ABNORMAL ACCOUNTING GROWTH AND ANALYST FORECASTS

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Abstract

Analysts center on a firm's business growth to forecast earnings. The more uncertainty in growth, the more difficult for analysts to forecast. Therefore, forecasts are more dispersed and less accurate. To evaluate this hypothesis, this paper structures the content of uncertainty in growth and integrates them into one metric: abnormal accounting growth (AAG). AAG captures two dimensions of uncertainty in growth: 1) the uncertainty from the disagreement across various growth rates and 2) the uncertainty from the deviation of the firm-specific mean to the grand mean. Validity tests show that AAG materially and incrementally contributes to traditional risk metrics: the volatility of weekly return and market beta. Empirical results confirm that high AAG distinctly explains high forecast dispersion and low forecast accuracy. Besides traditional determinants AAG's explanatory power is incremental. In addition, when earnings surprise is negative or loss occurs, it is more difficult to forecast. Accordingly, the effect of AAG on forecast dispersion and accuracy is magnified. This work emphasizes that 1) the disagreement across growth rates and 2) high or low growth both are risky. Through AAG, this work complements the understanding of how uncertainty in growth affects forecasting performance.

Keywords: Abnormal accounting growth, Risk, Forecast dispersion, Forecast accuracy

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1. Introduction

To forecasting earnings, analysts have to understand a firm's business growth. If there is more uncertainty in a firm's growth, it is more difficult for analysts to predict earnings. Accordingly, analysts' forecasting performance is bad. Previous literature (e.g., Duru and Reeb 2002; Gu and Wu 2003; Behn, Choi, and Kang 2008; Zhang 2006; So 2013.) has documented the negative effect of uncertainty on the quality of forecasts. However, there is an incomplete understanding of what the uncertainty in growth is and to what extent the uncertainty in growth affects forecasting performance.

Most of the traditional understanding of the uncertainty in growth centers on the risk of high growth. That *high-growth firms are risky* has been extensively documented in many textbooks (e.g., Penman 2013; Ross, Westerfield, and Jordan 2010; Ross, Westerfield, and Jaffe 2012), and literature (e.g., Myers and Turnbull 1977; Fama and French 1993; Bansal and Yaron 2004; Campbell, Polk, and Vuolteenaho 2010). Only one study (Lev and Kunitzky 1974)[1] discusses the risk in each high or low growth rate relative to years' firm-specific mean. This paper extends the understanding of uncertainty in growth and structures the uncertainty in growth into two dimensions: 1) the uncertainty from the disagreement across various growth rates, 2) the uncertainty from the deviation of the firm-specific mean of growth to the grand mean. The former is likely due to firm-specific shocks and the latter is likely due to economic or industry shocks. For example, the supply chain disruption probably affects sales growth and expenses growth much stronger than total asset growth, which leads to the high disagreement of various growth rates. A

[1] Even though their work considers the risk in both high and low growth, they focus on past growth information, at least 15 years ago. As the current and forecasted growth information is more useful in exploring the uncertainty in growth, this work focuses on how to use current and forecasted growth information to establish FSA-based uncertainty metric and examine the extent of the metric in explaining future risk and forecast performance.

financial crisis or industry recession possibly results in low growth for all growth rates, which makes the firm-specific mean of growth highly deviate from the grand mean. Both cases could generate uncertainty in a firm's future performance.

From the practical perspective, if sales growth and total asset growth are very low but expenses growth is very high, the profit margin can be very low, which may be because of poor corporate governance or bad business. It suggests that the unbalanced growth rates contain uncertainty. If sales growth, expenses growth, and total asset growth all are minimal or negative, say about -3%, which highly deviates from the grand mean, the earnings may be positive, but the business is shrinking, which leads to high uncertainty in a firm's future performance. If sales growth, expenses growth, and total asset growth are all very high, about 15%, which also highly deviates from the grand mean, it may be caused by the prosperity of some industries, innovation generating popular products, or bubbles. As a result, high growth involves high uncertainty in predicting a firm's future performance.

Based on the financial statement analysis, a firm-specific uncertainty metric: abnormal accounting growth (AAG) is constructed to capture both dimensions of uncertainty in growth. AAG is measured as the standard deviation of various growth rates, such as sales growth, and total asset growth, assuming the "true" mean as 7%. High AAG indicates high uncertainty from various shocks such as arcane (possibly manipulated) accounting practices, poor governance, an unstable business model, or economic recession. As the uncertainty is risky, the issue at hand is to what extent AAG indicates traditional risk metrics, such as stock volatility and systematic risk. Given that high uncertainty in growth makes forecasting tasks more difficult and complex, the main research question is to what extent AAG, through the uncertainty concept, explains forecast performance: forecast dispersion and forecast accuracy.

In the construction of AAG, I carefully select 8 growth rates that capture a firm's business growth. Five are trailing growth rates: total assets growth, total liabilities growth, enterprise value growth, sales growth, and expenses growth, and the other three are forecasted growth rates: sales and expenses growth from t to t+1, and sales growth from t+1 to t+2 to involve the uncertainty in forecasted future. AAG is just the standard deviation of 8 growth assuming the "true" mean as 7%. 7% is employed because the cross-sectional mean of various growth rates, such as sales and expenses, is about 7% and 7% is a simple starting point to discuss how AAG structures the content of uncertainty in growth[2].

To verify that AAG captures firm-specific uncertainty, I examine the connection between AAG and traditional risk indicators: the volatility of weekly return, and market beta. The correlation is materially positive in all 18 years. The annual rank correlation between AAG and standard deviation of weekly return (beta) approximates 0.40 (0.26). Furthermore, AAG successfully explains risk in the next year. The median rank correlation between AAG and standard deviation of weekly return (beta) approximates 0.38 (0.24). Robustly, in the simulations analyses, AAG correctly and significantly assesses the future risk. Incremental to firm characteristics: unexpected earnings, SIZE, ROA, earnings volatility, and BTM, AAG's explanatory power to risk is still distinct. In the volatility of weekly return regressions, the inclusion of AAG increases R^2 by 0.027 (0.011) in Fama-MacBeth (Fixed Effects) model and the absolute value of the standardized coefficient of AAG is 0.226. With regard to market beta, the inclusion of AAG increases R^2 by

[2] Other adjusted grand mean could be more accurate in capturing the uncertainty in growth. However, this work focuses on constructing FAS-based diagnostic and through the diagnostic to explain forecast performance instead of exploring the possible grand mean to find the best AAG in capturing uncertainty in growth.

0.011 (0.004) in Fama-MacBeth (Fixed Effects) model and the absolute value of the standardized coefficient of AAG is 0.099.

High AAG shows high uncertainty may stemming from different sources, such as poor governance, arcane accounting practice, bad business model, or an unstable economic environment. High uncertainty heightens the difficulty and complexity of analysts' forecasting process (Weiss 2010; Lehavy, Li, and Merkley 2011). The growth uncertainty makes it difficult for analysts to predict firms' earnings growth in the future. Therefore, forecast performance, such as forecast dispersion and forecast accuracy is low (Hutton, Lee, Shu 2012). The increased task complexity induces simpler decision rules that undermine performance (Earley 1985; Payne 1976; Payne et al. 1988). In facing the complexity of forecasting, analysts may simplify the forecasting process, which in turn reduces their performance and yields more dispersed and less accurate forecasts. Additionally, the increased information asymmetry widens interpretations of information and hence analysts' heterogeneous interpretation is likely to spawn a wide variety of forecasts and low forecast accuracy. Taken together, it is hypothesized that AAG positively correlates with forecast dispersion and negatively correlates with forecast accuracy.

The empirical results confirm the hypothesis and AAG's explanatory power is incremental to traditionally accepted determinants: unexpected earnings, SIZE, ROA, earnings volatility, and BTM (e.g., Barron, Kile, and O'Keefe 1999; Kinney, Burgstahler, and Martin 2002; Gu and Wu 2003; Zhang 2006; Behn, Choi, and Kang 2008; So 2013; Bochkay and Joos 2021). In forecast dispersion analysis, the inclusion of AAG increases R^2 by 0.008 (0.004) in Fama-MacBeth (Fixed Effects) model and the absolute value of the standardized coefficient of AAG is 0.1. In terms of forecast accuracy, the inclusion of AAG increases R^2 by 0.004 (0.002) in Fama-MacBeth (Fixed Effects) model and the absolute value of the standardized coefficient of AAG is

0.055. The incremental contribution of AAG gradually decreases with the year progresses and becomes marginal for forecast dispersion (forecast accuracy) until the 12th (6th) month after the earnings announcement.

If analysts are subject to uncertainty in the forecasting process, a very relevant question is how the bad news that induces a worse information environment affects the role of AAG in the forecast dispersion and accuracy. The reasons for bad news tend to be more complex. Given the complex reasons, it is more difficult for analysts to fill a number, which leads to high forecast dispersion and poorer accuracy. In addition, if a firm experiences bad earnings or sales news, managers may intentionally hide details of bad news (Verrecchia 1983; Dye 1986; Shin 2003; Anilowski, Feng, and Skinner 2007; Kothari, Shu, and Wysocki 2009). The selective disclosure by withholding bad news increases information asymmetry, which in turn magnifies the effect of AAG on forecast dispersion and accuracy. The empirical results confirm the hypothesis by two proxies of bad news: negative earnings surprise and loss.

This paper contributes to the literature on several levels. First, I extend the understanding of the uncertainty in growth. The concept that growth is risky has been universally discussed (e.g., Penman 2013; Ross, Westerfield, and Jordan 2010; Ross, Westerfield, and Jaffe 2012; Myers and Turnbull 1977; Fama and French 1993; Bansal and Yaron 2004; Campbell, Polk, and Vuolteenaho 2010). Most of the works focus on the uncertainty in high-growth firms. As far as I know, only one work by Lev and Kunitzky (1974) discusses the risk in each high or low growth relative to the firm-specific historical mean. This work structures the content of uncertainty in growth and highlights that there are two dimensions of uncertainty in growth: 1) the uncertainty from unbalanced growth, and 2) the uncertainty from the deviation of the firm-specific mean to the grand mean. Both dimensions of uncertainty are risky in forecasting firms' future performance.

To capture these two dimensions of uncertainty, abnormal accounting growth (AAG) is constructed as the standard deviation of 8 growth rates assuming the “true” mean as 7% for each firm. Validity analysis shows that AAG materially and incrementally explains traditional risk indicators: the standard deviation of weekly return and beta in t/t+1.

Next, the evidence complements and reinforces the understanding of the forecasting process. Previous literature (e.g., L’Her and Suret’s 1996; Johnson 2004; Diether, Malloy, and Scherbina. 2002) documents that uncertainty drives the various perception of analysts and thus determinates different forecasts. This paper extends and supports the above argument by discussing the role of uncertainty in growth, through AAG construction, in forecast dispersion and accuracy. Evidence shows that AAG strongly explains forecast dispersion and accuracy and the explanatory power is incremental to traditionally accepted determinants: unexpected earnings, SIZE, ROA, earnings volatility, and BTM. As the year progresses, the explanatory power of AAG gradually declines. When news is bad, e.g. earnings surprise is negative or loss occurs it is more difficult to forecast. Therefore, AAG’s explanatory power for forecast dispersion and accuracy is magnified.

2. Construction of AAG and Validity Test

2.1 Construction of AAG

AAG is a firm-specific metric, measured as the standard deviation of 8 growth rates assuming the "true" mean as 7%. 7% as a starting point is derived from the cross-sectional mean of various growth rates, such as sales growth and expenses growth. AAG captures both two dimensions of uncertainty in growth: 1) the uncertainty from the deviation of firm-specific mean to the grand mean and 2) the uncertainty from unbalanced growth rates.

Assume that X is a set of various growth intra-firm at time t.

Then AAG^2=E{(X-7%)^2}

= E(X^2 -2*7%*X + 7%^2)

= E{X^2 – E(X) ^2 +E(X) ^2-2*7%*X + 7%^2}

= Var(X) + {E(X) -7%}^2

From the above equation, AAG is decomposed as two components: Var(X) and {E(X) -K}^2. Var(X) is the variance of various growth rates. It measures the uncertainty of unbalanced growth rates. {E(X) -K}^2 is the squared difference between the firm-specific mean and the grand mean. It estimates the uncertainty of the firm-specific mean deviating from the grand mean. These two components construct four types of contents of AAG.

I use four examples to explain how two components constitute AAG, how AAG connects with risk, and therefore stipulates the difficulty of forecasting.

1) High Var(X) and high {E(X) -7%}^2. For example, Tetra Technologies in 2015: sales growth is 4.9%, expenses growth is 0.7%, and asset growth is -20%. These growth rates are in high disagreement, which shows the high Var(X). As the mean of these three growth rates: E(X) is -4.8%, the deviation of the firm-specific mean from the 7% is also high. Both components lead to high AAG (=0.21). The relevant beta is 1.82, which confirms AAG's ability in indicating risk.

2) High Var(X) and low {E(X) -7%}^2. For example, CMC Materials in 2018: sales growth is 16.4%, expenses growth is 14.2%, and asset growth is -6.4%. The extent of disagreement in these three growth rates is high, which shows the high uncertainty from the first component: Var(X). The firms-specific mean: E(X) is 8.1%, which is close to the grand mean of 7%. The second component of AAG: {E(X) -7%}^2 is correspondingly low. These two components construct a relatively high AAG (=0.13). The beta (=1.26) turns out to be relatively high.

3) low Var(X) and high {E(X) -7%}^2. For example, DXP Enterprises in 2013: sales growth is -16.8%, expenses growth is -16.8%, and asset growth is -18.3%. The first component: the variance of three growth rates is low but as the firms-specific mean is -17.3%, the second component: {E(X) -7%}^2 is very high, which leads to high AAG (=0.3). The relevant beta is 1.78, which confirms the high risk indicated by AAG.

4) low Var(X) and low {E(X) -7%}^2. For example, Phibro Animal Health in 2018: sales growth is 7.3%, expenses growth is 7.9%, and asset growth is 7.7%. These three growth rates have a low disagreement and the firms-specific mean of 7.6% is close to 7%. AAG (=0.01) is correspondingly low. The low beta value (=0.34) confirms the low risk.

Instead of variance value, the standard deviation is employed as AAG because, from the practical application, the unit of standard deviation is consistent with the random variable. In other words, AAG can be directly compared with the growth rates to acknowledge the extent of uncertainty.

Based on FSA, 8 simple-structured growth rates are selected to capture a firm's business growth. In specific, total asset growth and total liability growth are employed as they focus on the change in balance sheets, which generates earnings in the income statement. If the uncertainty in total asset growth and total liability growth is high, the risk in forecasting future earnings is high. Enterprise value growth is also employed to indicate the merging, acquisition, and changes in stock price. Merging and acquisition show investors' confidence in firms' future business growth. Stock price contains the expectation of future earnings. The high the stock price is, the high the expected earnings investors would believe. Therefore, enterprise value growth is effective in exploring the uncertainty in growth. Sales and expenses growth rates are selected to directly seize the uncertainty in earnings construction. Considering the uncertainty in forecasted growth, 3 forecasted growth rates: sales growth from t to t+1, sales growth from t+1 to t+2, and expenses growth from t to t+1, are also involved. To avoid outliers, all growth rates are taken logged value before AAG calculation.

The sample includes S&P 1500 firms, from 2001 to 2018, a total of 18 years. I select S&P 1500 firms because the quality of analysts' forecasts is relatively high, and this sample selection also avoids the outliers from very small firms. The sample period starts from 2001 because analysts' forecasts are not accurate on average before 2000, the pre-Reg FD period (Kross and Suk 2012). In addition, before 2001, forecast sales for t+2 before the t-year earnings announcement is only available for a few firms.

Financial data comes from COMPUSTAT, forecasts data come from IBES summary, and stock price data comes from CRSP. To obtain forecast information as accurately as possible, in the AAG calculation I use the analysts' consensus median forecasts issued in the two months before the earnings announcement. The expenses forecast is just the difference between the sales forecast and earnings forecast. Enterprise value is calculated by adding market capitalization and total debt, then subtracting all cash and cash equivalents. More details about variable construction are shown in Appendix A.

[Please insert Table 1 about here]

Table 1 shows the summary statistics of 8 growth. Panel A tabulates the distribution of each growth in the full sample. As shown, the median of these 8 growth ranges from 4.5% to 7.2%. Forecasted growth rates have relatively lower median and smaller volatility than trailing growth rates do because IBES reports "street earnings" that do not involve non-recurring items[3]. SG_{t+1}^{t+2} carries the lowest volatility; the interquartile (Q3 - Q1) is 6.7%. EVG_{t-1}^{t} carries the highest volatility; the interquartile is 29% because merging, acquisitions, and price movement make enterprise value more volatile. The median of SG_{t-1}^{t} and $ExpG_{t-1}^{t}$ is about 7%, showing the evidence for assuming the grand mean as 7%. Panel B shows the distribution of the firm-specific median in each year. The firm-specific median value is just the median of 8 growth rates intra-firm. The sample size is smaller from 2001 to 2003 because only a few firms are covered by analysts in reporting sales forecasts for t+2 before the t-year earnings announcement. Across 18 years, the median centers on 7%, which also supports the grand mean as 7%. In 2001, even though the median: 7.4% looks normal, the interquartile (= 17%) signals high uncertainty. It echoes with the burst of the dot-com

[3] More details about the difference between street earnings and GAAP earnings are discussed in Bradshaw et al. (2018).

bubble. As the bursting of the dot-com bubble erodes investors' confidence, during 2002, firms grow slowly, as evidenced by the low value of the firm-specific median (Median= 4.8%). During the financial crisis in 2008 and 2009, the firm-specific median is extensively low; Q1 is -2.1% for 2008 and -2.5% for 2009, Median is 2.9% for 2008 and 2.7% for 2009, and Q3 is 8.2% for 2008 and 7.4% for 2009. The low growth reflects the sluggish economics. In 2015, the median value (= 3.5%) is also low due to the mini-recession. Business investment correspondingly experienced a sharp slowdown.

[Please insert Table 2 about here]

Table 2 shows the summary statistics of AAG. Panel A shows the distribution of AAG across years and Panel B shows the distribution of AAG in each year. In the full sample, AAG shows right skewness with an interquartile of 0.13, reflecting the more discrete and high growth in risky firms. The full sample median of AAG is 0.13. In Panel B, the median is distinctly high in 2001 (median=0.20), 2002 (median=0.17), 2008 (median=0.20), 2009 (median=0.17), which are close to the third quantile in the full sample. It casts high uncertainty because of the dot-com bubble and financial crises. The high volatility in 2001 (Q3 – Q1=0.24), 2002(Q3 – Q1=0.21), and 2008 (Q3 – Q1=0.17) also confirm AAG in capturing uncertainty even though the volatility in 2009 (Q3 – Q1=0.14) is relatively low, which is due to the recovery of economics. Collectively, AAG successfully indicates uncertainty.

2.2 Validity Test: AAG and Risk

This section introduces a validity test to examine the connection between AAG and risk. AAG represents the extent of the uncertainty from unbalanced growth rates and the uncertainty from the deviation of the firm-specific mean to the grand mean. The uncertainty in a firm growth generates two levels of uncertainty in investors' decision-making process: 1) the uncertainty of individual investors' beliefs, and 2) the disagreement in beliefs across investors. As these two levels of uncertainty are risky, it is assumed that AAG positively correlates with risk. The standard deviation of weekly return: Std.WR and market beta are employed as two risk indicators as they are extensively studied in previous literature. The distribution of these two risk indicators is shown in Panel A of Table 3. The median of Std.WR (Beta) is 0.04 (1.12) and the interquartile (Q3-Q1) of Std.WR (Beta) is 0.03 (0.66). Then I rank correlate AAG and risk indicators in year t for each year and tabulate the distribution of the rank correlation in Panel B of Table 3. Results show that if the standard deviation of weekly return is employed as a risk indicator, the rank correlation is strongly positive for all 18 years, and on average, approximates 0.40. The minimum rank correlation is 0.31 which is also effectively strong. If beta is applied, the rank correlation is relatively weak but still distinctly positive with a median of 0.26. The lower rank correlation between AAG and Beta is because Beta is harder to explain (e.g., Lev 1974; Lev, and Kunitzky, S. 1974). Collectively, AAG strongly explains risk in year t.

[Please insert Table 3 about here]

Next, I examine whether AAG could explain the future risk. Similarly, I rank correlate AAG and two risk indicators in t+1 for each year and tabulate the distribution of rank correlations in Panel C of Table 3. The rank correlation is positive for all 18 years and strong for both Std.WR and Beta, even though it is a little lower than that between AAG and risk in t but the correlation is still distinct. The median correlation between AAG and Std.WR (Beta) is 0.38 (0.24) respectively. Results confirm that AAG successfully leads the risk in the future.

As a robustness test, a bootstrap analysis is designed to examine the predictive power of extremely high (low) AAG to future risk. I first define "Extreme" as the *top* two septiles, based on AAG and the rest is not extreme. Then I pick two firms at random from each of the two categories and check whether there is a higher (lower) risk in the extreme category. Redo with 1000 draws with replacement and calculate the probability of extremely high AAG giving a correct assessment of future risk. Both the standard deviation of weekly return in t+1 and beta in t+1 are examined. Results are shown in Panel D1 of Table 3. It is shown that the probability of extremely high AAG giving the correct assessment of future risk is 68% using the standard deviation of weekly return as a risk indicator. If beta is employed, the corresponding probability is relatively low: 61% but still distinct, which indicates the successful assessment of AAG. In addition, I redefine the "extreme" as the *bottom* two septiles and the rest is non-extreme. Then I check whether a firm in the extreme category has a lower risk. 1000 draws with replacement gives us the probability of correct assessment by extremely low AAG for risk in t+1. Results are displayed in Panel D2 of Table 3. It is shown that the probability of extremely low AAG gives the correct assessment of Std.WR in t+1 as 69%. The probability of correct assessment for beta is relatively low: 64% but still distinct. Taken together, the robustness tests evidence the role of AAG in explaining future risk.

As other confounding variables such as dome firm characteristics also affect risk, it is interesting to know the AAG's incrementally explanatory power. Several universally accepted variables: unexpected earnings, SIZE, ROA, earnings volatility, and BTM in literature (McInnis 2010; Shanthikumar 2012; Fama and French 2013, 2015) are added as controls. Regression results are reported in Panel E of Table 3. Fama-MacBeth Model, Fixed Effects Model, and Standardized Model are all applied in regression analyses. Fixed Effects Model controls industry and year fixed effects and the standard errors are clustered by industry. The Standardized Model is estimated by regressing standardized dependent variables on standardized independent variables. As reported, either Stdv.WR in t+1 or Beta in t+1 proxied as the risk indicator, coefficients of AAG in all models are significantly positive. It confirms that high AAG indicates high future risk. In terms of incremental explanatory power, for both risk indicators, AAG's incremental explanatory power is strong. Specifically, if Stdv.WR in t+1 proxies for the risk indicator, after adding AAG, the increase in R-square is 0.020 (0.012) in Fama-MacBeth (Fixed Effects) model. With regard to standardized analysis, if the magnitude of the standardized coefficient is smaller than 0.05, the explanatory power is negligible (Johannesson, Ohlson, and Zhai 2022). According to this rule, AAG displays both high explanatory power and high economic significance as the magnitude of the standardized coefficient is 0.185. If Beta in t+1 proxies for the risk indicator, adding AAG increases R-square by 0.011 (0.005) in Fama-MacBeth (Fixed Effects) model. The magnitude of AAG's standardized coefficient (0.011) suggests both high explanatory power and high economic significance. Overall, AAG strongly correlates with traditional risk indicators and incrementally explains future risk.

3. Hypothesis Development

I posit two lines of reasoning regarding the effect of AAG on forecast dispersion and accuracy.

AAG measures both the uncertainty from the unbalanced growth rates and the uncertainty from the deviation of the firm-specific mean to the grand mean. The high uncertainty may be due to economic events, such as financial crisis, or firm-specific events, such as poor governance, arcane accounting practice, or a bad business model. The perplexed reasons increase the difficulty and complexity of analysts' forecasting process (Weiss 2010; Lehavy, Li, and Merkley 2011). Specifically, if various growth rates are in high disagreement, the extent of information ambiguity is high. For example, if sales growth is 7%, expenses growth is 10%, and total asset growth is 3%, the profit margin is low but asset turnover could be high. The unbalanced growth makes interpreting information more convoluted and increases the difficulty and complexity of forecasting future performance. The high deviation of various growth rates from the "true" mean also makes forecasting more difficult and complex. For example, if sales growth is 16%, expenses growth is 15%, and total asset growth is 17%, this firm seems to be experiencing high business growth, which may be caused by the prosperity of some industries, innovation generating popular products, or bubbles. Verifying whether the high growth can continue and lead to further good performance increases the difficulty of forecasting. Another example is a firm with various low growth rates, such as sales growth of 2%, expenses growth of 1%, and total asset growth of 1%. The various low growth rates may be because the firm has a bad business or poor governance, but it is also possible that this firm is in a low-growth industry but earns stable earnings and cash flow. Such possible reasons complicate the forecasting process.

To deal with the increased difficulty and complexity of forecasting, analysts may simplify the forecasting process, and in turn, reduce their performance. Therefore, forecasts will be more dispersed and less accurate. Prior literature (Payne 1976; Payne et al. 1988) finds that increased difficulty and complexity lead to simpler decision rules. The simpler decision rules result in the incomplete use of available information and undermine performance (Earley 1985). Empirical works (Duru and Ree 2002; Behn, Choi, and Kang 2008; Hutton, Lee, Shu 2012) have confirmed the high forecast dispersion and low forecast accuracy due to the difficulty of forecasting, caused by less reliable financial reporting and international diversification.

In addition, the uncertainty in growth generates high information asymmetry, and, in turn, leads to differential beliefs of analysts. The heterogeneity of analysts' interpretation is likely to spawn a wide variety of forecasts and low forecast accuracy. Previous literature has documented that analysts' forecasts display high dispersion and low accuracy, reflecting the uncertainty of firms' information, such as earnings uncertainty (Imhoff and Lobo 1992), and the annual reporting readability (Lehavy, Li, and Merkley 2011). Thus, I posit that AAG positively correlates with forecast dispersion and negatively correlates with forecast accuracy.

H1: AAG positively correlates with future forecast dispersion.

H2: AAG negatively correlates with future forecast accuracy.

If analysts are subject to uncertainty in the forecasting process, a very relevant question is how the bad news that induces a worse information environment affects the role of AAG in the forecasting process. The reasons for bad news tend to be more complex than those for good news. It may be due to intended accounting practices, such as "big bath", poor corporate governance, failure in marketing, bad production market, or a bad business model. To face the complexity of forecasting from high uncertainty, analysts may simplify the forecasting process and in turn lower their performance. As a result, the effect of AAG on forecast dispersion and forecast accuracy becomes stronger when bad news occurs.

In addition, if a firm experiences bad news, managers may intentionally hide details of bad news. Theoretical models (Verrecchia 1983; Dye 1986; Shin 2003.) and empirical evidence (Anilowski, Feng, and Skinner 2007; Kothari, Shu, and Wysocki 2009.) suggest that managers, on average, engage in selective disclosure by withholding bad news. Less information disclosure results in high information asymmetry, which in turn magnifies the effect of AAG on forecast dispersion and accuracy. Hence, the third hypothesis is that:

H3a: The effect of AAG on future forecast dispersion is stronger in firms with bad news.

H3b: The effect of AAG on future forecast accuracy is stronger in firms with bad news.

4. Empirical Analyses

In this section, I examine how AAG affects forecast dispersion and forecast accuracy in univariate analyses and regression analyses. In addition, the role of news in the AAG-forecast dispersion/accuracy correlation is also examined.

4.1 Research Design

After establishing the empirical link between AAG and risk, this section sets the empirical regressions to examine how AAG, through the two dimensions of uncertainty in growth, affects forecast dispersion and accuracy and the role of news in AAG-forecast dispersion/accuracy.

$$DISP_{t+1} = \beta_0 + \beta_1 AAG_t + \beta_2 AbsUE_t + \beta_3 SIZE_t + \beta_4 ROA_t + \beta_5 EVol_t + \beta_6 BTM_t + \varepsilon \quad (1)$$

$$ACCRY_{t+1} = \beta_0 + \beta_1 AAG_t + \beta_2 AbsUE_t + \beta_3 SIZE_t + \beta_4 ROA_t + \beta_5 EVol_t + \beta_6 BTM_t + \varepsilon \quad (2)$$

Equations (1) and (2) are employed to test the H1 and H2 respectively. I focus on β_1 in both equations.

Forecast Dispersion: DISP is defined as the standard deviation of analyst EPS forecasts for t+1, scaled by the stock price in t and then multiplied by 100. Forecast accuracy: ACCRY is calculated as the absolute difference between the IBES consensus median EPS forecast for t+1 and the actual value of EPS, scaled by the stock price in t and then multiplied by -100. The high ACCRY, the high forecast accuracy. Analyst EPS forecast in both DISP and ACCRY calculation is announced in the first month after t year's earnings announcement.

I involve five control variables: firm size (SIZE), absolute unexpected earnings (AbsUE), firms' performance (ROA), earnings volatility (EVOL), and book-to-market ratio (BTM). These controls are universally used in explaining forecast dispersion and accuracy (e.g., Gu and Wu 2003; Zhang 2006; So 2013).

SIZE is the log value of the total asset. It is widely accepted that a small firm has a worse information environment that leads to high information asymmetry. In facing high information asymmetry, analysts derive diversified and high uncertain beliefs that transfer to high forecast dispersion and worse accuracy. However, the complexity in big firms may also lower analysts' performance (Duru and Reeb 2002), which leads to high dispersion and low accuracy. Additionally, a small firm usually has fewer analysts to follow. A small number of analysts following naturally generates less dispersed forecasts. So, the effect of SIZE on forecast dispersion and forecast accuracy is ambiguous.

Unexpected earnings are another factor that affects forecast dispersion and accuracy. The high unexpected earnings indicate the extent of the prior deviation between analysts' perception of information and a firm's actual situation. As the deviation is likely to be persistent, unexpected earnings are supposed to positively affect forecast dispersion and negatively affect forecast accuracy. This argument has been supported by Barron, Kile, and O'Keefe (1999), Behn, Choi, and Kang (2008), and Kinney, Burgstahler, and Martin (2002). The unexpected earnings: AbsUE, is measured as the absolute difference between the consensus median EPS forecast for t and the actual value of EPS for t, scaled by the stock price in t-1. The consensus median is announced the two months before t-year earnings announcement,

ROA is just the ratio of earnings to total assets, which measures a firm's recent performance. The correlation between earnings performance and forecast error has been documented in numerous studies (e.g., Brown 2001; Eames, Glover, and Kennedy 2002; Bochkay and Joos 2021). Firms that perform poorly are less likely to disclose public information (Kasznik and Lev 1995; Miller

2002; Kothari, Shu, and Wysocki 2009), which makes analysts hard to forecast. As a result, ROA is expected to have a negative correlation with forecast dispersion and a positive correlation with forecast accuracy.

When earnings are more volatile, the future earnings are less explainable (Graham et al. 2005). Combined with less public disclosure in firms with high earnings volatility (Waymire 1985), forecast dispersion is expected to be high, and forecast accuracy is expected to be low. Previous studies (Kross et al. 1990; Mensah, Song and Ho 2004; Behn, Choi, and Kang, T. 2008; Donelson and Resutek 2015) have suggested that earning volatility leads to high forecast dispersion and low forecast accuracy. To control the uncertainty in earnings volatility, I add EVOL, measured as the standard deviation of the previous five (at least three) years' earnings before extraordinary items, scaled by total assets.

BTM captures a firm's growth options and the risk in fundamentals. It is assumed that high book-to-market ratios entail higher dispersion and lower accuracy. And this explanation is supported by analyses reported by Diether, Malloy, and Scherbina (2002), Johnson (2004), Liu and Natarajan (2012), and Chapman, Miller, and White (2019).

$$DISP_{t+1} = \beta_0 + \beta_1 AAG_t + \beta_2 BadNews_t + \beta_3 AAG_t * BadNews_t + \beta_i AControls_{it} + \varepsilon \qquad (3)$$

$$ACCRY_{t+1} = \beta_0 + \beta_1 AAG_t + \beta_2 BadNews_t + \beta_3 AAG_t * BadNews_t + \beta_i AControls_{it} + \varepsilon \qquad (4)$$

Equations (3) and (4) are employed to test the H3a and H3b respectively. I focus on β_3 in both equations.

There are 3 proxies for BadNews: negative earnings surprise, negative sales surprise, and loss. In specific, BadNews is a dummy variable, which equals 1 if actual earnings (sales) for t is smaller than the consensus median of forecast earnings (sales) for t, and 0 otherwise. If Loss is employed as a BadNews metric, then BadNews is 1 if actual earrings in t are negative, and 0 otherwise. The interaction term: AAG*BadNews is assumed to have a significantly positive coefficient: β_3. As AbsUE is defined very closely with negative earnings or sales surprise, if negative earnings or sales surprise proxies for BadNews, controls only involve SIZE, ROA, EVol, BTM. Due to the same reason, if Loss proxies for BadNews, controls only involve AbsUE, SIZE, EVol, BTM.

4.2 Descriptive Statistics

This section shows the summary statistics of dependent variables and rank correlations to preliminarily analyze how AAG contributes to analysts' forecast dispersion and accuracy.

In Panel A of Table 4, I display the distribution of the dependent variables: forecast dispersion (DISP), forecast accuracy (ACCRY), and control variables: firm size (SIZE), absolute unexpected earnings (AbsUE), firms' performance (ROA), earnings volatility (EVOL), and book-to-market ratio (BTM). All variables have been adjusted for stock splits. To avoid the effect of outliers, all variables are winsorized at the 1% top and bottom level. DISP is right-skewed with a median of 0.22. The distribution is consistent with Zhang (2006). ACCRY is left-skewed, and the median is -0.58. SIZE is relatively big and the Q1 is 6.97 as we focus on S&P1500. The magnitude of AbsUS (median=0.12) is smaller as I focus on the earnings forecasts issued very close to the earnings announcement. The median ROA is 0.05. EVol has a median of 0.02 and a large interquartile of 0.04 (=Q3-Q1), indicating big differences in earnings volatility across firms. The median of BTM is 0.45, exhibiting high growth prospects.

[Please insert Table 4 about here]

In Panel B1, B2, and B3 of Table 4, rank correlations are tabulated to provide initial evidence for the effect of AAG on forecast dispersion and forecast accuracy. Panel B1 provides rank correlation in the full sample. The rank correlation between DISP and ACCRY is materially negative (=-0.54). It is consistent with the understanding that high forecast dispersion is usually combined with low forecast accuracy. AAG presents a distinctly positive correlation (=0.29) with DISP and a distinctly negative correlation (=-0.23) with ACCRY. It confirms the hypotheses that AAG strongly explains forecast dispersion and accuracy. In terms of controls, except SIZE, other controls exhibit strong correlations with both DISP and ACCRY, which are consistent with previous literature (e.g., Barron, Kile, and O'Keefe 1999; Kinney, Burgstahler, and Martin 2002; Gu and Wu 2003; Zhang 2006; Behn, Choi, and Kang 2008; So 2013; Bochkay and Joos 2021.). To robustly examine the correlation between DISP (ACCRY) and independent variables, the rank correlation is examined each year and the distribution of correlations across years is shown in Panel B2 (Panel B3). The median correlation is qualitatively the same as the correlation in the full sample. Specifically, the median correlation between DISP and AAG is 0.27, which evidences the strong explanatory power of AAG on DISP. The median correlation between ACCRY and AAG is -0.21, which evidences the distinct explanatory power of AAG on ACCRY. In terms of controls, as examined in the full sample, except SIZE, other controls exhibit strong relationships with both DISP and ACCRY.

4.3 Regression Analyses

To control variable sources of variation in the effect of AAG on forecast dispersion and accuracy, this section does the regression analyses.

4.4.1 AAG and Forecast Dispersion

[Please insert Table 5 about here]

Table 5 reports the estimates from regressing forecast dispersion on independent variables by Fama-MacBeth Model, Fixed Effects Model, and Standardized Model. Columns (1) and (2) report the Fama-MacBeth results with and without AAG respectively. In column (2), the coefficient of AAG is 0.421 and significant at 1% level. It confirms H1 that high AAG increases analysts' difficulty in forecasting performance and widens analysts' beliefs. Therefore high AAG contributes to the high forecast dispersion. Additionally, except for SIZE, other controls significantly correlate with forecast dispersion. The coefficient of AbsUE is 0.379 and the t-value is 13.533, which indicates that the extent of unexpected earnings explains forecast disagreement. This finding is consistent with previous studies (e.g., Gu and Wu 2003; Zhang 2006; So 2013). As noted earlier, the SIZE effect on forecast dispersion is ambiguous, evidenced by the insignificant coefficients. Firms' performance ROA has a significantly negative effect on forecast dispersion, which is consistent with previous findings (e.g., Brown 2001; Eames, Glover, and Kennedy 2002; Bochkay and Joos 2021) that firms with bad performance exhibit bad forecasting quality. As shown in previous studies (Kross et al. 1990; Mensah, Song and Ho 2004; Diether, Malloy, and Scherbina 2002; Johnson 2004; Bryan and Tiras 2007; Behn, Choi, and Kang, T. 2008; Donelson and Resutek 2015.), earnings volatility and BTM positively correlate with forecast dispersion and the relevant coefficients both are significant at 1% level. To examine the incremental contribution of AAG, I regress the forecast dispersion only on controls and report the results in column (1). The change in R-square between regressions with and without AAG is 0.008, indicating the materiality of AAG in explaining forecast dispersion.

To control the effect of invariant characteristics at the industry and year level, the Fixed Effect Model is estimated, and the results are reported in columns (3) and (4). Consistent with the Fama-MacBeth Model's results, the coefficient of AAG is significantly positive. The increase in R-square (=0.004) after adding AAG is lower but still distinct. The effects of control variables are qualitatively the same as in Fama-MacBeth Model.

To facilitate the interpretation of coefficients across variables, I report standardized coefficients in column (5), estimated by regressing standardized dependent variables on standardized independent variables. AAG exhibits the strongest correlation with forecast dispersion with a standardized coefficient estimate of 0.100 (t-stat=15.113), which also indicates the economic significance of AAG. AbsUE displays the highest association with forecast dispersion with a standardized coefficient of 0.315 (t-stat=49.541). The explanatory power of BTM is equivalent to AbsUE, with a standardized coefficient of 0.314 (t-stat=45.040). These high correlations are probably due to the denominator: stock price. Low BTM usually has a high EP ratio, which makes the disagreement in earnings relatively high to stock price. Given that, BTM should highly contribute to forecast dispersion. EVol and ROA also exhibit a clear correlation with forecast dispersion as suggested by the standardized coefficient of 0.187 and -0.092.

[Please insert Figure 1 about here]

Next, I examine how the incremental explanatory power of AAG changes as the year progresses. Equation (1) is regressed for forecast dispersion each month after the earnings announcement and the change in R-square with and without AAG is plotted in Panel A of Figure 1. As shown, the explanatory power of AAG exhibits a declining trend with a little volatility for both Fama-MacBeth Model (solid line) and Fixed Effects Model (dashed line). It is simply because the new information changes a firm's environment and decreases the old information's explanatory power. The absolute value of standardized coefficients plotted by the solid line in Panel B of Figure 1 shows similar results. It is observed that the incremental explanatory power of AAG gradually decreases with the year progresses and becomes marginal until the 12th month after the earnings announcement.

Collectively, AAG distinctly explains forecast dispersion and the explanatory power is incrementally strong to traditionally accepted determinants: unexpected earnings, SIZE, ROA, earnings volatility, and BTM. As the year progresses, the AAG's incremental explanatory power and economic significance both decline.

4.4.2 AAG and Forecast Accuracy

[Please insert Table 6 about here]

Table 6 reports the estimates from forecast accuracy regressions by Fama-MacBeth Model, Fixed Effects Model, and Standardized Model. The estimates of Fama-MacBeth Model with and without AAG are reported in columns (1) and (2) respectively. In column (2), the significantly negative coefficient of AAG (=-2.644) indicates that high AAG leads to low forecast accuracy. It confirms H2 that the uncertainty in growth increases the difficulty of analysts' forecasting process and information asymmetry and in turn, lowers forecast accuracy. In terms of controls, AbsUE, Evol, and BTM load with significantly negative coefficients, which means that high unexpected earnings, earnings volatility, and BTM all reduce forecast accuracy. ROA exhibits a significantly positive coefficient, which maps a firm's performance to analysts' future forecast accuracy. The results of controls are consistent with previous literature (e.g., Brown 2001; Eames, Glover, and Kennedy 2002; Bochkay and Joos 2021; Gu and Wu 2003; Zhang 2006; So 2013; Kross et al. 1990; Mensah, Song, and Ho 2004; Diether, Malloy, and Scherbina 2002; Johnson 2004; Bryan and Tiras 2007; Behn, Choi, and Kang, T. 2008; Donelson and Resutek 2015.). As discussed before, SIZE loads an insignificant coefficient. To understand AAG's incremental explanatory power to forecast accuracy, R-squares in the models with AAG in column (2) and without AAG in column (1) are compared. After adding on AAG, the R-square increases by 0.004, which is distinct even though the increase is lower than that in forecast dispersion regressions.

To control both the unobserved-invariant characteristics in industry and year level, I add the industry and year fixed effect and report the estimates in columns (3) and (4). The standard error is clustered by industry. In column (4), the coefficient of AAG is significantly negative, which is consistent with the hypothesis. Regarding controls, the effect of AbsUE, SIZE, ROA, and BTM are qualitatively the same as the Fama-MacBeth results. Conversely, EVol loses its explanatory power as indicated by the insignificant coefficient. It may be because fixed-effects swallow the EVol's explanatory power. The incremental explanatory power of AAG is also examined by comparing the R-square with and without AAG. It is shown that adding on AAG increases the R-square from 0.083 to 0.085. The increase is lower than that for Fama-MaBeth Models.

The standardized model is also employed to compare the effect of different independent variables in explaining forecast accuracy. In the standardized model, I first standardized both dependent variables and independent variables and re-do OLS analysis. The coefficient of AAG is -0.055 and significant at 1% level, which robustly evidences the hypothesis that high AAG worsens forecast accuracy. The highest explanatory power is carried by AbsUE (Coeff=-0.192). The second-highest is BTM (Coeff=-0.084), which is not surprised due to the denominators: stock price. For other controls, their explanatory power is at best marginal because their coefficients are lower than 0.05.

The time-series behavior of the incremental contribution of AAG in explaining forecast accuracy is reported in Figure 2. In Panel A, the solid (dashed) line shows the change in R-square in equation (2) with and without AAG by applying Fama-MaBeth (Fixed Effects) method. Roughly speaking, both lines decline over time. These results suggest that the information content of AAG decreases with new information disclosed during the next year. The absolute coefficients in standardized regression show a similar trend as indicated by the dashed line in Panel B. Specifically, the absolute coefficient becomes lower than 0.05 until the 6^{th} month after the earnings announcement. It means the incremental explanatory power of AAG becomes marginal in the 6^{th} month after the earnings announcement.

Taken together, AAG effectively explains the forecast accuracy and the explanatory power is incremental to traditionally accepted determinants: unexpected earnings, SIZE, ROA, earnings volatility, and BTM. With the passage of time, the incremental explanatory power gradually decreases.

4.4.3 Good News vs Bad News in AAG-Forecast Dispersion

This and the next section examine how the effect of AAG in explaining forecast dispersion or accuracy changes when bad vs good news occurs. The reasons for bad news tend to be more complex than those for good news. Given the complex reasons, it is harder for analysts to fill a number. In addition, if a firm experiences bad news, managers may intentionally hide details of bad news. Less information disclosure results in high information asymmetry, which in turn magnifies the effect of AAG on forecast dispersion and accuracy. In the empirical analysis, three proxies for BadNews: negative earnings surprise, and negative sales surprise and loss are examined. BadNews is defined as 1 if earnings surprise (sales surprise, or actual earnings) for year t is negative, and 0 otherwise. Table 7 shows the empirical results of the role of news in the effects of AAG on forecast dispersion by Fama-MacBeth Model, Fixed Effects Model, and Standardized Model. Table 8 shows the relevant results for forecast accuracy.

[Please insert Table 7 about here]

In terms of the effect of BadNews on AAG-DISP correlation, I examine equation (3) for three BadNews proxies. Columns (1), (4), and (7) in Panel A report the effect of negative earnings surprise on AAG-DISP correlation using different models. In column (1) of Panels A, Fama-MacBeth Model loads a significantly positive coefficient (=0.648) of the interaction term between AAG and BadNews, indicating the stronger explanatory power of AAG on forecast dispersion when bad earning news occurs. In column (4), the Fixed Effects Model exhibits the same result; the coefficient of AAG*BadNews is significantly positive (=0.817). To view the magnitude difference in the effects of negative earnings surprise on forecast dispersion, the Standardized Model is examined. In column (7) of Panels A, the coefficient of AAG*BadNews is material (=0.136) and significant at 1% level. Taken together, negative earnings surprise makes AAG stronger in explaining forecast dispersion and the extent of difference in AAG's explanatory power between negative and positive earnings surprise is material.

The effect of negative sales surprise on AAG-DISP correlation is reported in columns (2), (4), and (8). In column (2) of Panels A, Fama-MacBeth Model shows that the coefficient of the interaction term between AAG and BadNews is positive but not significant. As Fama-MacBeth method may lead to false failure rejection of the null hypothesis, it is necessary to consider the results of other methodologies. In column (5) of Panels A, the Fixed Effects Model shows a significantly positive coefficient of AAG*BadNews (=0.234). But low absolute t-value (=2.392) given the sample size (=16861) indicates the improvement of AAG's effect in negative sales surprise firms is minimal. The Standardized Model reports the significant coefficient of AAG*BadNews (=0.047) but the magnitude of the coefficient (<0.05) indicates the minimal difference in the effect of AAG on forecast dispersion between negative sales surprise and positive sales surprise. Collectively, AAG's effect on forecast dispersion is indifferent between negative sales surprise and positive sales surprise. The reason is that sales information should be combined with expenses information to discuss.

Regarding the effect of Loss on AAG-DISP correlation, results are reported in columns (3), (6), and (9). Fama-MacBeth Model, reported in column (3), loads a positive but insignificant coefficient of AAG*BadNews, indicating the indifference in AAG on forecast dispersion between loss firms and profit firms. In Fixed Effects Model, the coefficient of AAG*BadNews is 0.596 and significant at 5% level. Given the sample size (=16861), the t-stat (=2.138) is not big enough to indicate the stronger effect of AAG on forecast dispersion in loss firms. In Standardized Model, the coefficient of AAG*BadNews is 0.069 and significant at 1% level. Compared with the threshold of 0.05, 0.069 is moderate, indicating the extent of the higher explanatory power of AAG on forecast dispersion in loss firms is moderate. Collectively, it is concluded that in loss firms, AAG has stronger explanatory power on forecast dispersion and the extent is moderate.

Taken together, H3a is confirmed. Negative earnings surprise or loss worsen the information environment and make forecasting more difficult. Accordingly, the effect of AAG on forecast dispersion is magnified.

4.4.4 Good News vs Bad News in AAG-Forecast Accuracy

[Please insert Table 8 about here]

The effect of three bad news proxies on the AAG-ACCRY correlation is reported in Table 8. In terms of negative earnings surprises, Fama-MacBeth Model, Fixed Effect Model, and Standardized Model all show that AAG has stronger explanatory power for forecast accuracy. In specific, in column (1), Fama-MacBeth Model loads a significantly negative coefficient of

AAG*BadNews (=-7.906) and in column (4), Fixed Effect Model also reports a significantly negative coefficient of AAG*BadNews (=-9.476). In columns (7), the standardized coefficient of AAG*BadNews is -0.105 and the magnitude of standardized coefficients is much larger than 0.05, which indicates that negative earnings surprise materially increases AAG's explanatory power.

Regarding the negative sales surprise, Fama-MacBeth Model reported in column (2) shows a negative but insignificant coefficient of AAG*BadNews. Fixed Effect Model reported in column (5) shows a significantly negative coefficient of AAG*BadNews (=-4.055), but a low absolute t-value (=2.038) given the sample size (=16861) indicates the improvement of AAG's effect in negative sales surprise firms is minimal. The standardized coefficients of AAG*BadNews (=-0.049) reported in columns (8) are significant but the magnitude is low. Given that if the standardized coefficient is 0.05 or less, the incremental explanatory power is less than 0.001, the effect of AAG on forecast accuracy is indifferent between negative sales surprise and positive sales surprise. The results suggest that it is necessary to consider both sales and expenses in discussing firms' performance.

Compared with loss firms and profit firms, Fama-MacBeth Model, Fixed Effect Model, and Standardized Model all exhibit stronger explanatory power of AAG for forecast accuracy in loss firms. Specifically, in column (3), Fama-MacBeth Model reports a significantly negative coefficient of AAG*BadNews (= -9.830). In column (6), Fixed Effect Model also shows a significantly negative coefficient of AAG*BadNews (-10.356). The standardized coefficient of AAG*BadNews in column (9) is -0.108 and significant at 1% level. The magnitude of the standardized coefficient (>0.05) indicates the stronger explanatory power of AAG on forecast accuracy in loss firms.

Overall, these findings confirm H3b and suggest that bad news is essential in the forecasting process. Negative earnings surprise and loss indicate a worse information environment and make it more difficult for analysts to forecast. Therefore, the effect of AAG in explaining accuracy is stronger.

5. Summary Remarks

The uncertainty in growth generates risk and makes analysts more difficult to forecast earnings. The relevant forecasting performance is bad. To capture the content of uncertainty in growth, this paper develops a simple metric: AAG. High AAG indicates high uncertainty of growth attributed to two dimensions: 1) the uncertainty from disagreement across various growth rates and 2) the uncertainty from high or low growth. Through these two dimensions, this work explains how and to what extent the uncertainty of growth explains forecast performance: forecast dispersion and accuracy. Empirical results show that AAG distinctly explains forecast dispersion and accuracy. The explanatory power of AAG is incremental to traditionally accepted determinants: unexpected earnings, SIZE, ROA, earning volatility, BTM. As the year progresses, the explanatory power gradually decreases. In addition, when earnings surprise is negative or loss occurs, it is more difficult to forecast. Therefore, AAG's explanatory power to both forecast dispersion and accuracy is stronger.

The construction of AAG emphasizes that both the unbalanced growth rates and the deviation of growth rates from the grand mean are risky. Neither of them should be less noticed. AAG is easy to be understood and implemented by researchers and practitioners. The selection of growth rates in AAG calculation could be crafted in the future to empirically improve the representativeness of uncertainty in growth. The method of AAG construction is also applicable to specific aspects, such as the uncertainty in production market growth simply by replacing the growth rates in AAG construction.

Reference

Anilowski, C., Feng, M., & Skinner, D. J. (2007). Does earnings guidance affect market returns? The nature and information content of aggregate earnings guidance. Journal of Accounting and Economics, 44(1), 36–63.

Barron, O. E., Kile, C. O., & O'Keefe, T. B. (1999). MD&A quality as measured by the SEC and analysts' earnings forecasts. *Contemporary Accounting Research*, *16*(1), 75-109.

Bansal, R., & Yaron, A. (2004). Risks for the long run: A potential resolution of asset pricing puzzles. The journal of Finance, 59(4), 1481-1509.

Behn, B. K., Choi, J. H., & Kang, T. (2008). Audit quality and properties of analyst earnings forecasts. *The Accounting Review*, *83*(2), 327-349.

Bradshaw, M. T., Christensen, T. E., Gee, K. H., & Whipple, B. C. (2018). Analysts' GAAP earnings forecasts and their implications for accounting research. Journal of Accounting and Economics, 66(1), 46-66.

Bochkay, K., & Joos, P. R. (2021). Macroeconomic Uncertainty and Quantitative versus Qualitative Inputs to Analyst Risk Forecasts. *The Accounting Review*, *96*(3), 59-90.

Brown, L. D. (2001). A temporal analysis of earnings surprises: Profits versus losses. Journal of accounting research, 39(2), 221-241.

Campbell, J. Y., Polk, C., & Vuolteenaho, T. (2010). Growth or glamour? Fundamentals and systematic risk in stock returns. The Review of Financial Studies, 23(1), 305-344.

Chapman, K., Miller, G. S., & White, H. D. (2019). Investor relations and information assimilation. *The Accounting Review*, *94*(2), 105-131.

Diether, K. B., Malloy, C. J., & Scherbina, A. (2002). Differences of opinion and the cross-section of stock returns. *The Journal of Finance*, *57*(5), 2113-2141.

Donelson, D. C., & Resutek, R. J. (2015). The predictive qualities of earnings volatility and earnings uncertainty. *Review of Accounting Studies*, *20*(1), 470-500.

Duru, A., & Reeb, D. M. (2002). International diversification and analysts' forecast accuracy and bias. *The Accounting Review*, *77*(2), 415-433.

Dye, R. A. (1986). Proprietary and nonproprietary disclosures. *Journal of business*, 331-366.

Earley, C. 1985. Influence of information, choice and task complexity upon goal acceptance, performance, and personal goals. Journal of Applied Psychology 70: 4.

Eames, M., Glover, S. M., & Kennedy, J. (2002). The association between trading recommendations and broker-analysts' earnings forecasts. *Journal of Accounting Research*, *40*(1), 85-104.

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of financial economics*, *33*(1), 3-56.

Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. *Journal of financial economics*, *116*(1), 1-22.

Graham, J. R., Harvey, C. R., & Rajgopal, S. (2005). The economic implications of corporate financial reporting. *Journal of accounting and economics*, *40*(1-3), 3-73.

Gu, Z., & Wu, J. S. (2003). Earnings skewness and analyst forecast bias. *Journal of Accounting and Economics*, *35*(1), 5-29.

Hutton, A. P., Lee, L. F., & Shu, S. Z. (2012). Do managers always know better? The relative accuracy of management and analyst forecasts. *Journal of Accounting Research*, *50*(5), 1217-1244.

Johannesson, E., Ohlson, J. A., & Zhai, S. W. (2022). The explanatory power of explanatory variables. *Available at SSRN 3622743*.

Johnson, T. C. (2004). Forecast dispersion and the cross-section of expected returns. *The Journal of Finance*, *59*(5), 1957-1978.

Kasznik, R., and B. Lev. 1995. To warn or not to warn: Management disclosures in the face of an earnings surprise. *The Accounting Review* 70: 113–134.

Kinney, W., Burgstahler, D., & Martin, R. (2002). Earnings surprise "materiality" as measured by stock returns. *Journal of Accounting Research*, *40*(5), 1297-1329.

Kothari, S. P., Shu, S., & Wysocki, P. D. (2009). Do managers withhold bad news? Journal of Accounting Research, 47(1), 241–276.

Kross, W. J., & Suk, I. (2012). Does Regulation FD work? Evidence from analysts' reliance on public disclosure. *Journal of Accounting and Economics*, *53*(1-2), 225-248.

Imhoff Jr, E. A., & Lobo, G. J. (1992). The effect of ex-ante earnings uncertainty on earnings response coefficients. *Accounting Review*, 427-439.

Lang, M. H., Lins, K. V., & Miller, D. P. (2003). ADRs, analysts, and accuracy: Does cross-listing in the United States improve a firm's information environment and increase market value?. *Journal of accounting research*, *41*(2), 317-345.

Lehavy, R., Li, F., & Merkley, K. (2011). The effect of annual report readability on analyst following and the properties of their earnings forecasts. *The Accounting Review*, *86*(3), 1087-1115.

Lev, B. (1974). On the association between operating leverage and risk. *Journal of financial and quantitative analysis*, *9*(4), 627-641.

Lev, B., & Kunitzky, S. (1974). On the association between smoothing measures and the risk of common stocks. The Accounting Review, 49(2), 259-270.

Liu, X. G., & Natarajan, R. (2012). The effect of financial analysts' strategic behavior on analysts' forecast dispersion. *The Accounting Review*, *87*(6), 2123-2149.

Mensah, Y. M., Song, X., & Ho, S. S. (2004). The effect of conservatism on analysts' annual earnings forecast accuracy and dispersion. *Journal of Accounting, Auditing & Finance*, *19*(2), 159-183.

McInnis, J. (2010). Earnings smoothness, average returns, and implied cost of equity capital. *The Accounting Review*, *85*(1), 315-341.

Miller, G.S. 2002. Earnings performance and discretionary disclosure. *Journal of Accounting Research* 40: 173–204.

Myers, S. C., & Turnbull, S. M. (1977). Capital budgeting and the capital asset pricing model: Good news and bad news. *The Journal of Finance*, *32*(2), 321-333.

Penman, S. H. (2013). Financial statement analysis and security valuation. Fifth Edition. McGraw-Hill.

Ross, S. A., Westerfield, R., and Jordan, B. D. (2010). Fundamentals of corporate finance. Ninth Edition. Tata McGraw-Hill Education.

Ross, S., Westerfield, R., and Jaffe, J. (2012). Corporate finance. Ninth Edition. McGraw-Hill Higher Education.

Payne, J. 1976. Task complexity and contingent processing in decision making: An information search and protocol analysis. Organizational Behavior and Human Performance 16: 366-387.

Payne, J., J. Bettman, and E. Johnson. 1988. Adaptive strategy selection in decision making. Journal of Experimental Psychology: Learning, Memory, and Cognition 14.

Shanthikumar, D. M. (2012). Consecutive earnings surprises: Small and large trader reactions. *The Accounting Review*, *87*(5), 1709-1736.

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

Verrecchia, R. E. (1983). Discretionary disclosure. *Journal of accounting and economics*, *5*, 179-194.

Skinner, D. J. (1997). Earnings disclosures and stockholder lawsuits. Journal of Accounting and Economics, 23(3), 249–282.

Waymire, G. (1985). Earnings volatility and voluntary management forecast disclosure. Journal of Accounting Research, 268-295.

Weiss, D. (2010). Cost behavior and analysts' earnings forecasts. *The Accounting Review*, *85*(4), 1441-1471.

Zhang, X. F. (2006). Information uncertainty and analyst forecast behavior. *Contemporary Accounting Research*, *23*(2), 565-590.

Appendix A

Variables	Definitions	Source
SG_t^{t+1}	Sales growth from t to t+1. Sales in t+1 are the analysts' consensus median forecast sales for year t+1, announced in the two months before t year earnings announcement for year t. Sales in t is the actual value reported in financial statements.	IBES/COMPUSTAT
$ExpG_t^{t+1}$	Expenses growth from t to t+1. Expenses in t+1 are calculated by subtracting earnings in t+1 from sales in t+1. Earnings (sales) in t+1 are the analysts' consensus median forecast earnings for year t+1, announced in the two months before earnings announcement for year t. Expenses in t is the actual value reported in financial statements.	IBES/COMPUSTAT
SG_{t+1}^{t+2}	Sales growth from t+1 to t+2. Sales in t+1 (t+2) are the analysts' consensus median forecast sales for year t+1 (t+2), announced in the two months before earnings announcement for year t.	IBES
EVG_{t-1}^{t}	Enterprise value growth from t-1 to t. Enterprise value is calculated by adding market capitalization (Compustat item: CSHO*PRCC_F) and total debt (Compustat item: AT-CEQ-MIB), then subtracting all cash and cash equivalents (Compustat item: CHE).	COMPUSTAT
SG_{t-1}^{t}	Sales growth from t-1 to t. Sales is SALE from COMPUSTAT.	COMPUSTAT
$ExpG_{t-1}^{t}$	Expenses growth from t-1 to t. Expenses are calculated by subtracting net income (COMPUSTAT item: NI) from sales (COMPUSTAT item: SALE).	COMPUSTAT
TAG_{t-1}^{t}	Total asset growth from t-1 to t. Total asset is AT from COMPUSTAT.	COMPUSTAT
TLG_{t-1}^{t}	Total liability growth from t-1 to t. Total liability is calculated by subtracting equity from total asset (Compustat item: AT-CEQ-MIB).	COMPUSTAT
DISP	Forecast dispersion is the standard deviation of analyst earnings forecast per share for t+1, scaled by the stock price in t and then multiplied by 100. The earnings forecast per share is announced in the first month after t year's earnings announcement.	IBES/CRSP
ACCRY	Forecast accuracy is calculated as the absolute difference between IBES consensus median earnings forecast per share for t+1 and the actual value, scaled by the stock price in t and then multiplied by -100. The consensus median earnings forecast per share is announced in the first month after t year's earnings announcement.	IBES/CRSP
AAG	Abnormal accounting growth is calculated by standard deviation of 8 growth rates assuming 'true' mean as 7%.	
Std.WR	The standard deviation of weekly return.	CRSP
Beta	Beta is calculated from market model.	CRSP
AbsUE	Absolute unexpected earnings are the absolute difference between the IBES consensus median earnings forecast per share for t, and the actual value, scaled by the stock price in t-1 and then multiplied by 100. The consensus median EPS forecast is announced in the two months before t year's earnings announcement.	IBES/CRSP
SIZE	Firm size is the log of total assets in year t.	COMPUSTAT
ROA	Return on total asset in year t, calculated by earnings before extraordinary items, divided by total assets.	COMPUSTAT
EVol	Earnings volatility is the standard deviation of the previous five (at least three) years' earnings before extraordinary items, scaled by total assets.	COMPUSTAT
BTM	The ratio of common equity to the market value of the firm in year t.	COMPUSTAT

BadNews	BadNews is a dummy variable, which equals to 1 if actual earnings (sales) value is smaller than forecast earnings (sales) value, and 0 otherwise.	IBES

Table 1 Summary Statistics of Growth

This table displays summary statistics of 8 growth rates. Panel A shows the distributions of each growth in full sample and Panel B shows the distribution of the firm-specific median of 8 growth rates for each year. Q1 is the first quantile and Q3 is the third quantile. The last column: Q3 - Q1 shows the difference between Q1 and Q3. Details of variables' calculation are reported in Appendix A.

Panel A: Distribution of each growth (%)					
Variable	N	Q1	Median	Q3	Q3 - Q1
TAG_{t-1}^{t}	16861	-0.3	5.9	14.6	14.9
TLG_{t-1}^{t}	16861	-3.1	5.0	17.6	20.7
EVG_{t-1}^{t}	16861	-6.0	7.2	23.0	29.0
SG_{t-1}^{t}	16861	-0.3	6.8	15.4	15.7
$ExpG_{t-1}^{t}$	16861	-0.9	6.7	15.8	16.7
SG_{t}^{t+1}	16861	1.4	5.6	10.8	9.4
$ExpG_{t}^{t+1}$	16861	-1.6	4.5	10.7	12.4
SG_{t+1}^{t+2}	16861	3.6	6.2	10.2	6.7
Panel B: Distribution of the firm-specific median of 8 growth rate (%)					
Year	N	Q1	Median	Q3	Q3 - Q1
2001	341	-1.0	7.4	15.9	17.0
2002	515	-1.2	4.8	11.8	13.0
2003	768	4.3	8.7	14.9	10.6
2004	801	5.1	9.7	15.9	10.7
2005	817	3.9	8.8	14.9	11.0
2006	886	4.2	8.3	14.6	10.4
2007	932	3.4	8.2	14.5	11.1
2008	977	-2.1	2.9	8.2	10.4
2009	1064	-2.5	2.7	7.4	10.0
2010	1112	2.8	6.9	12.6	9.8
2011	1094	2.4	6.5	12.0	9.6
2012	1109	1.9	5.5	10.5	8.6
2013	1105	1.9	5.4	10.0	8.0
2014	1073	2.0	5.5	10.7	8.8
2015	1072	-0.8	3.5	8.1	8.9
2016	1096	1.5	4.8	9.6	8.1
2017	1072	2.2	5.5	10.5	8.3
2018	1027	1.2	4.4	8.8	7.7

Table 2 Summary Statistics of Abnormal Accounting Growth

This table displays summary statistics of abnormal accounting growth (AAG). AAG is a firm-specific metric, calculated by the standard deviation of 8 growth rates, assuming the "true" mean as 7%. Panel A shows the distribution of AAG in the full sample and Panel B shows the distribution of AAG in each year. Q1 is the first quantile and Q3 is the third quantile. The last column: Q3 - Q1 shows the difference between Q1 and Q3. Details of variables' calculations are reported in Appendix A.

Panel A: Distribution of AAG in the full sample					
Variable	N	Q1	Median	Q3	Q3 - Q1
AAG	16861	0.08	0.13	0.21	0.13
Panel B: Distribution of AAG in each year					
Year	N	Q1	Median	Q3	Q3 - Q1
2001	341	0.12	0.20	0.36	0.24
2002	511	0.10	0.17	0.32	0.21
2003	766	0.08	0.13	0.23	0.15
2004	801	0.08	0.13	0.21	0.14
2005	817	0.08	0.12	0.19	0.11
2006	886	0.07	0.12	0.20	0.13
2007	932	0.08	0.14	0.22	0.14
2008	976	0.12	0.20	0.30	0.17
2009	1064	0.12	0.17	0.25	0.14
2010	1112	0.08	0.12	0.20	0.12
2011	1093	0.08	0.12	0.19	0.12
2012	1109	0.07	0.11	0.18	0.11
2013	1105	0.07	0.12	0.18	0.11
2014	1073	0.07	0.11	0.18	0.11
2015	1072	0.08	0.13	0.21	0.12
2016	1096	0.07	0.11	0.19	0.12
2017	1072	0.08	0.12	0.19	0.11
2018	1027	0.09	0.13	0.20	0.11

Table 3 Abnormal Accounting Growth and Risk

This table displays the connection between abnormal accounting growth and risk. Panel A shows the distribution of two risk metrics: the standard deviation of weekly return: Std.WR and market beta. Q1 is the first quantile and Q3 is the third quantile. The last column: Q3 - Q1 shows the difference between Q1 and Q3. Panel B shows the distribution of rank correlation between AAG and risk in t. Panel C shows the distribution of rank correlation between AAG and risk in t+1. AAG is a firm-specific metric, calculated by the standard deviation of 8 growth rates, assuming the "true" mean as 7%. Panel D1 and D2 show the simulation results of correct risk assessment using AAG. In Panel D1, I first define "Extreme" as the top two septiles, based on AAG and the rest are not extreme. Then I pick two firms at random from each of the two categories and check the probability that there is a higher (lower) risk in the extreme (non-extreme) category. Redo with 1000 draws with replacement and calculate the probability of the AAG giving a correct assessment of future risk. Similarly, in Panel D2, I re-define the "Extreme" as the bottom two septiles, based on AAG and the rest are not extreme and re-do the picking process to check whether there is a lower risk in the extreme category. The probability of AAG's correct assessment is also calculated. Panel E reports the regression estimates by Fama-MacBeth Model, Fixed Effects Model, and Standardized Model. Standardized Model is estimated by regressing standardized dependent variables on standardized independent variables. Details of variables' calculations are reported in Appendix A.

Panel A: Summary Statistics of Risk					
Variable	Q1	Median	Q3	Q3 - Q1	
Std.WR	0.03	0.04	0.06	0.03	
Beta	0.81	1.12	1.47	0.66	
Panel B: Distribution of rank correlation between AAG and risk in t					
Variable	Min	Q1	Median	Q3	Max
Std.WR	0.31	0.38	0.40	0.50	0.59
Beta	0.12	0.17	0.26	0.40	0.46
Panel C: Distribution of rank correlation between AAG and risk in t+1					
Variable	Min	Q1	Median	Q3	Max
Std.WR	0.32	0.35	0.38	0.47	0.55
Beta	0.10	0.18	0.24	0.38	0.45
Panel D1: The probability of the extremely high AAG giving a correct assessment of future risk.					
Std.WR	68%		Beta:	61%	
Panel D2: The probability of the extremely low AAG giving a correct assessment of future risk.					
Std.WR	69%		Beta:	64%	

Panel E: Regression estimates of risk in t+1 on AAG.										
	Dependent Variable: Stdv.WR in t+1					Dependent Variable: Beta in t+1				
	Fama-MacBeth Model		Fixed Effects Model		Standardized Model	Fama-MacBeth Model		Fixed Effects Model		Standardized Model
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
AAG		0.023***		0.023***	0.185***		0.422***		0.333***	0.119***
		(7.115)		(8.792)	(24.469)		(9.673)		(5.038)	(14.909)
AbsUE	0.004***	0.003***	0.004***	0.004***	0.094***	0.060***	0.052***	0.059***	0.053***	0.055***
	(6.917)	(7.921)	(5.727)	(5.472)	(12.884)	(3.686)	(3.307)	(5.148)	(4.659)	(7.132)
SIZE	-0.004***	-0.004***	-0.003***	-0.003***	-0.231***	-0.045***	-0.043***	-0.030***	-0.028***	-0.117***
	(-12.586)	(-12.165)	(-8.801)	(-8.399)	(-31.490)	(-4.168)	(-4.012)	(-3.376)	(-3.165)	(-15.089)
ROA	-0.042***	-0.037***	-0.048***	-0.041***	-0.071***	-0.651**	-0.540*	-0.755***	-0.665***	-0.069***
	(-5.016)	(-4.604)	(-12.085)	(-10.339)	(-8.735)	(-2.444)	(-2.101)	(-5.014)	(-4.494)	(-8.109)
EVol	0.092***	0.072***	0.076***	0.057***	0.133***	1.705***	1.313***	1.177***	0.915***	0.137***
	(12.475)	(9.014)	(11.204)	(10.473)	(16.873)	(8.364)	(6.130)	(5.929)	(4.624)	(16.450)
BTM	0.009***	0.009***	0.011***	0.011***	0.139***	0.206***	0.198***	0.253***	0.246***	0.145***
	(3.597)	(3.603)	(6.432)	(6.042)	(17.435)	(3.872)	(3.808)	(4.496)	(4.315)	(17.239)
Constant	0.070***	0.066***	0.066***	0.061***	2.430***	1.372***	1.296***	1.263***	1.197***	2.200***
	(20.100)	(19.941)	(22.385)	(20.329)	(56.540)	(11.756)	(11.105)	(16.014)	(15.580)	(48.385)
N	18	18	16861	16861	16861	18	18	16861	16861	16861
R-sq	0.354	0.374	0.518	0.530	0.218	0.162	0.173	0.279	0.284	0.125
Industry FE	No	No	Yes	Yes	No	No	No	Yes	Yes	No
Year FE	No	No	Yes	Yes	No	No	No	Yes	Yes	No
Cluster by Industry	No	No	Yes	Yes	No	No	No	Yes	Yes	No
Change in R-sq	0.020		0.012			0.011		0.005		

Table 4 Summary Statistics of Other Variables and Correlations

This table displays the descriptive statistics and rank correlation. Panel A shows the distribution of dependent variables and controls in the full sample. Panel B1 shows the rank correlation in the full sample. Panel B2 (Panel B3) shows the distribution of rank correlation between forecast dispersion (Forecast accuracy) and independent variables. The rank correlation is examined each year. AAG is calculated by the standard deviation of 8 growth rates, assuming the "true" mean as 7%. Forecast dispersion (DISP) is the standard deviation of analyst EPS forecasts for t+1, scaled by the stock price in t. Forecast accuracy (ACCRY) is calculated as the absolute difference between IBES consensus median EPS forecast for t+1, and the actual value of EPS, scaled by the stock price in t and multiplied by -100. The EPS forecasts in DISP and ACCRY calculation are announced in the first month after t year's earnings announcement. AbsUE is the absolute value of unexpected earnings for year t. EVol is earnings volatility, measured as the standard deviation of five years' earnings, scaled by total asset. Details of variables' calculation are reported in Appendix A.

***, **, * Represent statistical significance at 1, 5, and 10 percent, respectively, in a two-tailed test.

Panel A: Summary statistics of other variables

Variable	N	Q1	Median	Q3	Q3 - Q1
DISP	16861	0.11	0.22	0.49	0.38
ACCRY	16861	-1.53	-0.58	-0.22	1.31
SIZE	16861	6.97	8.06	9.28	2.31
AbsUE	16861	0.04	0.12	0.30	0.26
ROA	16861	0.02	0.05	0.09	0.07
EVol	16861	0.01	0.02	0.05	0.04
BTM	16861	0.28	0.45	0.71	0.43

Panel B1: Rank correlation in full sample

	DISP	ACCRY	AAG	AbsUE	SIZE	ROA	EVol	BTM
DISP	1.00							
ACCRY	-0.54***	1.00						
AAG	0.29***	-0.23***	1.00					
AbsUE	0.44***	-0.35***	0.16***	1.00				
SIZE	-0.03***	0.12***	-0.20***	-0.08***	1.00			
ROA	-0.37***	0.25***	-0.17***	-0.27***	-0.18***	1.00		
EVol	0.27***	-0.22***	0.36***	0.15***	-0.42***	0.07***	1.00	
BTM	0.45***	-0.31***	0.07***	0.29***	0.17***	-0.58***	-0.16***	1.00

Panel B2: Distribution of rank correlation between forecast dispersion and independent variables

Indep.Var	N	Minimum	Q1	Median	Q3	Maximum
AAG	18	0.14	0.24	0.27	0.29	0.46
AbsUE	18	0.36	0.41	0.43	0.46	0.51
SIZE	18	-0.09	-0.07	0.00	0.03	0.08
ROA	18	-0.63	-0.47	-0.36	-0.33	-0.25
EVol	18	0.21	0.24	0.27	0.30	0.34
BTM	18	0.35	0.40	0.42	0.45	0.59

Panel B3: Distribution of rank correlation between forecast accuracy and independent variables

Indep.Var	N	Minimum	Q1	Median	Q3	Maximum
AAG	18	-0.33	-0.25	-0.21	-0.16	-0.13
AbsUE	18	-0.42	-0.40	-0.36	-0.31	-0.17
SIZE	18	0.02	0.05	0.11	0.15	0.19
ROA	18	0.16	0.22	0.25	0.29	0.44
EVol	18	-0.29	-0.26	-0.23	-0.17	-0.10
BTM	18	-0.47	-0.34	-0.28	-0.26	-0.24

Table 5 The Effect of Abnormal Accounting Growth on Forecast Dispersion

This table displays the estimates from regressing forecast dispersion on independent variables by Fama-MacBeth Model, Fixed Effects Model, and Standardized Model. Fixed Effects Model controls industry and year fixed effects and the standard errors are cluster by industry. Standardized Model is estimated by regressing standardized dependent variable on standardized independent variables. I regress forecast dispersion on control variables in columns (1) and (3), and on both AAG and controls in columns (2), (4), and (5). AAG is calculated by the standard deviation of 8 growth rates, assuming the "true" mean as 7%. The dependent variable is forecast dispersion (DISP), measured as the standard deviation of analyst EPS forecasts for t+1, scaled by the stock price in t. The EPS forecast is announced in the first month after t year's earnings announcement. AbsUE is the absolute value of unexpected earnings for year t. EVol is earnings volatility, measured as the standard deviation of five years' earnings, scaled by total asset. Details of variables' calculation are reported in Appendix A.

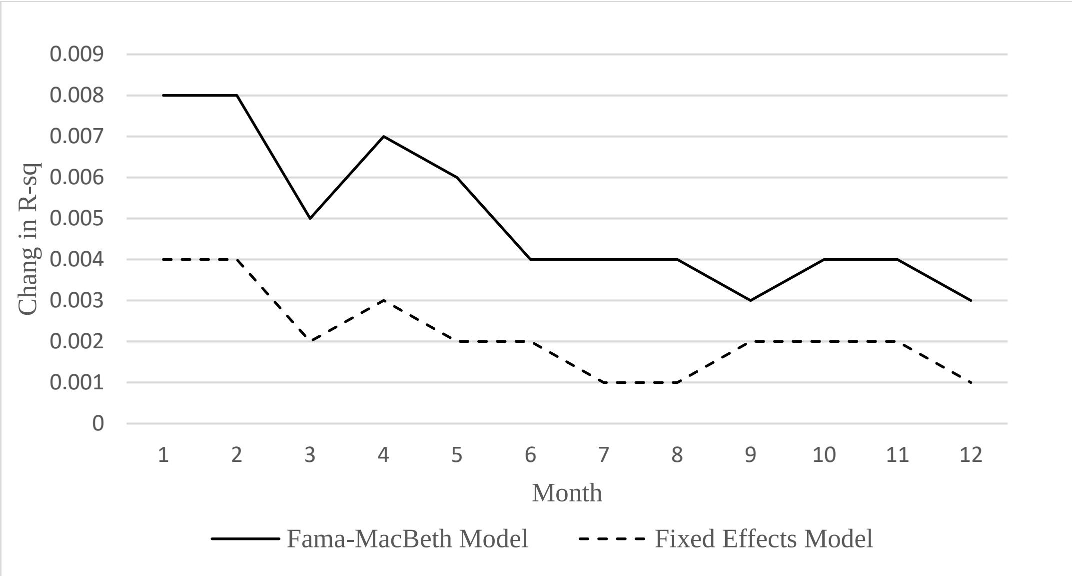
***, **, * Represent statistical significance at 1, 5, and 10 percent, respectively, in a two-tailed test.

	Fama-MacBeth Model		Fixed Effects Model		Standardized Model
	(1)	(2)	(3)	(4)	(5)
AAG		0.421***		0.417***	0.100***
		(4.714)		(6.821)	(15.113)
AbsUE	0.386***	0.379***	0.383***	0.376***	0.315***
	(13.083)	(13.533)	(12.632)	(12.482)	(49.541)
SIZE	0.000	0.002	-0.003	0.000	-0.007
	(0.019)	(0.310)	(-0.376)	(0.004)	(-1.036)
ROA	-1.345***	-1.241***	-1.515***	-1.402***	-0.092***
	(-7.198)	(-6.691)	(-8.403)	(-7.875)	(-13.078)
EVol	3.332***	2.980***	2.814***	2.485***	0.187***
	(7.540)	(7.006)	(6.825)	(6.613)	(27.222)
BTM	0.616***	0.610***	0.692***	0.683***	0.314***
	(10.510)	(10.884)	(8.559)	(8.487)	(45.040)
Constant	-0.038	-0.114	-0.019	-0.101	-0.205***
	(-0.576)	(-1.507)	(-0.216)	(-1.124)	(-5.467)
N	18	18	16861	16861	16861
R-sq	0.383	0.391	0.471	0.475	0.403
Industry FE	No	No	Yes	Yes	No
Year FE	No	No	Yes	Yes	No
Cluster by Industry	No	No	Yes	Yes	No
Change in R-sq	0.008		0.004		

Figure 1 The Time-series Pattern of Incremental Contribution of Abnormal Accounting Growth for Forecast Dispersion.

This figure shows the incremental contribution of AAG in forecast dispersion regression from month 1 to month 12 after t year's earnings announcement. Equation (1) is regressed for forecast dispersion in each month after the earnings announcement by Fama-MacBeth Model, Fixed Effect Model and Standardized Model.

Panel A: Change in R-square for Fama-MacBeth Model and Fixed Effect Model with and without AAG.



Panel B: Absolute coefficients in Standardized Model.

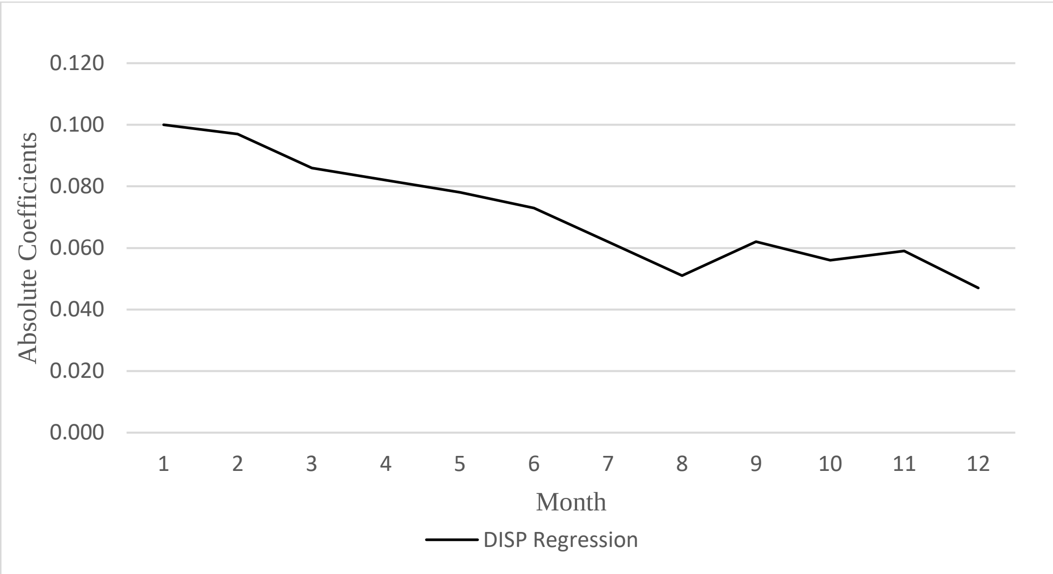


Table 6 The Effect of Abnormal Accounting Growth on Forecast Accuracy

This table displays the estimates from regressing forecast accuracy on independent variables by Fama-MacBeth Model, Fixed Effects Model, and Standardized Model. Fixed Effects Model controls industry and year fixed effects and the standard errors are cluster by industry. Standardized Model is estimated by regressing standardized dependent variable on standardized independent variables. Forecast accuracy is regressed on control variables in columns (1) and (3), and on both AAG and controls in columns (2), (4) and (5). AAG is calculated by the standard deviation of 8 growth rates, assuming the true mean as 7%. The dependent variable is Forecast accuracy (ACCRY), calculated as the absolute difference between IBES consensus median EPS forecast for t+1, and the actual value of EPS, scaled by the stock price in t and then multiplied by -100.. The consensus median EPS forecast is announced in the first month after t year's earnings announcement. AbsUE is the absolute value of unexpected earnings for year t. EVol is earnings volatility, measured as the standard deviation of five years' earnings, scaled by total asset. Details of variables' calculation are reported in Appendix A.

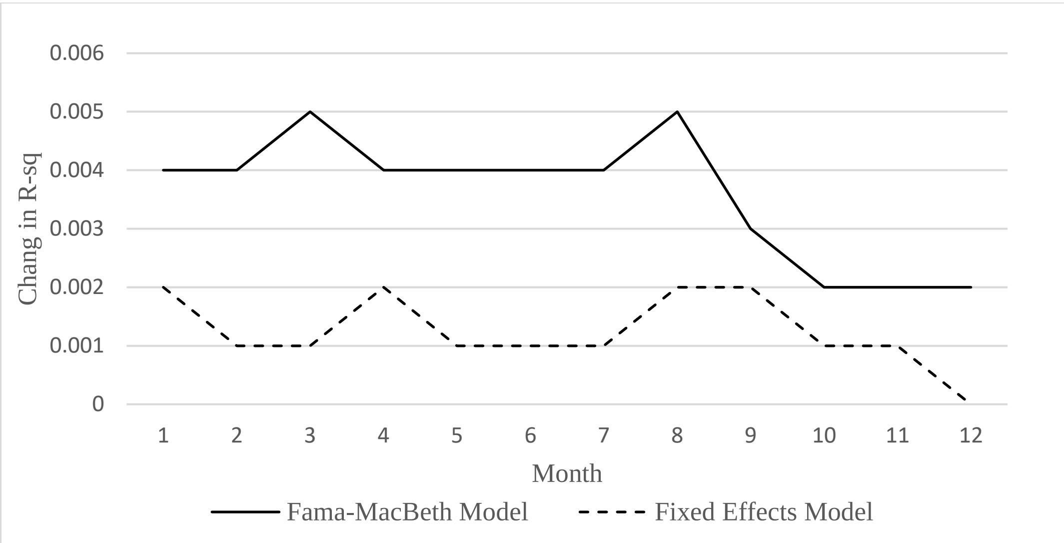
***, **, * Represent statistical significance at 1, 5, and 10 percent, respectively, in a two-tailed test.

	Fama-MacBeth Model		Fixed Effects Model		Standardized Model
	(1)	(2)	(3)	(4)	(5)
AAG		-2.644***		-3.284***	-0.055***
		(-3.144)		(-3.209)	(-6.719)
AbsUE	-4.190***	-4.127***	-3.293***	-3.234***	-0.192***
	(-3.845)	(-3.810)	(-3.076)	(-3.017)	(-24.277)
SIZE	0.074	0.064	0.045	0.022	0.013
	(0.923)	(0.789)	(0.698)	(0.329)	(1.590)
ROA	6.660***	6.049**	7.783**	6.891*	0.037***
	(3.253)	(2.879)	(2.076)	(1.881)	(4.155)
EVol	-5.850***	-3.506**	-2.970	-0.383	-0.010
	(-4.136)	(-2.227)	(-1.073)	(-0.141)	(-1.116)
BTM	-2.145***	-2.093***	-2.767***	-2.699***	-0.084***
	(-2.971)	(-3.014)	(-3.239)	(-3.173)	(-9.646)
Constant	-0.333	0.135	-0.070	0.575	0.028
	(-0.340)	(0.125)	(-0.071)	(0.565)	(0.600)
N	18	18	16861	16861	16861
R-sq	0.170	0.174	0.083	0.085	0.071
Industry FE	No	No	Yes	Yes	No
Year FE	No	No	Yes	Yes	No
Cluster by Industry	No	No	Yes	Yes	No
Change in R-sq	0.004		0.002		

Figure 2 The Time-series Pattern of Incremental Contribution of Abnormal Accounting Growth for Forecast Accuracy.

This figure shows the incremental contribution of AAG in forecast accuracy regression from month 1 to month 12 after t year's earnings announcement. Equation (2) is regressed for forecast dispersion in each month after the earnings announcement by Fama-MacBeth Model, Fixed Effect Model and Standardized Model.

Panel A: Change in R-square for Fama-MacBeth Model and Fixed Effect Model with and without AAG.



Panel B: Absolute coefficients in Standardized Model.

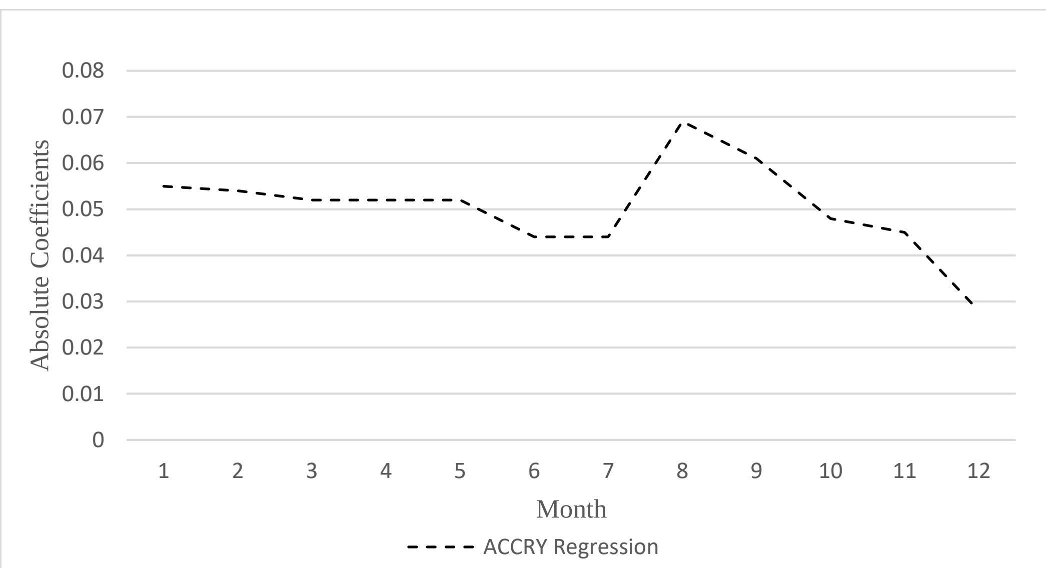


Table 7 The Difference in Abnormal Accounting Growth to Forecast Dispersion between Good News and Bad News

This table shows the role of news in the effects of AAG on forecast dispersion by Fama-MacBeth Model, Fixed Effects Model, and Standardized Model. Fixed Effects Model controls industry and year fixed effects and the standard errors are cluster by industry. Standardized Model is estimated by regressing standardized dependent variable on standardized independent variables. AAG is calculated by the standard deviation of 8 growth rates, assuming the "true" mean as 7%. The dependent variable is forecast dispersion (DISP), measured as the standard deviation of analyst EPS forecasts for t+1, scaled by the stock price in t. The EPS forecast is announced in the first month after t year earnings announcement. The consensus median EPS forecast is announced in the first month after t year earnings announcement. BadNews is a dummy variable, which equals to 1 if the earnings surprise (sales surprise, actual earnings) is negative, and 0 otherwise, EVol is earnings volatility, measured as the standard deviation of five years' earnings, scaled by total asset. Details of variables' calculations are reported in Appendix A.

***, **, * Represent statistical significance at 1, 5, and 10 percent, respectively, in a two-tailed test.

	Fama-MacBeth Model			Fixed Effects Model			Standardized Model		
	Earning News	Sales News	Loss	Earning News	Sales News	Loss	Earnings news	Sales news	Loss
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
AAG	0.352***	0.527***	0.323***	0.311***	0.484***	0.263***	0.071***	0.105***	0.071***
	(5.224)	(4.833)	(4.365)	(4.205)	(5.774)	(5.142)	(8.703)	(12.040)	(9.834)
AAG*BadNews	0.648***	0.142	0.436	0.817***	0.234**	0.596**	0.136***	0.047***	0.069***
	(4.608)	(1.530)	(1.515)	(5.780)	(2.392)	(2.138)	(12.395)	(4.215)	(5.923)
BadNews	0.020	-0.009	0.329***	-0.018	-0.019	0.277***	-0.006	-0.012	0.124***
	(0.746)	(-0.423)	(3.964)	(-0.939)	(-1.320)	(3.463)	(-0.613)	(-1.245)	(11.515)
AbsUE			0.356***			0.354***			0.295***
			(14.120)			(11.985)			(46.722)
SIZE	-0.004	-0.004	0.008	-0.006	-0.009	0.003	-0.019***	-0.021***	0.005
	(-0.548)	(-0.588)	(1.332)	(-0.687)	(-0.916)	(0.388)	(-2.869)	(-3.130)	(0.787)
ROA	-1.612***	-1.710***		-1.741***	-1.816***		-0.124***	-0.131***	
	(-9.087)	(-9.607)		(-8.436)	(-8.377)		(-16.662)	(-17.460)	
EVol	3.516***	3.454***	2.735***	3.010***	2.973***	2.193***	0.221***	0.217***	0.156***
	(7.754)	(7.570)	(6.995)	(7.021)	(6.899)	(6.603)	(30.345)	(29.509)	(22.585)
BTM	0.734***	0.748***	0.645***	0.817***	0.825***	0.706***	0.372***	0.380***	0.316***
	(11.939)	(12.032)	(13.334)	(9.178)	(9.384)	(9.571)	(51.213)	(51.825)	(49.402)
Constant	-0.042	-0.037	-0.256***	-0.021	-0.004	-0.215***	-0.101**	-0.094**	-0.328***
	(-0.556)	(-0.425)	(-4.445)	(-0.221)	(-0.040)	(-2.666)	(-2.494)	(-2.300)	(-9.544)
N	18	18	18	16861	16861	16861	16861	16861	16861
R-sq	0.315	0.305	0.411	0.409	0.401	0.488	0.330	0.317	0.422
Industry FE	No	No	No	Yes	Yes	Yes	No	No	No
Year FE	No	No	No	Yes	Yes	Yes	No	No	No
Cluster by Industry	No	No	No	Yes	Yes	Yes	No	No	No

Table 8 The Difference in Abnormal Accounting Growth to Forecast Accuracy between Good News and Bad News

This table shows the role of news in the effects of AAG on forecast accuracy by Fama-MacBeth Model, Fixed Effects Model, and Standardized Model. Fixed Effects Model controls industry and year fixed effects and the standard errors are cluster by industry. Standardized Model is estimated by regressing standardized dependent variable on standardized independent variables. AAG is calculated by the standard deviation of 8 growth rates, assuming the "true" mean as 7%. The dependent variable is forecast accuracy (ACCRY), calculated as the absolute difference between IBES consensus median EPS forecast for t+1, and the actual value of EPS, scaled by the stock price in t and multiplied by -100. The consensus median EPS forecast is announced in the first month after t year earnings announcement. BadNews is a dummy variable, which equals to 1 if the earnings surprise (sales surprise, actual earnings) is negative, and 0 otherwise, EVol is earnings volatility, measured as the standard deviation of five years' earnings, scaled by total asset. Details of variables' calculations are reported in Appendix A.

***, **, * Represent statistical significance at 1, 5, and 10 percent, respectively, in a two-tailed test.

	Fama-MacBeth Model			Fixed Effects Model			Standardized Model		
	Earning News	Sales News	Loss	Earning News	Sales News	Loss	Earnings news	Sales news	Loss
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
AAG	-1.718	-3.092***	-1.141**	-1.593	-3.059***	-0.876	-0.029***	-0.049***	-0.022**
	(-1.568)	(-2.931)	(-2.395)	(-1.311)	(-4.282)	(-1.508)	(-3.001)	(-4.755)	(-2.427)
AAG*BadNews	-7.906***	-2.164	-9.830**	-9.476**	-4.055**	-10.356**	-0.105***	-0.049***	-0.108***
	(-3.026)	(-1.262)	(-2.428)	(-2.055)	(-2.038)	(-2.621)	(-8.028)	(-3.708)	(-7.318)
BadNews	0.260	0.204	-0.225	0.533	0.343	0.082	0.023*	0.016	0.005
	(0.898)	(1.041)	(-0.444)	(1.146)	(1.338)	(0.093)	(1.891)	(1.356)	(0.400)
AbsUE			-3.940***			-3.087***			-0.184***
			(-3.749)			(-2.902)			(-23.079)
SIZE	0.112	0.116	0.051	0.077	0.097	0.024	0.021**	0.022***	0.010
	(1.146)	(1.160)	(0.735)	(1.073)	(1.255)	(0.418)	(2.574)	(2.701)	(1.311)
ROA	10.156***	11.112***		9.740**	10.358**		0.056***	0.060***	
	(3.350)	(3.511)		(2.317)	(2.434)		(6.328)	(6.726)	
EVol	-6.453***	-6.089***	-0.458	-4.974**	-4.659**	2.745	-0.030***	-0.028***	0.009
	(-3.837)	(-3.655)	(-0.174)	(-2.437)	(-2.183)	(0.950)	(-3.467)	(-3.204)	(1.047)
BTM	-3.187***	-3.317***	-2.344***	-3.835***	-3.895***	-2.704***	-0.119***	-0.123***	-0.083***
	(-4.151)	(-4.297)	(-4.707)	(-4.506)	(-4.683)	(-4.135)	(-13.732)	(-14.170)	(-10.288)
Constant	-0.745	-0.787	0.490	-0.225	-0.345	0.651	-0.050	-0.048	0.035
	(-0.564)	(-0.648)	(0.677)	(-0.188)	(-0.299)	(0.972)	(-1.036)	(-0.996)	(0.817)
N	18	18	18	16861	16861	16861	16861	16861	16861
R-sq	0.113	0.102	0.191	0.059	0.055	0.090	0.045	0.040	0.077
Industry FE	No	No	No	Yes	Yes	Yes	No	No	No
Year FE	No	No	No	Yes	Yes	Yes	No	No	No
Cluster by Industry	No	No	No	Yes	Yes	Yes	No	No	No