst's forecast for a particular company and time period to the mean accuracy and optimism for all analysts who make forecasts for the same company and time period. This relative performance metric, therefore, controls for any company or time-specific factors that affect forecast optimism. Relative forecast optimism (RFOPT) is estimated for stock price returns forecast as follow:

$$RFOPT_{ijt} = \frac{FORECAST_{ijt} - \overline{FORECAST_{jt}}}{STDEV(FORECAST_{jt})} \quad \text{(vii)}$$

$FORECAST_{itj}$ is analyst *i*'s forecast of company *j*'s stock return for period *t*, where the forecast is made at time *t-1*. This forecast is then compared $\overline{FORECAST}_{jt}$ which is average forecast for all analysts making forecasts for company *j*'s stock returns for period *t*. The relative forecast is standardized across firms by deflating by the standard deviation of forecasts across all analysts forecasting. We construct regression model that using RFOPT as dependent variable and incorporated alphas and control variables to capture the relation of analyst optimistic reaction and risk-adjusted returns. The model as follow:

$$\begin{aligned} &RFOPT_{ijt} \\ &= \alpha + \beta_1 ALPHA_{\mathbf{jt-1}} + \beta_2\, LOGSIZE_{jt} + \beta_3\, GEXP_{it} \\ &\quad + \beta_4 FIRMEXP_{it} + \beta_5\, STDV_{jt-1} + \beta_6 LOGVOL_{ijt-1} \quad \text{(viii)} \\ &\quad + \beta_7 SD_{it} + \beta_8 OPIN_{jt} + \beta_9\, TOP10_{it} \\ &\quad + \beta_{10} CHGEPS_{jt} + \beta_{11} CHGAUDIT_{jt} + \varepsilon_{\mathbf{ijt}} \end{aligned}$$

where $RFOPT_{itj}$ analyst *i*'s relative forecast optimism of firm *j*'s on time *t*. $LOGSIZE_{jt}$ is logarithmic form of firm size, $GEXP_{it}$ is general forecasting experience, which number of years that analysts *i* supply forecast, $FEXP_{it-1}$ is analysts' firm-specific experience which number of years that analyst *i* supply forecast for firm *j*, ROA_{jt-1} is Return on Asset in previous year, $STDV_{jt-1}$ is standard deviation of firm monthly stock returns from the prior year as a measure of information uncertainty, $LOGVOL_{\mathbf{jt}}$ is logarithmic form of trading volume, SD_{jt} is standard deviation of forecast error of firm *j* on time *t* $OPIN_{jt}$ is dummy variable which is equal 1 if analyst announce opinion for firm *j* on time *t* and 0 otherwise, $TOP10_{ijt}$ is dummy variable with value of 1 if analyst *i* works at a top decile broker (in terms of number of employees) in year *t* and 0 otherwise,. $CHGEPS_{jt}$ is dispersion of earning per share which is the different between earning per share of firm *j* on time *t* minus earning per share on *t-1*, $CHGAUDIT_{jt}$ is dummy variable which is equal 1 if firm *j* having the change in auditing method in time *t* and 0 otherwise.

For measuring forecast revision frequency, I adopt the approach by Holden and Stuerke (2008) by measuring number of revision of existing forecast of firm *j*'s made by the analyst *i*'s on time *t* divided by number of analyst following that firm. Then I include alpha and control variables into a model as:

$$\begin{aligned} FREQ_{ijt} = \beta_0 + \beta_1 ALPHA_{jt-1} + \beta_2 LOGSIZE_{jt} + \\ \beta_3 STDV_{jt-1} + \beta_4 LOGVOL_{jt} + \beta_5 SD_{jt} \quad \text{(ix)} \\ + \beta_6 CHGEPS_{jt} + \beta_7 CHGAUDIT_{jt} + \varepsilon_{ijt} \end{aligned}$$

Where, $LOGSIZE_{jt}$ is logarithmic form of firm size, $STDV_{\mathbf{jt-1}}$ is standard deviation of firm monthly stock returns from the prior year as a measure of information uncertainty, $LOGVOL_{\mathbf{jt}}$ is logarithmic form of trading volume, SD_{jt} is standard deviation of forecast error of firm *j* on time *t*, $CHGEPS_{jt}$ is dispersion of earning per share which is the different between earning per share of firm *j* on time *t* minus earning per share on *t-1*, $CHGAUDIT_{jt}$ is dummy variable which is equal 1 if firm *j* having the change in auditing method in time *t* and 0 otherwise.

3.3. Data Description and Sample Selection Method

This study collects earnings forecast and actual earnings data of United States from Institutional Broker Estimate System (I/B/E/S) from 1982 to 2012. Firm's accounting data is obtained from Compustat and stock returns are collected from CRSP. Following the study of Clement [13], this study excludes observations that have earnings surprise more than 40 percentages relative to the firm's actual earnings. After eliminating observations with missing values in our model, there are 357,965 earnings forecasts.

4. Empirical Result

4.1. Summary Statistics

Table 1 provides the summary statistics of our sample in this study. Table 2 shows correlation coefficients and distributions of the regression variables. This table shows that the number of analyst following have negative correlation with One factor alpha, -0.00929 with $p<0.001$ and Three factor alpha -0.00124 with $p = 0.4479$. The correlation itself is less negative from one factor alpha to three factors alpha but it is not changed significantly. Meanwhile, the correlation between numbers of analyst following is positive with four factors alpha 0.00012, but this change also not significant. Correlation between ALPHA and forecast accuracy is all negative for each ALPHA. The changes for one factor alpha, three factors alpha and four factors alpha, respectively, -0.0069, -0.00534, and -0.00713 with each variable significance at $p < 0.001$.

The correlation between analysts forecast revision and ALPHA are positive and changed significantly, 0.01339, 0.01178 and 0.0127 respectively to one factor alpha, three factors alpha and four factors alpha. For the other control variables which related to analysts' characteristic is number of firms followed by analyst (NUMB) show not significant. The other variable which explains about the depth of information that analysts may get is broker size (TOP10). The result shows not significant for one factor alpha, three factors alpha and four factors alpha. Meanwhile, the others control variables coefficient correlations are show significant. For better hypothesis investigations, it will be more appropriate to do the joint test for each model related to analysts following, analysts' accuracy, analyst optimism and analysts forecast revision frequency.

Table 1. Dataset summary statistics

Panel A. Initial sample of annual earnings forecasts from I/B/E/S

Year	Analys	Forecast	Broker	Firm	Year	Analys	Forecast	Broker	Firm
1982	35	44	23	21	1998	5,297	205,276	375	5,962
1983	2,145	34,486	101	1,132	1999	5,643	205,975	385	5,668
1984	2,486	67,155	124	1,445	2000	5,849	197,153	379	5,267
1985	2,567	82,761	142	1,634	2001	5,825	199,449	361	4,625
1986	2,579	89,200	149	1,920	2002	5,878	207,372	349	4,414
1987	2,717	101,995	167	2,324	2003	5,874	213,352	395	4,342
1988	2,718	112,083	188	2,650	2004	5,750	228,954	448	4,564
1989	3,047	124,216	194	3,371	2005	5,746	260,899	451	4,769
1990	3,226	135,075	205	3,617	2006	5,843	287,229	452	4,884
1991	2,972	143,499	203	3,736	2007	6,006	310,431	418	4,866
1992	2,700	147,037	221	3,989	2008	6,025	345,998	416	4,629
1993	2,914	159,423	244	4,373	2009	6,135	371,062	452	4,322
1994	3,290	170,365	238	4,884	2010	6,260	390,964	458	4,180
1995	3,680	178,714	259	5,286	2011	6,163	401,857	457	4,005
1996	4,256	191,950	287	6,006	2012	6,205	434,776	459	3,981
1997	4,887	195,483	334	6,137	2013	1,818	35,466	224	314

Panel B. sample after combining I/B/E/S, CRSP, Compustat

Year	Analys	Forecast	Broker	Firm	Year	Analys	Forecast	Broker	Firm
1982	14	17	13	3	1998	4,587	128,313	346	2193
1983	1,910	25,628	100	511	1999	4,696	128,523	344	1974
1984	2,170	47,819	120	619	2000	4,745	120,990	313	1838
1985	2,230	58,867	135	776	2001	4,457	96,433	299	1342
1986	2,248	61,136	140	797	2002	4,817	135,553	293	1953
1987	2,346	68,348	156	840	2003	4,910	144,104	357	2024
1988	2,234	74,959	171	964	2004	4,800	157,339	408	2138
1989	2,586	77,508	184	1106	2005	4,928	178,528	414	2326
1990	2,701	84,549	193	1186	2006	4,928	195,986	390	2422
1991	2,426	89,883	193	1207	2007	5,066	215,926	375	2484
1992	2,188	92,969	210	1338	2008	5,096	244,738	375	2482
1993	2,459	101,663	222	1549	2009	5,160	262,343	404	2342
1994	2,842	104,993	227	1688	2010	5,343	282,778	412	2384
1995	3,128	108,767	239	1831	2011	5,376	295,790	409	2382
1996	3,556	115,609	260	1980	2012	5,437	324,657	398	2410
1997	4,145	119,338	307	2201					

Panel C. Final sample after controlling missing data

Year	Analys	Forecast	Broker	Firm	Year	Analys	Forecast	Broker	Firm
1983	938	3479	89	234	1998	2385	11117	226	1304
1984	1117	4502	99	270	1999	2528	12001	222	1218
1985	1169	4686	108	338	2000	2756	14419	202	1141
1986	1312	6053	107	377	2001	2267	10402	179	842
1987	1271	5616	114	401	2002	2430	15774	178	1257
1988	1233	5922	128	463	2003	2408	15203	223	1329
1989	1377	6865	143	523	2004	2529	17011	245	1426
1990	1463	6941	148	559	2005	2744	20203	256	1827
1991	1334	6410	157	582	2006	2785	21333	241	1918
1992	1226	5882	150	620	2007	2759	22447	225	1972
1993	1383	7089	168	724	2008	2728	24536	224	2022
1994	1526	6791	167	850	2009	2528	22318	240	1987
1995	1720	7663	170	997	2010	2803	25229	257	2016
1996	1882	8639	196	1073	2011	2888	25077	240	2026
1997	2205	10600	212	1280	2012	2768	20705	230	2109

Note: This table combined three databases I/B/E/S, CRSP and COMPUSTAT during sample period 1982 – 2013. *No. Analysts* represents the number of analysts in the sample. *No. Forecasts* represents the number of annual earnings forecasts in the sample. *No. Brokers* represents the number of brokers (analyst employers) in the sample. *No. Firms* represents the number of firms in the sample.

Table 2. Correlation coefficients and Distribution of regression variables (N=374,838)

	One factor Alpha	Three factor Alpha	Four factor Alpha	NAFL	PMAFE	RFOPT	FREQ	STDV	VOL	ROA
Panel A. Pearson Correlation Coeeficient										
One factor Alpha	1									
Three factor Alpha	0.9414***	1								
Four factor Alpha	0.9249***	0.9787***	1							
NAFL	-0.0094***	-0.0013	0.0001	1						
PMAFE	-0.0069***	-0.0053***	-0.0071***	-0.0083***	1					
RFOPT	0.0085***	0.0103***	0.0104***	0.0049***	0.0008	1				
FREQ	0.0134***	0.0117***	0.0127***	0.0640***	0.0459***	0.0024	1			
STDV	0.0296***	0.0341***	0.0323***	-0.1338***	0.0441***	-0.0406***	-0.0073***	1		
VOL	0.0294***	0.0235***	0.0081***	-0.1132***	-0.0065***	-0.0292***	0.0014	0.1268***	1	
ROA	0.1008***	0.0999***	0.0995***	0.1172***	-0.0005	0.0417***	-0.0035**	-0.2395***	-0.1096***	1
CHGEPS	-0.0028	-0.0026	-0.0035	0.0014	0.0008	0.0795***	-0.0045***	0.0032**	-0.0003	-0.0103***
CHGAUDIT	-0.0592***	-0.0641***	-0.0621***	-0.0453***	0.0012	-0.0024	0.0048***	0.0529***	0.0169***	-0.0141***
OPIN	0.0522***	0.0658***	0.0622***	-0.0307***	0.0057***	-0.0012	-0.0639***	0.0387***	-0.1606***	0.0386***
SD	-0.0054***	-0.0062***	-0.0068***	-0.0069***	-0.0017	-0.8670***	-0.0009	-0.0024	0.0162***	-0.0073***
PMAFEt-1	-0.0025	-0.0014	-0.0024	-0.0011	0.0892***	0.0005***	0.0040**	0.0092***	-0.0154***	-0.0036**
FIRMEXP	-0.0277***	-0.0238***	-0.0262***	0.0715***	0.0992***	0.0124***	-0.0176***	-0.1123***	0.0605***	0.0449***
GEXP	-0.0127***	-0.0123***	-0.0136***	-0.0553***	0.0674***	0.0040**	-0.0472***	-0.0479***	0.1234***	0.0234***
NUMB	0.0026	0.0011	-0.0033	-0.0289***	0.0378***	0.0011	-0.0513***	-0.0563***	0.0269***	-0.0069***
LOGSIZE	-0.0438***	-0.0404***	-0.0464***	0.5259***	-0.0095***	-0.0053***	0.0349***	-0.3610***	0.1396***	0.1088***
TOP10	0.0026	0.0011	0.0008	-0.0137***	-0.0222***	-0.0047***	-0.0030*	0.0023	-0.0348***	-0.0016
INST	0.0759***	0.0687***	0.0624***	0.0910***	-0.0041**	-0.0120***	0.0221***	-0.0346***	0.3458***	0.0278***
Panel B. Distribution of Regression Variables										
Minimum	-0.01	-0.01	-0.01	2.00	-18.85	-10254.73	1.00	0.03	19.86	-0.67
Q1	0.00	0.00	0.00	13.00	-0.09	0.96	1.00	0.07	21.91	0.01
Median	0.00	0.00	0.00	21.00	0.05	4.18	2.00	0.10	23.00	0.05
Q3	0.00	0.00	0.00	33.00	0.25	10.73	2.00	0.14	23.69	0.11
Maximum	0.01	0.01	0.01	81.00	1.00	688.31	6.00	0.36	23.91	0.39

	CHGEPS	CHG AUDIT	OPIN	SD	PMAFE t-1	FIRM EXP	GEXP	NUMB	LOGSIZE	TOP10	INST
Panel A. Pearson Correlation Coeeficient											
One factor Alpha											
Three factor Alpha											
Four factor Alpha											
NAFL											
PMAFE											
RFOPT											
FREQ											
STDV											
VOL											
ROA											
CHGEPS	1										
CHGAUDIT	-0.0019	1									
OPIN	0.0007	-0.0047***	1								
SD	-0.2095***	-0.0027*	0.0052***	1							
PMAFEt-1	-0.0027	0.0003***	0.0071***	-0.0002	1						
FIRMEXP	-0.0006	-0.0261***	-0.0452***	-0.0015	0.0667***	1					
GEXP	-0.0003	-0.0084***	-0.0400***	0.0048***	0.0723***	0.6842***	1				
NUMB	0.0032 *	-0.0109***	-0.0077***	0.0014	0.0458***	0.2295***	0.3326***	1			
LOGSIZE	-0.0014	-0.0555***	-0.1226***	0.0298***	-0.0043***	0.2040***	0.0921***	0.0517***	1		
TOP10	-0.0039 **	0.0047***	0.0074***	0.0040**	-0.0189***	-0.0351***	-0.0522***	-0.0634***	-0.0368***	1	
INST	-0.0068***	-0.0388***	-0.1165***	0.0156***	-0.0061***	0.0784***	0.0640***	0.0476***	0.0906***	-0.0384***	1
Panel B. Distribution of Regression Variables											
Minimum	-1343.00	0.00	0.00	0.00	-2.34	1.00	1.00	4.00	2.59	3.81	0.00
Q1	-0.14	0.00	0.00	0.09	-0.11	1.00	2.00	11.00	589.65	6.38	0.48
Median	0.11	0.00	1.00	0.21	0.04	2.00	3.00	15.00	2270.39	7.73	0.66
Q3	0.37	0.00	1.00	0.45	0.25	4.00	6.00	20.00	8942.00	9.10	0.81
Maximum	5680.00	1.00	1.00	1946.33	0.93	12.00	17.00	29.00	2692538.00	12.50	16.63

Note: This table divided into two part. Panel A shows Pearson's Correlation Coefficients for the regression variables. ***, **, * are coefficient significantly different from zero at 1%, 5% and 10% respectively. Panel B shows distribution of regressions variables. *One factor alpha, Three factor alpha* and *Four factor alpha* are risk-adjusted measurement derived from Jensen's Alpha [35], Fama and French 3 Factor Model [21] and Carhart Four Factor Model [10], respectively. *NAFLit* is Number of analysts that follow firm j in year t, *PMAFEijt* can be interpreted as analyst i's fractional forecast error relative to the average of analysts' absolute forecast errors for firm j in fiscal year t. Meanwhile *PMAFEijt-1* is *PMAFE* in year t. *FREQijt* is number of revision of existing forecast of firm j's made by the analyst i's on time t divided by number of analyst following that firm. $RFOPT_{itj}$ is Analyst i's relative forecast optimism of firm j's on time t. *LOGSIZEjt* is Logarithmic form of firm j's size in time t. *INSTjt* is Share of institutional holding of firm i on time t. *VOLjt* is trading volume of firm j's in time t. *GEXPit* is general forecasting experience, which number of years that analysts i supply forecast in time t. *FIRMEXPit* is analysts' firm-specific experience which number of years that analyst i supply forecast for firm j. ROAjt-1 is return on asset of firm j in time t-1. *STDVjt-1* is standard deviation of firm monthly stock returns from the prior year as a measure of information uncertainty. *NUMBit* is number of firm(s) followed by analyst i in year t, *TOP10it* is dummy variable with value of 1 if analyst i works at a top decile broker (in terms of number of employees) in year t and 0 otherwise. *OPINjt* is dummy variable with value of 1 if analyst i works at a top decile broker (in terms of number of employees) in year t and 0 otherwise. SDjt is dummy variable which is equal 1 if analysts announce opinion for firm j on time t and 0 otherwise. *CHGEPSjt* is dispersion of earning per share which is the different between earning per share of firm j on time t minus earning per share on t-1. *CHGAUDITjt* is dummy variable which is equal 1 if firm j having the change in auditing method in time t and 0 otherwise.

Table 3. Regression result risk-adjusted returns on analyst following

Variable	Predicted Sign	Parameter Result		
		[1]	[2]	[3]
One factor alpha$_{jt-1}$	+	89.6396***		
		(11.40)		
Three factor alpha$_{jt-1}$	+		128.2595***	
			(11.42)	
Four Factor Alpha$_{jt-1}$	+			148.4661***
				(11.76)
LOGSIZE$_{jt}$	+	4.4806***	4.4813***	4.4824***
		(0.01)	(0.01)	(0.01)
ROA$_{jt-1}$	+	0.3392***	0.3353***	0.3338***
		(22.32)	(0.04)	(0.04)
STDV$_{jt-1}$	-	22.3184***	22.2752***	22.2723***
		(0.31)	(0.31)	(0.31)
NUMB$_{jt}$	-	-0.1278***	-0.1278***	-0.1276***
		(0.00)	(0.00)	(0.00)
INST$_{jt}$	+	7.1097***	7.0952***	7.0886***
		(0.08)	(0.08)	(0.08)
LOGVOL$_{jt}$	+	-3.2240***	-3.2232***	-3.2202***
		(0.02)	(0.02)	(0.02)
Intercept	+	57.3857***	57.3759***	57.2974***
		(0.40)	(0.40)	(0.40)
Adj. R^2		0.3343	0.3345	0.3345

Note: The table provides the summary results of separate regression for each *Alpha*$_{jt-1}$ during sample periods 1982 – 2012 using the model (iv). Each column presents the regressions coefficients for each variable, meanwhile standard error on below the coefficient in bracket. The dependent variable is *NAFL*$_{jt}$, presents number of analyst following firm *j* on time *t*. For definition of independent variables, see appendix list of definition. Adj. R^2 is are adjusted R square over period. *** indicates statistical significance at the 1 percent two-tailed confidence level.

4.2. Result of Analyst Following Hypothesis

This section provides tests of the hypothesis that analysts' decision to follow firm relationship with risk-adjusted returns of the firm. This part explained that analysts' relation with risk-adjusted returns will influences their decision to follow the firm.

From the section 3 we already constructed the model to test the hypothesis of ALPHA influences on analyst following. Using ALPHA that taken from equation (i), (ii), and (iii) and control variables that taken from Bhushan [6] and Koopman [36] which include the size of the firm and institutional ownership of the firm. Three regressions incorporated with one factor alpha, three factors alpha and four factors alpha respectively for each regression model. We do the regression with equation (iv) to find out the result.

Table 3 presents the result of the regression of ALPHA on analyst following. The regression results show that, one factor alpha has positive and significant regression coefficient 89.6396. The regression coefficients even showed more positive and significant on the second and third regression. The coefficient regression of three factors alpha and four factors alpha are 128.2595 and 148.4661, respectively. All coefficients in the estimation are statistically significant ($p<0.001$). When risk-adjusted returns outperform on more risk factors (i.e, market, size and value risk factor), on average, will attract analyst to follow that firm 35% more than with just one risk factor (market risk). Furthermore, adding one more risk factor (momentum) will increase the influence of risk-adjusted returns on analyst following for 54%. This result implies that firm with better risk-adjusted returns will be followed by more analysts. Firm that generate positive alpha following exposure on more risk factors will attract more analysts to follow the firm. It is consistent with findings by Cliff and Denis [15] regarding to manager ability to generate positive impact on returns of the firm will gain more analysts to follow the firm.

Meanwhile, the other control variables also show significant and the sign are consistent as we expected. Following finding by Bhushan [6] that firm size will have positive relation with analyst following, the result on Table 3 show positive and significant for firm size with coefficient regression 4.4806 in interactions with one factor alpha. The results also increase significantly on the other two regressions which show 4.4813 in regression with three factors alpha, and 4.4824 with four factors alpha. This implies that better risk-adjusted returns from a big size company will attract more analysts to follow the firm rather than small size company. Regression results that have different sign as expected but statistically significant are firm trading volume (LOGVOL). The result shows that trading volume has negative relation with number of analyst following with coefficient regression -3.2240 in interaction one factor alpha. But the result is show become less negative in interaction with three factor alpha and four factor alpha where the coefficients are -3.2232 and -3.2202 respectively. This result may imply that the interaction between risk-adjusted returns for high trading volume firms still can be considered attractive to analyst to follow the firm.

4.3. Result of Analyst Forecast Accuracy

This section provides tests of the hypothesis that better risk-adjusted returns will make analyst forecast more accurate. To test the accuracy of forecast by analyst, we use model regression (v) with one factor alpha, three factor alpha and four factor alpha and control variables for analyst innate ability (Firm and general experience), analyst complexity (Number of firm that followed by analyst) and the depth of information (broker size, relative to number of analyst employed). The other control variables that included in the regression are standard deviation of forecast error, analyst opinion, change in earning per share and change in auditing method. The original hypotheses in terms of forecast accuracy, yet the empirical tests investigate analysts' forecast errors. Small forecast errors represent a high level of accuracy. The result will be explained as follow.

Table 4 presents regression result of one factor alpha of risk-adjusted returns on analyst forecast accuracy. Column 1 of Table 4 presents the results from estimation of equation (v) including all control variables. Column 2 and column 3 presents regression results while dropping one of the variables that related to experience since it suspected have high collinearity between variables that related to experience. Column 2 does not include analysts' firm experience meanwhile column 3 does not include the general analysts' experience. The regression result for all variables in column 1 is mostly significant and the sign is as expected. Coefficient result for one factor alpha in column 1 is -2.2491 which is statistically significant ($p<0.001$). Results in column 2 and 3 also showed similar which is negative and significant with coefficient regression -2.2683 and -2.7249, respectively for model 2 and 3. For analyst experience (firm and general experience) have positive and significant result in column 2 and 3. In column 1 the coefficient for general experience (GEXP) are negative and significant. This result implies that analyst that follow firm with better risk-adjusted return with more general experience in making forecasts, on average, have more accurate forecast rather than analyst who have more less general experience. The result is consistent with the idea by Clement [13] that related to experience, analysts with more experience over time have much better in making accurate forecast rather than firm experiences.

Variable firm size (LOGSIZE) in column 1 also shows negative and significant with regression coefficient -0.0040. This implies that bigger size firm better risk-adjusted returns will help analysts to make their forecasts more accurate rather than small size firm. For complexity measures variables which are standard deviation of monthly stock returns ($STDV_{jt-1}$), forecast accuracy from the previous year ($PMAFE_{jt-1}$), and number of firms that followed by the analyst on this year results shows positive and significant. This result explains about how analyst makes effort to produce better forecast for future stock returns. Analyst that follow firm with better risk-adjusted return and using their previous experience on making forecast for that firm will produce more accurate forecast rather than analyst who did not use their past forecast performance.

Table 4. Regression result of one factor alpha on analysts forecast accuracy

Variable	Predicted Sign	Parameter Result		
		[1]	[2]	[3]
One factor alpha$_{jt-1}$	-	-2.2491***	-2.2683***	-2.7249***
		(0.54)	(0.54)	(0.54)
LOGSIZE$_{jt}$	-	-0.0040***	-0.0038***	0.0002***
		(0.00)	(0.00)	(0.00)
GEXP$_{ijt}$	-	-0.0029***		0.0093***
		(0.00)		(0.00)
FIRMEXP$_{ijt}$	-	0.0291***	0.0262***	
		(0.00)	(0.00)	
ROA$_{jt-1}$	-	0.0067***	0.0067***	0.0074***
		(0.00)	(0.00)	(0.00)
STDV$_{jt-1}$	+	0.4111***	0.4082***	0.3820***
		(0.01)	(0.01)	(0.01)
ACCURACY$_{jt-1}$	+	0.0831***	0.0828***	0.0851***
		(0.00)	(0.00)	(0.00)
NUMB$_{it}$	+	0.0016***	0.0013***	0.0017***
		(0.00)	(0.00)	(r0.00)
TOP10$_{it}$	-	-0.0452***	-0.0445***	-0.0446***
		(0.00)	(0.00)	(0.00)
OPIN$_{jt}$	-	0.0079***	0.0083***	0.0079***
		(0.00)	(0.00)	(0.00)
SD$_{jt}$	-	-0.0054**	-0.0053**	-0.0048**
		(0.00)	(0.00)	(0.00)
CHGEPS$_{jt}$	-	0.0015	0.0014	0.0011
		(0.00)	(0.00)	(0.00)
CHGAUDIT$_{jt}$	+	0.0010	0.0006	-0.0026
		(0.00)	(0.00)	(0.00)
Intercept		-0.0947***	-0.0963***	-0.0954***
		(0.01)	(0.01)	(0.01)
Adj R^2		0.0213	0.0211	0.0151

Note: The table provides the summary results of for one factor alpha$_{jt-1}$ during sample periods 1982 – 2012 using the model (v). Column 1 presents the regression with all variables included. Column 2 presents regression without including $GEXP_{ijt}$. Column 3 presents regression without including $FIRMEXP_{ijt}$. Standard error on below the coefficient presents in bracket. The dependent variable is $PMAFE_t$, can be interpreted as analyst *i*'s fractional forecast error relative to the average of analysts' absolute forecast errors for firm *j* in fiscal year *t*.For definition of independent variables, see appendix list of definition. Adj. R^2 is are adjusted R square over period. *** and ** indicates statistical significance at the 1 and 5 percent two-tailed confidence level.

Table 5. Regression result of three factor alpha on analysts forecast accuracy

Variable	Predicted Sign	Parameter Result		
		[1]	[2]	[3]
Three factor alpha$_{jt-1}$	-	-1.9794***	-1.9892***	-2.3366***
		(0.54)	(0.54)	(0.54)
LOGSIZE	-	-0.0040***	-0.0038***	0.0002***
		(0.00)	(0.00)	(0.00)
GEXP	-	-0.0029***		0.0093***
		(0.00)		(0.00)
FIRMEXP	-	0.0292***	0.0262***	
		(0.00)	(0.00)	
ROA	-	0.0066***	0.0066***	0.0074***
		(0.00)	(0.00)	(0.00)
STDV	+	0.4113***	0.4084***	0.3822***
		(0.01)	(0.01)	(0.01)
ACCURACY	+	0.0831***	0.0828***	0.0852***
		(0.00)	(0.00)	(0.00)
NUMB	+	0.0016***	0.0013***	0.0017***
		(0.00)	(0.00)	(0.00)
TOP10	-	-0.0452***	-0.0445***	-0.0447***
		(0.00)	(0.00)	(0.00)
OPIN	-	0.0080***	0.0083***	0.0079***
		(0.00)	(0.00)	(0.00)
SD	-	-0.0055**	-0.0053**	-0.0048**
		(0.00)	(0.00)	(0.00)
CHGEPS	-	0.0014	0.0013	0.0010
		(0.00)	(0.00)	(0.00)
CHGAUDIT	+	0.0010	0.0007	-0.0025
		(0.00)	(0.00)	(0.00)
Intercept		-0.0950***	-0.0966***	-0.0958***
		(0.01)	(0.01)	(0.01)
Adj R^2		0.0213	0.0211	0.0151

Note: The table provides the summary results of for three factor alpha$_{jt-1}$ during sample periods 1982 – 2012 using the model (v). Column 1 presents the regression with all variables included. Column 2 presents regression without including $GEXP_{ijt}$. Column 3 presents regression without including $FIRMEXP_{ijt}$. Standard error on below the coefficient presents in bracket. The dependent variable is $ACCURACY_{jt}$, presents forecast error by analyst *i* for firm *j* on time *t*. For definition of independent variables, see sppendix list of definition. Adj. R^2 is are adjusted R square over period. *** and ** indicates statistical significance at the 1 and 5 percent two-tailed confidence level.

Table 6. Regression result of four factor alpha on analysts forecast accuracy

Variable	Predicted Sign	Parameter Result		
		[1]	[2]	[3]
Four Factor Alpha$_{jt-1}$	-	-2.5164***	-2.5295***	-2.9086***
		(0.56)	(0.56)	(0.56)
LOGSIZE	-	-0.0040***	-0.0038***	0.0002***
		(0.00)	(0.00)	(0.00)
GEXP	-	-0.0029***		0.0093***
		(0.00)		(0.00)
FIRMEXP	-	0.0291***	0.0262***	
		(0.00)	(0.00)	
ROA	-	0.0067***	0.0067***	0.0074***
		(0.00)	(0.00)	(0.00)
STDV	+	0.4116***	0.4088***	0.3826***
		(0.01)	(0.01)	(0.01)
ACCURACY	+	0.0831***	0.0828***	0.0851***
		(0.00)	(0.00)	(0.00)
NUMB	+	0.0016***	0.0013***	0.0017***
		(0.00)	(0.00)	(0.00)
TOP10	-	-0.0452***	-0.0446***	-0.0447***
		(0.00)	(0.00)	(0.00)
OPIN	-	0.0080***	0.0084***	0.0080***
		(0.00)	(0.00)	(0.00)
SD	-	-0.0057**	-0.0055**	-0.0051**
		(0.00)	(0.00)	(0.00)
CHGEPS	-	0.0014	0.0014	0.0010
		(0.00)	(0.00)	(0.00)
CHGAUDIT	+	0.0008	0.0005	-0.0028
		(0.00)	(0.00)	(0.00)
Intercept		-0.0948***	-0.0964***	-0.0955***
		(0.01)	(0.01)	(0.01)
Adj R^2		0.0213	0.0211	0.0151

Note: The table provides the summary results of for four factor $Alpha_{jt-1}$ during sample periods 1983 – 2012 using the model (v). Column 1 presents the regression with all variables included. Column 2 presents regression without including $GEXP_{ijt}$. Column 3 presents regression without including $FIRMEXP_{ijt}$. Standard error on below the coefficient presents in bracket. The dependent variable is $ACCURACY_{jt}$, presents forecast error by analyst *i* for firm *j* on time *t*. For definition of independent variables, see appendix list of definition. Adj. R^2 is are adjusted R square over period. *** and ** indicates statistical significance at the 1 and 5 percent two-tailed confidence level.

In Table 5 presents regression result of risk-adjusted returns with three factor alpha on analysts' forecast accuracy. Results show as expected. Three factor alpha coefficient regressions on column 1 show -1.9794 which is less negative compared with regression result on Table 4 column 1. The result in column 2 and 3 are -1.9892, -2.3366, respectively, are also less negative compared to result in Table 4 column 2 and 3. This result consistent with the hypothesis, that analyst that follow firm with better risk-adjusted returns will have less negative forecast error. In the other term, analyst that follow firm with better risk-adjusted returns perform more accurate forecast. Analyst who follow firm with better risk-adjusted performance after exposures more risk factor will have 13% more accurate forecast.

Related to analysts' experiences, the results in column 1 showed that negative and significant for analysts' general experiences with coefficient regression -0.0029 and positive significant for analysts' firm experience with coefficient regression 0.0291. Meanwhile the other variables showed significant are broker size ($TOP10_{it}$), analysts' opinion ($OPIN_{jt}$) and standard deviation of forecast error (SD_{it}) with coefficient regression -0.0452, 0.0079 and -0.0054 respectively. The other two variables which is the change of Earning per Share ($CHGEPS_{jt}$) and change in auditing method ($CHGAUDIT_{jt}$) are showed positive but not statistically significant. All the variables that reported significant are significantly different from zero at 1% level except variable SD_{it} which significantly different from zero at 5% level.

Table 6 presents the same regression with Table 4 using the influence of four factor alpha on analyst forecast accuracy. The result on Table 6 column 1 which is using four factor alpha in the regression showed that the result is more negative (-2.5164, p>0.001) rather than result with influence of variable three factor alpha (-1.9794 p>0.001) in Table 5 column 1. Even, the result is shows more negative rather than using variable one factor alpha (-2.2491, p>0.001) in Table 4 column 1. The reasonable explanation behind this result is regarding momentum anomalies effects that reduce the accuracy of analysts forecast. Momentum effect found by Jegadeesh and Titman [34] stated that momentum effect will tend to move in reversal in the long run. This reversal will affect analyst forecast accuracy.

Table 7. Regression result risk-adjusted returns influences on analyst optimistic

Variable	Predicted sign	Parameter Result		
		[1]	[2]	[3]
One factor Alpha	+	189.6293***		
		30.35		
Three Factor Alpha	+		234.6741***	
			30.43	212.2584***
Four Factor Alpha	+			31.34
LOGSIZE	+	0.3098***	0.3097***	0.3098***
		0.03	0.03	0.03
GEXP	+	0.0540***	0.0537***	0.0537***
		0.03	0.03	0.03
FIRMEXP	+	0.1230	0.1233	0.1230
		0.02	0.02	0.02
STDV	-	-38.8338***	-38.8972***	-38.8751***
		0.90	0.90	0.90
LOGVOL	-	-0.6661***	-0.6670***	-0.6604***
		0.05	0.05	0.05
SD	-	-3.7306***	-3.7305***	-3.7305***
		0.00	0.00	0.00
OPIN	+	0.5948***	0.5748***	0.5867***
		0.11	0.11	0.11
TOP10	+	-0.3650	-0.3629	-0.3613
		0.24	0.24	0.24
CHGEPS	+	-0.3698***	-0.3698***	-0.3698***
		0.00	0.00	0.00
CHGAUDIT	+	-0.5838**	-0.5525**	-0.5715**
		0.24	0.24	0.24
Intercept	+	25.6693***	25.7088***	25.5527***
		1.07	1.07	1.07

Note: The table provides the summary results of separate regression for each $Alpha_{jt-1}$ (Jensen's alpha, Fama-French three factor alpha, Carhart Four Factor alpha) during sample periods 1983 – 2012 using model (viii). Each column presents the regressions coefficients for each variable, meanwhile standard error on below the coefficient in bracket. The dependent variable is $RFOPT_{ijt}$, analyst *i*'s relative forecast optimism of firm *j*'s on time *t*. $LOGSIZE_{jt}$ is logarithmic form of firm size, $GEXP_{it}$ is general forecasting experience, which number of years that analysts *i* supply forecast, $FEXP_{it-1}$ is analysts' firm-specific experience which number of years that analyst *i* supply forecast for firm *j*, ROA_{jt-1} is Return on Asset in previous year, $STDV_{jt-1}$ is standard deviation of firm monthly stock returns from the prior year as a measure of information uncertainty, $LOGVOL_{jt}$ is logarithmic form of trading volume, SD_{jt} is standard deviation of forecast error of firm *j* on time *t* $OPIN_{jt}$ is dummy variable which is equal 1 if analyst announce opinion for firm *j* on time *t* and 0 otherwise, $TOP10_{ijt}$ is dummy variable with value of 1 if analyst *i* works at a top decile broker (in terms of number of employees) in year *t* and 0 otherwise,. $CHGEPS_{jt}$ is dispersion of earning per share which is the different between earning per share of firm *j* on time *t* minus earning per share on *t-1*, $CHGAUDIT_{jt}$ is dummy variable which is equal 1 if firm *j* having the change in auditing method in time *t* and 0 otherwise.. Adj. R^2 is are adjusted R square over period. ***, **, * indicates statistical significance at 1%, 5%, 10% two-tailed confidence level, respectively.

Table 8. Regression result risk-adjusted returns on revision frequency of earning forecast

Variable	Predicted Sign	Parameter Result		
		[1]	[2]	[3]
One factor alpha$_{jt-1}$	+	0.3150***		
		(0.08)		
Three factor alpha$_{jt-1}$	+		0.2334***	
			(0.09)	
Four Factor Alpha$_{jt-1}$	+			0.4235***
				(0.1)
LOGSIZE	+	0.0007***	0.0006***	0.0007***
		(0.00)	(0.00)	(0.00)
STDV	+	0.0508***	0.0509***	0.0507***
		(0.00)	(0.02)	(0.02)
AVGVOL	+	-0.0020***	-0.0020***	-0.0020***
		(0.00)	(0.00)	(0.00)
SD	-	-0.0031***	-0.0031***	-0.0030***
		(0.00)	(0.00)	(0.00)
CHGEPS	+	-0.0003	-0.0002	-0.0002
		(0.00)	(0.00)	(0.00)
CHGAUDIT	+	0.0052***	0.0052***	0.0053***
		(0.01)	(0.00)	(0.01)
Intercept	+	0.1718***	0.1717***	0.1716***
		(0.02)	(0.02)	(0.02)
Adj R^2		0.0017	0.0016	0.0091

Note: The table provides the summary results of separate regression for each $Alpha_{jt-1}$ during sample periods 1982 – 2012 using the model (ix). Each column presents the regressions coefficients for each variable, meanwhile standard error on below the coefficient in bracket. The dependent variable is $FREQ_{ijt}$, presents number of analyst forecast revision for firm *j* on time *t*. $LOGSIZE_{jt}$ is logarithmic form of firm size, $STDV_{jt-t}$ is standard deviation of firm monthly stock returns from the prior year as a measure of information uncertainty, $LOGVOL_{jt}$ is logarithmic form of trading volume, SD_{jt} is standard deviation of forecast error of firm *j* on time *t*, $CHGEPS_{jt}$ is dispersion of earning per share which is the different between earning per share of firm *j* on time *t* minus earning per share on *t-1*, $CHGAUDIT_{jt}$ is dummy variable which is equal 1 if firm *j* having the change in auditing method in time *t* and 0 otherwise.. Adj. R^2 is are adjusted R square over period. ***, **, * indicates statistical significance at 1%, 5%, 10% two-tailed confidence level, respectively.

4.4. Result of Analyst Optimism

Table 7 presents the regression result of risk-adjusted returns on analyst optimism. In column 1, 2 and 3 we can see the risk-adjusted returns variables are positive and significant. This result implies that risk-adjusted returns influence analyst to react more optimistic. It is consistent with previous study by Easterwood and Nutt [19] that analysts overreact and more optimistic on positive information. This result also implies that analyst put more concern on firm with better risk-adjusted returns that they follow. The difference in risk-adjusted returns variables on column 1 and 2 shows that analysts are more optimistic for firms with better risk-adjusted returns (189.6293, p<0.001 on column 1 and 234.6741, p<0.001 on column 2). Analyst react 19% more optimistic to firm with better risk-adjusted returns measurement. The result of risk-adjusted returns variable in column 3 have slightly decline rather than in column 2 (212. 2584, p<0.001 on column 3 and 234.6741, p<0.001on column 2). But the result is still performing 11% better compared to result in column 1.

5. Conclusion

Many previous studies presented firm-analyst relationship on the matter of analysts' performance. Michaely and Womack [42], found that proximity between a firm and an analyst should improve the quality of information and the accuracy of forecasts or recommendations produced by analysts. Meanwhile Andreou, Ehrlich and Louca [4] present that there are positive relations between managerial ability and firm performance in three main measures which are returns, resources and asymmetric information. The study of Feldman et al., [22] suggests that the value of analysts' activities in the market stems from two sources which is analysts' skill at interpreting public information and/or their ability to collect and process private information [22].

The study investigates the firm risk-adjusted measurement upon the risk exposure to the various systematic factors that been documented by Jensen [35], Fama and French [21] and Carhart [10] to find out the influences on analyst performance which in this study define as analyst following, forecast accuracy, analyst optimism and earning forecast revision frequency. Our method is to measure firm risk-adjusted return using typical approach by regressing the assets returns in excess of the free risk and use the intercept into three model regression that related to analyst following, forecast accuracy and earning forecast revision frequency. Then, we integrate the intercept, the *alpha*, on analyst performances regression model to test the hypothesis. For control variables we adopt firm and analysts' characteristics used by McNichols and O'Brien [41], Clement [13], Holden and Stuerke [29].

The result shows that firm with better risk-adjusted returns that using three factors of risk exposure (market, size and value risks) will attract analyst to follow that firm 35% more than with just one risk factor (market risk).

Furthermore, adding one more risk factor (momentum) will increase the influence of risk-adjusted returns on analyst following for 54%. Firm with better risk-adjusted return, where the exposure is market risk, value and size [21] have been documented show have 13% more accurate forecast rather than firm that only put one exposure to risk factor which is market risk. But the result is less accurate when we observed more risk involved in documented by Carhart [10]. This result might be not as expected regarding momentum anomalies effects that reduce the accuracy of analysts forecast. Momentum effect finding by Jegadeesh and Titman [34] that momentum effect will tend to move in reversal in the long run that will affect analyst forecast accuracy. Analysts react in optimistic regarding better risk-adjusted return performance. Analyst react 19% more optimistic to firm with better risk-adjusted returns measurement. Even though there is slight decline when incorporated four factor alpha on the regression model, the result is still performing 11% better compared to result that use one factor alpha on regression. The result implies that risk-adjusted returns influence analyst to react more optimistic as they think that the stock is favorable and analyst may think that this kind of stocks will perform better in the future. But, this optimistic reaction may also imply that analyst reacting in positive manner to attract more investor since analyst will decline to issue negative news. Analysts' tend to utilize useful information in prior performance and the result is consistent with study by Easterwood and Nutt [19]. There is a slight change between regressions result as influence of risk-adjusted returns on analyst forecast revision frequency. Using less risk exposure with one factor alpha as risk-adjusted returns variable, the regression coefficient shows more positive than three factor alpha. But the result influence of four factors alpha shows even more positive which implies that analyst, on average, will tend to do more effort with more forecast revision frequency especially on long term forecast.

This study confirmed the influence of risk-adjusted returns on analyst decision to follow the firm and analyst performance. As the other study, there is limitation. For example, the time horizon of each asset that followed by analyst will explain more how analyst reaction on risk-adjusted returns and previous stock performance and influence analysts' decision to follow or to drop coverage. More precision on the time period of holding assets will strengthen the result related analyst decision to follow and their effort to produce better quality of earnings forecasts or recommendation reports.

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