Asia-Pacific Journal of Accounting & Economics

ISSN: 1608-1625 (Print) 2164-2257 (Online) Journal homepage: https://www.tandfonline.com/loi/raae20

The bright side of investor sentiment: evidence from real activities manipulation

Yi Si, Chongwu Xia & Endong Yang

To cite this article: Yi Si, Chongwu Xia & Endong Yang (2019): The bright side of investor sentiment: evidence from real activities manipulation, Asia-Pacific Journal of Accounting & Economics, DOI: 10.1080/16081625.2019.1673186

To link to this article: https://doi.org/10.1080/16081625.2019.1673186

ASIA-PACIFIC JOURNAL OF ACCOUNTING & ECONOMICS
https://doi.org/10.1080/16081625.2019.1673186

Routledge
Taylor & Francis Group

The bright side of investor sentiment: evidence from real activities manipulation

Yi Si[a], Chongwu Xia[b] and Endong Yang[c]

[a]Department of Accounting and Finance, The School of Management, Xi'an Jiaotong University; [b]International Institute of Finance, School of Management, University of Science and Technology of China; [c]Department of Finance and Business Economics, Faculty of Business Administration, University of Macau

ABSTRACT

This paper studies how investor sentiment affects managers' real activities manipulation (RAM). Under the *catering hypothesis*, managers engage in high level of RAM to meet investors' expectations of earnings when sentiment is high. Under the *curbing hypothesis*, managers are concerned about the negative impact of RAM and sentiment reversal in the future, and hence involve in less RAM when sentiment is high. We find consistent results with the *curbing hypothesis*. Our results are robust to alternative specifications and measures for investor sentiment and RAM.

ARTICLE HISTORY
Received 10 September 2018
Accepted 15 September 2019

KEYWORDS
Earnings management; real activities manipulation; investor sentiment

1. Introduction

The financial frauds in recent years question the extent to which financial information truthfully reflect firms' underlying economics, other than technically in accordance with Generally Accepted Accounting Principles (hereafter, GAAP) (DeFond and Zhang 2014). In particular, real activities manipulation (hereafter, RAM) boosts earnings through internal operations, and receives little scrutiny from auditors and regulators (Zang 2012). The importance of RAM intrigues a comprehensive literature documenting various factors that affect RAM (Chi, Lisic, and Pevzner 2011; Doukakis 2014; Chan et al. 2015; Cheng, Lee, and Shevlin 2016; Irani and Oesch 2016; Sohn 2016). These studies, however, all reply on stakeholders' rational incentives, and implicitly assume there are no behavioral factors in effect. We fill this void by examining whether and how investor sentiment affects managers' real activities manipulation.

Most extant studies on earnings management focus on detecting accrual manipulation (hereafter, AM), while RAM has received relatively less attention to date. Given the differences between AM and RAM, our study of RAM is interesting for the following reasons. First, AM involves within GAAP accounting choices in the managers' discretion of accruals. RAM is manager's deliberate operating actions to manipulate reported earnings in a certain direction by offering price discounts and more lenient credit terms to increase temporary sales, manipulating the abnormal cash flows from operations or discretionary revenues, engaging in overproduction to decrease COGs (cost of goods sold), or reducing discretionary expenses to increase margins (Roychowdhury 2006; Cohen and Zarowin 2010). Second, unlike AM, RAM has direct negative effects on cash flows and impairs firm value in the long run (Cohen and Zarowin 2008).[1] Though both AM and RAM are detrimental for firm value (Athanasakou, Strong, and Walker 2011), the effects are different. AM mainly affects firm valuation instead of firm fundamentals, while RAM has real effects on firm's operation and the effects last long. Third, the manipulation of accounting choices incurred by AM must be made under the scope of GAAP. Relying on AM alone to manage earnings is at high risk for regulators'

CONTACT Chongwu Xia chongwuxia@gmail.com International Institute of Finance, School of Management, University of Science and Technology of China, No.96 Jinzhai Road, Hefei 230026, China

sanction and even incurs class action litigations. RAM is exclusively managers' operation decisions, which is less likely to draw auditor or regulators' scrutiny than AM. Last, AM is usually manipulated at the end of year and limited by the levels of total accruals in the previous years (Barton and Simko 2002), while RAM cannot be done at the year end and managers manipulate RAM throughout the fiscal year. Given the differences between RAM and AM, particularly the different effects on firm's operations and long-term values, it is worthwhile to examine the effect of investor sentiment on RAM.

Baker and Wurgler (2007) define investor sentiment as 'a belief about future cash flows and investment risk that cannot be justified by the facts at hand'. Barberis, Shleifer, and Vishny (1998) and Daniel, Hirshleifer, and Subrahmanyam (1998) point out that sentiment tends to vary over time. This is because sentiment arises from either overconfidence or conservatism, and the appetites change for exogenous reasons. This nature of investor sentiment leads to different predictions about how it affects RAM, as illustrated in the following.

On the one hand, investor sentiment can positively affect RAM. First, the benefits of manipulating earnings upwards are higher when investor sentiment is higher. In high sentiment periods, investors tend to overvalue stocks and failure to meet such expectations will incur severely negative market reactions (Brown and Cliff 2005; Baker and Wurgler 2006; Seybert and Yang 2012). Second, the costs of manipulating earnings upwards are lower when investor sentiment is higher. External monitors in high sentiment periods may share the same sentiment and supply low-quality monitoring (Ma et al. 2017). We conveniently term this positive relation as the *catering hypothesis*.

On the other hand, investor sentiment can curb RAM. Different from AM, RAM negatively impacts firm performance in the long run (Graham, Harvey, and Rajgopal 2005; Gunny 2010).[2] The negative impact on operating performance can be a threat to managers since they are more likely to be dismissed after poor operating performance (Jenter and Kanaan 2015). In addition, the current high investor sentiment will reverse to a low level in the future (Baker and Wurgler 2007), potentially rendering manager's dismissal more sensitive to performance.[3] As a result, managers may strategically decrease RAM in high sentiment period to reserve earnings for poor performance, so that they are more likely to survive in the forthcoming periods with low sentiment. We conveniently term this negative relation as the *curbing hypothesis*.

To test which hypothesis holds, we use a sample of 53,562 U.S. firm-year observations from 1999 to 2015. The firm-level investor sentiment is measured by a composite sentiment score (hereafter, CSS) from RavenPack News Analytics. The RAM is measured by two aggregate measures *RAM1* and *RAM2*, following Cohen and Zarowin (2010) and Zang (2012). Our baseline results show that investor sentiment lowers RAM at less than the 1% significance level. The effect is also economically significant: a one standard deviation increase of *SENTIMENT* reduces *RAM1* by 14.9%.

Since investor sentiment (particularly market-level sentiment) is a behavioral bias unrelated to firm's fundamentals and is hard to be manipulated by managers, we do not think our main findings suffer from severe endogeneity problems. Nonetheless, to address the concern that some time-invariant unobservable firm characteristics are driving our results, we add firm fixed effects to mitigate such concern. We then conduct tests employing alternative metrics for investor sentiment. Specifically, we use firm's *RESIQ* (the residual of Tobin's Q) as an alternative measure of firm-level investor sentiment, and Baker and Wurgler's market sentiment index *BWMAR* as a measure of market-level investor sentiment. Our results remain robust. We also use alternative measures for RAM, and the results still hold.

Next, we conduct several cross-sectional analyses related to the incentives and costs to manipulate real activities. Firms with high leverage are more concerned about survival, and have low incentives to deviate from optimal business operations and manipulate real activities (Graham, Harvey, and Rajgopal 2005). Therefore, these firms have low RAM in the first place and are less affected by sentiment. In addition, firms with higher market-to-book ratio have higher growth opportunities, and are more likely to be punished by investors if they miss the earnings target (Skinner and Sloan 2002). Therefore, these firms have higher incentives for RAM and are more

likely to be affected by the investor sentiment. Our empirical results are consistent with the above conjectures. Moreover, firms with higher institutional ownership and more blockholders receive closer monitoring on operations, and incur higher costs of RAM. We find the effect of sentiment is lower for such firms.

Finally, we explicitly examine a channel (job security) through which investor sentiment affects manager's incentive of RAM. We test whether manager's forced turnover is less (more) sensitive to poor performance when sentiment is high (low). Our empirical results show that sentiment reduces manager's turnover performance sensitivity (hereafter, TPS), hence reduces manager's incentive to manipulate real activities to boost earnings. In addition, we find that the firms' ROA (return on assets) in the following years are positively affected by the current sentiment. These results suggest that in high sentiment period, knowing that sentiment will reverse (Baker and Wurgler 2007), managers would strategically decrease RAM to achieve better operating performance in the future (the time when sentiment is reversed to a low level, leading to high TPS), so that they will not be dismissed. Taken together, these findings show that investor sentiment curbs manager's RAM through its effects on job security-related incentives.

Our paper makes the following contributions to the literature. First, it contributes to the literature on earnings management. RAM and AM have many differences, particularly on the effects on firm's operation and long-term value[4]. Graham, Harvey, and Rajgopal (2005) provide survey evidence that managers prefer to use RAM compared to AM in order to meet earnings targets. Consistent with Graham, Harvey, and Rajgopal (2005), Cohen, Dey, and Lys (2008) document that managers have shifted away from AM to RAM in the post-SOX period. Thus, investigating the determinants of RAM is important in the new regulation period. Extant literature documents that IFRS adoption, internal governance, analyst coverage, adoption of compensation clawback, accounting comparability, and audit quality affect how managers use AM and RAM as substitutes according to their own costs and benefits (Chi, Lisic, and Pevzner 2011; Doukakis 2014; Chan et al. 2015; Cheng, Lee, and Shevlin 2016; Irani and Oesch 2016; Sohn 2016). Surprisingly, no study has examined how behavioral factors affect RAM. We fill the void by studying how investor sentiment affects RAM.

Second, our paper also contributes to the literature on investor sentiment. Bergman and Roychowdhury (2008) and Brown et al. (2012) find that managers strategically disclose to cater to high investor sentiment. Ali and Gurun (2009) and Simpson (2013) show that managers strategically manipulate discretionary accruals to respond to investor sentiment. Baker and Wurgler (2002) and Gilchrist, Himmelberg, and Huberman (2005) document that firms issue equity to utilize the high investor sentiment. While these findings all provide negative consequences of investor sentiment, our study documents a bright side of investor sentiment, i.e. curbing RAM.

Third, although prior study has analyzed the association between investor sentiment and accrual-based accounting manipulation (Simpson 2013), our investigation on RAM has incremental contributions to the extant literature for the following reasons. As discussed later in Section 2.2, RAM is quite different from AM through managerial discretions, economic consequences, regulatory scrutiny and flexibility (Roychowdhury 2006; Kothari, Mizik, and Roychowdhury 2015). To our best knowledge, this study is the first to provide the large sample and systematic evidence on the bright side effects of firm-year specific investor sentiment on RAM[5]. AM is usually manipulated at the end of year and limited by the business operations and accrual levels in the prior years (Barton and Simko 2002). Given that RAM cannot be done at the year-end, managers manipulate RAM throughout the fiscal year. Thus, given investor sentiment is continuous across the year defined as the annual average of the composite sentiment score, it is more likely to affect RAM than AM. In fact, our finding that sentiment curbs RAM cannot be generalized to AM.

The rest of the paper is organized as follows. Section 2 reviews the literature and develops hypotheses. Section 3 describes the research methodology. Section 4 presents the empirical results. Section 5 provides additional analyses. Section 6 concludes.

2. Literature review and hypothesis development

2.1. Related literature on investor sentiment

Investor sentiment basically refers to 'a belief about future cash flows and investment risk that cannot be justified by the facts at hand' (Baker and Wurgler 2007). Since investor sentiment stems from behavioral biases (Barberis, Shleifer, and Vishny 1998; Daniel, Hirshleifer, and Subrahmanyam 1998), by nature it cannot last long and varies over time.

Managers typically respond to investor sentiment in manners that hurt investors' welfare. In accounting literature, Bergman and Roychowdhury (2008) show that managers disclose strategically to maintain high investor sentiment. Brown et al. (2012) find that managers tend to issue pro forma earnings disclosure out of opportunistic motives when facing high investor sentiment. Ali and Gurun (2009) and Simpson (2013) show that managers strategically manipulate discretionary accruals to respond to investor sentiment. In corporate finance literature, Baker and Wurgler (2002) and Gilchrist, Himmelberg, and Huberman (2005) document that firms are more likely to issue equity when investor sentiment is high. Polk and Sapienza (2009) find that managers overinvest (underinvest) when investor sentiment is high (low).

Besides firm managers, other parties are also affected by investor sentiment. Hribar and McInnis (2012) and Walther and Willis (2013) show that analysts' earnings forecast biases are affected by investor sentiment. Ma et al. (2017) document that auditor effort and quality are lower when investor sentiment is high. These findings also suggest a negative impact on investor sentiment.

However, there are few studies on the bright side of investor sentiment. Perhaps the only positive impact of investor sentiment documented so far is in the innovation literature. Olivier (2000), Caballero, Farhi, and Hammour (2006), and Jermann and Quadrini (2007) analytically demonstrate that investor sentiment can spur innovation. Dang and Xu (2018) empirically show that investor sentiment leads to more innovations. We contribute to the investor sentiment literature by documenting another bright side of investor sentiment. Specifically, as discussed later, we show that managers involve in less RAM when investor sentiment is high.

2.2. Related literature on real activities manipulation

As Healy and Wahlen (1999) define: 'earnings management occurs when managers use *judgment in financial reporting* and *in structuring transactions* to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers. In the spirit of Healy and Wahlen (1999), earnings management occurs not only when managers manipulate accounting estimates and methods, but also through the distortions in operating decisions. Therefore, prior literature classifies earnings management methods into two broad categories (Lo 2007), AM and RAM.

AM involves the within GAAP accounting choices in the manipulation of accruals which have no direct cash flow consequences (Dechow and Skinner 2000). RAM occurs when managers take actions that deviate from normal business practices, such actions may include overproductions to lower COGs (cost of goods sold), reduction in discretionary expenditures to improve profit margins and offering price discounts to increase sales (Roychowdhury 2006). Unlike AM, these departures incurred by RAM have direct effects on cash flows and impair firm value in the long term (Cohen and Zarowin 2008). Although RAM potentially imposes huge long-run costs on the firms, managers are willing to bear the costs and engage in RAM versus AM for several reasons. First, accounting choices must be made under the scope of GAAP. Aggressive financial reporting in terms of AM is at high risk for regulatory scrutiny and may even incur class action litigations. While RAM is exclusively the internal operating decisions, it is less likely to draw auditor and regulatory scrutiny than AM. Second, managers have limited flexibility to manipulate earnings through AM at the year-end. AM is limited by the business operations and accrual levels in the prior years (Barton and Simko 2002). When managers realize the gap between desired targets and

unmanipulated earnings at the year-end, it is less likely to rely on AM alone. Given that RAM cannot be done at the year-end, managers manipulate RAM throughout the fiscal year.

Extant studies provide plenty of evidence on the existence that managers use RAM to achieve earnings targets. In the survey of Graham, Harvey, and Rajgopal (2005), they report that 55 percent of surveyed CFOs are willing to postpone new projects, 80 percent decrease R&D, advertising and maintenance expenditures in order to meet multiple earnings targets (e.g. analyst forecasts, zero earnings, and previous period earnings). By extending this notion, Roychowdhury (2006) find that managers use RAM to meet zero targets and analyst forecasts. Cohen and Zarowin (2010) and Kothari, Mizik, and Roychowdhury (2015) document that firms engage in RAM around SEOs to meet certain earnings benchmarks.

Given the heterogeneity among firms, the costs of earnings management are not constant across all firms. Specifically, managers trade-off the cost and benefits between AM and RAM when they manipulate earnings (Zang 2012). In line with Zang (2012), Cohen, Dey, and Lys (2008) find that AM declines significantly after the passage of SOX while RAM increases significantly. Furthermore, other research provides more firm-specific evidence that managers use AM and RAM as substitutes according to their own costs and benefits, in various settings such as IFRS adoption, internal governance, analyst coverage, adoption of compensation clawback, accounting comparability, and enhanced audit quality (Chi, Lisic, and Pevzner 2011; Doukakis 2014; Chan et al. 2015; Cheng, Lee, and Shevlin 2016; Irani and Oesch 2016; Sohn 2016).

By above-mentioned definition, RAM negatively impacts firm performance in the long run because the managers have great willingness to sacrifice future cash flows for current period earnings (Graham, Harvey, and Rajgopal 2005). Gunny (2010) finds that RAM has an economically significant negative effect on subsequent operating income. Vorst (2016) document that RAM reflects managerial myopia and opportunistic behavior, and thus resulting in two to six percent reduction in future ROA or CFOs (cash flow from operations). By extending the dark side consequences of RAM, a growing literature investigates this issue in specific financing events. These studies find that managers exhibit a greater propensity for RAM around SEOs (seasoned equity offerings) and post-SEOs underperformance incurred by RAM is severer than AM (Cohen and Zarowin 2010; Kothari, Mizik, and Roychowdhury 2015). Furthermore, RAM impairs earnings quality and deteriorates information quality. Outside investors and bondholders perceive RAM as a risk factor and thus demand higher premiums in the cost of capital and bond yield spreads (Kim and Sohn 2013; Ge and Kim 2014).

2.3. Investor sentiment and real activities manipulations: hypothesis development

The financial frauds in recent years have highlighted the significance of the extent to which financial information faithfully reflect underlying economics, not technically in accordance with GAAP (DeFond and Zhang 2014). Surprisingly, no prior research has examined how investor sentiment affects RAM, one of the important earnings management methods to manipulate earnings through deviations from firms' underlying economics. This issue is interesting and important. As discussed earlier, the majority of existing accounting literature focuses on rational incentives of managers, investors and other stakeholders, ignoring the potential effect of behavioral bias (Baker and Wurgler 2012).

Baker, Ruback, and Wurgler (2007) posit that managers respond to high investor sentiment by packaging the firm and its securities in a way that maximizes appeal to investors. First, the benefits of manipulating earnings upwards are higher in high sentiment periods than in low ones. Voluminous research has documented that managers have strong incentives to manage earnings in order to meet a batch of earnings thresholds, such as avoiding losses and debt covenant violations, beating analyst forecasts, etc. (Graham, Harvey, and Rajgopal 2005). Besides accrual manipulation, RAM is broadly used by managers to manipulate earnings to meet above-mentioned earnings targets (Roychowdhury 2006; Cohen and Zarowin 2010; Kothari, Mizik, and Roychowdhury 2015). Moreover, in high

sentiment periods, investors are more likely to overvalue stocks and failing to meet such expectations (e.g. failure to meet earnings targets) will incur severely negative market reactions (Brown and Cliff 2005; Baker and Wurgler 2006; Seybert and Yang 2012). Second, the costs of manipulating earnings upwards are lower in high sentiment periods than in low ones. External monitoring forces in high sentiment may share the same sentiment and supply low-quality monitoring. For example, Ma et al. (2017) find that high sentiment is associated with fewer audit hours and less audit adjustments. Given the higher benefits and lower costs of manipulating earnings in high sentiment, managers tend to use RAM to further boost earnings to cater to market sentiment. Therefore, one should observe a *positive* relation between investor sentiment and RAM. We conveniently term this prediction as the *catering hypothesis*.

On the other hand, there are other arguments working against the above *catering hypothesis* and adding tension in this study. In comparison with accrual manipulations, RAM negatively impacts firm performance in the long run (Graham, Harvey, and Rajgopal 2005). Extant studies have documented consistent evidence that RAM has economically detrimental influences on subsequent operating performance and firm value (Gunny 2010; Cohen and Zarowin 2010; Kothari, Mizik, and Roychowdhury 2015; Vorst 2016). Though Gunny (2010), Di Meo, Garcia Lara, and Surroca (2017), and Lail and Martin (2017) document that RAM leads to higher future firm performance for a subsample of firms that just beat earnings benchmarks or are associated with entrenched CEOs, but their results show the average effect of RAM on future firm performance is still negative.[6] In addition, Jenter and Kanaan (2015) find that managers are more likely to be dismissed in the presence of poor operating performance. Given the asymmetric information between inside managers and outsiders, managers have a good knowledge of the firms' underlying economics and forthcoming investor sentiment reversals (Healey and Wahlen 1999; Baker and Wurgler 2007), they may strategically decrease RAM in high sentiment to smooth and reserve earnings for poor performance in future low sentiment period. One should, therefore, observe a *negative* relation between investor sentiment and RAM. We term this prediction as the *curbing hypothesis*. Taken together, it is an empirical question of whether investor sentiment has a positive or negative effect on RAM.

3. Research methodology

3.1. Sample selection

We obtain financial statement, stock return and investor sentiment data from the COMPUSTAT, CRSP, and RavenPack News Analytics database, respectively. Our sample period is from the fiscal year 1999 to 2015. We implement the following process for sample selection. We first remove 62,632 observations in financial and utility sectors from the initial sample of 191,322 observations. We also delete 28,228 observations due to missing data to calculate RAM. Moreover, we remove 34,581 observations due to missing investor sentiment data in the RavenPack News Analytics database. In addition, we delete 12,319 observations with missing values to calculate related control variables. We end up with 53,562 observations for the main test model, which is specified in Equation (4). Detailed sample construction procedures are summarized in Table 1.

3.2. Measures of real activities manipulation

Following Roychowdhury (2006), we use three metrics to compute the level of RAM: abnormal levels of cash flow from operations (*AB_CFO*), production costs (*AB_PROD*) and discretionary expenses (*AB_EXP*). Specifically, we first run the following cross-sectional regressions for each year and industry:

Table 1. Sample selection.

Procedures	Observations
Compustat firm-years over the period 1999 to 2015	191,322
Less:	
Observations in financial and utility sectors	(62,632)
Observations of observations with missing values on *RAM* measures	(28,228)
Observations of observations with missing values on sentiment measure	(34,581)
Observations of observations with missing values on control variables	(12,319)
Final Sample	53,562

$$\frac{CFO_{i,t}}{TA_{i,t-1}} = \alpha_0 + \alpha_1 \frac{1}{TA_{i,t-1}} + \alpha_2 \frac{SALES_{i,t}}{TA_{i,t-1}} + \alpha_3 \frac{\Delta SALES_{i,t}}{TA_{i,t-1}} + \varepsilon_{i,t} \quad (1)$$

$$\frac{PROD_{i,t}}{\mathrm{TA}_{i,t-1}} = \alpha_{0+}\alpha_1 \frac{1}{TA_{i,t-1}} + \alpha_2 \frac{SALES_{i,t}}{\mathrm{TA}_{i,t-1}} + \alpha_3 \frac{\Delta SALES_{i,t}}{TA_{i,t-1}} + \alpha_4 \frac{\Delta SALES_{i,t-1}}{\mathrm{TA}_{i,t-1}} + \varepsilon_{i,t} \quad (2)$$

$$\frac{EXP_{i,t}}{TA_{i,t-1}} = \alpha_0 + \alpha_1 \frac{1}{\mathrm{TA}_{i,t-1}} + \alpha_2 \frac{SALES_{i,t}}{\mathrm{TA}_{i,t-1}} + \varepsilon_{i,t} \quad (3)$$

where TA_{t-1} is the total assets at the end of year *t-1*, $SALES_t$ is the sales in year *t* and $\Delta SALES_{i,t} = SALES_{i,t} \_SALES_{i,t-1}$. Production cost is defined as $COGs_{i,t} + \Delta INVT_{i,t}$, where $COGs_{i,t}$ is the cost of goods sold for firm *i* in year *t* and $\Delta INVT_{i,t}$ is the change in inventory for firm *i* in year *t*. $EXP_{i,t}$ is the discretionary expenses, including R&D, advertising[7], selling, general, and administrative expenses for firm *i* over the period *t*.

In the above Equation (1–3), for each firm-year, abnormal levels of RAM are calculated as the actual levels of RAM minus the normal levels using estimated coefficients from each corresponding industry-year Equation (1–3) and the intercept. In order to capture the total levels of RAM, we follow Cohen and Zarowin (2010) and Cheng et al. (2016) to use two aggregate measures of RAM: *RAM1* and *RAM2*[8]. For *RAM1*, we first multiply abnormal discretionary expenses by negative one (so that the higher amount, the more likely it is that the firm is cutting discretionary expenses) and add it to abnormal production costs. The higher the amount of this aggregate measure, the more likely the firm engages in real earnings management activities. For *RAM2*, we first multiply abnormal cash flows from operations and abnormal discretionary expenses by negative one and then aggregate them into one measure. We multiply the components by negative one, so that the higher these amounts, the more likely that the firm is engaging in manipulating sales and cutting discretionary expenditures to manage reported earnings upwards.

3.3. Measures of investor sentiment

We obtain the firm-level investor sentiment measure from RavenPack News Analytics database. This database automatically tracks and monitors relevant news information on almost 200,000 firms, people and organizations, which facilitates us to quantify firm-level investor sentiment in the financial markets. The database has been widely used in recent accounting and finance literature (Kolasinski, Reed, and Ringgenberg 2013; Shroff et al. 2013; Dang, Moshirian, and Zhang 2015).

Specifically, firm-year *SENTIMENT* is defined as the annual average of the monthly composite sentiment score (CSS) from RavenPack. According to the data description from RavenPack, CSS represents the news sentiment score (CSS is between 0 and 100) of a specific news story by using multiple sentiment analysis techniques. In a specific news story, the direction of CSS is determined by emotional words or phrases that have positive or negative stock price impact, which is typically rated by experts. For example, words such as 'low, minor, small, inconsequential' are considered as *Low Magnitude*, 'moderate, mellow, dainty' are considered as *Moderate Magnitude*, 'substantial, durable,

considerable, extensive' are considered as *Substantial Magnitude*, 'severe, commanding, destructive, excruciating' are considered as *Severe Magnitude*, and 'critical, devastation, massacre, catastrophic' are considered as *Critical Magnitude*. The exact numerical magnitude of the score is empirically estimated from intraday stock price reactions. It essentially combines five sentiment analytics from global equities, earnings evaluations, editorial & commentary, and venture, company, mergers & acquisitions.[9] If CSS is greater (lower, equal to) than 50, it means a positive (negative, neutral) sentiment among investors. To better explain the sentiment, we define *SENTIMENT* as the CSS minus 50. Therefore, a positive (negative) value of *SENTIMENT* means investor hold optimistic (pessimistic) sentiment for the firm. In the robustness tests, we also use the residual of Tobin's Q (*RESIQ*) as an alternative measure of firm-level investor sentiment and Baker and Wurgler's market sentiment index (*BWMAR*) as a measure of market-level investor sentiment.

3.4. Empirical model

The empirical model is specified as an OLS regression, as follows:

$$\begin{aligned} RAM_{i,t} = {} & \beta_0 + \beta_1 SENTIMENT_{i,t} + \beta_2 SIZE_{i,t-1} + \beta_3 BIG4_{i,t-1} + \beta_4 ROA_{i,t-1} \\ & + \beta_5 MTB_{i,t-1} + \beta_6 TANGIBLE_{i,t-1} + \beta_7 LEV_{i,t-1} + \beta_8 MKTSHARE_{i,t-1} + \beta_9 ZSCORE_{i,t-1} \\ & + \beta_{10} IO_{i,t-1} + \beta_{11} SOX_{i,t-1} + \beta_{12} NOA_{i,t-1} + \beta_{13} CYCLE_{i,t-1} + Firm\ and\ Year\ FE + \varepsilon_{i,t} \end{aligned} \tag{4}$$

In the above OLS model, $RAM_{i,t}$ represents each of the abnormal levels of cash flow from two aggregate real activities manipulation measures estimated by Roychowdhury (2006)'s model for firm i in year t (see the definition in Section 3.2 for details). $SENTIMENT_{i,t}$ is firm specific investor sentiment measures (see the definition in Section 3.3 for details). A significantly negative coefficient on $SENTIMENT_{i,t}$ lends support to the *curbing hypothesis* while a significantly positive one indicates that the *catering hypothesis* holds.

Following Roychowdhury (2006), Cohen and Zarowin (2010), and Zang (2012), we control for firm characteristics that could affect RAM. First, we control for firm size (*SIZE*), profitability (*ROA*), growth opportunity (*MTB*), and financial leverage (*LEV*). Second, earning management incurs cost, so we control for audit firm size (*BIG4*), firm market share (*MKTSHARE*), Altman Z_Score (*ZSCORE*), institutional ownership (*IO*)[10], SOX dummy variable (*SOX*), net operating assets dummy variable (*NOA*), and length of operating cycles (*CYCLE*).

Finally, we include firm and year dummies to control for firm and year fixed effects. Following Petersen (2009) and Gow, Ormazabal, and Taylor (2010), we cluster standard errors by firm to adjust for time effects in the panel data. All the variable definitions are summarized in the Appendix.

4. Empirical results

4.1. Descriptive statistics

Table 2 presents the descriptive statistics of variables used in this study. To mitigate the concern of outliers, we winsorize all the continuous variables at the top (bottom) 1% level. The distribution of dependent and control variables is highly comparable to related studies (Roychowdhury 2006; Cheng, Lee, and Shevlin 2016; Irani and Oesch 2016). The median value of *SENTIMENT* is close to zero, which suggests that investors' optimistic and pessimistic sentiment is almost equally distributed.

Table 3 presents the Pearson and Spearman correlation matrix between main variables in our empirical analyses. Pearson's correlation coefficients are shown in the lower triangle, while Spearman's rank correlations appear above the diagonal. The bold font indicates instances

Table 2. Descriptive statistics.

Vars	N	Mean	Std	P25	Median	P75
Panel A: Descriptive Statistics of Dependent Variables						
AB_CFO	53,562	−0.072	0.250	−0.185	−0.075	0.020
AB_EXP	53,562	0.117	0.407	−0.021	0.123	0.319
AB_PROD	53,562	−0.022	0.303	−0.164	−0.029	0.094
RAM1	53,562	0.094	0.594	−0.127	0.111	0.373
RAM2	53,562	0.045	0.384	−0.097	0.058	0.220
Panel B: Descriptive Statistics of Independent Variables						
SENTIMENT	53,562	−0.197	1.509	−0.609	−0.008	0.514
SIZE	53,562	5.706	2.197	4.165	5.746	7.178
BIG4	53,562	0.764	0.425	1.000	1.000	1.000
ROA	53,562	−0.010	0.295	−0.034	0.059	0.114
MTB	53,562	3.903	7.537	1.229	2.096	3.765
TANGIBLE	53,562	0.262	0.242	0.073	0.177	0.382
LEV	53,562	0.180	0.181	0.005	0.140	0.297
MKTSHARE	53,562	0.061	0.167	0.000	0.003	0.027
ZSCORE	53,562	0.326	5.702	0.205	1.477	2.434
IO	53,562	0.599	0.350	0.282	0.669	0.964
SOX	53,562	0.808	0.394	1.000	1.000	1.000
NOA	53,562	0.527	0.499	0.000	1.000	1.000
CYCLE	53,562	37.769	297.930	27.770	60.361	94.126

Panel A and B present the descriptive statistics of both dependent and independent variables used in this study. All the variable definitions are given in the Appendix. To mitigate the concern of outliers, all the continuous variables are winsorized at the top (bottom) 1% level.

where the correlation coefficients are significant at the 5% level (two-sided). The correlations between *SENTIMENT* and RAM measures are highly significant with negative signs, which provides preliminary evidence for the *curbing hypothesis*.

4.2. Baseline results

In this section, we present the baseline result of how investor sentiment affects the firm's real activities manipulation. Specifically, we run the regression using the OLS model from Eq. (4), and report the results in Table 4. In Columns (1)–(2), the measures of real activities manipulation are *RAM1* and *RAM2* respectively. The coefficients of *SENTIMENT* are negative and significant at 1% significance level for both specifications, suggesting that there is a negative relation between investor sentiment and RAM. The effects are also economically significant. For example, when *RAM1* is used, a one standard deviation increase of *SENTIMENT* lowers real activities manipulation by −0.014 (calculated as −0.009*1.509), which is 14.9% of the mean *RAM1* (0.094) of our sample. In sum, our results lend support to the *curbing hypothesis*.

4.3. Robustness tests

4.3.1. Alternative measures of firm-level investor sentiment

The sentiment measure in our main analysis is CSS, which is based on the emotionally charged words and phrases from the media. Though the sentiment from the media reasonably reflects investor sentiment (Kolasinski, Reed, and Ringgenberg 2013; Dang, Moshirian, and Zhang 2015), we employ a capital market-based sentiment measure in this subsection to check whether our results remain robust. Specifically, we follow Morck, Shleifer, and Vishny (1990) and Goyal and Yamada (2004) and use a regression residual of Tobin's Q (*RESIQ)* to measure the firm-level investor sentiment. Specifically, the regression is done by regressing Tobin's Q on return of equity, financial leverage, and operating sales growth by year and industry.[11]

We present the results with *RESIQ* in Table 5 Panel A. The dependent variable is *RAM1* and *RAM2* in Columns (1)–(2) of Table 5 Panel A, respectively. The results show that the coefficients of

Table 3. Correlation matrix.

Vars	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RAM1	1.000	**0.861**	**−0.037**	**0.018**	**0.015**	**−0.022**	**−0.169**	0.000	**0.105**	**0.050**	**0.059**	**0.024**	**0.015**	**0.083**	−0.005
RAM2	**0.874**	1.000	**−0.063**	**−0.062**	**−0.024**	**−0.107**	**−0.197**	**−0.023**	**0.116**	**0.015**	−0.008	−0.004	**0.012**	**0.082**	**−0.014**
SENTIMENT	**−0.034**	**−0.056**	1.000	**0.072**	**−0.023**	**0.174**	**0.083**	**−0.014**	**−0.025**	**0.032**	**0.074**	**0.086**	**0.108**	**0.009**	−0.006
SIZE	**0.037**	**−0.030**	**0.159**	1.000	**0.468**	**0.447**	**0.371**	**0.121**	**0.137**	**0.551**	**0.280**	**0.294**	**0.101**	**0.106**	**−0.036**
BIG4	**0.028**	−0.006	**0.010**	**0.464**	1.000	**0.159**	**0.051**	**0.108**	**0.098**	**0.302**	**0.112**	**0.180**	**−0.107**	**0.046**	**−0.035**
ROA	**0.073**	**−0.014**	**0.091**	**0.335**	**0.143**	1.000	**0.167**	**0.139**	**0.084**	**0.476**	**0.723**	**0.165**	**0.013**	**−0.059**	**0.073**
MTB	**−0.133**	**−0.127**	**0.028**	**0.091**	**−0.030**	**−0.228**	1.000	**−0.162**	**−0.070**	**−0.067**	**−0.068**	**0.032**	**0.013**	**−0.125**	**−0.105**
TANGIBLE	**0.025**	0.007	**−0.016**	**0.077**	**0.077**	**0.097**	**−0.090**	**1.000**	**0.345**	**0.212**	**0.098**	**0.050**	**−0.035**	**0.097**	**−0.214**
LEV	**0.090**	**0.099**	**−0.037**	**0.087**	**0.086**	**0.099**	**0.090**	**0.287**	1.000	**0.313**	−0.008	**0.075**	**−0.051**	**0.202**	**−0.019**
MKTSHARE	0.008	0.008	**0.017**	**0.232**	**0.097**	**0.116**	**−0.018**	**0.014**	**0.079**	1.000	**0.536**	**0.173**	**0.017**	−0.004	**0.056**
ZSCORE	**0.077**	0.004	**0.039**	**0.281**	**0.158**	**0.696**	**−0.230**	**0.078**	**0.065**	**0.101**	1.000	**0.098**	**−0.037**	**−0.191**	**0.133**
IO	**0.032**	0.000	**0.108**	**0.334**	**0.221**	**0.164**	**−0.016**	**0.045**	**0.072**	**0.082**	**0.112**	1.000	**0.205**	**0.061**	**−0.029**
SOX	**0.015**	**0.014**	**0.169**	**0.102**	**−0.107**	**0.031**	**−0.029**	−0.004	**−0.047**	**0.025**	**−0.034**	**0.204**	1.000	0.005	**−0.063**
NOA	**0.080**	**0.080**	**0.011**	**0.105**	**0.046**	0.005	**−0.100**	**0.108**	**0.201**	**−0.018**	0.003	**0.065**	0.005	1.000	**0.189**
CYCLE	**−0.037**	**−0.049**	−0.006	**0.042**	**0.022**	**0.223**	**−0.064**	**−0.052**	**0.042**	**0.025**	**0.164**	**0.017**	**−0.025**	**0.023**	1.000

This table presents the Pearson and Spearman correlation matrix. Pearson's correlation coefficients are shown in the lower triangle, including the diagonal, while Spearman's rank correlations appear above the diagonal. The bold font indicates instances where the correlation coefficients are significant at the 5% level or greater (two-sided). All the variable definitions are given in the appendix.

Table 4. Baseline result: investor sentiment and real activities manipulation.

Vars	*RAM1* (1)	*RAM2* (2)
SENTIMENT	−0.009***	−0.009***
	(−4.21)	(−5.71)
SIZE	0.022***	0.012***
	(3.43)	(2.76)
BIG4	0.021	0.012
	(1.38)	(1.22)
ROA	0.146***	0.017
	(2.79)	(0.49)
MTB	−0.007***	−0.006***
	(−7.85)	(−8.96)
TANGIBLE	−0.110**	−0.107***
	(−2.18)	(−3.26)
LEV	0.188***	0.163***
	(6.54)	(8.10)
MKTSHARE	−0.017	−0.005
	(−0.60)	(−0.23)
ZSCORE	0.003	0.002
	(0.61)	(0.65)
IO	−0.012	−0.017*
	(−0.82)	(−1.67)
SOX	0.055***	0.046***
	(3.18)	(3.84)
NOA	0.063***	0.030***
	(8.77)	(5.99)
CYCLE	−0.000***	−0.000***
	(−2.91)	(−3.39)
Constant	−0.093**	−0.053*
	(−2.25)	(−1.90)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	53,562	53,562
Adj R^2	0.608	0.485

This table presents the results of OLS regression results based on Eq. (4). In Column (1) and (2), the dependent variable is *RAM1* and *RAM2*, respectively. Both firm and year fixed effects are included. Variable definitions are given in the Appendix. Standard errors are clustered by the firm level. ***, **, and * indicate two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

RESIQ are negative and significant at 1% significance level, in both specifications. The results suggest that our findings remain robust when we use the alternative measure of firm-level sentiment. The effect is also economically significant.

4.3.2. Market-level investor sentiment and real activities manipulation

In this subsection, we test how market-level investor sentiment affects RAM. Presumably, it is infeasible for a single manager to manipulate the market-level investor sentiment. Hence, the result of market-level sentiment helps to alleviate endogeneity concerns.[12]

Specifically, we follow Baker and Wurgler (2006, 2007) and use the first principal component of the correlation matrix of five proxies (*BWMAR*) to measure market-level investor sentiment. Baker and Wurgler (2006, 2007) employ five sentiment proxies (value-weighted dividend premium, first-day IPO returns, IPO volumes, closed-end fund discount, and equity share in new issues) orthogonalized with respect to six macroeconomic indicators (industrial production index, nominal durables consumption, nominal services consumption, NBER recession indicator, employment, and CPI), and then compute the first principle component of the orthogonalized sentiment proxies as the sentiment index *BWMAR*. We then run the following OLS regression and report the results in Table 5 Panel B.

Table 5. Sensitivity checks.

Panel A: Residual of Tobin Q as the Alternative Firm-Level Sentiment Measure

Vars	*RAM1* (1)	*RAM2* (2)
RESIQ	-0.030***	-0.025***
	(-8.33)	(-9.01)
SIZE	0.033***	0.020***
	(4.76)	(4.36)
BIG4	0.018	0.013
	(1.23)	(1.28)
ROA	0.105*	-0.017
	(1.83)	(-0.47)
MTB	-0.008***	-0.007***
	(-7.08)	(-8.43)
TANGIBLE	-0.138***	-0.112***
	(-2.86)	(-3.42)
LEV	0.185***	0.157***
	(6.36)	(7.68)
MKTSHARE	-0.026	-0.001
	(-0.91)	(-0.06)
ZSCORE	0.003	0.002
	(0.48)	(0.58)
IO	-0.003	-0.013
	(-0.21)	(-1.20)
SOX	0.027	0.023*
	(1.53)	(1.84)
NOA	0.052***	0.022***
	(7.24)	(4.42)
CYCLE	-0.000**	-0.000***
	(-2.31)	(-3.17)
Constant	-0.127***	-0.084***
	(-3.04)	(-3.01)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	50,772	50,772
Adj R^2	0.631	0.505

This panel presents the results of OLS regression results based on Eq. (4). In Column (1) and (2), the dependent variable is *RAM1* and *RAM2*, respectively. Test variable, *RESIQ* is the residual of Tobin'Q. Both firm and year fixed effects are included. Variable definitions are given in the Appendix. Standard errors are clustered by the firm level. ***, **, and * indicate two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel B: Baker and Wurgler's Market-Level Sentiment Measure

Vars	*RAM1* (1)	*RAM2* (2)
BWMAR	-0.013***	-0.010***
	(-3.13)	(-3.04)
SIZE	0.031***	0.018***
	(5.02)	(4.48)
BIG4	0.021	0.009
	(1.36)	(0.84)
ROA	0.158***	0.021
	(2.92)	(0.58)
MTB	-0.008***	-0.006***
	(-7.83)	(-9.01)
TANGIBLE	-0.088*	-0.103***
	(-1.68)	(-2.97)
LEV	0.217***	0.182***
	(7.23)	(8.53)
MKTSHARE	-0.004	0.004
	(-0.13)	(0.17)
ZSCORE	0.001	0.001
	(0.31)	(0.39)
IO	-0.019	-0.016
	(-1.29)	(-1.54)

(*Continued*)

Table 5. (Continued).

Panel B: Baker and Wurgler's Market-Level Sentiment Measure

Vars	*RAM1* (1)	*RAM2* (2)
SOX	-0.004	0.009
	(-0.38)	(1.21)
NOA	0.064***	0.029***
	(8.52)	(5.55)
CYCLE	-0.000**	-0.000***
	(-2.56)	(-2.86)
Constant	-0.098**	-0.056**
	(-2.47)	(-2.08)
Firm FE	Yes	Yes
Observations	50,095	50,095
Adj R^2	0.600	0.474

This panel presents the results of OLS regression results based on Eq. (5). In Column (1) and (2), the dependent variable is *RAM1* and *RAM2*, respectively. Firm and fixed effects are included. Variable definitions are given in the Appendix. Standard errors are clustered by the firm level. ***, **, and * indicate two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel D: Propensity Score Matching (PSM)

1)

Vars	Pre-match (1)	Post-match (2)
SIZE	-0.052***	0.000
	(-10.06)	(0.03)
ROA	0.568***	0.086
	(12.39)	(1.36)
MTB	0.008***	-0.001
	(5.85)	(-0.28)
LEV	-0.266***	-0.005
	(-5.32)	(-0.08)
RET	0.058***	0.011
	(6.35)	(0.92)
VOLATILITY	-5.814***	0.830
	(-10.81)	(1.11)
TURNOVER	-0.068*	-0.052
	(-1.72)	(-1.02)
BLOWN	-0.464***	0.001
	(-8.55)	(0.02)
Constant	-0.649**	-0.211
	(-2.00)	(-0.44)
Observations	32,562	14,388
Pseudo R^2	0.032	0.001

2)

Vars	Treated Group	Control Group	T-Stats	P>T
SIZE	5.915	5.933	-0.540	0.590
ROA	0.049	0.047	0.730	0.468
MTB	3.392	3.457	-0.640	0.524
LEV	0.160	0.160	-0.090	0.931
RET	0.240	0.229	0.730	0.465
VOLATILITY	0.033	0.033	0.830	0.409
TURNOVER	0.167	0.170	-0.790	0.429
BLOWN	0.171	0.172	-0.410	0.684

3)

Vars	*RAM1* (1)	*RAM2* (2)
SENTIMENT	-0.019**	-0.013**
	(-2.43)	(-2.34)
SIZE	0.007	0.007
	(0.57)	(0.82)
BIG4	-0.014	-0.011

(*Continued*)

Table 5. (Continued).

	3)	
Vars	*RAM1* (1)	*RAM2* (2)
	(-0.65)	(-0.75)
ROA	0.028	-0.054
	(0.16)	(-0.43)
MTB	-0.008***	-0.006***
	(-4.43)	(-4.44)
TANGIBLE	-0.182*	-0.087
	(-1.83)	(-1.24)
LEV	0.310***	0.205***
	(5.54)	(4.89)
MKTSHARE	0.020	0.024
	(0.29)	(0.37)
ZSCORE	0.038***	0.026***
	(4.05)	(4.08)
IO	0.036	0.035
	(0.97)	(1.28)
SOX	0.107***	0.079***
	(4.85)	(4.98)
NOA	0.075***	0.039***
	(6.02)	(4.20)
CYCLE	0.000	-0.000
	(0.25)	(-0.08)
Constant	-0.064	-0.093*
	(-1.02)	(-1.94)
Year FE	YES	YES
Firm FE	YES	YES
Observations	14,388	14,388
Adj R^2	0.725	0.608

This panel presents the results of PSM results based on Eq. (6). Both firm and year fixed effects are included. Variable definitions are given in the Appendix. Standard errors are clustered by the firm level. ***, **, and * indicate two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

$$RAM_{i,t} = \beta_0 + \beta_1 BWMAR_{i,t} + \beta_2 SIZE_{i,t-1} + \beta_3 BIG4_{i,t-1} + \beta_4 ROA_{i,t-1} + \beta_5 MTB_{i,t-1} + \beta_6 TANGIBLE_{i,t-1} + \beta_7 LEV_{i,t-1} + \beta_8 MKTSHARE_{i,t-1} + \beta_9 ZSCORE_{i,t-1} + \beta_{10} IO_{i,t-1} + \beta_{11} SOX_{i,t-1} + \beta_{12} NOA_{i,t-1} + \beta_{13} CYCLE_{i,t-1} + Firm\ and\ Year\ FE + \varepsilon_{i,t} \quad (5)$$

The coefficients of *BWMAR* are negative and significant for both *RAM1* and *RAM2*. Hence, we provide further evidence that market-level sentiment also leads to lower RAM.

4.3.3. Alternative measures of real activities manipulation

In this subsection, we use alternative measures for RAM. Specifically, we divide *RAM1* and *RAM2* into specific components and use abnormal cash flow from operations (*AB_CFO*), abnormal discretionary expenses (*AB_EXP*), and abnormal production cost (*AB_PROD*) to measure RAM, and run the OLS regression as specified in Eq. (4). The results are reported in Table 5 Panel C.

In Columns (1) to (3) of Table 5 Panel C, the dependent variables are *AB_CFO, AB_EXP*, and *AB_PROD* respectively. The results show that the coefficients of *SENTIMENT* are all negative and significant at 1% significance level, suggesting that our findings that sentiment curbs RAM are robust to different measures of RAM.

4.3.4. Propensity score matching

To address the endogeneity problem stemming from the model misspecifications, we conduct propensity score matching (PSM) in this subsection. Particularly, within the PSM sample, the main

observable firm characteristics can be ensured to be similar for firms with high and low investor sentiment.

We sort the firms into quartiles based on investor sentiment and define the firms in the highest sentiment quartile as the treatment group (*High Sentiment*), and employ the remaining firms as the control group. Following You, Zhang, and Zhang (2017), we run the following probit regression using the whole sample:

$$\begin{aligned} High\ Sentiment_{i,t} = {} & \beta_0 + \beta_1 SIZE_{i,t-1} + \beta_2 ROA_{i,t-1} + \beta_3 MTB_{i,t-1} + \beta_4 LEV_{i,t-1} + \beta_5 RET_{i,t-1} \\ & + \beta_6 VOLATILITY_{i,t-1} + \beta_7 TURNOVER_{i,t-1} + \beta_8 BLOWN_{i,t-1} \\ & + Industry\ and\ Year\ FE + \varepsilon_{i,t} \end{aligned} \tag{6}$$

The results are reported in Table 5 Panel D. We then use the propensity scores to perform nearest neighbor one-to-one matching with caliper 0.05. For each firm in the high sentiment treatment group, we match it with a firm from the control group within the same year and industry. We end up with 7,194 pairs of observations. We then rerun Equation (6), and none of the determinant variables are significant for the PSM sample. In addition, we check the covariate balance and find that the differences of all the determinant are statistically insignificant between the high and low sentiment firms. We finally rerun Equation (4) for the matched sample, the results are reported in Table 5 Panel D (3). The coefficients of *SENTIMENT* are negative and statistically significant at 5% significance level for both *RAM1* and *RAM2*. The results suggest that our findings are robust.

4.4. Investor sentiment and real activities manipulation incentives

In this section, we conduct cross-sectional analyses regarding managers' incentive to manipulate real activities. First, we hypothesize that firms with high financial leverage are more concerned about survival, and have low incentive to deviate from optimal businesses and manipulate real activities (Graham, Harvey, and Rajgopal 2005). Since firms with high leverage have low incentives to engage in RAM in the first place, we expect our finding that sentiment reduces RAM to be less pronounced for these firms.

To test the conjecture, we split the sample into firms with high and low financial leverage based on the median level, and run the regression using Equation (4) separately. The results are reported in Table 6 Panel A. In Columns (1) and (2), we use *RAM1* to measure real activities manipulation, while in Columns (3) and (4) we use *RAM2*. The coefficients of *SENTIMENT* are negative and statistically significant. However, the magnitude of the coefficient is 0.003 (0.003) larger for the low leverage subsample, when RAM is measured by *RAM1* (*RAM2*). These results are consistent with our conjecture that firms with high leverage have low incentive to manipulate real activities and the effect of sentiment on curbing RAM should be lower for such firms.

Second, firms with higher market-to-book ratio are associated with higher growth opportunities and are penalized more by the stock market if they miss earnings target (Skinner and Sloan 2002). We hence conjecture that these firms have higher incentives to manipulate real activities, and the curbing effect of investor sentiment is stronger for these firms. In Table 6 Panel B, we split the sample into firms with high and low *MTB* based on the median level, and run the regression using Eq. (4) separately. The results show that though investor sentiment has a curbing effect for both subsamples, the effect is stronger for firms with high *MTB*.

4.5. Investor sentiment and real activities manipulation costs

In this section, we conduct cross cross-sectional analyses regarding managers' costs to manipulate real activities. Specifically, we hypothesize that firms with higher institutional ownership and more blockholders face closer monitoring on the operations (Bushee 1998; Roychowdhury 2006; Zang

Table 6. Investor sentiment, earnings management incentives, and real activities manipulation.

Panel A: Financial Leverage				
Dependent Vars	*RAM1*	*RAM1*	*RAM2*	*RAM2*
	(1)	(2)	(3)	(4)
Partitioning Var	High Lev	Low Lev	High Lev	Low Lev
SENTIMENT	−0.012***	−0.015***	−0.010***	−0.013***
	(−4.27)	(−3.70)	(−5.47)	(−4.88)
Control Vars	Included	Included	Included	Included
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	26,777	26,785	26,777	26,785
Adj R^2	0.113	0.074	0.089	0.065
Panel B: Growth Opportunity				
Dependent Vars	*RAM1*	*RAM1*	*RAM2*	*RAM2*
	(1)	(2)	(3)	(4)
Partitioning Var	High MTB	Low MTB	High MTB	Low MTB
SENTIMENT	−0.012**	−0.008***	−0.011***	−0.008***
	(−2.38)	(−3.12)	(−3.32)	(−4.84)
Control Vars	Included	Included	Included	Included
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	26,777	26,785	26,777	26,785
Adj R^2	0.095	0.125	0.074	0.113

This table presents the results of investor sentiment, earnings management incentives and real activities manipulation on Equation (4). The dependent variables are *RAM1* and *RAM2*. Samples are divided into each subsample according to the median level. Both industry and year fixed effects are included. Variable definitions are given in the Appendix. Standard errors are clustered by the firm level. ***, **, and * indicate two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

2012), therefore are associated with high RAM costs. As a result, the curbing effect of sentiment should be weaker for such firms as they have lower levels of RAM in the first place.

In Table 7 Panel A, we split our sample into subsamples with high and low institutional ownership (*IO*) and run the regression using Equation (4) separately. The coefficient of *SENTIMENT* is −0.007 (−0.008) for the *High IO* firms and −0.020 (−0.015) for the *Low IO* firms, depending on using *RAM1* (*RAM2*) as a measure of RAM. The results suggest that the effect of investor sentiment is higher for firms with low institutional ownership. Similarly, in Table 7 Panel B, we split our sample into subsamples with high and low number of blockholders (*BO*) and run the regression using Eq. (4) separately. The coefficient of *SENTIMENT* is −0.008 (−0.008) for the *High BO* firms and −0.022 (−0.017) for the *Low BO* firms, depending on using *RAM1* (*RAM2*) as a measure of RAM. These findings suggest that the effect of investor sentiment is higher for firms with fewer blockholders.

We also conjecture that firms with entrenched CEOs are associated with lower cost of RAM and hence the effect of sentiment is weaker for them. There are two reasons: First, Di Meo, Garcia Lara, and Surroca (2017) and Lail and Martin (2017) show that RAM by entrenched managers can be informative and lead to higher performance in the future, i.e. entrenched managers face little or no punishment for RAM; Second, entrenched CEOs are less likely to be dismissed, and face lower job security risk. In Table 7 Panel C, we follow Di Meo, Garcia Lara, and Surroca (2017) and Lail and Martin (2017), and define CEO entrenchment by a dummy variable that equals one if E-index is greater than three and zero otherwise. We then split our sample into subsamples with and without entrenched CEOs and run the regression using Equation (4) separately. While the coefficient of *SENTIMENT* is negative and significant for firms with non-entrenched CEOs (Columns (2) (4)), it is insignificant for firms with entrenched CEOs (Columns (1) (3)). These findings suggest that the effect of investor sentiment is higher for firms without entrenched CEOs.

Table 7. Investor sentiment, corporate governance and real activities manipulation.

Panel A: Institutional Ownership				
Dependent Vars	*RAM1*	*RAM1*	*RAM2*	*RAM2*
	(1)	(2)	(3)	(4)
Partitioning Var	High IO	Low IO	High IO	Low IO
SENTIMENT	−0.006*	−0.021***	−0.007**	−0.016***
	(−1.74)	(−6.35)	(−2.55)	(−8.19)
Control Vars	Included	Included	Included	Included
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	24,654	28,908	24,654	28,908
Adj R^2	0.083	0.094	0.078	0.075
Panel B: Number of Blockholders				
Dependent Vars	*RAM1*	*RAM1*	*RAM2*	*RAM2*
	(1)	(2)	(3)	(4)
Partitioning Var	High BO	Low BO	High BO	Low BO
SENTIMENT	−0.010*	−0.020***	−0.010***	−0.017***
	(−1.83)	(−5.11)	(−3.42)	(−7.02)
Control Vars	Included	Included	Included	Included
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	14,779	20,119	14,779	20,119
Adj R^2	0.119	0.102	0.106	0.085
Panel C: Entrenched Managers				
Dependent Vars	*RAM1*	*RAM1*	*RAM2*	*RAM2*
	(1)	(2)	(3)	(4)
Partitioning Var	*High*	*Low*	*High*	*Low*
SENTIMENT	0.004	−0.011**	−0.002	−0.011***
	(0.38)	(−2.03)	(−0.39)	(−3.36)
Control Vars	Included	Included	Included	Included
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	2,360	7,758	2,360	7,758
Adj R^2	0.171	0.152	0.158	0.147

This table presents the results of investor sentiment, earnings management incentives and real activities manipulation on Eq. (4). The dependent variables are *RAM1* and *RAM2*. In Panel A and B, samples are divided into each subsample according to the median level. In Panel C, samples are divided into high and low subsamples according to E-Index (*High*->3, *Low*-≤3). Both industry and year fixed effects are included. Variable definitions are given in the Appendix. Standard errors are clustered by the firm level. ***, **, and * indicate two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

Collectively, these results show that sentiment has a stronger curbing effect in RAM for firms with higher costs to manipulate real activities, which lend further support to our hypothesis that investor sentiment reduces RAM.

5. Additional analyses: investor sentiment and job security related RAM incentive

In this section, we examine a specific channel (i.e. job security) through which investor sentiment affects manager's incentive to manipulate real activities. Specifically, managers face the threat of forced turnover, which is sensitive to operating performances (Coughlan and Schmidt 1985; Warner, Watts, and Wruck 1988; Parrino 1997). Facing the possibility of job loss, managers, therefore, have the incentive to engage in RAM to boost performance, and this incentive is affected by the turnover-performance sensitivity (hereafter, TPS). Arguably, when TPS is high (low), managers have high (low) incentives to manipulate real activities since they are more (less) likely to be dismissed due to poor performance.

We hypothesize that investor sentiment reduces TPS. This is because when investors have higher sentiment and are overoptimistic, they pay less attention to firm's fundamentals and are less likely to attribute poor performance to manager's ability (but rather believe poor performance is temporary). We directly test this conjecture by testing whether higher (lower) sentiment is associated with lower (higher) TPS. In turn, by reducing TPS, investor sentiment curbs manager's incentives of RAM.

Following prior studies (Farrell and Whidbee 2003; Cao and Narayanamoorthy 2011; Gao, Harford, and Li 2012; Laux and Stocken 2012; Koh, Qian., and Wang 2014; Peters and Wagner 2014; Jenter and Kanaan 2015), we use forced CEO turnover to measure manager's job security.[13] We explicitly test whether CEOs' forced turnover are less (more) sensitive to operating performance in high (low) investor sentiment periods. Specifically, we split the sample into high and low sentiment based on the median level, and run the following regression separately:

$$\begin{aligned} FORCETURN_{i,t} = {} & \beta_0 + \beta_1 ROA_{i,t} + \beta_2 SIZE_{i,t-1} + \beta_3 BIG4_{i,t-1} + \beta_4 MTB_{i,t-1} \\ & + \beta_5 TANGIBLE_{i,t-1} + \beta_6 LEV_{i,t-1} + \beta_7 SENTIMENT_{i,t} \\ & + Year\ and\ Industry\ FE + \varepsilon_{i,t} \end{aligned} \tag{7}$$

The TPS is measured by the coefficient of ROA (Huson, Parrino, and Starks 2001; Jenter and Kannan 2015). Since CEO is more likely to be dismissed following poor operating performance, the relation between *FORCETURN* and *ROA* should be negative. Put it in another way, when *ROA* is higher, *FORCETURN* should be less likely to happen. Therefore, if the coefficient of ROA is more negative, it shows TPS is higher.

The results are reported in Table 8 Panel A. Column (1)/(2) presents the results for the high/low investor sentiment subsamples. We find that the coefficient of *ROA* is negative and significant at 1% significance level for the subsample of low sentiment (*Low Sentiment* in Column (2)), but not significant for the high sentiment subsample (*High Sentiment* in Column (1)). The coefficient difference is statistically significant with the one-side p-value 0.012. Therefore, the results show that the CEOs' TPS is reduced by investor sentiment.[14]

Next, we test whether investor sentiment affects future operating performance, to provide another channel through which sentiment affects the job security related RAM incentive. While we have shown in Table 8 Panel A that sentiment affects turnover-performance sensitivity, here we show that sentiment affects operating performance itself. Knowing sentiment will be reversed in the future (Baker and Wurgler 2007), managers should strategically reduce RAM when the current investor sentiment is high, so that the future operating performance will not be hurt. This is because, in the future, sentiment will be reversed to a low level, and CEO dismissal will be highly sensitive to performance (sentiment is negatively related to TPS as shown in Table 8 Panel A) and managers would rather not have poor operating performance in the future.

Empirically, we test whether sentiment affects ROA for the subsamples of high and low RAM separately. We use the *ROA* at year *t*+ 1 to *t*+ 3 to measure firm's operating performance. The results are reported in Table 8 Panel B. In Columns (1)–(6) we divide the sample based on the median of *RAM1*, while in Columns (7)–(12) the division is based on *RAM2*. Consistent with our conjecture, we find that the coefficients of *SENTIMENT* are all positive and significant (except Column (11)). We find that sentiment indeed improves the firm's operating performance. In addition, the effect of sentiment is stronger in the subsample of low RAM, which provides stronger incentive for managers to engage in low RAM when sentiment is high.

Take the effect of investor sentiment on TPS and operating performance per se, we provide evidence that sentiment reduces manager's incentives to manipulate real activities due to job security.

Table 8. Investor sentiment, operating performance and economic consequences.

Dependent Var	FORCETURN	FORCETURN
Partitioning Var	(1) High Sentiment	(2) Low Sentiment
ROA Difference	Coefficients Difference=0.010** P value=0.012	
ROA	-0.003	-0.013***
	(-1.28)	(-3.49)
SIZE	0.002***	0.006***
	(3.45)	(7.10)
BIGN	0.003	0.001
	(1.13)	(0.47)
MTB	-0.000**	-0.000*
	(-2.03)	(-1.93)
TANGIBLE	-0.004	-0.005
	(-0.55)	(-0.65)
LEV	0.0123*	0.0218***
	(1.83)	(2.93)
SENTIMENT	-0.004**	-0.000
	(-2.53)	(-0.95)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	12,859	12,304
Adj R^2	0.032	0.027

This panel presents the results of OLS regression results of investor sentiment, operating performance and forced CEO turnover based on Eq. (7). In Column (1) and (2), the dependent variable is the indicator for forced CEO turnover (Jenter and Kanaan, 2015). Samples are divided into *High Sentiment* subsample and *Low Sentiment* subsample according to the median level. Both industry and year fixed effects are included. Variable definitions are given in the Appendix. Standard errors are clustered by the firm level. ***, **, and * indicate two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

Investor Sentiment, Operating Performance and Economic Consequences Panel B: Future Operating Performance

Time of ROA	T+1 (1)	T+1 (2)	T+2 (3)	T+2 (4)	T+3 (5)	T+3 (6)	T+1 (7)	T+1 (8)	T+2 (9)	T+2 (10)	T+3 (11)	T+3 (12)
Partitioning Vars	High *RAM1*	Low *RAM1*	High *RAM1*	Low *RAM1*	High *RAM1*	Low *RAM1*	High *RAM2*	Low *RAM2*	High *RAM2*	Low *RAM2*	High *RAM2*	Low *RAM2*
SENTIMENT	0.006***	0.009***	0.003*	0.010***	0.002	0.004**	0.006***	0.010***	0.003*	0.010***	0.002	0.004***
	(3.91)	(4.14)	(1.84)	(2.93)	(1.51)	(2.30)	(3.22)	(4.34)	(1.78)	(3.02)	(1.48)	(2.69)
SIZE	0.011***	0.011***	0.012***	0.010***	0.012***	0.011***	0.012***	0.010***	0.011***	0.011***	0.012***	0.011***
	(4.30)	(4.85)	(5.26)	(4.77)	(5.35)	(6.86)	(4.22)	(5.34)	(4.86)	(5.39)	(5.65)	(6.94)
BIG4	0.010	0.011	0.013	0.009	0.014	0.021**	0.013	0.007	0.016*	0.006	0.013	0.019**
	(1.30)	(1.45)	(1.44)	(1.07)	(1.35)	(2.39)	(1.55)	(1.00)	(1.74)	(0.70)	(1.34)	(2.29)
ROA	0.752***	0.778***	0.568***	0.642***	0.530***	0.444***	0.757***	0.780***	0.613***	0.597***	0.492***	0.460***

(*Continued*)

Table 8. (Continued).

Investor Sentiment, Operating Performance and Economic Consequences Panel B: Future Operating Performance												
Time of ROA	T+1 (1)	T+1 (2)	T+2 (3)	T+2 (4)	T+3 (5)	T+3 (6)	T+1 (7)	T+1 (8)	T+2 (9)	T+2 (10)	T+3 (11)	T+3 (12)
Partitioning Vars	High *RAM1*	Low *RAM1*	High *RAM1*	Low *RAM1*	High *RAM1*	Low *RAM1*	High *RAM2*	Low *RAM2*	High *RAM2*	Low *RAM2*	High *RAM2*	Low *RAM2*
	(12.40)	(15.73)	(8.16)	(9.90)	(6.75)	(10.66)	(12.37)	(16.86)	(9.33)	(8.48)	(7.76)	(8.81)
MTB	-0.001	-0.001*	-0.002**	-0.001*	-0.002***	-0.002**	-0.001	-0.001**	-0.001*	-0.002**	-0.002***	-0.001**
	(-1.43)	(-1.81)	(-2.20)	(-1.76)	(-2.78)	(-2.02)	(-1.12)	(-2.28)	(-1.87)	(-2.06)	(-2.64)	(-2.12)
TANGIBLE	0.049***	0.030	0.072***	0.061***	0.094***	0.050***	0.036*	0.052***	0.079***	0.049***	0.099***	0.050***
	(3.27)	(1.61)	(4.37)	(3.92)	(5.66)	(2.78)	(1.94)	(3.74)	(4.91)	(3.49)	(5.93)	(2.93)
LEV	0.078***	0.063***	0.121***	0.117***	0.125***	0.093***	0.086***	0.056***	0.127***	0.110***	0.133***	0.089***
	(5.87)	(4.13)	(8.33)	(8.13)	(8.68)	(6.87)	(5.65)	(4.23)	(8.39)	(7.96)	(9.24)	(6.70)
MKTSHARE	-0.023	0.007	0.005	0.015*	0.006	0.018*	-0.013	-0.004	0.014	0.006	0.017	0.009
	(-1.61)	(1.08)	(0.49)	(1.71)	(0.51)	(1.95)	(-0.96)	(-0.52)	(1.36)	(0.74)	(1.53)	(1.06)
ZSCORE	0.004	0.004**	0.007**	0.005*	0.005	0.006***	0.005*	0.003*	0.005*	0.008**	0.005	0.007***
	(1.51)	(2.35)	(2.27)	(1.67)	(1.07)	(3.53)	(1.81)	(1.73)	(1.93)	(2.16)	(1.37)	(3.37)
IO	0.005	0.007	0.006	0.005	0.010	0.021**	0.005	0.008	0.007	0.005	0.016	0.016
	(0.50)	(0.71)	(0.54)	(0.44)	(0.75)	(2.15)	(0.45)	(0.77)	(0.63)	(0.36)	(1.35)	(1.54)
NOA	-0.024***	-0.022***	-0.018***	-0.019***	-0.021***	-0.021***	-0.025***	-0.021***	-0.022***	-0.017***	-0.025***	-0.017***
	(-4.06)	(-4.38)	(-3.10)	(-3.55)	(-3.49)	(-4.04)	(-4.06)	(-4.78)	(-3.74)	(-3.27)	(-4.31)	(-3.71)
CYCLE	0.000***	0.000*	0.000***	0.000	0.000***	0.000*	0.000***	0.000**	0.000***	0.000*	0.000***	0.000*
	(3.91)	(1.90)	(2.92)	(1.64)	(3.44)	(1.95)	(3.46)	(2.57)	(2.81)	(1.73)	(3.84)	(1.88)
Constant	-0.106***	-0.111***	-0.134***	-0.117***	-0.133***	-0.119***	-0.117***	-0.106***	-0.133***	-0.113***	-0.137***	-0.115***
	(-7.01)	(-9.11)	(-9.32)	(-9.54)	(-10.81)	(-11.03)	(-6.77)	(-10.49)	(-8.73)	(-9.82)	(-11.44)	(-11.00)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26,741	26,752	22,778	22,784	19,756	19,728	26,744	26,757	22,610	22,958	19,519	19,970
Adj R^2	0.406	0.367	0.295	0.281	0.267	0.272	0.389	0.366	0.309	0.260	0.289	0.237

This panel presents the results of OLS regression results of investor sentiment and future operating performance. Samples are divided into *High RAM* subsample and *Low RAM* subsample according to the median level of *RAM1* and *RAM2*, respectively. Both industry and year fixed effects are included. Variable definitions are given in the Appendix. Standard errors are clustered by the firm level. ***, **, and * indicate two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

6. Conclusions

Though a large body of literature has examined the determinants and consequences of RAM (Gunny 2010; Cohen and Zarowin 2008, 2010; Kim and Sohm 2013; Chan et al. 2015; Kothari, Mizik, and Roychowdhury 2015; Cheng, Lee, and Shevlin 2016), to our best knowledge, no prior study has tested whether and how investor sentiment affects RAM. Prior RAM studies have a presumption that investors, managers, and other stakeholders are rational, ignoring the potential behavioral bias among them (Baker, Ruback, and Wurgler 2007). Recent studies challenge this presumption and document that behavioral bias, specifically investor sentiment in this study, can be contagious among investors, managers and other stakeholders (Baker and Wurgler 2012; Ma et al. 2017). Our study fills this gap in the literature by establishing a bright side of investor sentiment, i.e. curbing managers' RAM. We also explicitly examine the channel that sentiment reduces RAM through deteriorating future job security.

We argue that high sentiment force managers to reduce RAM and reserve earnings for future sentiment reversals (Graham, Harvey, and Rajgopal 2005; Baker and Wurgler 2007; Cohen and Zarowin 2010). We term this the *curbing hypothesis*. However, the *catering hypothesis* suggests that managers have incentives to package earnings to obtain better pay-off in high sentiment periods (Brown and Cliff 2005; Baker and Wurgler 2006; Seybert and Yang 2012; Kothari, Mizik, and Roychowdhury 2015).

Using a large sample of U.S. public firms over the 17-year period from 1999 to 2015, we find that high investor sentiment reduces a firm's real activities manipulations, in line with the bright side *curbing hypothesis*. The results are robust to several sensitivity checks, including firm-fixed effects, alternative firm-level, and market-level sentiment measures as well as alternative RAM measures. In additional channel analyses, we find that managers' job security is the channel through which high sentiment mitigates RAM. We further find that the effect of sentiment is more pronounced in low leverage, high growth opportunity, low institutional ownership, low blockholder, and non-entrench CEO subsamples.

In conclusion, high investor sentiment reduces RAM at the firm level through threatening managers' job security. Given the scarcity of evidence on the contagious irrational behaviors among managers and shareholders, we recommend further research on the effects of sentiment on other managers' discretionary choices, such as investment choices and tax planning.

Notes

1. As a notable example, overproduction generates excessive inventories in the current period. These inventories have to be sold in the future and incur huge inventory holding costs in the long run.
2. Gunny (2010), Di Meo, Garcia Lara, and Surroca (2017) and Lail and Martin (2017) document that RAM leads to higher future firm performance for a subsample of firms that just beat earnings benchmarks or are associated with entrenched CEOs, but overall, the average effect of RAM on future firm performance is still negative. In the cross-sectional analyses, we find that the curbing effect of sentiment is only significant for firms without entrenched CEOs, consistent with the information interpretation of Di Meo, Garcia Lara, and Surroca (2017) and Lail and Martin (2017).
3. We explicitly test this conjecture in the empirical tests.
4. AM is undertaken by the manipulation of accruals with no direct effects on cash flows (Healy and Wahlen 1999). RAM is undertaken by the deviations from normal business practices, such as offering price discounts to increase earnings, engaging in overproductions to lower COGs, and reducing discretionary expenses to improve earnings margins, with direct effects on cash flows and long-term firm values (Roychowdhury 2006).
5. The measure is discussed in detail in Section 3.3.
6. Consistent with the information interpretation of Di Meo, Garcia Lara, and Surroca (2017) and Lail and Martin (2017), we find that the curbing effect of sentiment is only significant for firms without entrenched CEOs.
7. Following Roychowdhury (2006), we set advertising and R&D to zero if missing, as long as SG&A is available.
8. Comprehensive measures of RAM (*RAM1* and *RAM2*) are broadly used in other studies, such as Cohen, Dey, and Lys (2008), Ge and Kim (2014), Kothari, Mizik, and Roychowdhury (2015), and Cheng, Lee, and Shevlin (2016).
9. The details of the technology are not disclosed by RavenPack due to its proprietary nature.
10. We obtain institutional holding data from the Thomson Reuters Ownership Database.

11. We hesitate to use *RESIQ* as our primary measure of investor sentiment, as it suffers from higher measurement errors than the emotion words/phrases-based CSS.
12. We do not rely on the market-level investor sentiment as our main test variable, as it has no cross-sectional variation.
13. We thank Dirk Jenter and Fadi Kanaan for sharing the data of forced CEO turnover. Following Jenter and Kanaan (2015), CEO turnovers are classified as 'forced' by searching the Factiva news database. In our sample, 1.64% of the turnovers are classified as 'forced'.
14. Note that we cannot conduct a direct test with TPS as dependent variable and *SENTIMENT* as independent variable, as it is infeasible to estimate a unique coefficient of *ROA* for each firm-year observation.

Acknowledgments

We appreciate helpful comments of Wen He, Chao Kevin Li, Liuchuang Li, Baolei Qi, Zheng Qiao, Xiao'ou Yu and seminar participants at Xiamen University and Xi'an Jiaotong University. Part of the work was completed when Chongwu Xia was at Singapore Management University. Yi appreciates the financial support from the National Natural Science Foundation of China (Grant Number: 71502134, 71672141, 71602160, 71802171). Errors and omissions are our responsibility.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the National Natural Science Foundation of China [71502134, 71672141, 71602160, 71802171].

References

Ali, A., and U. Gurun. 2009. "Investor Sentiment, Accruals Anomaly and Accruals Management." *Journal of Accounting, Auditing and Finance* 24: 415–431. doi:10.1177/0148558X0902400305.

Altman, E. I. 1968. "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy." *The Journal of Finance* 23: 589–609. doi:10.1111/j.1540-6261.1968.tb00843.x.

Athanasakou, V., N. C. Strong, and M. Walker. 2011. "The Market Reward for Achieving Analyst Earnings Expectations: Does Managing Expectations or Earnings Matter?" *Journal of Business Finance & Accounting* 38: 58–94. doi:10.1111/j.1468-5957.2010.02219.x.

Baker, M., R. S. Ruback, and J. Wurgler. 2007. "Behavioral Corporate Finance: A Survey." In *Handbook of Corporate Finance: Empirical Corporate Finance*. NL: Elsevier/North Holland.

Baker, M., and J. Wurgler. 2002. "Market Timing and Capital Structure." *Journal of Finance* 57: 1–32. doi:10.1111/1540-6261.00414.

Baker, M., and J. Wurgler. 2006. "Investor Sentiment and the Cross-section of Stock Returns." *Journal of Finance* 61: 1645–1680. doi:10.1111/j.1540-6261.2006.00885.x.

Baker, M., and J. Wurgler. 2007. "Investor Sentiment in the Stock Market." *Journal of Economic Perspectives* 21: 129–151. doi:10.1257/jep.21.2.129.

Baker, M., and J. Wurgler. 2012. "Behavioral Corporate Finance: A Current Survey." In *Handbook of the Economics of Finance: Volume 2*. NL: Elsevier.

Barberis, N., S. Shleifer, and R. Vishny. 1998. "A Model of Investor Sentiment." *Journal of Financial Economics* 49: 307–343. doi:10.1016/S0304-405X(98)00027-0.

Barton, J., and P. J. Simko. 2002. "The Balance Sheet as an Earnings Management Constraint." *The Accounting Review* 77: 1–27. doi:10.2308/accr.2002.77.s-1.1.

Bergman, N., and S. Roychowdhury. 2008. "Investor Sentiment and Corporate Disclosure." *Journal of Accounting Research* 46: 1057–1083.

Brown, G. W., and M. T. Cliff. 2005. "Investor Sentiment and Asset Valuation." *Journal of Business* 78: 405–440. doi:10.1086/427633.

Brown, N., T. Christensen, W. Elliot, and R. Mergenthaler. 2012. "Investor Sentiment and Pro Forma Earnings Disclosures." *Journal of Accounting Research* 50: 1–50. doi:10.1111/j.1475-679X.2011.00427.x.

Bushee, B. 1998. "The Influence of Institutional Investors on Myopic R&D Investment Behavior." *The Accounting Review* 73 (3): 305–333.
Caballero, R., E. Farhi, and M. Hammour. 2006. "Speculative Growth: Hints from the U.S. Economy." *American Economic Review* 96: 1159–1192. doi:10.1257/aer.96.4.1159.
Cao, Z., and G. S. Narayanamoorthy. 2011. "The Effect of Litigation Risk on Management Earnings Forecasts." *Contemporary Accounting Research* 28: 125–173. doi:10.1111/care.2011.28.issue-1.
Chan, L. H., K. Chen, T. Y. Chen, and Y. X. Yu. 2015. "Substitution between Real and Accruals-based Earnings Management after Voluntary Adoption of Compensation Clawback Provisions." *The Accounting Review* 90: 147–174. doi:10.2308/accr-50862.
Cheng, Q., J. Lee, and T. J. Shevlin. 2016. "Internal Governance and Real Earnings Management." *The Accounting Review* 91: 1051–1085. doi:10.2308/accr-51275.
Chi, W., L. L. Lisic, and M. Pevzner. 2011. "Is Enhanced Audit Quality Associated with Greater Real Earnings Management?" *Accounting Horizons* 25: 315–335. doi:10.2308/acch-10025.
Cohen, D. A., A. Dey, and T. Z. Lys. 2008. "Real and Accrual-based Earnings Management in the Pre- and Post-Sarbanes-Oxley Periods." *The Accounting Review* 83: 757–787. doi:10.2308/accr.2008.83.3.757.
Cohen, D. A., and P. Zarowin. 2008. "Economic Consequences of Real and Accrual-based Earnings Management Activities." *The Accounting Review* 83: 758–787. doi:10.2308/accr.2008.83.3.757.
Cohen, D. A., and P. Zarowin. 2010. "Accrual-based and Real Earnings Management Activities around Seasoned Equity Offerings." *Journal of Accounting and Economics* 50: 2–19. doi:10.1016/j.jacceco.2010.01.002.
Coughlan, A., and R. Schmidt. 1985. "Executive Compensation, Management Turnover, and Firm Performance: An Empirical Investigation." *Journal of Accounting and Economics* 7: 43–66. doi:10.1016/0165-4101(85)90027-8.
Dang, T. L., F. Moshirian, and B. Zhang. 2015. "Commonality in News around the World." *Journal of Financial Economics* 116: 82–110. doi:10.1016/j.jfineco.2014.11.007.
Dang, T. V., and Z. Xu. 2018. "Market Sentiment and Innovation Activities." *Journal of Financial and Quantitative Analysis* 53: 1135–1161. doi:10.1017/S0022109018000078.
Daniel, K., D. Hirshleifer, and A. Subrahmanyam. 1998. "Investor Psychology and Security Market Under- and Overreactions." *Journal of Finance* 53: 1839–1885. doi:10.1111/0022-1082.00077.
Dechow, P. M., and D. J. Skinner. 2000. "Earnings Management: Reconciling the Views of Accounting Academics, Practitioners, and Regulators." *Accounting Horizons* 14: 235–250. doi:10.2308/acch.2000.14.2.235.
DeFond, M., and J. Zhang. 2014. "A Review of Archival Auditing Research." *Journal of Accounting and Economics* 58: 275–326. doi:10.1016/j.jacceco.2014.09.002.
Di Meo, F., J. M. Garcia Lara, and J. A. Surroca. 2017. "Managerial Entrenchment and Earnings Management." *Journal of Accounting and Public Policy* 36: 399–414. doi:10.1016/j.jaccpubpol.2017.07.003.
Doukakis, L. C. 2014. "The Effect of Mandatory IFRS Adoption on Real and Accrual-based Earnings Management Activities." *Journal of Accounting and Public Policy* 33: 551–572. doi:10.1016/j.jaccpubpol.2014.08.006.
Farrell, K. A., and D. A. Whidbee. 2003. "Impact of Firm Performance Expectations on CEO Turnover and Replacement Decisions." *Journal of Accounting and Economics* 36: 165–196. doi:10.1016/j.jacceco.2003.09.001.
Gao, H., J. Harford, and K. Li. 2012. "CEO Pay Cuts and Forced Turnover: Their Causes and Consequences." *Journal of Corporate Finance* 18: 291–310. doi:10.1016/j.jcorpfin.2012.01.001.
Ge, W., and J. B. Kim. 2014. "Real Earnings Management and the Cost of New Corporate Bonds." *Journal of Business Research* 67: 641–647. doi:10.1016/j.jbusres.2013.01.021.
Gilchrist, S., C. Himmelberg, and G. Huberman. 2005. "Do Stock Price Bubbles Influence Corporate Investment?" *Journal of Monetary Economics* 52: 805–827. doi:10.1016/j.jmoneco.2005.03.003.
Gow, I. D., G. Ormazabal, and D. J. Taylor. 2010. "Correcting for Cross-sectional and Time-series Dependence in Accounting Research." *The Accounting Review* 85: 483–512. doi:10.2308/accr.2010.85.2.483.
Goyal, V. K., and T. Yamada. 2004. "Asset Price Shocks, Financial Constraints, and Investment: Evidence from Japan." *Journal of Business* 77: 175–199. doi:10.1086/379866.
Graham, J. R., C. R. Harvey, and S. Rajgopal. 2005. "The Economic Implications of Corporate Financial Reporting." *Journal of Accounting and Economics* 40: 3–73. doi:10.1016/j.jacceco.2005.01.002.
Gunny, K. A. 2010. "The Relation between Earnings Management Using Real Activities Manipulation and Future Performance: Evidence from Meeting Earnings Benchmarks." *Contemporary Accounting Research* 27: 855–888. doi:10.1111/j.1911-3846.2010.01029.x.
Healy, P. M., and J. M. Wahlen. 1999. "A Review of the Earnings Management Literature and Its Implications for Standard Setting." *Accounting Horizons* 13: 365–383. doi:10.2308/acch.1999.13.4.365.
Hribar, P., and J. McInnis. 2012. "Investor Sentiment and Analysts' Earnings Forecast Errors." *Management Science* 58: 293–307. doi:10.1287/mnsc.1110.1356.
Huson, M. R., R. Parrino, and L. T. Starks. 2001. "Internal Monitoring Mechanisms and CEO Turnover: A Long-Term Perspective." *Journal of Finance* 56: 2265–2297. doi:10.1111/0022-1082.00405.
Irani, R. M., and D. Oesch. 2016. "Analyst Coverage and Real Earnings Management: Quasi-experimental Evidence." *Journal of Financial and Quantitative Analysis* 51: 589–627. doi:10.1017/S0022109016000156.

Jenter, D., and F. Kanaan. 2015. "CEO Turnover and Relative Performance Evaluation." *Journal of Finance* 70: 2155–2184. doi:10.1111/jofi.12282.
Jermann, U., and V. Quadrini. 2007. "Stock Market Boom and the Productivity Gains of the 1990s." *Journal of Monetary Economics* 54: 413–432. doi:10.1016/j.jmoneco.2005.10.021.
Jones, J. J. 1991. "Earnings Management During Import Relief Investigations." *Journal of Accounting Research* 29: 193–228. doi:10.2307/2491047.
Kim, J. B., and B. C. Sohn. 2013. "Real Earnings Management and Cost of Capital." *Journal of Accounting and Public Policy* 32: 518–543. doi:10.1016/j.jaccpubpol.2013.08.002.
Koh, P. S., C. Qian., and H. Wang. 2014. "Firm Litigation Risk and the Insurance Value of Corporate Social Performance." *Strategic Management Journal* 35: 1464–1482. doi:10.1002/smj.2171.
Kolasinski, A. C., A. V. Reed, and M. C. Ringgenberg. 2013. "A Multiple Lender Approach to Understanding Supply and Search in the Equity Lending Market." *Journal of Finance* 68: 559–595. doi:10.1111/jofi.12007.
Kothari, S. P., N. Mizik, and S. Roychowdhury. 2015. "Managing for the Moment: The Role of Earnings Management via Real Activities versus Accruals in SEO Valuation." *The Accounting Review* 91: 559–586. doi:10.2308/accr-51153.
Lail, B. E., and G. W. Martin. 2017. "Are Entrenched Managers' Accounting Choices More Predictive of Future Cash Flow?" *Journal of Business Finance & Accounting* 44: 593–610. doi:10.1111/jbfa.12247.
Laux, V., and P. C. Stocken. 2012. "Managerial Reporting, Overoptimism, and Litigation Risk." *Journal of Accounting and Economics* 53: 577–591. doi:10.1016/j.jacceco.2012.02.001.
Lo, K. 2007. "Earnings Management and Earnings Quality." *Journal of Accounting and Economics* 45: 350–357. doi:10.1016/j.jacceco.2007.08.002.
Ma, Z., L. Wu, J. Zhang, and K. Zhou. 2017. "Sentiment and Audit Quality." Working Paper. University of Texas at Dallas.
Morck, R., A. Shleifer, and R. W. Vishny. 1990. "The Stock Market and Investment: Is the Market a Sideshow?" *Brookings Papers on Economic Activity* 2: 157–215. doi:10.2307/2534506.
Olivier, J. 2000. "Growth-enhancing Bubbles." *International Economic Review* 41: 133–151. doi:10.1111/1468-2354.00058.
Parrino, R. 1997. "CEO Turnover and outside Succession: A Cross-Sectional Analysis." *Journal of Financial Economics* 46: 165–197. doi:10.1016/S0304-405X(97)00028-7.
Peters, F., and A. Wagner. 2014. "The Executive Turnover Risk Premium." *Journal of Finance* 69: 1529–1563. doi:10.1111/jofi.12166.
Petersen, M. A. 2009. "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches." *The Review of Financial Studies* 22: 435–480. doi:10.1093/rfs/hhn053.
Polk, C., and P. Sapienza. 2009. "The Stock Market and Corporate Investment: A Test of Catering Theory." *The Review of Financial Studies* 22: 187–217. doi:10.1093/rfs/hhn030.
Roychowdhury, S. 2006. "Earnings Management through Real Activities Manipulation." *Journal of Accounting and Economics* 42: 335–370. doi:10.1016/j.jacceco.2006.01.002.
Seybert, N., and H. I. Yang. 2012. "The Party's Over: The Role of Earnings Guidance in Resolving Sentiment-driven Overvaluation." *Management Science* 58: 308–319. doi:10.1287/mnsc.1110.1386.
Shroff, N., A. X. Sun, H. D. White, and W. Zhang. 2013. "Voluntary Disclosure and Information Asymmetry: Evidence from the 2005 Securities Offering Reform." *Journal of Accounting Research* 51: 1299–1345. doi:10.1111/joar.2013.51.issue-5.
Simpson, A. 2013. "Does Investor Sentiment Affect Earnings Management?" *Journal of Business Finance and Accounting* 40: 869–900. doi:10.1111/jbfa.12038.
Skinner, D. J., and R. G. Sloan. 2002. "Earnings Surprises, Growth Expectations, and Stock Returns or Don't Let an Earnings Torpedo Sink Your Portfolio." *Review of Accounting Studies* 7 (2–3): 289–312. doi:10.1023/A:1020294523516.
Sohn, B. C. 2016. "The Effect of Accounting Comparability on the Accrual-based and Real Earnings Management." *Journal of Accounting and Public Policy* 35: 513–539. doi:10.1016/j.jaccpubpol.2016.06.003.
Vorst, P. 2016. "Real Earnings Management and Long-term Operating Performance: The Role of Reversals in Discretionary Investment Cuts." *The Accounting Review* 91: 1219–1256. doi:10.2308/accr-51281.
Walther, B. R., and R. H. Willis. 2013. "Does Investor Sentiment Affect Sell-side Analysts' Forecast Accuracy?" *Review of Accounting Studies* 18: 207–227. doi:10.1007/s11142-012-9204-9.
Warner, J. B., R. L. Watts, and K. H. Wruck. 1988. "Stock Prices and Top Management Changes." *Journal of Financial Economics* 20: 461–492. doi:10.1016/0304-405X(88)90054-2.
You, J., B. Zhang, and L. Zhang. 2017. "Who Captures the Power of the Pen?" *Review of Financial Studies* 31: 43–96. doi:10.1093/rfs/hhx055.
Zang, A. 2012. "Evidence on the Trade-off between Real Activities Manipulation and Accrual-based Earnings Management." *The Accounting Review* 87: 675–703. doi:10.2308/accr-10196.

Appendix Variable Definitions

Vars	Definitions
Panel A: Dependent Variable	
AB_CFO	Abnormal cash flow from operations, defined following Roychowdhury (2006) and Cohen and Zarowin (2010). See more details in Section 3.2.
AB_EXP	Abnormal discretionary expenses, defined following Roychowdhury (2006) and Cohen and Zarowin (2010). See more details in Section 3.2.
AB_PROD	Abnormal production cost, defined following Roychowdhury (2006) and Cohen and Zarowin (2010). See more details in Section 3.2.
RAM1	A comprehensive measure of real activities manipulation, defined as negative abnormal discretionary expenses plus abnormal production costs, following Cohen and Zarowin (2010) and Cheng, Lee, and Shevlin (2016). See more details in Section 3.2.
RAM2	A comprehensive measure of real activities manipulation, defined as negative abnormal discretionary expenses plus negative abnormal cash flows from operations, following Cohen and Zarowin (2010) and Cheng, Lee, and Shevlin (2016). See more details in Section 3.2.
FORCETURN	Forced CEO turnover, an indicator that equals to one if there is forced CEO turnover and zero otherwise. Following Jenter and Kanaan (2015), CEO turnovers are classified as "forced" by searching the Factiva news database.
Panel B: Independent Variable	
SENTIMENT	Firm level investor sentiment measure, defined as the average of monthly composite sentiment index obtained from RavenPack Database. See more details in Section 3.3.
RESIQ	Firm level investor sentiment measure (residual of Tobin Q), defined as the residual from regressing each firm's Tobin's Q on the return of equity, financial leverage and operating sales growth (Morck, Shleifer, and Vishny 1990; Goyal and Yamada 2004).
BWMAR	Baker and Wurgler's market level investor sentiment measure (Baker and Wurgler 2006), obtained from Professor Wurgler's website (http://people.stern.nyu.edu/jwurgler/)
ABACC	Absolute value of discretionary accruals, estimated following Jones (1991).
SIZE	Firm size, defined as the natural logarithm of market value. Market value iscomputed as the year-end stock price multiplied by shares outstanding.
BIG4	BIG4 audit firm indicator, equals to one if the audit firm is one of the big 4 audit firms (PwC, DTT, KPMG and EY), and zero otherwise.
ROA	Return on assets, defined as the earnings before interest and tax scaled by total assets.
MTB	Market to book ratio, defined as the market value of equity divided by book value of equity.
TANGIBLE	Tangible assets, defined as the property, plant and equipment scaled by total assets.
LEV	Financial leverage, defined as the book value of total debt scaled by total assets.
MKTSHARE	Market share, defined as the fraction of company's sales to the total sales of its industry at the beginning of year *t*.
ZSCORE	Financial health measure Z score, following Altman (1968).
IO	Institutional ownership, defined as the fraction of shares owned by institutional investors at the beginning of year *t*.
SOX	SOX (Sarbanes-Oxley Act) indicator, defined as equals to one if fiscal year is after 2003, and zero otherwise
NOA	Net operating assets indicator, defined as equals to one if the net operating assets (i.e. shareholders' equity less cash and marketable securities and plus total debt) divided by lagged sales is above the median of the corresponding industry-year, and zero otherwise.
CYCLE	Length of operating cycles, defined as days receivable plus the days inventory less the days payable at the beginning of the year.
RET	Annual compounded monthly stock returns over the fiscal year.
VOLATILITY	Stock return volatility, defined as the standard deviation of daily stock return over the year.
TURNOVER	Stock turnover, defined as the average value of monthly stock turnover.
BLOWN	Block ownership, defined as the percentage of shares owned by blockholders. An institutional investor is defined as a blockholder if it owns more than 5% of the shares.
TREATED	Treated indicator, defined as equals to one for high sentiment group, and zero otherwise.