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Hierarchy of earnings thresholds based on discretionary accruals☆

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ABSTRACT

Prior studies identify hierarchies of earnings thresholds based on distributions of earnings (e.g., Degeorge et al., 1999) and survey opinions of CFOs (Graham, Harvey, & Rajgopal, 2005). We complement extant literature by investigating a threshold hierarchy in the context of accounting discretion exercised by managers. We examine the relative extent of discretionary accruals used to achieve three earnings thresholds—avoiding losses, avoiding earnings declines, and avoiding negative earnings surprises. Our empirical findings suggest that managers are likely to use the largest amount of discretionary accruals to avoid earnings declines, and the least amount of discretionary accruals to avoid negative earnings surprises. Thus, this study identifies the hierarchy of the earnings thresholds based on accounting discretion used in financial reporting. We also find that the hierarchy remains stable over the last two decades during our sample period. Then, we provide several explanations for why managers are likely to exercise more accounting discretion to avoid earnings declines. These explanations include earnings smoothing, reduction of stock returns volatility, and signaling of future growth potential. Overall, this study provides new insights into accruals management behavior.

1. Introduction

Managers often exercise considerable discretion over accruals in financial reporting to achieve pre-set earnings thresholds. Prior studies (e.g., Beneish, 1998; Healy & Wahlen, 1999) underscore the importance of understanding the motives and extent of accruals management. This study empirically measures the relative extent of discretionary accruals used in achieving three earnings thresholds—avoiding losses, avoiding earnings declines, and avoiding negative earnings surprises. Thus, a hierarchy of earnings thresholds emerges based on the extent of discretionary accruals. While prior studies also identify the hierarchy of earnings thresholds based on the distributions of earnings (Burgstahler & Dichev, 1997; Dechow, Richardson, & Tuna, 2003; Degeorge, Patel, & Zeckhauser, 1999), capital market rewards (Brown & Caylor, 2005), and survey opinions (Graham, Harvey, & Rajgopal, 2005), we focus on discretionary accruals that reflect managerial action to achieve these earnings thresholds.[1] We also explore factors that explain the hierarchy identified based on the relative use of discretionary accruals to achieve earnings thresholds.

Investigating the relative extent of discretionary accruals used to achieve earnings thresholds is particularly interesting and important for several reasons. First, accruals management is the main accounting mechanism employed by managers to achieve earnings thresholds. A large volume of research in earnings management literature suggests that managers rely on discretionary accruals to achieve earnings thresholds (Burgstahler & Eames, 2006; Matsumoto, 2002; Payne & Robb, 2000).[2] Moreover, academic researchers, policy makers, standard setters, and regulators have routinely expressed concerns about

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[1] Real earnings management can also play an important role in achieving earning thresholds. However, this study focuses on managerial discretion in financial reporting (i.e., accruals management) and we control for real earnings management in all our empirical analyses based on the finding of Zang (2012) that accruals management comes after real earnings management. (More discussion is provided later.) On the other hand, expectations management is applicable only for analysts' forecast. We do not control for expectations management, which is a potential limitation of our empirical analyses.

[2] Please refer to Healy and Wahlen (1999), Dechow and Skinner (2000), and Kothari (2001) for reviews on accruals management.

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earnings management based on accruals.[3] Second, identifying the hierarchy based on managerial discretion in financial reporting could potentially provide further insights into the relative extent of accruals management for achieving these thresholds, which may help regulators and auditors in their enforcement processes (Healy & Wahlen, 1999). Third, extant literature documents explanations for achieving earnings thresholds. Firms are rewarded (penalized) by the capital market for achieving (missing) those thresholds (Barth, Elliott, & Finn, 1999; Bartov, Givoly, & Hayn, 2002; Brown & Caylor, 2005; Graham et al., 2005; Kasznik & McNichols, 2002; Lopez & Rees, 2002). Graham et al. (2005) also offer other explanations for achieving earnings thresholds such as smoothing earnings, reducing stock price volatility, signaling about growth prospects, attaining desired credit rating, maintaining external reputation of management, and earning bonuses. For example, 96.9% of survey respondents in Graham et al. (2005) suggest that they prefer smooth earnings. Complementing prior studies, we provide explanations that are consistent with the hierarchy based on the relative extent of discretionary accruals used to achieve earnings thresholds.

To address our research questions, we use firm years between 1990 and 2012, which cover most of the sample periods of the prior studies that examine the hierarchy of earnings thresholds. We follow the research design by Brown and Caylor (2005) to identify eight mutually exclusive and collectively exhaustive categories of achieving or missing the three earnings thresholds. We then regress discretionary accruals on the eight category indicator variables after controlling for other factors that affect discretionary accruals.[4,5] This approach estimates the average amount of discretionary accruals used to achieve each earnings threshold, which, in turn, enables us to rank the three earnings thresholds based on the relative use of discretionary accruals. By relying on the regressions with the indicator variables of the eight mutually exclusive and collectively exhaustive categories of achieving/missing each earnings threshold, we also overcome the shortcoming of investigating one earnings threshold conditional on only one other earnings threshold (not the other two earnings thresholds at the same time).[6]

Empirical results show that discretionary accruals are consistently higher for avoiding earnings declines than for the other two earnings thresholds since the mid-1990s. These findings suggest that managers exercise more discretion over financial reporting to avoid earnings declines (i.e., smoothing earnings) than the other two earnings thresholds. Our results also suggest that managers use the least amount of discretionary accruals to avoid negative earnings surprises throughout the sample period. While we do not interpret these results as indicative of the relative importance of earnings thresholds to managers, we show the relative extent of discretionary accruals employed in achieving those thresholds. These results may also imply that managers rely on other mechanisms such as earnings guidance (i.e., expectations management), to avoid negative earnings surprises. By contrast, managerial discretion over financial reporting appears to be the main means of avoiding earnings declines. Unlike prior studies (e.g., Brown & Caylor, 2005; Dechow et al., 2003), we do not find evidence of any temporal shift in the hierarchy of earnings thresholds based on discretionary accruals. Our findings suggest that the hierarchy of the three earnings thresholds with respect to discretionary accruals used in financial reporting consistently maintains the following order: (1) avoiding earnings declines, (2) avoiding losses, and (3) avoiding negative earnings surprises. We also provide several explanations for the hierarchy that emerges from our analyses. First, we find that high historical earnings volatility is significantly associated with the incremental use of discretionary accruals to avoid earnings declines. Second, we observe that firms with high prior stock returns volatility are likely to use more discretionary accruals to avoid earnings declines. Third, managers of firms with high growth potentials are inclined to exercise more discretion over financial reporting to avoid earnings declines.[7] These findings are consistent with the notion that managers rely more on discretionary accruals to avoid earnings declines when they try to smooth earnings and convey future growth prospects to investors. Our results are robust to several sensitivity checks.

The findings in this study contribute to extant literature in several ways. First, we complement prior studies that examine the hierarchy of the three earnings thresholds based on earnings distributions (Dechow et al., 2003; Degeorge et al., 1999), capital market valuation (Brown & Caylor, 2005), and survey opinions (Graham et al., 2005) by identifying the hierarchy based on managerial discretion in financial reporting (i.e., discretionary accruals). To the best of our knowledge, this is the first study that examines the hierarchy of earnings thresholds based on discretionary accruals. Second, this study provides new insights into earnings management behavior for achieving earnings thresholds. We show that avoiding earnings declines receives the highest priority in using discretionary accruals. Along with prior archival findings, our results imply that managers rely more on other means (e.g., earnings guidance) to achieve other earnings thresholds. Third, our results indirectly suggest that firms that avoid earnings declines should be monitored closely when potential earnings management in financial reporting is investigated. Finally, several explanations are offered for achieving earnings thresholds based on the discretionary accruals that managers employ, which are consistent with the hierarchy of earnings thresholds reported in this study.

This study is organized as follows. Section 2 summarizes prior research and develops research questions. Section 3 describes the research design process. Section 4 explains the sample selection procedure and data requirements. Section 5 presents the empirical findings about the hierarchy of earnings thresholds based on discretionary accruals. Section 6 provides explanations for the hierarchy documented in this study. Section 7 discusses robustness checks. Section 8 concludes this study.

2. Relation to prior research and research questions

Burgstahler and Dichev (1997) and Degeorge et al. (1999) identify three earnings thresholds—avoiding losses, avoiding earnings declines, and avoiding negative earnings surprises. Several studies then confirm the importance of achieving individual earnings thresholds by providing evidence that the capital market rewards (penalizes) firms for achieving (missing) those thresholds (Barth et al., 1999; Bartov et al., 2002; Kasznik & McNichols, 2002; Lopez & Rees, 2002; Skinner & Sloan, 2002).[8] To investigate the relative importance of the three

[3] For example, Arthur Levitt, the former SEC chairman, expressed concerns about earnings management using several accruals during his speech at the New York University in 1998 (Please refer to "Numbers Game").

[4] We focus on the hierarchy of annual earnings thresholds whereas Brown and Caylor (2005) report the hierarchy of quarterly earnings thresholds as our analyses involve the estimation of discretionary accruals that exhibit quarterly seasonality.

[5] We employ two proxies of discretionary accruals—abnormal total accruals and abnormal current accruals—estimated from the respective cross-sectional version of the modified Jones Model discussed in Dechow et al. (1995). (Detailed discussions are provided later.)

[6] Degeorge et al. (1999) examine the importance of one earnings threshold conditional on only one other earnings threshold based on earnings distributions.

[7] We employ three proxies for growth potentials—market-to-book ratio, Tobin's Q, and analysts' long-term growth forecasts.

[8] Barth et al. (1999) document that firms exhibit higher price to earnings ratios when they continue to meet or beat prior period earnings but such higher ratios disappear when the increasing pattern of earnings breaks. Bartov et al. (2002) report that premiums associated with achieving analysts' forecasts exist even for the firms that achieve the benchmark by managing earnings or expectations. Brown and Caylor (2005) find the positive (negative) valuation consequences for achieving (missing) each of the three earnings thresholds.

earnings thresholds, prior studies establish the hierarchy of earnings thresholds that managers seek to achieve. Based on the distributions of annual earnings, Burgstahler and Dichev (1997) conclude that avoiding losses is preferred to avoiding earnings declines. By employing the distributions of quarterly earnings, Degeorge et al. (1999) confirm the relative preference reported in Burgstahler and Dichev (1997) and add the third threshold of avoiding negative earnings surprises measured as the actual earnings less the analysts' consensus forecasts. In documenting the hierarchy of the three earnings thresholds, Degeorge et al. (1999) examine the distribution of one earnings threshold conditional on the distribution of only one of the other two earnings thresholds.[9] By contrast, Dechow et al. (2003) use annual data to document that the proportion of firms avoiding negative earnings surprises has increased compared to the other two earnings thresholds during the last three years of their sample period (1991–2001). Brown and Caylor (2005) investigate whether the relative importance of the three earning thresholds has changed over time. Based on quarterly data, they find that managers focus more on avoiding losses or avoiding earnings declines during the early years (1985–1993) of their sample period, which is consistent with Degeorge et al. (1999). By contrast, they report that managers place greater importance on avoiding negative earnings surprises than the other two earnings thresholds during the later years (1996–2002) of their sample period, which is consistent with Dechow et al. (2003). Brown and Caylor (2005) also provide a plausible explanation for the temporal shift in the hierarchy by showing the corresponding shift in the pattern of the market rewards for achieving the earnings thresholds. They document that the market rewards for avoiding negative earnings surprises become greater than avoiding losses and avoiding earnings declines during the later years (1996–2002) of their sample period. Graham et al. (2005) use a survey approach to document CFO opinions about the relative preference of the four quarterly earnings benchmarks and identify the hierarchy in the following order: (1) earnings for the same quarter of last year, (2) analysts' consensus forecasts, (3) positive earnings and (4) earnings for the immediate prior quarter. Their survey findings indicate that avoiding earnings declines relative to the earnings for the same quarter of last year is the most preferred earnings threshold.

While prior studies provide the hierarchy of the earnings thresholds that managers seek to achieve, we provide evidence of the relative extent of accruals management to achieve those earnings thresholds. We identify the hierarchy of the three earnings thresholds in terms of the discretionary accruals used to achieve those thresholds as the extant literature provides ample evidence that managers rely on discretionary accruals to achieve such thresholds (Burgstahler & Eames, 2006; Cohen, Darrough, Huang, & Zach, 2011; Laksmana & Yang, 2014; Matsumoto, 2002; Moehrle, 2002; Payne & Robb, 2000; Perols & Lougee, 2011). Identifying the hierarchy of the three earnings thresholds with respect to the managers' discretionary accruals choices also complements Brown and Caylor (2005) who mention that they do not directly test whether the temporal shift in the threshold hierarchy is driven by the managers' actions.[10] In investigating how managers use discretionary accruals to achieve each earnings threshold, we follow the method used by Brown and Caylor (2005) to identify the eight mutually exclusive and collectively exhaustive categories of achieving/missing the three earnings thresholds. Our approach is more closely aligned with the managers' actions in achieving earnings thresholds. Thus, the hierarchy we identify may differ from that based on the methodologies adopted in prior studies. Our first research question is given as follows.

Research Question 1. Which earnings threshold is relatively more associated with discretionary accruals?

Brown and Caylor (2005) report the temporal shift in the hierarchy of earnings thresholds by providing evidence of the corresponding shift in the market valuation associated with achieving/missing the earnings thresholds. Hence, we investigate whether the temporal shift in the hierarchy of the three earnings thresholds documented in Brown and Caylor (2005) is also present in the hierarchy based on the discretionary accruals used to achieve the earnings thresholds. This analysis is relevant given that prior studies document evidence of the temporal changes in properties of earnings over the last four decades (Francis & Schipper, 1999; Givoly & Hayn, 2000).[11] Changes in GAAP and regulations may also influence accruals management behavior over time (Cohen, Dey, & Lys, 2008; Lobo & Zhou, 2010). Thus, our next research question is given as follows.

Research Question 2. Does a temporal shift occur in the hierarchy of the earnings thresholds associated with discretionary accruals?

Capital market valuation is an important explanation for achieving earnings thresholds. Prior studies (e.g., Dechow & Skinner, 2000; Fields, Lys, & Vincent, 2001; Graham et al., 2005; Healy & Wahlen, 1999) also suggest other potential explanations for achieving earnings thresholds, such as smoothing earnings, reducing stock price volatility, signaling about growth prospects, attaining desired credit rating, maintaining external reputation of management, and earning bonuses. Thus, we examine whether some of these explanations have incremental effects on the hierarchy based on discretionary accruals to achieve each earnings threshold.

3. Research design

This section describes the research design we employ in investigating the hierarchy of the three earnings thresholds based on discretionary accruals.

3.1. Estimation of discretionary accruals

We adopt two proxies for discretionary accruals. The first proxy is abnormal total accruals (*ATA*), which is defined as the firm specific residuals from Eq.(1) estimated cross-sectionally for each year-industry combination.[12]

$$\frac{TA_{it}}{A_{it-1}} = \varphi_0 + \varphi_1\left(\frac{1}{A_{it-1}}\right) + \varphi_2\left(\frac{\Delta REV_{it}}{A_{it-1}} - \frac{\Delta REC_{it}}{A_{it-1}}\right) + \varphi_3\left(\frac{PPE_{it}}{A_{it-1}}\right) + \varepsilon_{it} \tag{1}$$

TA is total accruals measured as the difference between income before extraordinary items (Compustat mnemonic: ib) and cash flows from operations (Compustat mnemonic: oancf) exclusive of cash flows from extraordinary items and discontinued operations (Compustat

(*footnote continued*)
Kasznik and McNichols (2002) provide evidence of the market premium for achieving analysts' forecasts. Lopez and Rees (2002) and Skinner and Sloan (2002) report that the market penalty for missing analysts' forecasts is disproportionately higher than the rewards for achieving them.

[9] For example, they investigate the distribution of avoiding losses conditional on the distribution of avoiding earnings declines or avoiding negative earnings surprises, not both simultaneously.

[10] In their conclusion (p. 439), Brown and Caylor (2005) state "We do not definitely show that managers altered their threshold prioritization because investors changed the thresholds they reward (sanction) the most."

[11] Prior studies also identify several factors associated with the shift including (but not limited to) increase in investments toward R&D expenditures and intangible assets (Lev & Zarowin, 1999), increase in frequencies of losses and special items (Collins, Maydew, & Weiss, 1997), and increase in volatility of revenues and cash flows, and poor matching of revenues and expenses (Dichev & Tang, 2008; Srivastava, 2014). Given the temporal changes in earnings (and hence accruals) properties, we may also observe a change in patterns of using discretionary accruals in achieving earnings thresholds.

[12] Eq. (1) is the modified Jones Model introduced in Dechow et al. (1995), and industry is defined based on the two-digit SIC code.

mnemonic: xidoc). ΔREV_{it} is the change in revenues (Compustat mnemonic: sale) from year $t-1$ to year t for firm i. ΔREC_{it} is the change in receivables (Compustat mnemonic: rect) from year $t-1$ to year t for firm i. PPE_{it} is the gross property plant and equipment (Compustat mnemonic: ppegt) of firm i for year t. $A_{it-1}$is total assets (Compustat mnemonic: at) of firm i for year $t-1$.

Prior studies (Ashbaugh, LaFond, & Mayhew, 2003; Bradshaw, Richardson, & Sloan, 2001; Guenther, 1994; Teoh, Welch, & Wong, 1998) suggest that current accruals are subject to more managerial discretion compared to long-term accruals that include depreciation, depletion, and amortization expenses. Thus, for our empirical tests, we also employ abnormal current accruals (*ACA*), which is defined as the firm specific residuals from Eq.(2) estimated cross-sectionally for each year-industry combination.[13]

$$\frac{CA_{it}}{A_{it-1}} = \varphi_0 + \varphi_1\left(\frac{1}{A_{it-1}}\right) + \varphi_2\left(\frac{\Delta REV_{it}}{A_{it-1}} - \frac{\Delta REC_{it}}{A_{it-1}}\right) + \varepsilon_{it} \tag{2}$$

CA is current accruals of firm i for year t, measured as the total accruals (*TA*) plus depreciation and amortization expenses (Compustat mnemonic: dp). All other variables are the same as those described in Eq.(1).

3.2. Multivariate regression model

We follow Brown and Caylor (2005) to identify the eight mutually exclusive and collectively exhaustive categories of achieving/missing the three earnings thresholds. To estimate the average discretionary accruals used to achieve each earnings threshold, we regress each proxy of discretionary accruals (*ATA* or *ACA*) on those eight category indicator variables and other control variables as in Eq.(3).

$$\begin{aligned} ATA_{it}\,(or\ ACA_{it}) = {} & \beta_1{}^*(T1^-T2^-T3^-) + \beta_2{}^*(T1^+T2^-T3^-) \\ & + \beta_3{}^*(T1^-T2^+T3^-) + \beta_4{}^*(T1^-T2^-T3^+) \\ & + \beta_5{}^*(T1^+T2^+T3^-) + \beta_6{}^*(T1^+T2^-T3^+) \\ & + \beta_7{}^*(T1^-T2^+T3^+) + \beta_8{}^*(T1^+T2^+T3^+) \\ & + \beta_9 LogAT_{it} + \beta_{10} BM_{it} \\ & + \beta_{11} LEV_{it} + \beta_{12} ROA_{it} + \beta_{13}(-1) * rmUDISX_{it} + \varepsilon_{it} \end{aligned} \tag{3}$$

T1 represents zero earnings (i.e., avoiding losses). *T2* represents prior period earnings (i.e., avoiding earnings declines). *T3* represents the analysts' forecasts (i.e., avoiding negative earnings surprises). Each "+" represents firms achieving each earnings threshold, while each "−" represents firms missing each earnings threshold. Following Zang (2012), we include the following variables to control for the systematic variation in discretionary accruals related to firm size, growth opportunities, leverage, and current period firm performance. $LogAT_{it}$ is the natural logarithm of total assets (Compustat mnemonic: at) of firm i for year t. BM_{it} is the book value of equity (Compustat mnemonic: ceq) divided by market value of equity (Compustat mnemonic: prcc_f × csho) in year t for firm i. ROA_{it} is return on assets defined as income before extraordinary items (Compustat mnemonic: ib) in year t divided by the average of total assets (Compustat mnemonic: at). $LEV_{it}$is total liability (Compustat mnemonic: lt) divided by total assets (Compustat mnemonic: at) in year t. $rmUDISX_{it}$ is the unexpected abnormal level of discretionary expenditures estimated following Zang (2012)[14] We include $rmUDISX_{it}$ as Zang (2012) reports that managers rely on accruals as a last resort to achieve earnings thresholds after managing real activities.[15] Details about the estimation procedure of *rmUDISX* are provided in Appendix A. To be assured of our results, we conduct regressions in three ways based on Eq.(3): (i) for all firm years, (ii) for each sub-period, and (iii) for each year.

3.3. Estimating average discretionary accruals to achieve each earnings threshold

To determine the hierarchy of the three earnings thresholds based on discretionary accruals, we rely on the six categories, excluding the two extreme categories of missing ($T1^-T2^-T3^-$) and achieving ($T1^+T2^+T3^+$) all three earnings thresholds. Among the six categories, three represent the firms that achieve only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$), and each of the other three represents the firms that achieve two earnings thresholds simultaneously ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$). The estimated coefficient on each category indicator variable is the conditional average of the discretionary accruals (*ATA* or *ACA*) used to achieve that category.

We present the hierarchy of the three earnings thresholds in two ways using the estimated coefficients on the six category indicator variables. First, we rely on the three category indicator variables achieving only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$). This method is straightforward. We conduct the tests of differences among the coefficients of the three category indicator variables to identify the hierarchy for firms achieving only one earnings threshold. We then plot the coefficients of each category indicator variable to provide visual presentations of the hierarchy and its changes over our sample period. Second, to derive an overall hierarchy of the three earnings thresholds based on discretionary accruals, we consider all six categories (i.e., three categories achieving only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$, $T1^-T2^-T3^+$), and three categories achieving two earnings thresholds simultaneously ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$)). We then obtain the aggregate discretionary accruals associated with achieving each earnings threshold in the following manner:

Earnings threshold	Categories	Coefficients	Aggregate discretionary accruals
Avoiding losses (*T1*)	$(\boldsymbol{T1}^+T2^-T3^-) + (\boldsymbol{T1}^+T2^+T3^-) + (\boldsymbol{T1}^+T2^-T3^+)$	$\beta_2 + \beta_5 + \beta_6$	x
Avoiding earnings declines (*T2*)	$(T1^-\boldsymbol{T2}^+T3^-) + (T1^+\boldsymbol{T2}^+T3^-) + (T1^-\boldsymbol{T2}^+T3^+)$	$\beta_3 + \beta_5 + \beta_7$	y
Avoiding negative earnings surprise (*T3*)	$(T1^-T2^-\boldsymbol{T3}^+) + (T1^+T2^-\boldsymbol{T3}^+) + (T1^-T2^+\boldsymbol{T3}^+)$	$\beta_4 + \beta_6 + \beta_7$	z

We test the differences in the aggregate discretionary accruals among the three earnings thresholds in pooled cross-sectional regressions using all firm years and in all sub-period regressions.[16]

[13] Eqs. (1) and (2) have two differences. First, total accruals are used in Eq. (1) while current accruals are used in Eq. (2). Second, PPE*it* is dropped in Eq. (2) as depreciation and amortization expenses (Compustat mnemonic: dp) are added back.

[14] We only use discretionary expenditures as a measure of real earnings management because other measures such as over-production would impose data restrictions and reduce our sample size.

[15] Our results do not alter when we exclude $rmUDISX_{it}$. Details are provided in Section 7 where robustness checks are discussed.

[16] We try every possible combination of the eight categories to quantify the managers' use of discretionary accruals to achieve each earnings threshold. The results are qualitatively very similar for all combinations. Details are explained in Section 7 where the robustness checks are discussed.

4. Data and sample selection

Our main sample is obtained from the Compustat fundamental annual file and I/B/E/S detail file between 1988 and 2012. Our sample begins in 1988 but our empirical tests are based on the sample period between 1990 and 2012 because we require one year and two years ahead financial information in estimating certain variables, including discretionary accruals (*ATA* or *ACA*) and unexpected abnormal level of discretionary expenditures ($rmUDISX_{it}$).

Following prior studies, we eliminate all firms in financial services (SIC codes: 6000–6999) and utilities (SIC codes: 4400–5000) industries. We also require firms to have Compustat data available for total assets (Compustat mnemonic: at) and income before extraordinary items (Compustat mnemonic: ib) in fiscal year t and $t-1$. Given than certain variables are scaled by the previous year's total assets, firm years with total assets of less than $1 million in fiscal year $t-1$ are deleted. We exclude the industries (i.e., two-digit SIC code) with < 10 firms in a given fiscal year for the estimation of abnormal total accruals (*ATA*), abnormal current accruals (*ACA*), and unexpected abnormal level of discretionary expenditures (*rmUDISX*) for each year-industry combination. We also require firms to have both annual earnings per share (EPS) forecasts (defined below) and actual annual EPS available in I/B/E/S. Our final sample contains 54,880 firm year observations between 1990 and 2012.

We follow Brown and Caylor (2005) in defining the three earnings thresholds—avoiding losses, avoiding earnings declines and avoiding negative earnings surprises. First, firms avoid losses when their income before extraordinary items in year t is equal to or greater than zero. Second, firms avoid earnings declines when their income before extraordinary items in year t is equal to or greater than their income before extraordinary items in year $t-1$. Third, firms avoid negative earnings surprises when their actual annual EPS is equal to or greater than their annual EPS forecasts. For the annual EPS forecasts, we use the single most recent forecast made by the timeliest analyst(s) prior to earnings announcement. We take the mean of all available analysts' forecasts if more than one analyst forecast is present on the most recent date prior to earnings announcement.

5. Empirical findings on hierarchy of earnings thresholds based on discretionary accruals

5.1. Descriptive statistics

Table 1 presents the descriptive statistics. Panel A of Table 1 shows the proportion of each category of achieving/missing each earnings threshold between 1990 and 2012. Panel A of Table 1 resembles Brown and Caylor (2005) with respect to the proportion of each category, but our sample encompasses a longer time span (1990–2012) than that of Brown and Caylor (2005).[17,18] Among the eight categories, the ($T1^+T2^+T3^+$) group, which represents firm years that achieve all three earnings thresholds, has the highest number of observations (36.4%). By contrast, the group missing all thresholds ($T1^-T2^-T3^-$) has only 11% of the observations.

Panel B of Table 1 provides the descriptive statistics of the variables. The upper (lower) panel presents the mean (median) of the variables used in our analyses. As both the mean and median suggest similar implications, our discussion centers on the mean. We focus on the six categories that achieve one or two earnings thresholds ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$, $T1^-T2^-T3^+$, $T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$) throughout the discussions of empirical findings because the two extreme categories of missing and achieving all three thresholds ($T1^-T2^-T3^-$ and $T1^+T2^+T3^+$) are common to all three earnings thresholds. The categories of avoiding losses have the highest and mostly positive discretionary accruals (0.011 *ATA* and 0.009 *ACA* for $T1^+T2^-T3^-$; 0.024 *ATA* and 0.023 *ACA* for $T1^+T2^+T3^-$; −0.002 *ATA* and − 0.002 *ACA* for $T1^+T2^-T3^+$), while the categories of avoiding negative earnings surprises exhibit the lowest and mostly negative discretionary accruals (−0.113 *ATA* and −0.092 *ACA* for $T1^-T2^-T3^+$; −0.002 *ATA* and −0.002 *ACA* for $T1^+T2^-T3^+$; −0.034 *ATA* and −0.016 *ACA* for $T1^-T2^+T3^+$). The categories of avoiding earnings declines ($T1^-T2^+T3^-$, $T1^+T2^+T3^-$ and $T1^-T2^+T3^+$) fall in between. The univariate analyses suggest that managers use the largest amount of discretionary accruals to avoid losses and the least amount to avoid negative earnings surprises. However, we cannot reach a conclusion based solely on the univariate analysis as Panel B of Table 1 also indicates that firm characteristics across the categories substantially differ. These differences may be systemically related to the level of discretionary accruals. Therefore, we control for the firm characteristics in our regression analyses. Most of all, *ROA* considerably varies across the categories. *BM* is the lowest and *LogAT* is the smallest for the categories of avoiding earnings declines ($T1^-T2^+T3^-$, $T1^+T2^+T3^-$, and $T1^-T2^+T3^+$), which implies that firms avoiding earnings declines tend to be growth firms. Their *ROA* is negative, but their growth potential seems to be valued by the capital market. We then examine whether firms with growth potential are more likely to avoid earnings declines by using discretionary accruals. *BM* also varies across other categories. For *LogAT*, the categories of avoiding losses ($T1^+T2^-T3^-$, $T1^+T2^+T3^-$ and $T1^+T2^-T3^+$) tend to be the highest, while the categories of avoiding negative earnings surprises ($T1^-T2^-T3^+$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$) fall in between. For *LEV*, no clear distinction exists among the three earnings thresholds but it varies across the categories. Zang (2012) finds that managers initially rely on real earnings management and use accruals as a last resort to achieve earnings thresholds. Therefore, following Zang (2012), we also control for unexpected abnormal level of discretionary expenditures (*rmUDISX*). *rmUDISX* also varies across the categories. The categories of avoiding earnings declines ($T1^-T2^+T3^-$, $T1^+T2^+T3^-$ and $T1^-T2^+T3^+$) show the most negative *rmUDISX* whereas the categories of avoiding losses ($T1^+T2^-T3^-$, $T1^+T2^+T3^-$ and $T1^+T2^-T3^+$) display the least negative *rmUDISX*.

Panel C of Table 1 presents the descriptive statistics of the variables for each sub-period. We identify four sub-periods (1990–1995, 1996–2002, 2003–2007, and 2008–2012) to examine whether a shift occurs over time in the hierarchy of the three earnings thresholds based on the managerial use of discretionary accruals. Brown and Caylor (2005) document a change in the hierarchy of the three earnings thresholds where avoiding negative earnings surprises is the least preferred threshold during the earlier years (prior to 1995) of their sample period but becomes the most preferred threshold during the later years (1996–2002) of their sample period. Thus, our first cut-off point is 1990–1995. We then set our second cut-off point as 1996–2002, because prior studies report a decrease in discretionary accruals after the implementation of the Sarbanes-Oxley Act (SOX) in 2002 that imposes significant changes in accounting and corporate governance, and improves corporate accountability (Cohen et al., 2008). The U.S. economy suffered from the financial recession in 2008 and 2009, which could have affected the financial reporting behavior of U.S. firms. Thus, we set our third cut-off point as 2003–2007. Then, we set 2008–2012 as a separate sub-period. Given that 2008 and 2009 are the periods of the financial crisis, we separately present the results for 2010–2012 to exclude the effects of the financial crisis. In Panel C of Table 1, the upper (lower) panel presents the mean (median) of the variables used in our analyses. Our discussions

[17] In order of ($T1^-T2^-T3^-$), ($T1^+T2^-T3^-$), ($T1^-T2^+T3^-$), ($T1^-T2^-T3^+$), ($T1^+T2^+T3^-$), ($T1^+T2^-T3^+$), ($T1^-T2^+T3^+$) and ($T1^+T2^+T3^+$), our proportions with respect to total observations are 10.94%, 8.93%, 4.08%, 8.32%, 14.71%, 12.47%, 4.16%, and 36.40% respectively. The proportions of Brown and Caylor (2005) are 7.51%, 12.09%, 1.73%, 4.14%, 13.18%, 12.68%, 2.76%, and 45.91% respectively (Footnote 17 of Brown and Caylor (2005)).

[18] Note that our analysis is based on annual data while that of Brown and Caylor (2005) uses quarterly data.

Table 1
Descriptive statistics.

Panel A: number and proportion of observations in each category

Year	$(T1^-T2^-T3^-)$	$(T1^+T2^-T3^-)$	$(T1^-T2^+T3^-)$	$(T1^-T2^-T3^+)$	$(T1^+T2^+T3^-)$	$(T1^+T2^-T3^+)$	$(T1^-T2^+T3^+)$	$(T1^+T2^+T3^+)$	Total
1990	180	285	46	57	355	194	21	471	1609
	0.33%	0.52%	0.08%	0.10%	0.65%	0.35%	0.04%	0.86%	2.93%
1991	212	266	47	106	285	234	19	512	1681
	0.39%	0.48%	0.09%	0.19%	0.52%	0.43%	0.03%	0.93%	3.06%
1992	182	213	66	82	403	157	49	648	1800
	0.33%	0.39%	0.12%	0.15%	0.73%	0.29%	0.09%	1.18%	3.28%
1993	233	215	71	121	411	214	29	760	2054
	0.42%	0.39%	0.13%	0.22%	0.75%	0.39%	0.05%	1.38%	3.74%
1994	187	181	69	103	459	193	52	1058	2302
	0.34%	0.33%	0.13%	0.19%	0.84%	0.35%	0.09%	1.93%	4.19%
1995	260	222	64	138	399	302	44	1012	2441
	0.47%	0.40%	0.12%	0.25%	0.73%	0.55%	0.08%	1.84%	4.45%
1996	295	202	70	194	406	339	53	1117	2676
	0.54%	0.37%	0.13%	0.35%	0.74%	0.62%	0.10%	2.04%	4.88%
1997	316	219	114	264	448	358	71	1283	3073
	0.58%	0.40%	0.21%	0.48%	0.82%	0.65%	0.13%	2.34%	5.60%
1998	394	297	93	299	382	399	90	1074	3028
	0.72%	0.54%	0.17%	0.54%	0.70%	0.73%	0.16%	1.96%	5.52%
1999	347	232	126	244	336	359	115	1096	2855
	0.63%	0.42%	0.23%	0.44%	0.61%	0.65%	0.21%	2.00%	5.20%
2000	462	261	100	326	375	299	85	888	2796
	0.84%	0.48%	0.18%	0.59%	0.68%	0.54%	0.15%	1.62%	5.09%
2001	394	225	102	454	174	428	165	578	2520
	0.72%	0.41%	0.19%	0.83%	0.32%	0.78%	0.30%	1.05%	4.59%
2002	246	150	181	254	273	237	245	837	2423
	0.45%	0.27%	0.33%	0.46%	0.50%	0.43%	0.45%	1.53%	4.42%
2003	191	157	162	166	268	280	218	910	2352
	0.35%	0.29%	0.30%	0.30%	0.49%	0.51%	0.40%	1.66%	4.29%
2004	179	148	116	131	423	215	136	1061	2409
	0.33%	0.27%	0.21%	0.24%	0.77%	0.39%	0.25%	1.93%	4.39%
2005	217	188	100	182	334	326	97	1004	2448
	0.40%	0.34%	0.18%	0.33%	0.61%	0.59%	0.18%	1.83%	4.46%
2006	244	182	103	175	402	322	107	976	2511
	0.44%	0.33%	0.19%	0.32%	0.73%	0.59%	0.19%	1.78%	4.58%
2007	289	238	94	180	372	339	105	868	2485
	0.53%	0.43%	0.17%	0.33%	0.68%	0.62%	0.19%	1.58%	4.53%
2008	410	280	108	297	225	355	90	663	2428
	0.75%	0.51%	0.20%	0.54%	0.41%	0.65%	0.16%	1.21%	4.42%
2009	222	192	141	268	247	410	190	654	2324
	0.40%	0.35%	0.26%	0.49%	0.45%	0.75%	0.35%	1.19%	4.23%
2010	161	130	113	135	420	221	124	996	2300
	0.29%	0.24%	0.21%	0.25%	0.77%	0.40%	0.23%	1.81%	4.19%
2011	171	205	81	173	375	284	84	849	2222
	0.31%	0.37%	0.15%	0.32%	0.68%	0.52%	0.15%	1.55%	4.05%
2012	213	211	70	215	300	379	95	660	2143
	0.39%	0.38%	0.13%	0.39%	0.55%	0.69%	0.17%	1.20%	3.90%
Total	6005	4899	2237	4564	8072	6844	2284	19,975	54,880
	10.94%	8.93%	4.08%	8.32%	14.71%	12.47%	4.16%	36.40%	100.00%

Panel B: descriptive statistics of variables in each category of achieving/missing three earnings thresholds

Mean

	Discretionary accruals proxy		$rmUDISX_{it}$	$LogAT_{it}$	BM_{it}	LEV_{it}	ROA_{it}
	ATA_{it}	ACA_{it}					
$(T1^-T2^-T3^-)$	−0.102	−0.086	0.004	5.119	0.790	0.526	−0.211
$(T1^+T2^-T3^-)$	0.011	0.009	−0.003	6.069	0.695	0.467	0.050
$(T1^-T2^+T3^-)$	−0.037	−0.024	−0.016	4.790	0.587	0.549	−0.173
$(T1^-T2^-T3^+)$	−0.113	−0.092	−0.008	5.667	0.707	0.478	−0.190
$(T1^+T2^+T3^-)$	0.024	0.023	−0.002	6.151	0.520	0.464	0.086
$(T1^+T2^-T3^+)$	−0.002	−0.002	0.003	6.522	0.603	0.472	0.057
$(T1^-T2^+T3^+)$	−0.034	−0.016	−0.028	4.978	0.496	0.491	−0.175
$(T1^+T2^+T3^+)$	0.017	0.017	0.004	6.237	0.457	0.454	0.096

Median

	Discretionary accruals proxy		$rmUDISX_{it}$	$LogAT_{it}$	BM_{it}	LEV_{it}	ROA_{it}
	ATA_{it}	ACA_{it}					
$(T1^-T2^-T3^-)$	−0.062	−0.050	0.010	4.931	0.634	0.509	−0.112
$(T1^+T2^-T3^-)$	0.006	0.002	−0.001	5.864	0.589	0.471	0.040
$(T1^-T2^+T3^-)$	−0.027	−0.016	−0.005	4.602	0.462	0.506	−0.084

(*continued on next page*)

Table 1 (*continued*)

Panel B: descriptive statistics of variables in each category of achieving/missing three earnings thresholds

Mean

	Discretionary accruals proxy		$rmUDISX_{it}$	$LogAT_{it}$	BM_{it}	LEV_{it}	ROA_{it}
	ATA_{it}	ACA_{it}					
$(T1^-T2^-T3^+)$	−0.068	−0.055	0.009	5.497	0.569	0.447	−0.094
$(T1^+T2^+T3^-)$	0.011	0.009	0.000	6.001	0.433	0.464	0.072
$(T1^+T2^-T3^+)$	−0.004	−0.005	0.002	6.421	0.524	0.475	0.048
$(T1^-T2^+T3^+)$	−0.029	−0.012	−0.015	4.794	0.420	0.434	−0.087
$(T1^+T2^+T3^+)$	0.006	0.005	0.003	6.075	0.387	0.449	0.081

Panel C: descriptive statistics of variables in each sub-period

Mean

	Discretionary accruals proxy		$rmUDISX_{it}$	$LogAT_{it}$	BM_{it}	LEV_{it}	ROA_{it}
	ATA_{it}	ACA_{it}					
1990–1995	−0.004	0.002	−0.001	5.387	0.597	0.480	0.034
1996–2002	−0.012	−0.007	−0.001	5.686	0.594	0.474	−0.018
2003–2007	−0.014	−0.011	0.000	6.291	0.433	0.459	0.014
2008–2012	−0.022	−0.020	−0.001	6.685	0.648	0.485	0.007
2010–2012	−0.014	−0.008	−0.001	6.803	0.570	0.483	0.024

Median

	Discretionary accruals proxy		$rmUDISX_{it}$	$LogAT_{it}$	BM_{it}	LEV_{it}	ROA_{it}
	ATA_{it}	ACA_{it}					
1990–1995	−0.001	0.001	0.000	5.185	0.502	0.478	0.051
1996–2002	0.001	−0.001	0.005	5.522	0.461	0.464	0.039
2003–2007	−0.009	−0.007	0.001	6.189	0.384	0.443	0.048
2008–2012	−0.014	−0.011	0.000	6.569	0.516	0.468	0.042
2010–2012	−0.011	−0.006	0.000	6.671	0.477	0.467	0.049

Table 1 presents the descriptive statistics of the variables used in our analyses. Panel A shows the proportion of eight mutually exclusive and collectively exhaustive categories of achieving/missing three earnings thresholds between 1990 and 2012. Panel B provides descriptive statistics of variables for each category. The upper panel presents the mean of the variables and the lower panel presents the median of the variables. Panel C presents the descriptive statistics of the variables for each sub-period. *T1* represents zero earnings (i.e., avoiding losses). *T2* represents prior period earnings (i.e., avoiding earnings declines). *T3* represents the analysts' forecasts (i.e., avoiding negative earnings surprises). Each "+" represents firms achieving each earnings threshold while each "−" represents firms missing each earnings threshold. Abnormal total accruals (*ATA*) are defined as the firm specific residuals estimated cross-sectionally from the following equation for each year-industry (two-digit SIC code) combination.

$$\frac{TA_{it}}{A_{it-1}} = \varphi_0 + \varphi_1\left(\frac{1}{A_{it-1}}\right) + \varphi_2\left(\frac{\Delta REV_{it}}{A_{it-1}} - \frac{\Delta REC_{it}}{A_{it-1}}\right) + \varphi_3\left(\frac{PPE_{it}}{A_{it-1}}\right) + \varepsilon_{it}$$

Abnormal current accruals (*ACA*) are defined as the firm specific residuals estimated cross-sectionally from the following equation for each year-industry (two-digit SIC code) combination.

$$\frac{CA_{it}}{A_{it-1}} = \varphi_0 + \varphi_1\left(\frac{1}{A_{it-1}}\right) + \varphi_2\left(\frac{\Delta REV_{it}}{A_{it-1}} - \frac{\Delta REC_{it}}{A_{it-1}}\right) + \varepsilon_{it}$$

TA is total accruals measured as the difference between income before extraordinary items (Compustat mnemonic: ib) and cash flows from operations (Compustat mnemonic: oancf) excluding cash flows from extraordinary items and discontinued operations (Compustat mnemonic: xidoc). *CA* is current accruals of firm *i* for year *t*, measured as the total accruals (*TA*) plus depreciation and amortization expenses (Compustat mnemonic: dp). ΔREV_{it} is change in revenues (Compustat mnemonic: sale) from year $t-1$ to year *t* for firm *i*. ΔREC_{it} is the change in receivables (Compustat mnemonic: rect) from year $t-1$ to year *t* for firm *i*. PPE_{it} is gross property plant and equipment (Compustat mnemonic: ppegt) of firm *i* for year *t*. $A_{it-1}$is total assets (Compustat mnemonic: at) of firm *i* for year $t-1$. $rmUDISX_{it}$is abnormal level of discretionary expenditures estimated following Zang (2012). Details about the estimation procedure of *rmUDISX* are provided in Appendix A. $LogAT_{it}$ is the natural logarithm of total asset (Compustat mnemonic: at) of firm *i* for year *t*. BM_{it} is the book value of equity (Compustat mnemonic: ceq) divided by the market value of equity (Compustat mnemonic: prcc_f x csho) in year *t* for firm *i*. $ROA_{it}$is return on assets defined as income before extraordinary items (Compustat mnemonic: ib) divided by the average of total assets (Compustat mnemonic: at). LEV_{it} is total liabilities (Compustat mnemonic: lt) divided by total assets (Compustat mnemonic: at) in year t.

focus on the mean because both the mean and median suggest similar implications. One aspect worth noting about the behavior of discretionary accruals is that both *ATA* and *ACA* decrease over time (Givoly & Hayn, 2000). *ROA* is positive for all sub-periods except for 1996–2002. *LogAT* becomes larger over time (5.387 for 1990–1995 and 6.685 for 2008–2012). *BM* and *LEV* do not show a consistent pattern. *rmUDISX* seems stable and close to zero over time. A comparison between 2008 and 2012 and 2010–2012 periods suggests that the spike in negative discretionary accruals during 2008 and 2012 (−0.022 for *ATA* and − 0.020 for *ACA*) is due to the financial crisis between 2008 and 2009. Thus, we provide a separate examination of the sub-period of 2010–2012 to avoid the influence of the financial crisis on the results.

5.2. Hierarchy of earnings thresholds based on discretionary accruals

To identify the hierarchy of the three earnings thresholds based on the managerial discretion in financial reporting (i.e., discretionary accruals choice), we estimate Eq.(3) that specifies discretionary accruals (*ATA* or *ACA*) as a function of the indicator variables of the eight mutually exclusive and collectively exhaustive categories of achieving/missing the three earnings thresholds. We estimate Eq.(3) with no intercept. Thus, the eight category indicator variables together represent the intercept of the equation. The coefficient on each category indicator variable represents the average discretionary accruals (as a percent of lagged total assets) used to achieve that category after controlling for other factors. Table 2 presents the regression results.

Table 2
Discretionary accruals to achieve three earnings thresholds.

Panel A: regression based on all observations

Dependent variable	ATA_{it}		ACA_{it}	
	Pooled cross-sectional regression	Fama-MacBeth regression	Pooled cross-sectional regression	Fama-MacBeth regression
$(T1^-T2^-T3^-)$	0.015***	0.004	0.027***	0.020**
$(T1^+T2^-T3^-)$	0.034***	0.024**	0.043***	0.034***
$(T1^-T2^+T3^-)$	0.052***	0.033**	0.065***	0.050***
$(T1^-T2^-T3^+)$	−0.002	−0.005	0.017***	0.014**
$(T1^+T2^+T3^-)$	0.036***	0.029***	0.047***	0.039***
$(T1^+T2^-T3^+)$	0.026***	0.019*	0.037***	0.031***
$(T1^-T2^+T3^+)$	0.056***	0.036**	0.073***	0.056***
$(T1^+T2^+T3^+)$	0.028***	0.023**	0.041***	0.035***
$LogAT_{it}$	−0.012***	−0.011***	−0.012***	−0.011***
BM_{it}	0.007***	0.016***	0.005***	0.012***
LEV_{it}	0.053***	0.048***	0.034***	0.034***
ROA_{it}	0.413***	0.382***	0.349***	0.338***
$(-1)\ x\ rmUDISX_{it}$	−0.473***	−0.669***	−0.445***	−0.629***
Year fixed effects	Yes	N/A	Yes	N/A
N	54,880	23	54,880	23
Adjusted R^2	0.464	0.565	0.455	0.537

Sub-period	1990–1995	1996–2002	2003–2007	2008–2012	2010–2012
Panel B: regressions for each sub-period: abnormal total accruals (*ATA*)					
$(T1^-T2^-T3^-)$	−0.019***	0.052***	−0.001	−0.017***	−0.025***
$(T1^+T2^-T3^-)$	0.000	0.063***	0.022***	0.011***	0.003
$(T1^-T2^+T3^-)$	−0.003	0.094***	0.031***	0.015***	0.016***
$(T1^-T2^-T3^+)$	−0.025***	0.024***	−0.005	−0.019***	−0.021***
$(T1^+T2^+T3^-)$	−0.001	0.066***	0.028***	0.015***	0.010**
$(T1^+T2^-T3^+)$	−0.005	0.056***	0.015***	0.003	−0.003
$(T1^-T2^+T3^+)$	−0.003	0.099***	0.037***	0.014***	0.007
$(T1^+T2^+T3^+)$	−0.007**	0.057***	0.023***	0.009**	0.005
$LogAT_{it}$	−0.005***	−0.018***	−0.012***	−0.008***	−0.009***
BM_{it}	0.009***	0.003***	0.018***	0.012***	0.027***
LEV_{it}	0.024***	0.067***	0.059***	0.042***	0.049***
ROA_{it}	0.361***	0.471***	0.347***	0.368***	0.363***
$rmUDISX_{it}$	−0.838***	−0.374***	−0.615***	−0.686***	−0.664***
Year fixed effects	Yes	Yes	Yes	Yes	Yes
N	11,887	19,371	12,205	11,417	6665
Adjusted R^2	0.627	0.446	0.478	0.588	0.538
Panel C: regressions for each sub-period: abnormal current accruals (*ACA*).					
$(T1^-T2^-T3^-)$	0.010***	0.043***	0.013***	0.003	−0.004
$(T1^+T2^-T3^-)$	0.024***	0.050***	0.029***	0.029***	0.018***
$(T1^-T2^+T3^-)$	0.026***	0.086***	0.050***	0.037***	0.036***
$(T1^-T2^-T3^+)$	0.004	0.026***	0.011**	0.004	0.002
$(T1^+T2^+T3^-)$	0.027***	0.058***	0.033***	0.030***	0.022***
$(T1^+T2^-T3^+)$	0.022***	0.045***	0.026***	0.021***	0.012**
$(T1^-T2^+T3^+)$	0.026***	0.097***	0.057***	0.042***	0.034***
$(T1^+T2^+T3^+)$	0.021***	0.050***	0.032***	0.027***	0.019***
$LogAT_{it}$	−0.007***	−0.015***	−0.012***	−0.010***	−0.010***
BM_{it}	0.005***	0.003***	0.015***	0.009***	0.022***
LEV_{it}	0.020***	0.032***	0.049***	0.034***	0.041***
ROA_{it}	0.323***	0.375***	0.318***	0.347***	0.348***
$rmUDISX_{it}$	−0.806***	−0.347***	−0.580***	−0.647***	−0.623***
Year fixed effects	Yes	Yes	Yes	Yes	Yes
N	11,887	19,371	12,205	11,417	6665
Adjusted R^2	0.601	0.436	0.455	0.566	0.502

*, **, *** represents significance at 10%, 5%, and 1% levels, respectively.

Table 2 exhibits the results of regressions for estimating discretionary accruals used to achieve each earnings threshold. Panel A reports the results of pooled cross-sectional regressions and the Fama-MacBeth regressions using all observations. Panel B displays the results of regressions using abnormal total accruals (*ATA*) as a proxy for discretionary accruals for each sub-period. Panel C reports the results of regressions using abnormal current accruals (*ACA*) as a proxy for discretionary accruals for each sub-period. To estimate average discretionary accruals used to achieve each earnings threshold, we regress the proxy of discretionary accruals (*ATA* or *ACA*) on eight category indicator variables and other control variables known to influence discretionary accruals as in the following equation.

$$ATA_{it}(or\ \ ACA_{it}) = \beta_1 * (T1^-T2^-T3^-) + \beta_2 * (T1^+T2^-T3^-) + \beta_3 * (T1^-T2^+T3^-) + \beta_4 * (T1^-T2^-T3^+) + \beta_5 * (T1^+T2^+T3^-) + \beta_6 * (T1^+T2^-T3^+) + \beta_4 * (T1^-T2^-T3^+) + \beta_5 * (T1^+T2^+T3^-) + \beta_6 * (T1^+T2^-T3^+) + \beta_7 * (T1^-T2^+T3^+) + \beta_8 * (T1^+T2^+T3^+) + \beta_9 LogAT_{it} + \beta_{10} BM_{it} + \beta_{11} LEV_{it} + \beta_{12} ROA_{it} + \beta_{13}(-1) * rmUDISX_{it} + \varepsilon_{it}$$

ATA is abnormal total accruals and *ACA* is abnormal current accruals as defined in Table 1. *T1* represents zero earnings (i.e., avoiding losses). *T2* represents prior period earnings (i.e., avoiding earnings declines). *T3* represents the analysts' forecasts (i.e., avoiding negative earnings surprises). Each "+" represents firms achieving each earnings threshold while each "−" represents firms missing each earnings threshold. $LogAT_{it}$ is the natural logarithm of total asset (Compustat mnemonic: at) of firm *i* for year *t*. BM_{it} is the book value of equity (Compustat mnemonic: ceq) divided by the market value of equity (Compustat mnemonic: prcc_f x csho) in year *t* for firm *i*. $ROA_{it}$is return on assets defined as income before extraordinary items (Compustat mnemonic: ib) divided by the average of total assets (Compustat mnemonic: at). LEV_{it} is total liabilities (Compustat mnemonic: lt) divided by total assets (Compustat mnemonic: at) in year t. $rmUDISX_{it}$is abnormal level of discretionary expenditures estimated following Zang (2012). Details about the estimation procedure of *rmUDISX* are provided in Appendix A.

Panel A of Table 2 reports results of the pooled cross-sectional and the Fama-MacBeth regressions using all observations. Three aspects stand out for both approaches. First, the average discretionary accruals (i.e., coefficients on *ATA* and *ACA*) associated with each category indicator variable are now mostly positive, whereas they are mostly negative in the univariate analyses reported in Panel B of Table 1. Second, the discretionary accruals associated with avoiding earnings declines are consistently the largest among all categories. Third, the discretionary accruals associated with avoiding negative earnings surprises are mostly smaller than the categories of avoiding losses and avoiding earnings declines.

To provide further specific interpretations of the regression results, we consider each of the three categories that achieve only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$). The coefficients on "$T1^+T2^-T3^-$"and "$T1^-T2^+T3^-$" are positive and significant for both *ATA* and *ACA*, while the coefficient on "$T1^-T2^-T3^+$" is positive and significant for *ACA* only. From the coefficients on these three indicator variables, a hierarchy emerges as "$T1^-T2^+T3^- > T1^+T2^-T3^- > T1^-T2^-T3^+$". *F*-tests show highly significant differences in the coefficients of these three category indicator variables (*p*-value < .0001) for both *ATA* and *ACA*. We then consider each of the three categories that achieve two earnings thresholds simultaneously ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$). All coefficients are positive and significant for both *ATA* and *ACA*. Based on the coefficients of the three indicator variables that achieve two earnings thresholds simultaneously, we find that "$T1^-T2^+T3^+ > T1^+T2^+T3^- > T1^+T2^-T3^+$" and the differences among the three category indicator variables are highly significant (*p*-value < .0001). For control variables, book-to-market (*BM*), leverage (*LEV*), and profitability (*ROA*) are positive and firm size (*LogAT*) is negative. These variables are highly significant (*p*-value < .0001). Consistent with the prior study (Zang, 2012), the proxy for real earnings management is negative and highly significant, which indicates a complementary relationship between real activity management and accruals management.

Panel B of Table 2 reports the regression results using abnormal total accruals (*ATA*) as a proxy for the discretionary accruals for each sub-period as defined in Table 1. The coefficients on each of the three categories that achieve only one earnings threshold exhibit the same hierarchy (i.e., $T1^-T2^+T3^- > T1^+T2^-T3^- > T1^-T2^-T3^+$) as in Panel A of Table 2 except for the first sub-period (1990–1995). The differences in the coefficients among these three categories are highly significant in all sub-periods, except for the first sub-period (1990–1995). For the categories that achieve two earnings thresholds ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$), the hierarchy is also largely consistent with that in Panel A of Table 2. Panel C of Table 2 reports the regression results using abnormal current accruals (*ACA*) as a proxy for the discretionary accruals for each sub-period. The hierarchies shown by the coefficients on the categories that achieve only one earnings threshold ($T1^-T2^+T3^- > T1^+T2^-T3^- > T1^-T2^-T3^+$) and by those on the categories that achieve two earnings thresholds ($T1^-T2^+T3^+ > T1^+T2^+T3^- > T1^+T2^-T3^+$) in each sub-period are consistent with those in Panel A of Table 2. To confirm our results, we test the differences among the coefficients of the category indicator variables for achieving one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$). The differences are statistically significant.

Overall, we find the consistent hierarchies of the discretionary accruals associated with the category indicator variables in all regressions presented in Panels A through C of Table 2. Among the categories that achieve only one earnings threshold, the hierarchy emerges as "$T1^-T2^+T3^- > T1^+T2^-T3^- > T1^-T2^-T3^+$". For the categories that achieve two earnings thresholds, the hierarchy emerges as "$T1^-T2^+T3^+ > T1^+T2^+T3^- > T1^+T2^-T3^+$".[19]

To derive an overall hierarchy of the earnings thresholds based on discretionary accruals, we consider all six categories and obtain the aggregate discretionary accruals associated with achieving each earnings threshold in the following manner:

Earnings threshold	Categories	Coefficients	Aggregate discretionary accruals
Avoiding losses (*T1*)	$(T1^+T2^-T3^-) + (T1^+T2^+T3^-) + (T1^+T2^-T3^+)$	$\beta_2 + \beta_5 + \beta_6$	x
Avoiding earnings declines (*T2*)	$(T1^-T2^+T3^-) + (T1^+T2^+T3^-) + (T1^-T2^+T3^+)$	$\beta_3 + \beta_5 + \beta_7$	y
Avoiding negative earnings surprise (*T3*)	$(T1^-T2^-T3^+) + (T1^+T2^-T3^+) + (T1^-T2^+T3^+)$	$\beta_4 + \beta_6 + \beta_7$	z

We then test whether $y > x > z$ in the pooled cross-sectional regressions using all observations and in all sub-period regressions. The differences are highly significant (*p*-value < .0001) in the pooled cross-sectional regressions using all observations. In the sub-period regressions, y is significantly greater than x (*p*-value < .0001) in all sub-periods, except for "1990–1995" for both *ATA* and *ACA*. However, x is significantly greater than z in all sub-periods, except for "1996–2002" for *ATA* and except for "2003–2007" and "2010–2012" for *ACA*. Thus, our findings suggest the hierarchy based on discretionary accruals as *T2* (avoiding earnings declines) > *T1* (avoiding losses) > *T3* (avoiding negative earnings surprises) (RQ1).

5.3. Temporal trend of hierarchy based on discretionary accruals

To show the temporal trend of the hierarchy based on discretionary accruals, we plot the discretionary accruals (*ATA* and *ACA*) associated with achieving only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) based on the sub-period regressions and annual regressions. Using the six category indicator variables ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$, $T1^-T2^-T3^+$, $T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$), we also plot the aggregate discretionary accruals (i.e., sum of the coefficients) related to achieving each earnings threshold computed in the same manner as in the previous sub-section.

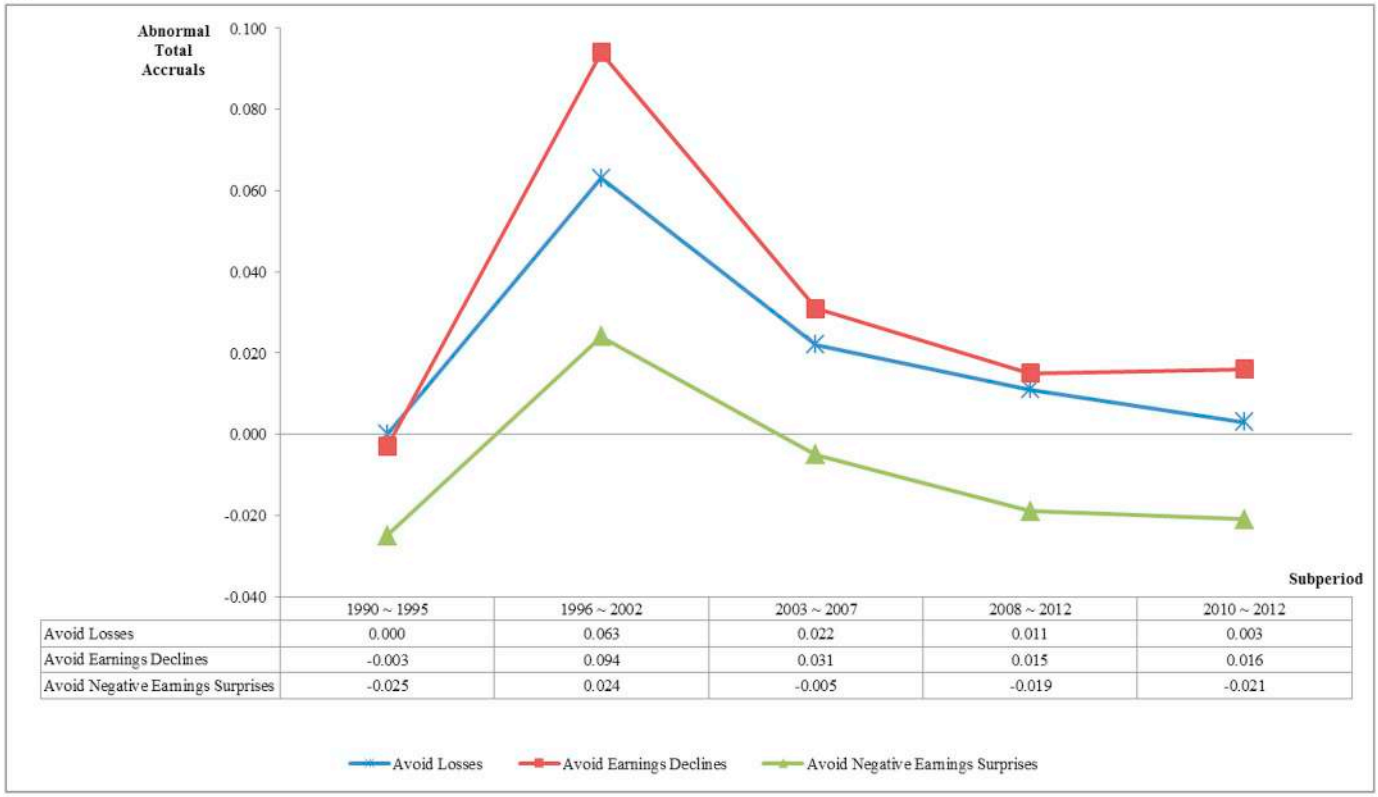
Panels A (*ATA*) and B (*ACA*) of Fig. 1 present discretionary accruals associated with achieving only one earnings threshold for each sub-period. Analyses in both panels clearly indicate that earnings thresholds can be ranked based on discretionary accruals in the following order: (1) avoiding earnings declines (*T2*), (2) avoiding losses (*T1*), and (3) avoiding negative earnings surprises (*T3*). This order remains unchanged over time, except for the first sub-period (1990–1995). Notably, the financial crisis does not alter this hierarchy, although the average levels of discretionary accruals (*ATA* and *ACA*) decrease after 2003, which may be attributable to the SOX (Cohen et al., 2008).

Using the coefficients on the six category indicator variables, Panels C (*ATA*) and D (*ACA*) of Fig. 1 present the aggregate discretionary accruals associated with achieving each earnings threshold for each sub-period. Results are consistent with those reported in Panels A and B of Fig. 1. The hierarchy based on the aggregate discretionary accruals generally maintains the following order: (1) avoiding earnings declines (*T2*), (2) avoiding losses (*T1*) and (3) avoiding negative earnings surprises (*T3*). In sum, avoiding earnings declines (*T2*) unambiguously and consistently exhibit the largest amount of discretionary accruals in all sub-periods.

In Fig. 2, we plot the discretionary accruals (*ATA* and *ACA*)

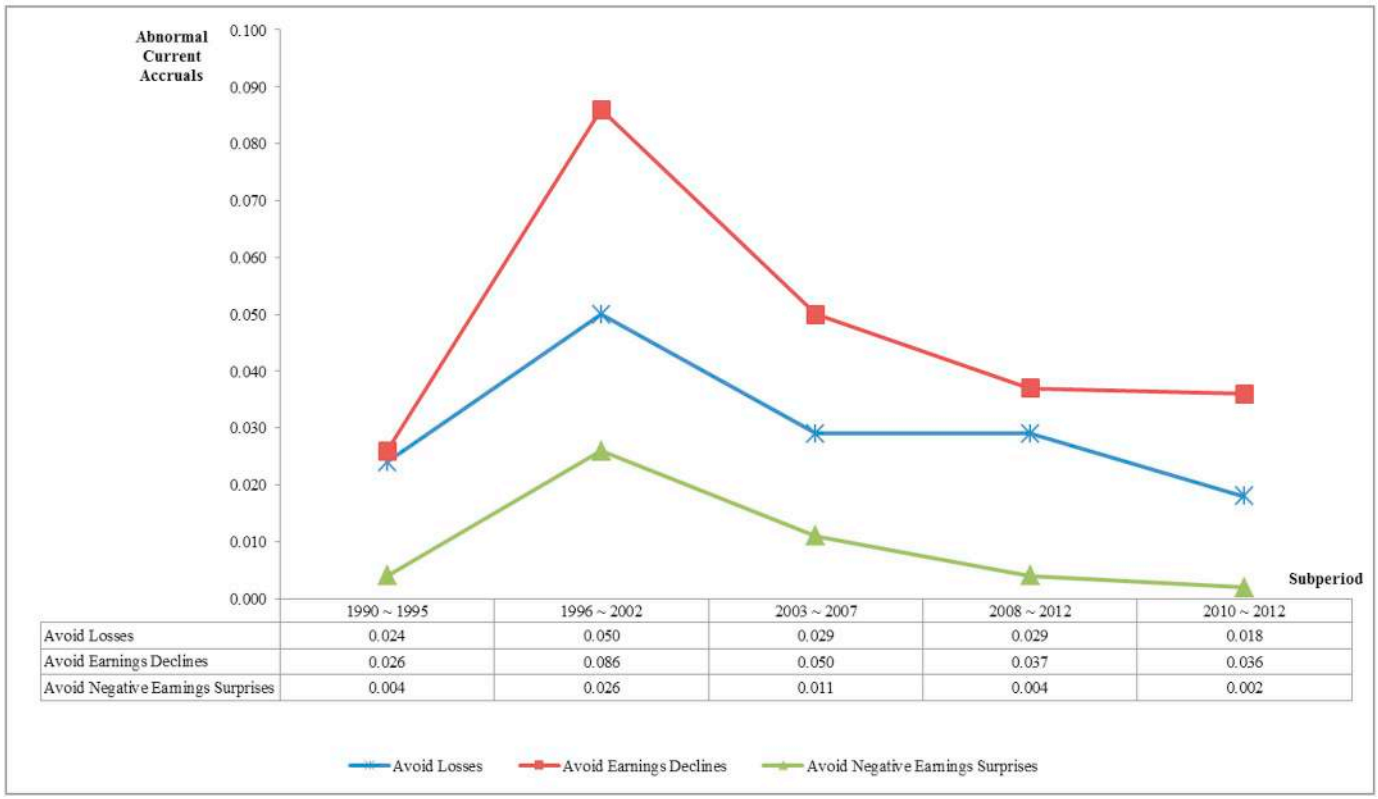
[19] We also conduct annual regressions for each year from 1990 through 2012 (results are not tabulated for brevity). The coefficients on three categories that achieve only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) exhibit a similar hierarchy (i.e., $T1^-T2^+T3^- > T1^+T2^-T3^- > T1^-T2^-T3^+$) in 13 (14) out of 16 annual regressions using *ATA (ACA)* as a proxy for the discretionary accruals. For categories that achieve two earnings thresholds, we find a similar hierarchy in 13 (15) out of 17 annual regressions for *ATA* (*ACA*).

A



	1990 ~ 1995	1996 ~ 2002	2003 ~ 2007	2008 ~ 2012	2010 ~ 2012
Avoid Losses	0.000	0.063	0.022	0.011	0.003
Avoid Earnings Declines	-0.003	0.094	0.031	0.015	0.016
Avoid Negative Earnings Surprises	-0.025	0.024	-0.005	-0.019	-0.021

B



	1990 ~ 1995	1996 ~ 2002	2003 ~ 2007	2008 ~ 2012	2010 ~ 2012
Avoid Losses	0.024	0.050	0.029	0.029	0.018
Avoid Earnings Declines	0.026	0.086	0.050	0.037	0.036
Avoid Negative Earnings Surprises	0.004	0.026	0.011	0.004	0.002

(caption on next page)

Fig. 1. Discretionary accruals to achieve three earnings thresholds for each sub-period.
Panel A: abnormal total accruals (*ATA*): categories achieving one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$).
Panel B: abnormal current accruals (*ACA*): categories achieving one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$).
Panel C: abnormal total accruals (*ATA*): sum of categories achieving one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) and categories achieving two earnings thresholds ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$).
Panel D: abnormal current accruals (*ACA*): sum of categories achieving one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) and categories achieving two earnings thresholds ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$).
Fig. 1 plots a temporal trend of the average discretionary accruals to achieve each earnings threshold for each sub-period between 1990 and 2012 based on Panels B and C of Table 2. The average discretionary accruals to achieve each earnings threshold is estimated from the following equation.

$$ATA_{it}(or\quad ACA_{it}) = \beta_1 * (T1^-T2^-T3^-) + \beta_2 * (T1^+T2^-T3^-) + \beta_3 * (T1^-T2^+T3^-) + \beta_4 * (T1^-T2^-T3^+) + \beta_5 * (T1^+T2^+T3^-) + \beta_6 * (T1^+T2^-T3^+) \quad + \beta_7 * (T1^-T2^+T3^+) + \beta_8 * (T1^+T2^+T3^+) + \beta_9 LogAT_{it} + \beta_{10} BM_{it} + \beta_{11} LEV_{it} + \beta_{12} ROA_{it} + \beta_{13}(-1) * rmUDISX_{it} + \varepsilon_{it}$$

ATA is abnormal total accruals and *ACA* is abnormal current accruals as defined in Table 1. *T1* represents zero earnings (i.e., avoiding losses). *T2* represents prior period earnings (i.e., avoiding earnings declines). *T3* represents the analysts' forecasts (i.e., avoiding negative earnings surprises). Each "+" represents firms achieving each earnings threshold while each "−" represents firms missing each earnings threshold. $LogAT_{it}$ is the natural logarithm of total asset (Compustat mnemonic: at) of firm *i* for year *t*. BM_{it} is the book value of equity (Compustat mnemonic: ceq) divided by the market value of equity (Compustat mnemonic: prcc_f x csho) in year *t* for firm *i*. ROA_{it} is return on assets defined as income before extraordinary items (Compustat mnemonic: ib) divided by the average of total assets (Compustat mnemonic: at). LEV_{it} is total liabilities (Compustat mnemonic: lt) divided by total assets (Compustat mnemonic: at) in year t. $rmUDISX_{it}$is abnormal level of discretionary expenditures estimated following Zang (2012). Details about the estimation procedure of *rmUDISX* are provided in Appendix A. Panel A plots the discretionary accruals associated with achieving each earnings threshold from the categories of achieving only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) for each sub-period, using abnormal total accruals (*ATA*) as a proxy for discretionary accruals. Panel B plots the discretionary accruals associated with achieving each earnings threshold from the categories of achieving only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) for each sub-period, using abnormal current accruals (*ACA*) as a proxy for discretionary accruals. Panel C plots the aggregate discretionary accruals associated with achieving each earnings threshold from the categories of both achieving only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) and achieving two earnings thresholds ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$) for each sub-period, using abnormal total accruals (*ATA*) as a proxy for discretionary accruals. Panel D plots the aggregate discretionary accruals associated with achieving each earnings threshold from the categories of both achieving only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) and achieving two earnings thresholds ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$) for each sub-period, using abnormal current accruals (*ACA*) as a proxy for discretionary accruals. The aggregate discretionary accruals using the six category indicator variables ($T1^+T2^-T3^-$, $T1^-T2^-T3^+$, $T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$) presented in Panels C and D are computed in the following manner.

Earnings threshold	Categories	Aggregate discretionary accruals (sum of three coefficients)
Avoiding losses (*T1*)	$(\boldsymbol{T1}^+T2^-T3^-) + (\boldsymbol{T1}^+T2^+T3^-) + (\boldsymbol{T1}^+T2^-T3^+)$	$\beta_2 + \beta_5 + \beta_6$
Avoiding earnings declines (*T2*)	$(T1^-\boldsymbol{T2}^+T3^-) + (T1^+\boldsymbol{T2}^+T3^-) + (T1^-\boldsymbol{T2}^+T3^+)$	$\beta_3 + \beta_5 + \beta_7$
Avoiding negative earnings surprise (*T3*)	$(T1^-T2^-\boldsymbol{T3}^+) + (T1^+T2^-\boldsymbol{T3}^+) + (T1^-T2^+\boldsymbol{T3}^+)$	$\beta_4 + \beta_6 + \beta_7$

associated with achieving each earnings threshold for each year in the same manner as in Fig. 1. The plots in Fig. 2 are presented on a five-year rolling basis to smooth out the potential fluctuations of the discretionary accruals in certain years.[20]Fig. 2 confirms the results based on sub-periods reported in Panel B of Table 2 and demonstrates the hierarchy of the three earnings thresholds in the following order: (1) avoiding earnings declines (*T2*), (2) avoiding losses (*T1*), and (3) avoiding negative earnings surprises (*T3*). This order is largely unchanged over time, except for the early years (1990–1995). Consistent with Fig. 1, Fig. 2 also exhibits a decrease in the average levels of discretionary accruals (*ATA* and *ACA*) after 2003.

Taken together, avoiding earnings declines is associated with the largest amount of discretionary accruals. Based on discretionary accruals, the hierarchy of the three earnings thresholds is shown in the order of avoiding earnings declines, avoiding losses and avoiding negative earnings surprises (RQ1) in all analyses. This order generally remains unchanged over time (RQ2). However, this outcome does not mean managers do not exert efforts to avoid negative earnings surprises. As one of CFOs interviewed in Graham et al. (2005) mentions, managers may also use other mechanisms to avoid negative earnings surprises such as earnings guidance, while managers rely more on discretion over financial reporting to avoid earnings declines after managing real activities.

6. Explanations for hierarchy of earnings thresholds based on discretionary accruals

Results in the previous sections suggest that managers use more discretionary accruals to avoid earnings declines relative to the other two earnings thresholds. In this section, we provide explanations for the incremental use of discretionary accruals to avoid earnings declines. Table 3 presents the results.

6.1. Earnings volatility and stock returns volatility

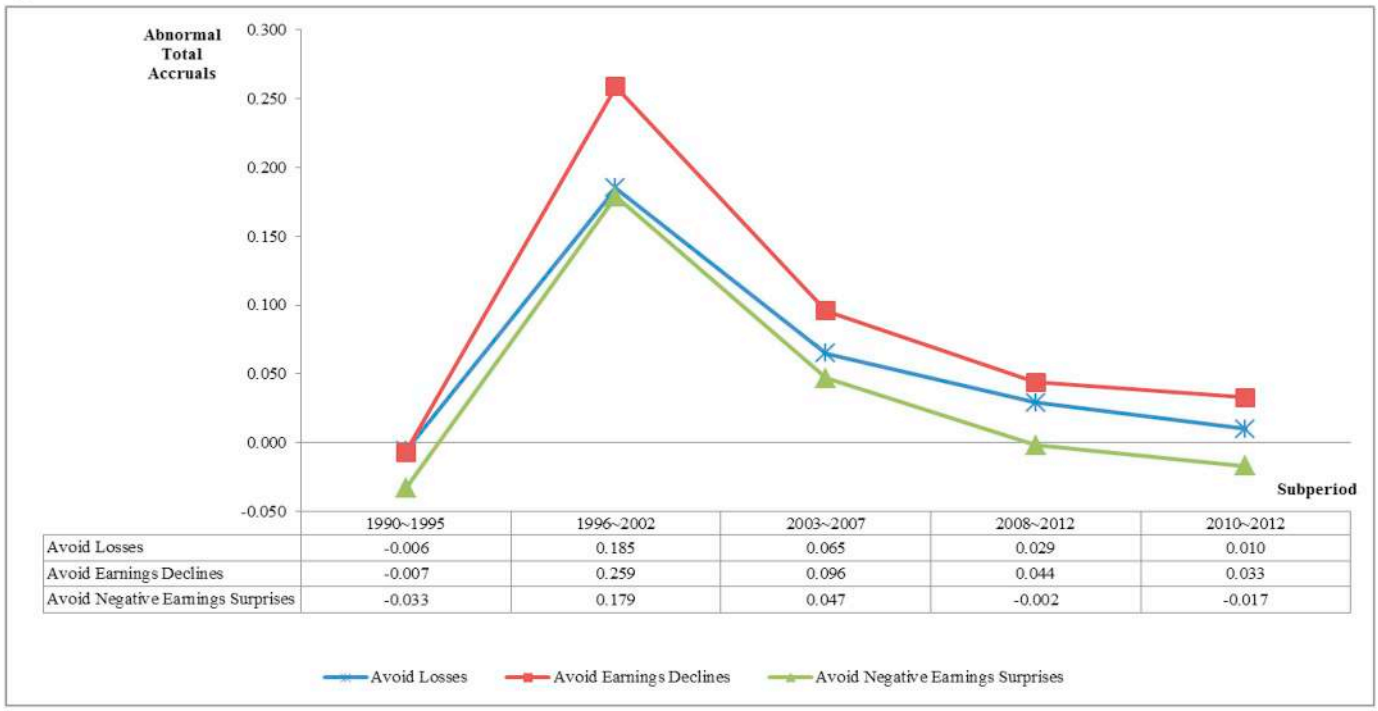
Prior studies document that earnings volatility may increase risk perception about the firm. Barth et al. (1999) report that the variability of earnings reflects operating risks. Other studies also suggest that volatile earnings can increase estimation risks, which can affect the costs of capital (Britten-Jones, 1999; Jorion, 1985). Thus, as indicated in Graham et al. (2005), managers are highly concerned about smoothing earnings given that smoother earnings are perceived by investors to be less risky, and provide the predictability of future earnings that investors and analysts value.[21] Prior studies (e.g., Barton, 2001; Pincus & Rajgopal, 2002; Shust, 2014) document empirical evidence that managers rely on accruals to reduce earnings volatility. This finding leads to the conjecture that firms with historically volatile earnings are likely to utilize more discretionary accruals to avoid earnings declines (i.e., to reduce earnings volatility). To measure historical earnings volatility, we use the standard deviation of five years' earnings (i.e., *ROA*) including the previous four years and the current year. We then form tercile ranks based on the level of historical earnings volatility and designate firms in the top rank as firms with highly volatile earnings. In the regression analyses, those firms are labeled as "*HIGHVOL*" and interacted with the category indicator variables.

In addition, high stock price volatility can also affect the risk

[20] Figures based on individual years' discretionary accruals generate similar results.

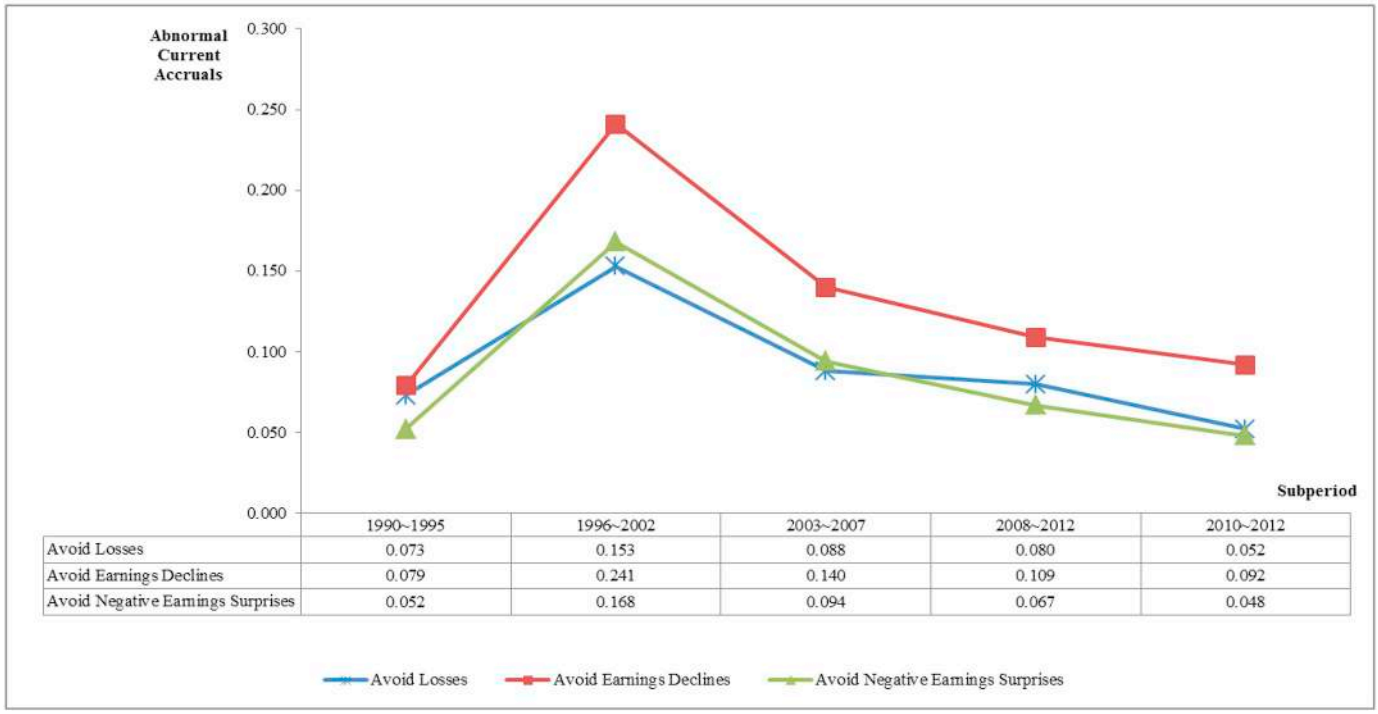
[21] Graham et al. (2005) report that 96.9% of survey respondents prefer smooth earnings.

C



	1990~1995	1996~2002	2003~2007	2008~2012	2010~2012
Avoid Losses	-0.006	0.185	0.065	0.029	0.010
Avoid Earnings Declines	-0.007	0.259	0.096	0.044	0.033
Avoid Negative Earnings Surprises	-0.033	0.179	0.047	-0.002	-0.017

D

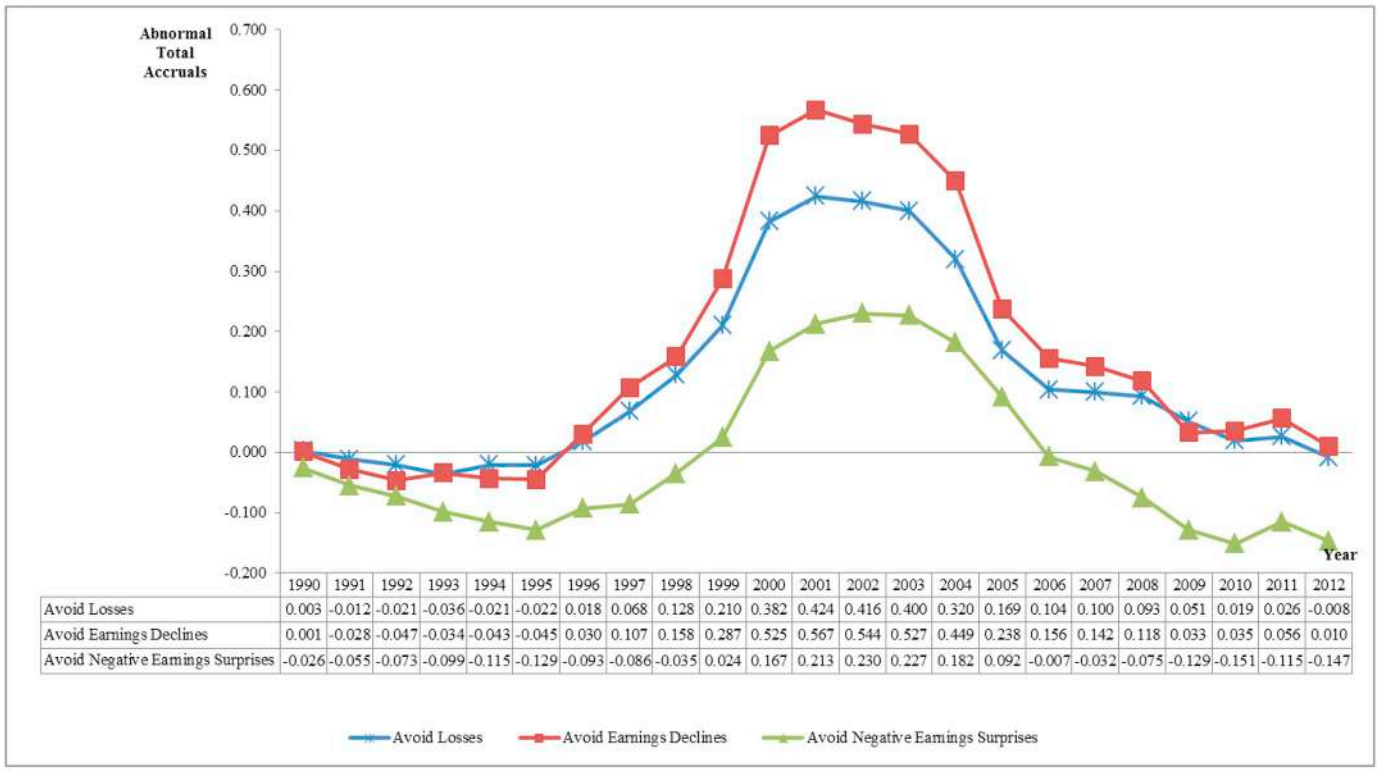


	1990~1995	1996~2002	2003~2007	2008~2012	2010~2012
Avoid Losses	0.073	0.153	0.088	0.080	0.052
Avoid Earnings Declines	0.079	0.241	0.140	0.109	0.092
Avoid Negative Earnings Surprises	0.052	0.168	0.094	0.067	0.048

Fig. 1. (*continued*)

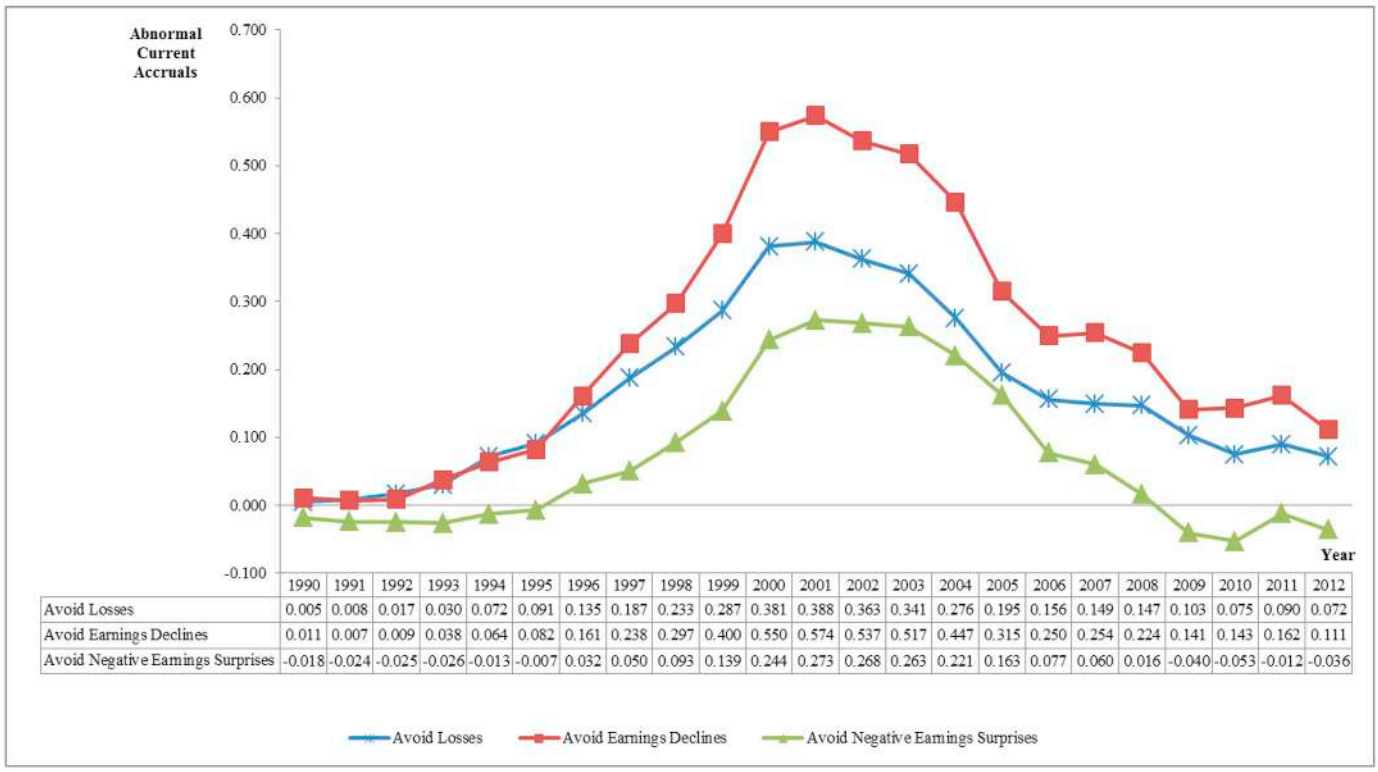
perception of investors, which, in turn, can also influence their estimation of the required rate of return (Froot, Perold, & Stein, 1992). The survey findings in Graham et al. (2005) also indicate that 67% of CFOs achieve earnings thresholds to reduce stock price volatility, and that earnings volatility is likely to affect stock returns volatility. Thus, to the extent that the volatility of earnings has spill-over effects on the stock returns volatility, firms with historically volatile stock returns are likely to use more discretionary accruals to avoid earnings declines (i.e., to reduce stock returns volatility). Given this conjecture, we then examine whether stock returns volatility is incrementally associated with avoiding earnings declines. We measure historical stock returns volatility in two ways. First, we use the standard deviation of the monthly raw stock returns for the last 12 months. Second, we use the standard deviation of the monthly market-adjusted stock returns for the last 12 months. Then, we form tercile ranks based on the stock returns volatility and designate firms in the top rank as firms with highly volatile

A



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Avoid Losses	0.003	-0.012	-0.021	-0.036	-0.021	-0.022	0.018	0.068	0.128	0.210	0.382	0.424	0.416	0.400	0.320	0.169	0.104	0.100	0.093	0.051	0.019	0.026	-0.008
Avoid Earnings Declines	0.001	-0.028	-0.047	-0.034	-0.043	-0.045	0.030	0.107	0.158	0.287	0.525	0.567	0.544	0.527	0.449	0.238	0.156	0.142	0.118	0.033	0.035	0.056	0.010
Avoid Negative Earnings Surprises	-0.026	-0.055	-0.073	-0.099	-0.115	-0.129	-0.093	-0.086	-0.035	0.024	0.167	0.213	0.230	0.227	0.182	0.092	-0.007	-0.032	-0.075	-0.129	-0.151	-0.115	-0.147

B



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Avoid Losses	0.005	0.008	0.017	0.030	0.072	0.091	0.135	0.187	0.233	0.287	0.381	0.388	0.363	0.341	0.276	0.195	0.156	0.149	0.147	0.103	0.075	0.090	0.072
Avoid Earnings Declines	0.011	0.007	0.009	0.038	0.064	0.082	0.161	0.238	0.297	0.400	0.550	0.574	0.537	0.517	0.447	0.315	0.250	0.254	0.224	0.141	0.143	0.162	0.111
Avoid Negative Earnings Surprises	-0.018	-0.024	-0.025	-0.026	-0.013	-0.007	0.032	0.050	0.093	0.139	0.244	0.273	0.268	0.263	0.221	0.163	0.077	0.060	0.016	-0.040	-0.053	-0.012	-0.036

(caption on next page)

Fig. 2. Discretionary accruals to achieve three earnings thresholds for each year.
Panel A: abnormal total accruals (*ATA*): categories achieving one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$).
Panel B: abnormal current accruals (*ACA*): categories achieving one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$).
Panel C: abnormal total accruals (*ATA*): sum of categories achieving one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) and categories achieving two earnings thresholds ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$).
Panel D: abnormal current accruals (*ACA*): sum of categories achieving one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) and categories achieving two earnings thresholds ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$).
Fig. 2 plots a temporal trend of average discretionary accruals to achieve each earnings threshold for each year between 1990 and 2012 on a five-year rolling basis. Average discretionary accruals to achieve each earnings threshold is estimated from the following equations.

$$ATA_{it}(or\ ACA_{it}) = \beta_1 * (T1^-T2^-T3^-) + \beta_2 * (T1^+T2^-T3^-) + \beta_3 * (T1^-T2^+T3^-) + \beta_4 * (T1^-T2^-T3^+) + \beta_5 * (T1^+T2^+T3^-) + \beta_6 * (T1^+T2^-T3^+) + \beta_7 * (T1^-T2^+T3^+) + \beta_8 * (T1^+T2^+T3^+) + \beta_9 LogAT_{it} + \beta_{10} BM_{it} + \beta_{11} LEV_{it} + \beta_{12} ROA_{it} + \beta_{13}(-1) * rmUDISX_{it} + \varepsilon_{it}$$

ATA is abnormal total accruals and *ACA* is abnormal current accruals as defined in Table 1. *T1* represents zero earnings (i.e., avoiding losses). *T2* represents prior period earnings (i.e., avoiding earnings declines). *T3* represents the analysts' forecasts (i.e., avoiding negative earnings surprises). Each "+" represents firms achieving each earnings threshold while each "−" represents firms missing each earnings threshold. $LogAT_{it}$ is the natural logarithm of total asset (Compustat mnemonic: at) of firm *i* for year *t*. BM_{it} is the book value of equity (Compustat mnemonic: ceq) divided by the market value of equity (Compustat mnemonic: prcc_f x csho) in year *t* for firm *i*. ROA_{it} is return on assets defined as income before extraordinary items (Compustat mnemonic: ib) divided by the average of total assets (Compustat mnemonic: at). LEV_{it} is total liabilities (Compustat mnemonic: lt) divided by total assets (Compustat mnemonic: at) in year t. $rmUDISX_{it}$is the abnormal level of discretionary expenditures estimated following Zang (2012). Details about the estimation procedure of *rmUDISX* are provided in Appendix A. Panel A plots the discretionary accruals associated with achieving each earnings threshold from the categories of achieving only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) for each year, using abnormal total accruals (*ATA*) as a proxy for discretionary accruals. Panel B plots the discretionary accruals associated with achieving each earnings threshold from the categories of achieving only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) for each year, using abnormal current accruals (*ACA*) as a proxy for discretionary accruals. Panel C plots the aggregate discretionary accruals associated with achieving each earnings threshold from the categories of both achieving only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) and achieving two earnings thresholds ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$) for each year, using abnormal total accruals (*ATA*) as a proxy for discretionary accruals. Panel D plots the aggregate discretionary accruals associated with achieving each earnings threshold from the categories of both achieving only one earnings threshold ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$ and $T1^-T2^-T3^+$) and achieving two earnings thresholds ($T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$) for each year, using abnormal current accruals (*ACA*) as a proxy for discretionary accruals. The aggregate discretionary accruals using the six category indicator variables ($T1^+T2^-T3^-$, $T1^-T2^+T3^-$, $T1^-T2^-T3^+$, $T1^+T2^+T3^-$, $T1^+T2^-T3^+$ and $T1^-T2^+T3^+$) presented in Panels C and D are computed in the following manner.

Earnings threshold	Categories	Aggregate discretionary accruals (sum of three coefficients)
Avoiding losses (*T1*)	$(\boldsymbol{T1}^+T2^-T3^-) + (\boldsymbol{T1}^+T2^+T3^-) + (\boldsymbol{T1}^+T2^-T3^+)$	$\beta_2 + \beta_5 + \beta_6$
Avoiding earnings declines (*T2*)	$(T1^-\boldsymbol{T2}^+T3^-) + (T1^+\boldsymbol{T2}^+T3^-) + (T1^-\boldsymbol{T2}^+T3^+)$	$\beta_3 + \beta_5 + \beta_7$
Avoiding negative earnings surprise (*T3*)	$(T1^-T2^-\boldsymbol{T3}^+) + (T1^+T2^-\boldsymbol{T3}^+) + (T1^-T2^+\boldsymbol{T3}^+)$	$\beta_4 + \beta_6 + \beta_7$

stock returns (*HIGHVOL*) in both approaches.

We extend Eq.(3) using "*HIGHVOL*" to indicate firms in the highest rank of earnings or stock returns volatility as in Eq.(4). All other variables are defined in the same way as in Eq.(3).

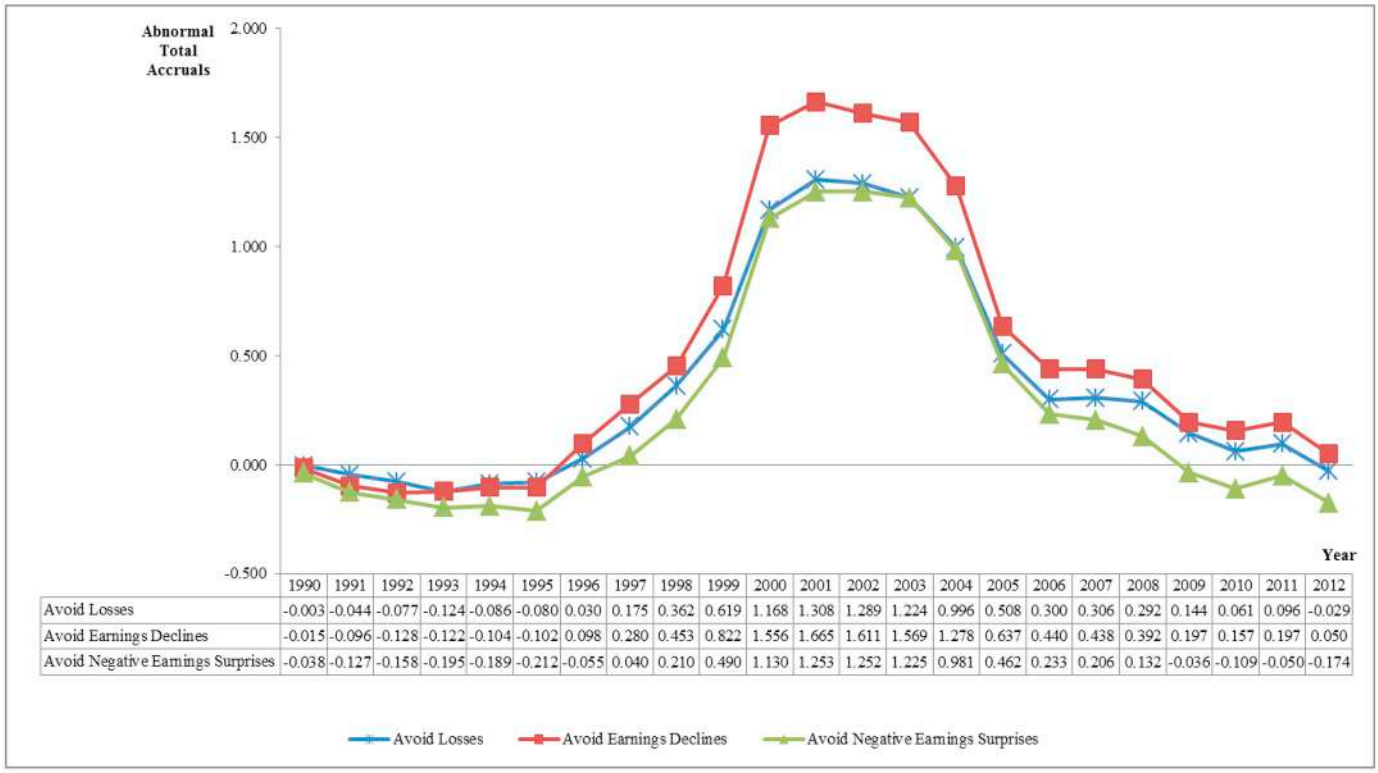
$$\begin{aligned} ATA_{it}(or\ ACA_{it}) = {} & \beta_1{}^*(T1^-T2^-T3^-) + \beta_2{}^*(T1^+T2^-T3^-) \\ & + \beta_3{}^*(T1^-T2^+T3^-) + \beta_4{}^*(T1^-T2^-T3^+) \\ & + \beta_5{}^*(T1^+T2^+T3^-) + \beta_6{}^*(T1^+T2^-T3^+) \\ & + \beta_7{}^*(T1^-T2^+T3^+) + \beta_8{}^*(T1^+T2^+T3^+) \\ & + \beta_9{}^*(T1^+T2^-T3^-) * HIGHVOL \\ & + \beta_{10}{}^*(T1^-T2^+T3^-) * HIGHVOL \\ & + \beta_{11}{}^*(T1^-T2^-T3^+) * HIGHVOL \\ & + \beta_{12}{}^*(T1^+T2^+T3^-) * HIGHVOL \\ & + \beta_{13}{}^*(T1^+T2^-T3^+) * HIGHVOL \\ & + \beta_{14}{}^*(T1^-T2^+T3^+) * HIGHVOL \\ & + \beta_{15}{}^*(T1^+T2^+T3^+) * HIGHVOL + \beta_{16}{}^*HIGHVOL \\ & + \beta_{17}\, LogAT_{it} + \beta_{18}\, BM_{it} + \beta_{19}\, LEV_{it} + \beta_{20}\, ROA_{it} \\ & + \beta_{21}(-1) * rmUDISX_{it} + \varepsilon_{it} \end{aligned} \tag{4}$$

Using all observations, we estimate Eq.(4) based on the pooled cross-sectional regressions with year fixed effects. Panel A of Table 3 presents the results with three measures of *HIGHVOL* (Columns 2 and 3 for earnings volatility, Columns 4 and 5 for raw stock returns volatility and Columns 6 and 7 for market-adjusted stock returns volatility). The interaction terms between *HIGHVOL* and the category indicator variables associated with avoiding earnings declines, (i.e., $T1^-\boldsymbol{T2}^+T3^-$, $T1^+\boldsymbol{T2}^+T3^-$ and $T1^-\boldsymbol{T2}^+T3^+$) are generally significantly positive. Among the interaction terms with the category indicator variables that achieve only one earnings threshold, only the interaction term with avoiding earnings declines ($T1^-\boldsymbol{T2}^+T3^-$) is consistently significantly positive at the conventional level in all six regressions. Among the interaction terms with the category indicator variables that achieve two earnings thresholds, the interaction terms with "$T1^-\boldsymbol{T2}^+T3^+$" are significantly positive (p-value < .01) in all six regressions and the interaction terms with "$T1^+\boldsymbol{T2}^+T3^-$" are significantly positive (p-value < .01) for stock returns volatility. These findings provide evidence that firms with historically high earnings and stock returns volatility have incremental effects on the association between the firms' tendency to avoid earning declines and discretionary accruals.

6.2. Future growth potentials

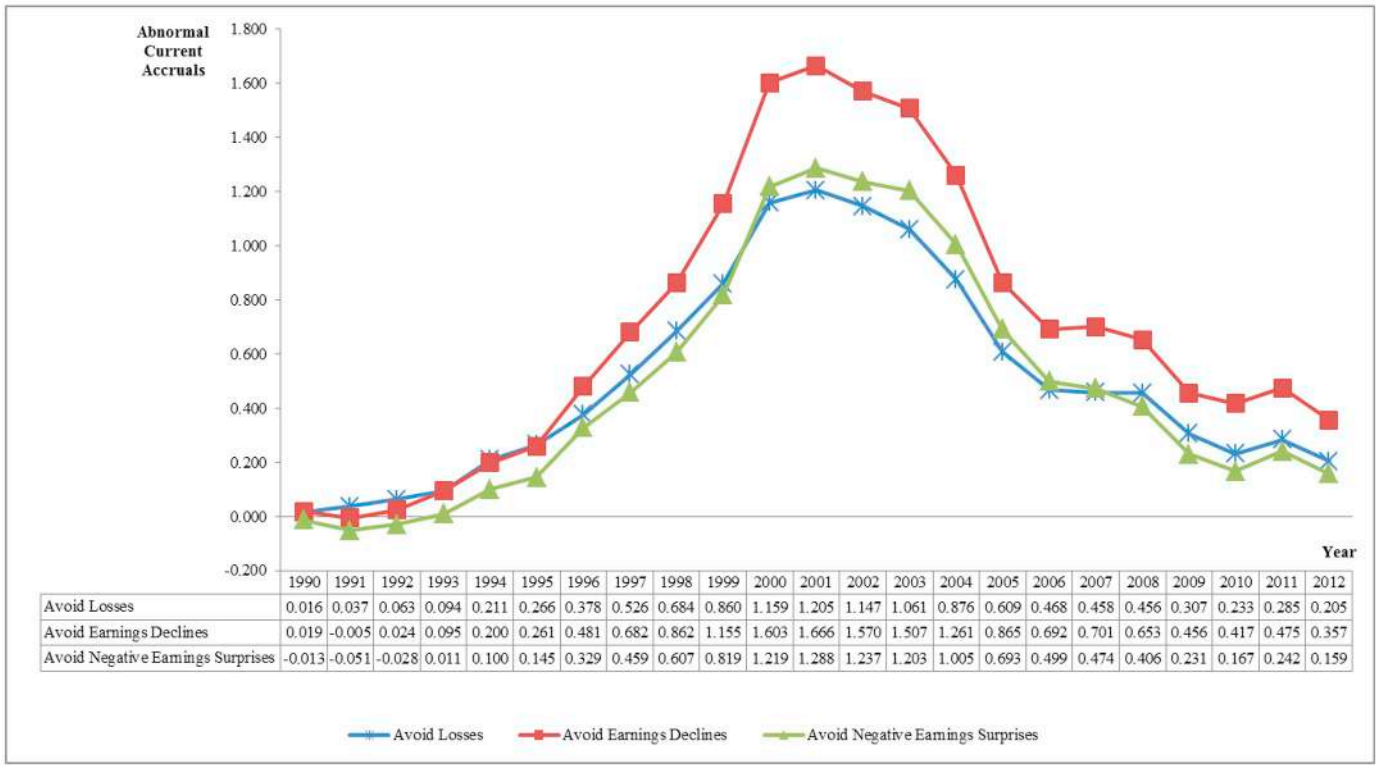
We then examine whether another explanation, conveying information about future growth prospect, is associated with the hierarchy documented in this study. Survey evidence in Graham et al. (2005) indicates that 74% of CFOs believe that achieving earnings thresholds helps convey information about future growth prospects to investors. Moreover, 80.7% of CFOs also believe that missing earnings thresholds increases uncertainty about future growth prospects. They further report that comparing with prior period earnings provides a measure of growth, and smoother earnings convey information about higher growth prospects to investors. Therefore, we conjecture that firms with high growth potential are expected to focus more on

C



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Avoid Losses	-0.003	-0.044	-0.077	-0.124	-0.086	-0.080	0.030	0.175	0.362	0.619	1.168	1.308	1.289	1.224	0.996	0.508	0.300	0.306	0.292	0.144	0.061	0.096	-0.029
Avoid Earnings Declines	-0.015	-0.096	-0.128	-0.122	-0.104	-0.102	0.098	0.280	0.453	0.822	1.556	1.665	1.611	1.569	1.278	0.637	0.440	0.438	0.392	0.197	0.157	0.197	0.050
Avoid Negative Earnings Surprises	-0.038	-0.127	-0.158	-0.195	-0.189	-0.212	-0.055	0.040	0.210	0.490	1.130	1.253	1.252	1.225	0.981	0.462	0.233	0.206	0.132	-0.036	-0.109	-0.050	-0.174

D



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Avoid Losses	0.016	0.037	0.063	0.094	0.211	0.266	0.378	0.526	0.684	0.860	1.159	1.205	1.147	1.061	0.876	0.609	0.468	0.458	0.456	0.307	0.233	0.285	0.205
Avoid Earnings Declines	0.019	-0.005	0.024	0.095	0.200	0.261	0.481	0.682	0.862	1.155	1.603	1.666	1.570	1.507	1.261	0.865	0.692	0.701	0.653	0.456	0.417	0.475	0.357
Avoid Negative Earnings Surprises	-0.013	-0.051	-0.028	0.011	0.100	0.145	0.329	0.459	0.607	0.819	1.219	1.288	1.237	1.203	1.005	0.693	0.499	0.474	0.406	0.231	0.167	0.242	0.159

Fig. 2. (*continued*)

avoiding earnings declines to signal high growth potential to the capital market. For the proxies of growth potential, we employ three variables—market-to-book ratio (*MB*), Tobin's Q, and the analysts' growth forecasts. Then, we form tercile ranks for each proxy and label the firms in the top rank of each proxy as "*HIGHGROW*", which is interacted with the category indicator variables as in Eq.(5). All other variables are defined in the same way as in Eq.(3).

$$\begin{aligned} ATA_{it}\,(or\ ACA_{it}) \;=\; & \beta_1{}^*(T1^-T2^-T3^-) + \beta_2{}^*(T1^+T2^-T3^-) \\ & + \beta_3{}^*(T1^-T2^+T3^-) + \beta_4{}^*(T1^-T2^-T3^+) \\ & + \beta_5{}^*(T1^+T2^+T3^-) + \beta_6{}^*(T1^+T2^-T3^+) \\ & + \beta_7{}^*(T1^-T2^+T3^+) + \beta_8{}^*(T1^+T2^+T3^+) \\ & + \beta_9{}^*(T1^+T2^-T3^-) * HIGHGROW \\ & + \beta_{10}{}^*(T1^-T2^+T3^-) * HIGHGROW \\ & + \beta_{11}{}^*(T1^-T2^-T3^+) * HIGHGROW \\ & + \beta_{12}{}^*(T1^+T2^+T3^-) * HIGHGROW \\ & + \beta_{13}{}^*(T1^+T2^-T3^+) * HIGHGROW \\ & + \beta_{14}{}^*(T1^-T2^+T3^+) * HIGHGROW \\ & + \beta_{15}{}^*(T1^+T2^+T3^+) * HIGHGROW \\ & + \beta_{16}{}^*HIGHGROW + \beta_{17}\,LogAT_{it} + \beta_{18}\,BM_{it} \\ & + \beta_{19}\,LEV_{it} + \beta_{20}\,ROA_{it} \\ & + \beta_{21}(-1) * rmUDISX_{it} + \varepsilon_{it} \end{aligned} \tag{5}$$

Using all observations, we estimate Eq.(5) based on the pooled cross-sectional regressions with year fixed effects. Panel B of Table 3 presents the regression results with the three measures of *HIGHGROW* (Columns 2 and 3 for market-to-book ratio, Columns 4 and 5 for Tobin's Q, and Columns 6 and 7 for the analysts' growth forecasts). The interaction terms between *HIGHGROW* and the category indicator variables associated with avoiding earnings declines, (i.e., $T1^-\boldsymbol{T2}^+T3^-$, $T1^+\boldsymbol{T2}^+T3^-$ and $T1^-\boldsymbol{T2}^+T3^+$) are generally significantly positive. Among the interaction terms with the category indicator variables that achieve only one earnings threshold, only the interaction term with avoiding earnings declines ($T1^-\boldsymbol{T2}^+T3^-$) is consistently significantly positive in all six regressions (p-value < .01). Among the interaction terms with the category indicator variables that achieve two earnings thresholds, the interaction terms with "$T1^-\boldsymbol{T2}^+T3^+$" are significantly positive in all six regressions (p-value < .01) and the interaction terms with "$T1^+\boldsymbol{T2}^+T3^-$" are significantly positive for the analysts' growth forecasts (p-value < .01). These findings support the conjecture that managers of firms with high growth opportunities are more likely to signal the growth potential by avoiding earnings declines using discretionary accruals.

Overall, the results in Table 3 suggest that managers tend to use more discretionary accruals to avoid earnings declines, when their firms exhibit historically high earnings and stock returns volatilities, and managers try to communicate future growth potentials to the capital market.

7. Robustness checks

We perform several robustness checks to ensure that our primary results are not sensitive to our research design choices.

7.1. Performance-matched abnormal accruals

Prior studies suggest that the Jones type abnormal accruals models are mis-specified in the presence of high and low performance (Dechow, Sloan, & Sweeney, 1995). To control for the effect of earnings performance (i.e., *ROA*) on discretionary accruals, we re-run the regressions using the performance-matched abnormal total accruals (*PMATA*) and performance-matched abnormal current accruals (*PMACA*) as the dependent variables in Eq.(3). The regression results with *PMATA* and *PMACA* are consistent with the findings reported in our main analyses.[22] Results are not reported as a separate table for brevity.

7.2. Alternative approach to estimate accruals hierarchy

We plot Panels C and D of Figs. 1 and 2 based on two other combinations of the coefficients on the category indicator variables. (i) To estimate the average amount of discretionary accruals used to achieve a certain earnings threshold, we add the coefficient of the category indicator variable of achieving only one earnings threshold to the incremental coefficients of the category indicator variables of achieving two earnings thresholds from Eq.(3) in the following manner:

Earnings threshold	Categories	Coefficients	Aggregate discretionary accruals
Avoiding losses (*T1*)	$(\boldsymbol{T1}^+T2^-T3^-) + \{(\boldsymbol{T1}^+T2^+T3^-) - (T1^-T2^+T3^-)\} + \{(\boldsymbol{T1}^+T2^-T3^+) - (T1^-T2^-T3^+)\}$	$\beta_2 + (\beta_5 - \beta_3) + (\beta_6 - \beta_4)$	x
Avoiding earnings declines (*T2*)	$(T1^-\boldsymbol{T2}^+T3^-) + \{(T1^+\boldsymbol{T2}^+T3^-) - (T1^-T2^+T3^-)\} + \{(T1^-\boldsymbol{T2}^+T3^+) - (T1^-T2^+T3^-)\}$	$\beta_3 + (\beta_5 - \beta_2) + (\beta_7 - \beta_4)$	y
Avoiding negative earnings surprise (*T3*)	$(T1^-T2^-\boldsymbol{T3}^+) + \{(T1^+T2^-\boldsymbol{T3}^+) - (T1^-T2^+T3^-)\} + \{(T1^-T2^+\boldsymbol{T3}^+) - (T1^-T2^+T3^-)\}$	$\beta_4 + (\beta_6 - \beta_2) + (\beta_7 - \beta_3)$	z

(ii) Next, we rely on the different combinations of the seven category indicator variables to derive the hierarchy. More specifically, we add the coefficient of the category indicator variable of achieving only one earnings threshold, the incremental coefficients of the category indicator variables of achieving two earnings thresholds, and the incremental coefficient of the category indicator variable of achieving all three earnings thresholds in the following manner:

Earnings threshold	Categories	Coefficients	Aggregate discretionary accruals
Avoiding losses (*T1*)	$(\boldsymbol{T1}^+T2^-T3^-) + \{(\boldsymbol{T1}^+T2^+T3^-) - (T1^-T2^+T3^-)\} + \{(\boldsymbol{T1}^+T2^-T3^+) - (T1^-T2^-T3^+)\} + \{(\boldsymbol{T1}^+T2^+T3^+) - (T1^-T2^+T3^+)\}$	$\beta_2 + (\beta_5 - \beta_3) + (\beta_6 - \beta_4) + (\beta_8 - \beta_7)$	x
Avoiding earnings declines (*T2*)	$(T1^-\boldsymbol{T2}^+T3^-) + \{(T1^+\boldsymbol{T2}^+T3^-) - (T1^-T2^+T3^-)\} + \{(T1^-\boldsymbol{T2}^+T3^+) - (T1^-T2^+T3^-)\} + \{(T1^+\boldsymbol{T2}^+T3^+) - (T1^+T2^-T3^+)\}$	$\beta_3 + (\beta_5 - \beta_2) + (\beta_7 - \beta_4) + (\beta_8 - \beta_6)$	y
Avoiding negative earnings surprise (*T3*)	$(T1^-T2^-\boldsymbol{T3}^+) + \{(T1^+T2^-\boldsymbol{T3}^+) - (T1^-T2^+T3^-)\} + \{(T1^-T2^+\boldsymbol{T3}^+) - (T1^-T2^+T3^-)\} + \{(T1^+T2^+\boldsymbol{T3}^+) - (T1^+T2^+T3^-)\}$	$\beta_4 + (\beta_6 - \beta_2) + (\beta_7 - \beta_3) + (\beta_8 - \beta_5)$	z

[22] We estimate performance-matched discretionary accruals suggested by Kothari, Leone, and Wasley (2005). Following the approach used in Francis, LaFond, Olsson, and Schipper (2005), we first group firms into the decile ranks based on earnings performance (i.e., *ROA*) for each industry (i.e., two-digit SIC code). Then, performance-matched discretionary accruals of firm *i* is estimated by subtracting the median discretionary accruals of the industry *ROA* decile from firm *i*'s discretionary accruals, where the median discretionary accruals of the industry *ROA* decile is calculated excluding firm *i*. Discretionary accruals are estimated from Eqs. (1) and (2) respectively.

Table 3
Factors motivating managerial discretionary accruals choices to achieve earnings thresholds.

Panel A: earnings volatility and stock returns volatility

	Earnings		Stock returns			
			Raw stock return		Market-adjusted stock returns	
	ATA_{it}	ACA_{it}	ATA_{it}	ACA_{it}	ATA_{it}	ACA_{it}
$(T1^-T2^-T3^-)$	0.013***	0.020***	0.018***	0.027***	0.017***	0.027***
$(T1^+T2^-T3^-)$	0.035***	0.039***	0.030***	0.039***	0.030***	0.040***
$(T1^-T2^+T3^-)$	0.028***	0.037***	0.035***	0.048***	0.036***	0.048***
$(T1^-T2^-T3^+)$	0.007***	0.015***	0.012***	0.022***	0.008***	0.021***
$(T1^+T2^+T3^-)$	0.030***	0.037***	0.029***	0.041***	0.030***	0.042***
$(T1^+T2^-T3^+)$	0.028***	0.034***	0.025***	0.035***	0.025***	0.036***
$(T1^-T2^+T3^+)$	0.027***	0.037***	0.035***	0.050***	0.033***	0.050***
$(T1^+T2^+T3^+)$	0.028***	0.035***	0.024***	0.038***	0.025***	0.039***
$(T1^+T2^-T3^-)$ * *HIGHVOL*	−0.016***	−0.022***	0.007	0.009**	0.004	0.005
$(T1^-T2^+T3^-)$ * *HIGHVOL*	0.024***	0.020***	0.017***	0.013***	0.013***	0.011**
$(T1^-T2^-T3^+)$ * *HIGHVOL*	−0.002	0.002	−0.005	0.003	−0.001	0.004
$(T1^+T2^+T3^-)$ * *HIGHVOL*	−0.004	−0.013***	0.014***	0.014***	0.009***	0.008***
$(T1^+T2^-T3^+)$ * *HIGHVOL*	−0.013***	−0.020***	0.003	0.005	−0.001	0.000
$(T1^-T2^+T3^+)$ * *HIGHVOL*	0.020***	0.023***	0.023***	0.020***	0.024***	0.019***
$(T1^+T2^+T3^+)$ * *HIGHVOL*	−0.008***	−0.016***	0.017***	0.013***	0.011***	0.008***
HIGHVOL	−0.001	0.010***	−0.009***	−0.003	−0.005**	0.000
$LogAT_{it}$	−0.010***	−0.010***	−0.010***	−0.010***	−0.011***	−0.010***
BM_{it}	0.006***	0.005***	0.007***	0.005***	0.007***	0.005***
LEV_{it}	0.040***	0.029***	0.042***	0.024***	0.042***	0.024***
ROA_{it}	0.363***	0.326***	0.373***	0.310***	0.375***	0.312***
(-1) *x* $rmUDISX_{it}$	−0.652***	−0.593***	−0.636***	−0.599***	−0.637***	−0.599***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	36,344	36,344	52,886	52,886	52,886	52,886
Adjusted R^2	0.562	0.535	0.539	0.528	0.538	0.528

Panel B: growth potentials

	MB		Tobin's Q		Analysts' growth forecasts	
	ATA_{it}	ACA_{it}	ATA_{it}	ACA_{it}	ATA_{it}	ACA_{it}
(*T1-T2-T3-*)	0.024***	0.035***	0.030***	0.040***	−0.004	0.007**
$(T1^+T2^-T3^-)$	0.042***	0.050***	0.047***	0.055***	0.005	0.016***
$(T1^-T2^+T3^-)$	0.052***	0.065***	0.052***	0.064***	0.024***	0.037***
$(T1^-T2^-T3^+)$	0.013***	0.031***	0.021***	0.036***	−0.009***	0.003
$(T1^+T2^+T3^-)$	0.043***	0.055***	0.048***	0.059***	0.003	0.018***
$(T1^+T2^-T3^+)$	0.036***	0.046***	0.043***	0.051***	0.000	0.013***
$(T1^-T2^+T3^+)$	0.056***	0.071***	0.060***	0.075***	0.015***	0.034***
$(T1^+T2^+T3^+)$	0.037***	0.050***	0.043***	0.054***	−0.002	0.014***
$(T1^+T2^-T3^-)$* *HIGHGROW*	−0.011**	−0.007	−0.008	−0.005	0.018***	0.010**
$(T1^-T2^+T3^-)$* *HIGHGROW*	0.024***	0.022***	0.048***	0.044***	0.022***	0.009
$(T1^-T2^-T3^+)$* *HIGHGROW*	−0.023***	−0.026***	−0.028***	−0.024***	−0.028***	−0.016***
$(T1^+T2^+T3^-)$* *HIGHGROW*	−0.007	−0.004	0.000	0.002	0.021***	0.012***
$(T1^+T2^-T3^+)$* *HIGHGROW*	−0.014***	−0.010**	−0.015***	−0.009**	0.008	0.000
$(T1^-T2^+T3^+)$* *HIGHGROW*	0.019***	0.021***	0.028***	0.027***	0.036***	0.027***
$(T1^+T2^+T3^+)$* *HIGHGROW*	−0.006	−0.003	−0.003	0.001	0.018***	0.009**
HIGHGROW	−0.010***	−0.008***	−0.016***	−0.015***	−0.012***	0.000
$LogAT_{it}$	−0.011***	−0.012***	−0.012***	−0.012***	−0.010***	−0.010***
BM_{it}	N/A	N/A	N/A	N/A	0.018***	0.015***
LEV_{it}	0.046***	0.030***	0.040***	0.025***	0.061***	0.041***
ROA_{it}	0.413***	0.349***	0.413***	0.349***	0.470***	0.389***
(-1) *x* $rmUDISX_{it}$	−0.473***	−0.446***	−0.473***	−0.446***	−0.476***	−0.452***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	54,880	54,880	54,841	54,841	39,043	39,043
Adjusted R^2	0.462	0.45	0.464	0.452	0.467	0.46

*, **, *** represents significance at 10%, 5%, and 1% levels, respectively.

Table 3 investigates the motivations for avoiding earnings declines using discretionary accruals. Panel A examines whether earnings and stock returns volatilities cause managers to rely on discretionary accruals more to avoid earnings declines based on the following equation.

$$ATA_{it}(or\ \ ACA_{it}) = \beta_1 * (T1^-T2^-T3^-) + \beta_2 * (T1^+T2^-T3^-) + \beta_3 * (T1^-T2^+T3^-) + \beta_4 * (T1^-T2^-T3^+) + \beta_5 * (T1^+T2^+T3^-) + \beta_6 * (T1^+T2^-T3^+) + \beta_4 * (T1^-T2^-T3^+) + \beta_5 * (T1^+T2^+T3^-) + \beta_6 * (T1^+T2^-T3^+) + \beta_7 * (T1^-T2^+T3^+) + \beta_8 * (T1^+T2^+T3^+) + \beta_9 * (T1^+T2^-T3^-) * \text{HIGHVOL} + \beta_{10} * (T1^-T2^+T3^-) * \text{HIGHVOL} + \beta_{11} * (T1^-T2^-T3^+) * \text{HIGHVOL} + \beta_{12} * (T1^+T2^+T3^-) * \text{HIGHVOL} + \beta_{13} * (T1^+T2^-T3^+) * \text{HIGHVOL} + \beta_{14} * (T1^-T2^+T3^+) * \text{HIGHVOL} + \beta_{15} * (T1^+T2^+T3^+) * \text{HIGHVOL} + \beta_{16} * \text{HIGHVOL} + \beta_{17} LogAT_{it} + \beta_{18} BM_{it} + \beta_{19} LEV_{it} + \beta_{20} ROA_{it} + \beta_{21}(-1) * rmUDISX_{it} + \varepsilon_{it}$$

To measure historical earnings volatility, we take the standard deviation of five years' earnings (i.e., *ROA*) including the previous four years and the current year. Then, we form tercile ranks based on the level of historical earnings volatility, and designate firms in the top rank as firms with highly volatile earnings (*HIGHVOL*). To measure historical stock returns volatility, we take both the standard deviation of the monthly raw stock returns for the previous 12 months and the standard deviation of the monthly market-adjusted stock returns based on the value-weighted index for the previous 12 months. Then, we form tercile ranks based on stock

returns volatility, and designate firms in the top rank as firms with highly volatile stock returns (*HIGHVOL*) for both approaches. Panel B investigates whether growth potential causes managers to use discretionary accruals more to avoid earnings declines based on the following equation.

$$ATA_{it}(or\quad ACA_{it}) = \beta_1 * (T1^- T2^- T3^-) + \beta_2 * (T1^+ T2^- T3^-) + \beta_3 * (T1^- T2^+ T3^-) + \beta_4 * (T1^- T2^- T3^+) + \beta_5 * (T1^+ T2^+ T3^-) + \beta_6 * (T1^+ T2^- T3^+) + \beta_4 * (T1^- T2^- T3^+) + \beta_5 * (T1^+ T2^+ T3^-) + \beta_6 * (T1^+ T2^- T3^+) + \beta_7 * (T1^- T2^+ T3^+) + \beta_8 * (T1^+ T2^+ T3^+) + \beta_9 * (T1^+ T2^- T3^-) * \text{HIGHGROW} + \beta_{10} * (T1^- T2^+ T3^-) * \text{HIGHGROW} + \beta_{11} * (T1^- T2^- T3^+) * \text{HIGHGROW} + \beta_{12} * (T1^+ T2^+ T3^-) * \text{HIGHGROW} + \beta_{13} * (T1^+ T2^- T3^+) * \text{HIGHGROW} + \beta_{14} * (T1^- T2^+ T3^+) * \text{HIGHGROW} + \beta_{15} * (T1^+ T2^+ T3^+) * \text{HIGHGROW} + \beta_{16} * \text{HIGHGROW} + \beta_{17} LogAT_{it} + \beta_{18} BM_{it} + \beta_{19} LEV_{it} + \beta_{20} ROA_{it} + \beta_{21}(-1) * rmUDISX_{it} + \varepsilon_{it}$$

For proxies of growth potential, we employ three variables—*MB*, Tobin's Q and the analysts' growth forecasts. Then, we form tercile ranks for each proxy and label firms in the top rank of each variable as "*HIGHGROW*". *MB* is the market value of equity (Compustat mnemonic: prcc_f x csho) divided by the book value of equity (Compustat mnemonic: ceq). Tobin's Q is the sum of the market value of common equity (Compustat mnemonic: prcc_f x csho), the book value of preferred equity (Compustat mnemonic: pstk), long-term debt (Compustat mnemonic: dltt) and short-term debt (Compustat mnemonic: dlc), divided by total assets (Compustat mnemonic: at). The analysts' growth forecasts are obtained from forecasts of earnings growth rate from the I/B/E/S Detail dataset. *ATA* is abnormal total accruals and *ACA* is abnormal current accruals as defined in Table 1. *T1* represents zero earnings (i.e., avoiding losses). *T2* represents prior period earnings (i.e., avoiding earnings declines). *T3* represents the analysts' forecasts (i.e., avoiding negative earnings surprises). Each "+" represents firms achieving each earnings threshold while each "−" represents firms missing each earnings threshold. $LogAT_{it}$ is the natural logarithm of total asset (Compustat mnemonic: at) of firm *i* for year *t*. BM_{it} is the book value of equity (Compustat mnemonic: ceq) divided by the market value of equity (Compustat mnemonic: prcc_f x csho) in year *t* for firm *i*. ROA_{it} is return on assets defined as income before extraordinary items (Compustat mnemonic: ib) divided by the average of total assets (Compustat mnemonic: at). LEV_{it} is total liabilities (Compustat mnemonic: lt) divided by total assets (Compustat mnemonic: at) in year t. $rmUDISX_{it}$is the abnormal level of discretionary expenditures estimated following Zang (2012). Details about the estimation procedure of *rmUDISX* are provided in Appendix A.

We consistently find the same hierarchy as reported in our main analyses ($y > x > z$) under these two different combinations of estimating the average amount of discretionary accruals used to achieve each earnings threshold. The differences between discretionary accruals to achieve each earnings threshold ($y > x$ and $x > z$) become larger than those reported in the main analyses.

7.3. Revised regression model

We revise our main model of Eq.(3) by replacing the middle six category indicator variables with the three indicator variables (i.e., avoiding losses, avoiding earnings declines, and avoiding negative earnings surprises) as in Eq.(6), and repeat our main tests using Eq. (6)

$$\begin{aligned} ATA_{it}(or\ \ ACA_{it}) = {} & \beta_1{}^*(T1^- T2^- T3^-) + \beta_2{}^*(T1^+) + \beta_3{}^*(T2^+) + \beta_4{}^*(T3^+) \\ & + \beta_5{}^*(T1^+ T2^+ T3^+) \\ & + \beta_6 LogAT_{it} + \beta_7 BM_{it} + \beta_8 LEV_{it} + \beta_9 ROA_{it} \\ & + \beta_{10}(-1) * rmUDISX_{it} + \varepsilon_{it} \end{aligned} \tag{6}$$

The regression results with Eq.(6) are consistent with those reported in the paper. The level of the discretionary accruals associated with each earnings threshold changes over time but the hierarchy over the sample period remains stable.

7.4. Loss firm years

In our main analyses, observations avoiding earnings declines ($T2^+$) and avoiding earnings surprises ($T3^+$) may include loss firms, which could lead to a downward bias in the coefficients. Thus, we re-run Eqs. (3) and (6) after removing loss firm year observations. Untabulated results are consistent with those reported in our main analyses.

7.5. Other robustness tests

We conduct additional robustness tests as follows. First, we define current accruals using the balance sheet approach (e.g., Sloan, 1996).[23] Results using the current accruals based on the balance sheet approach are qualitatively similar. Second, instead of the single most recent forecast made by the timeliest analyst(s) prior to the earnings announcement, we use the mean analyst consensus forecast of the month immediately prior to the earnings announcement in measuring earnings surprises. The results remain unchanged. Third, to understand whether low discretionary accruals reported by the firms that avoid negative earnings surprises are attributable to the firms with low analyst following, we form the tercile ranks based on the number of analyst following and repeat the main analyses using the firm years that belong to top two tercile ranks. Our results are unaffected by the number of analyst following. Fourth, discretionary accruals are known to vary by industry. To control for the systematic variation of discretionary accruals by industry, we repeat the main analyses after including industry fixed effects based on the two-digit SIC code. The results are not sensitive to the inclusion of the industry fixed effects. Finally, to investigate whether the inclusion of the proxy for real earnings management (i.e., *rmUDISX* in Table 2) drives the results, we conduct our main tests after excluding the proxy for the real earnings management. The results are not altered.

8. Concluding remarks

This study identifies a hierarchy based on the relative extent of discretionary accruals used to achieve three earnings thresholds—avoiding losses, avoiding earnings declines and avoiding negative earnings surprises. While prior studies document the hierarchies of the three earnings thresholds based on earnings distributions, capital market valuation, and survey opinions, we focus on the hierarchy based on the empirical proxies for managerial discretion in financial reporting (i.e., discretionary accruals choice). Since the mid-1990s, discretionary accruals are consistently higher for avoiding earnings declines than the other two thresholds. This finding suggests that managers are likely to use the largest amount of discretionary accruals to avoid earnings declines. We also find that managers use the least amount of discretionary accruals to avoid negative earnings surprises. Overall, our empirical analyses rank the three earnings thresholds based on discretionary accruals in the following order: (1) avoiding earnings declines, (2) avoiding losses, and (3) avoiding negative earnings surprises. This trend remains unaltered over time throughout our sample period. We then provide explanations for the hierarchy derived based on discretionary accruals used to achieve those thresholds. Our empirical analyses suggest that managers tend to adjust their discretion in financial reporting to attain the desired level of earnings outcomes that reduce earnings and stock returns volatilities, and convey signals about future growth potentials.

Overall, we identify a new hierarchy of the three earnings thresholds based on discretionary accruals associated with achieving those thresholds, and find potential explanations consistent with the hierarchy documented in this study. These findings provide further insights

[23] The accruals used in Sloan (1996) are defined as (ΔCA − ΔCash) − (ΔCL − ΔSTD − ΔTP) − DEP where CA is current assets (Compustat mnemonic: act), Cash is cash and cash equivalents (Compustat mnemonic: che), CL is current liabilities (Compustat mnemonic: lct), STD is short-term debt (Compustat mnemonic: dlc), TP is taxes payable (Compustat mnemonic: txp), and DEP is depreciation and amortization expenses (Compustat mnemonic: dp). All variables are scaled by the beginning total assets.

into the managerial behavior of exercising accounting discretion in financial reporting. However, a few caveats are in order while interpreting our results. First, although our findings show that the largest (least) amount of discretionary accruals is used to avoid earnings declines (negative earnings surprises), we do not conclude that avoiding earnings declines is more important to managers than avoiding negative earnings surprises. We also do not suggest that our findings are inconsistent with the hierarchies reported in prior studies (Brown & Caylor, 2005; Dechow et al., 2003). However, our results along with prior archival findings may imply that managers tend to rely on different earnings management mechanisms for different earnings thresholds. For instance, managers exercise more discretion in financial reporting to avoid earnings declines, while they may count more on earnings guidance (i.e., expectations management) to avoid negative earnings surprises. Second, while we apply a widely used proxy for earnings expectations (i.e., analysts' forecasts) to measure earnings surprises, this measure is a noisy measure and may bias the coefficients toward zero. Finally, we control for real earnings management in our main analyses with the assumption that accruals management comes after real earnings management (Zang, 2012)[24] and real earnings management is used uniformly to achieve all three earnings thresholds. However, this may not be the case. Future research may extend our study to examine the hierarchy of the three earnings thresholds with respect to real earnings management.

Appendix A. Estimation of unexpected abnormal level of discretionary expenditures

To control for real earnings management, we use the unexpected abnormal level of discretionary expenditures ($rmUDISX_{it}$) as a proxy for abnormal level of real earnings management.

Following Zang (2012), we first estimate the abnormal level of discretionary expenditures ($rmDISX_{it}$) as residuals from the Regression (a) below. The regression is estimated cross-sectionally for each year and each two-digit SIC code with at least 10 observations.

$$\frac{DISX_{it}}{A_{it-1}} = \alpha_0 + \alpha_1\left(\frac{1}{A_{it-1}}\right) + \alpha_2\left(\frac{S_{it-1}}{A_{it-1}}\right) + \varepsilon_{it} \tag{a}$$

where

$DISX_{it}$: firm i's discretionary expenditures defined as the sum of R&D (Compustat mnemonic: xrd), advertising (Compustat mnemonic: xad), and SG&A expenditures (Compustat mnemonic: xsga) in year t.
S_{it}: firm i's revenue (Compustat mnemonic: sale) at year t;
A_{it-1}: total asset (Compustat mnemonic: at) of firm i for year $t-1$.

After finding the abnormal level of discretionary expenditures ($rmDISX_{it}$), we estimate the unexpected abnormal level of discretionary expenditures ($rmUDISX_{it}$) as residuals from Regression (b) below. The regression is estimated cross-sectionally for industry-years. The two-digit SIC industry grouping is used.

$$rmDISX_{it} = \beta_0 + \beta_1 Market\_Share_{it-1} + \beta_2 ZSCORE_{it-1} + \beta_3 Tax\_Rate_{it} + \beta_4 BIG8_{it} + \beta_5 NOA_{it-1} + \beta_6 CYCLE_{it-1} + \beta_7 ROA_{it} + \beta_8 LogAT_{it} + \beta_9 MtoB_{it} + \beta_{10} Earn_{it} + \varepsilon_{it} \tag{b}$$

where

$Market\_Share_{it-1}$: the percentage of the company's sales to the total sales of its industry at the beginning of year t, where industry is defined based on three-digit SIC codes.
$ZSCORE_{it-1}$: Z-score at the beginning of year t. $ZSCORE_{it}$ is computed using the following equation

$$ZSCORE_{it} = 0.3\left(\frac{NI_{it}}{Asset_{it}}\right) + 1.0\left(\frac{Sales_{it}}{Asset_{it}}\right) + 1.4\left(\frac{Retained\ Earnings_{it}}{Asset_{it}}\right) + 1.2\left(\frac{Working\ Capital_{it}}{Asset_{it}}\right) + 0.6\left(\frac{Stock\ Price * Shares\ Outstanding_{it}}{Total\ liabilities_{it}}\right)$$

TAX_Rate_{it}: income tax expense divided by pre-tax income at year t.
$BIG8_{it}$: indicator variable that equals 1 if the firm's auditor is one of the Big 8, and 0 otherwise.
NOA_{it-1}: indicator variable that equals 1 if the net operating assets, i.e. shareholders' equity less cash and marketable securities and plus total debt, at the beginning of the year divided by lagged sales is above the median of the corresponding industry-year, and 0 otherwise.
$CYCLE_{it-1}$: days receivable plus the days inventory less the days payable at the beginning of the year, then scaled by the number of the days in the year $t-1$.
ROA_{it}: return on assets, computed using income before extraordinary items divided by average of asset in year t and asset in year $t-1$.
$LogAT_{it}$: natural logarithm of asset at year t.
$MtoB_{it}$: market-to-book ratio.
$Earn_{it}$: earnings before extraordinary items scaled by previous year's asset less aa_{it}, the measure of discretionary accrual, and $rmDISX_{it}$, the negative value of the measure of discretionary expenditures.

To be consistent with Zang (2012), the unexpected abnormal level of discretionary expenditures ($rmUDISX_{it}$) (i.e., the residuals from the Regression (b)) are multiplied by (-1) such that higher values indicate greater amounts of unexpected abnormal level of discretionary expenditures reduced by firms to increase reported earnings.

[24] Our results do not alter even when real earnings management is not controlled for.

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