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Optimistic Disclosure Tone and Conservative Debt Policy

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Abstract

We examine the relationship between managerial optimism and debt conservatism (i.e. the low-leverage puzzle). Our analysis demonstrates that optimistic tone, our time-varying optimism measure, significantly decreases leverage. This evidence supports the proposition that optimistic managers who consider external financing as unduly costly use debt conservatively. This reduced reliance on external financing can be explained by our further evidence that optimistic tone significantly increases cash holdings and decreases dividend payment. The negative tone-leverage relation is stronger in the presence of high insider purchase of own stocks which confirms that optimistic tone reflects managerial optimism. This study suggests that managerial optimism can help explain the low-leverage puzzle.

Keywords: managerial optimism, debt conservatism, cash, dividend, tone analysis, insider trading.

JEL classification: G30, G32, G02

1. Introduction

Since the seminal work of Modigliani and Miller, many studies have built upon the trade-off theory and the pecking order theory to examine the effects of various firm and industry characteristics on firm capital structure (see e.g., Frank and Goyal, 2009). Recent literature highlights the significance of managers' personality traits in determining capital structure (see e.g., Malmendier et al., 2011), which we build on. However, an unresolved puzzle in the literature is that many companies have low leverage and in particular that debt levels are often lower than the optimal level (see Graham, 2000). A growing literature suggests that managerial biases (e.g. overconfidence) play a significant role in explaining corporate policies.¹ Our paper primarily contributes to the literature by demonstrating that time-varying managerial optimism², a well-documented bias in social psychology (e.g., Weinstein, 1980) and often considered as a particular form of overconfidence (Moore and Healy, 2008)³, can help explain this low-leverage puzzle. Specifically, we provide evidence that time-varying managerial optimism, associated with the overestimation of firm actual performance, is

¹ Prior literature suggests that managerial overconfidence, broadly speaking, is relevant to a wide range of finance and accounting issues including firm investment (Malmendier and Tate, 2005; Goel and Thakor, 2008), acquisitions (Malmendier and Tate, 2008); innovation (Hirshleifer, Low and Teoh, 2012), managerial turnover (Campbell et al., 2011), managerial earnings forecasts (Hilary and Hsu, 2011; Libby and Rennekamp, 2012; Hribar and Yang, 2016), accounting fraud (Schrand and Zechman, 2012), and fund manager performance (Eshraghi and Taffler, 2012), among others. Similar to these studies, we investigate what happens inside the firm when managers are rational except for how they perceive the firm performance.

² In this paper, we study the effect of optimism, one of the most widely studied forms of overconfidence in psychology. According to Moore and Healy (2008), there are three major forms of overconfidence, namely (1) overestimation of one's actual performance, or chance of success, (2) excessive precision in one's belief (i.e. miscalibration), and (3) overplacement of one's performance relative to others, and around 64% and 31% of the empirical studies focus on the first two forms respectively. We use the term optimism throughout the paper, rather than a broader term overconfidence, because the relevant studies discussed in this paper also largely focus on this particular form of overconfidence.

³ Overconfidence and optimism, although often used interchangeably in the finance and accounting literature, are two related but distinct concepts (Hilary et al., 2016). Hackbarth (2008) defines optimism as the overestimation of earnings growth, while overconfidence is defined as the underestimation of earnings volatility. Optimism can be considered as one form of overconfidence. Malmendier et al. (2011) define the "type of overconfidence" analysed in their paper as "the overestimation of mean future cash flows", and use the term "overconfidence" to refer to this particular managerial bias which is in fact optimism according to Hackbarth (2008); however they also recognize that "a different behavioral bias sometimes referred to as "overconfidence" is the underestimation of variance" (Malmendier et al., 2011, p. 1688). Therefore, we use the term, optimism, when we discuss Malmendier et al.'s (2011) study in this paper.

robustly negatively related to leverage, suggesting that optimistic managers tend to use debt conservatively.

The role of managerial optimism in determining firms' capital structure receives considerable attention in the academic literature (see e.g., Heaton, 2002; Hackbarth, 2008; Malmendier et al., 2011; Graham et al., 2013). Recent theoretical literature, which we discuss briefly in Section 2, suggests that managerial optimism may either increase or decrease leverage. For example, Hackbarth (2008) extends the trade-off theory to show that optimistic managers who overestimate earnings growth use more debt compared to rational managers. In contrast, Malmendier et al. (2011) suggest managerial optimism⁴, which is associated with the overestimation of mean returns to investment or future cash flows, can result in conservative debt usage because optimistic managers overestimate the external financing costs and prefer internal financing. Thus, managerial optimism has the potential to explain the low-leverage puzzle (see e.g., Graham, 2002). Overall, the link between managerial optimism and capital structure is ultimately an empirical matter, which our paper seeks to address (Malmendier et al., 2011).

Empirically, Malmendier et al. (2011) provide evidence on the relation between managerial optimism and leverage. Their empirical analysis is based mainly on a time-invariant option-based optimism measure that captures managers' tendency to hold their in-the-money options too long. To control for firm fixed effects, Malmendier et al. (2011) compare leverage under different CEOs operating the same firm and find that optimistic managers choose higher leverage than their rational predecessors or successors. Graham et al. (2013) examine the relation between the survey-based optimism measures and leverage. They, however, do not control for firm fixed effects.

⁴ As explained in footnote 3, we use the term, optimism, to describe the type of managerial overconfidence analyzed in Malmendier et al. (2011).

The key difference in approach between this study and the above literature is that we use a set of time-varying managerial words-based measures of optimism and control for firm fixed effects. Our emphasis on time-varying measures of optimism is important because the optimism level of corporate managers who take too much credit for good firm performance may increase over time. This phenomenon is called “dynamic over-optimism” meaning that “managers are made (rather than just born) over-optimistic and specifically “managerial over-optimism should increase after a series of successes” (Hilary et al., 2016, p. 47). Seligman (2006, p. 207), the founder of positive psychology who proposes the idea of “learned optimism” in 1990, argues that “pessimists can learn the skills of optimism ... Even optimists can benefit from learning how to change. Almost all optimists have periods of at least mild pessimism”. This suggests that people can learn to become more optimistic, and optimism can be time-varying. Thus, it is important to capture the inter-temporal variations in managerial optimism in order to assess the significance of this important personality trait on capital structure.

Our words-based measures of optimism are constructed using computational content analysis of the tone of UK Chairman’s Statement in the annual report. It is recognized that language may reflect certain psychological biases of the speaker in general (Garrard et al., 2014) and content analysis of corporate disclosures can be conducted to measure management behavioural characteristics in particular (Li, 2010a). Our tone-based measure is based on the idea that optimistic tone may reflect “a manager-specific tendency to be optimistic or pessimistic” (Davis et al., 2015, p. 639). This idea is well supported by the psychology literature that suggests that optimists and pessimists are different in the way they cope with adversity (Scheier et al., 1986; Carver et al., 1989). Specifically, optimism is often associated with certain coping strategies, including the “positive reframing” of coping situations in terms of their most positive aspects (Scheier et al., 1994; Carver and Scheier, 2002). Optimism is

also associated with positive thinking that is the tendency to “see the best in bad situations” and less focus on “the negative aspects of their experience” (Carver and Scheier, 2002, p. 235-236). We thus expect that an optimistic manager tends to use more positive words and fewer negative words. To ensure the validity of our tone measures, we construct composite tone index using principal component analysis, which consists of four individual measures of optimistic tone (see Section 3.1.1).

This study has two major findings. First, optimistic tone is negatively related to leverage, suggesting that managerial optimism can lead to conservative debt policy. This finding is in line with our further evidence that optimistic tone has a positive effect on cash holdings and a negative effect on dividend payment, which can be attributed to optimistic managers’ reluctance to use external financing. This additional evidence suggests that the reason why firms with optimistic managers have lower leverage can be that these firms hold more cash and pay lower dividend and thus rely less on external financing. Our further analysis confirms that the negative tone-leverage relation is not driven by information asymmetry, impression management or financial constraints.

Second, we explore whether managers’ words are consistent with their actions. This helps us to distinguish between the managerial optimism and impression management interpretations of tone.⁵ We find interesting moderating effects of insider (especially CEOs) trading on the relation between optimistic tone and leverage. Our analysis shows that insider purchases enhance the negative tone-leverage relation, which corroborates our argument that optimistic tone reflects managerial optimism. In contrast, insider selling weakens the negative tone-leverage relation. We posit that when insider selling contradicts optimistic tone, it indicates that managers are not as optimistic as their words suggest. In this case, managerial

⁵ Our research design is, to some extent, similar to Rogers, Buskirk and Zechman (2011) who focus on the direct effect of disclosure tone on shareholder litigation and then examine whether insider trading modifies this relationship.

optimistic tone may instead be reflecting managers' intention to manipulate investors' perception of firm performance (i.e. impression management).

This study primarily contributes to the capital structure literature by providing evidence that suggests that optimistic tone is a significant determinant of leverage. Specifically, we provide evidence that time-varying managerial optimism leads to lower leverage, controlling for firm fixed effects. This evidence supports Malmendier et al.'s (2011) proposition that debt conservatism may be caused by managerial optimism, which sheds light on the low-leverage puzzle. In addition, we contribute to the growing literature on managerial optimism by developing a time-varying measure of managerial optimism using computational tone analysis. Using a time-varying measure of optimism makes it easier to control for firm fixed effects, which could impact both managerial optimism and corporate policies. Thus, in turn, it mitigates the potential endogeneity problem that is apparent in time-invariant measures of optimism.

In addition, our study is related to the literature on the interaction between disclosure tone and insider trading. We explore the empirical implications of the inconsistency between managerial words and actions, which helps us to distinguish between the managerial optimism and impression management interpretations of tone.⁶ In a different setting, Rogers, Buskirk and Zechman (2011) examine the interaction between optimistic tone of earnings announcements and insider trading in the context of shareholder litigation. They document that litigation risk is higher when managers use optimistic language and engage in insider selling, because insider selling signals managers' intent to mislead investors using optimistic language. Similar to Rogers, Buskirk and Zechman (2011), we examine when insider trading conflicts with disclosure tone, which we interpret as impression management, then the tone-leverage relationship is weakened. However, when insider trading confirms disclosure tone,

⁶ We thank an anonymous referee for suggesting we consider this issue in more depth.

then the tone-leverage relationship is intensified, consistent with the managerial optimism interpretation. Overall, our study contributes to the literature by suggesting that corporate disclosure tone may reveal managerial optimism which in turn can explain corporate financing decisions.

We proceed as follows. Section 2 reviews alternative explanations of optimistic tone and develops the hypotheses. Section 3 describes our measures of managerial optimism and the sample. Section 4 discusses main results and their alternative interpretations. Section 5 conducts further analysis and robustness checks. Section 6 concludes.

2. Disclosure Tone and Hypotheses

This section first provides a brief overview of various alternative interpretations of corporate disclosure tone and then develops the link between tone and leverage from a managerial optimism perspective. Finally, we show the joint effects of managers' tone and actions (measured by directors' insider trading) on leverage.

2.1 CORPORATE DISCLOSURE TONE - AN OVERVIEW

A growing body of accounting and finance literature examines the tone (i.e. the use of optimistic/pessimistic or positive/negative language) of various corporate disclosures including Managerial Discussion and Analysis (MD&A) (e.g., Li, 2010b; Feldman et al., 2010; Davies and Tama-Sweet, 2012; Huang, Teoh and Zhang, 2014), earnings press releases (e.g., Henry, 2008; Davis, Piger and Sedor, 2012; Huang, Teoh and Zhang, 2014; Henry and Leone, 2016; Hilary et al., 2016), and earnings conference calls (e.g., Price et al., 2012; Larker and Zakolyukina, 2012; Davis et al., 2015; Lee, Hwang and Chen, 2017). Specifically, this line of literature examines whether the tone of various corporate disclosures is associated with, for example, cost of capital, return volatility, and analyst forecasts (Kothari, Li and

Short, 2009), shareholder litigation (Rogers, Buskirk and Zechman, 2011), financial misreporting (Larker and Zakolyukina, 2012), earnings quality (Li, 2010b), and market pricing (e.g., Henry, 2008; Li, 2010b; Feldman et al., 2010; Davis, Piger and Sedor, 2012).⁷

However, the effects of disclosure tone on corporate financial decisions remain a neglected area of research. Although investors may interpret disclosure tone as containing value-relevant soft information, previous studies suggest that disclosure tone might be used to (i) “inform” investors and thus reduce information asymmetry, (ii) “intentionally misinform” investors by managers who want to manipulate investors’ impression, or (iii) “unintentionally misinform” investors by irrational managers whose words and/or actions are likely to be driven by their optimism bias. As shown in Figure 1, disclosure tone is subject to three major alternative interpretations from information asymmetry, impression management and optimism perspectives respectively.⁸

	Inform Investors	Misinform Investors
Intentionally	Reducing information asymmetry	Impression management (“hying”)
Unintentionally		Driven by managerial bias (e.g. optimism)

Figure 1. Alternative interpretations of corporate disclosure tone

2.1.1 Information asymmetry perspective: “*inform investors*”

Positive disclosure tone can be interpreted as “incremental information” (Merkl-Davies and Brennan, 2011), which “informs” investors and therefore reduces information asymmetry

⁷ See table 1 in Li (2010a) and table 3 in Kearney and Liu (2014) for a summary of the studies on various implications of corporate disclosures. More recently, Loughran and McDonald (2016) provide an review of contemporary textual analysis in accounting and finance.

⁸ See Merkl-Davies and Brennan (2011) for a comprehensive review on various explanations of narrative disclosures and a conceptual framework of impression management. They provide four explanations for corporate disclosure, namely incremental information, impression management, hubris and retrospective sense-making.

between managers and investors. This information asymmetry interpretation of tone is based on the assumption that investors are rational and are able to undo reporting bias. Considering that reporting bias will reduce stock price performance and managerial reputation (Baginski et al., 2000), managers therefore have no incentive to engage in biased reporting. Lang and Lundholm (2000) investigate voluntary disclosure activities around equity offerings and their impacts on stock prices. They find that firms with a consistent level of disclosure experience relatively smaller price declines at the announcement date. This is because disclosure reduces information cost associated with equity offering. Furthermore, Kothari, Li and Short (2009) find that positive management disclosure is negatively related to equity cost of capital and return volatility, which supports the view that disclosures can mitigate information asymmetry⁹ (see e.g., Diamond and Verrecchia, 1991; Easley and O'Hara, 2004).

2.1.2 Impression management perspective: “*intentionally misinform investors*”

Disclosure tone can also be regarded as a form of impression management whereby managers attempt to “intentionally misinform” investors or manipulate investors’ perception of firm performance. More specifically, impression management can be caused by agency problems between managers and investors where biased reporting is a strategic choice of self-interested managers to maximize their personal wealth (e.g., Adelberg, 1979; Merkl-Davies and Brennan, 2007). Moreover, impression management may be used as another mechanism (in addition to “reducing information asymmetry”) to reduce the cost of equity, namely “hyping” (Lang and Lundholm, 2000). Empirically, Lang and Lundholm (2000) document that firms with a considerable increase of disclosure in the six months before the equity offering experience price increase prior to the equity offering. However, those firms have much larger

⁹ In particular, positive/favourable disclosures are associated with market makers’ favourable evaluation of firm future value and risk, which in turn reduce the transaction cost of equity (i.e. adverse-selection component of the bid-ask spread).

negative returns at and subsequent to the announcement. This observation is consistent with the proposition that disclosure is used to “hype the stock”.

2.1.3 Managerial optimism: “*unintentionally misinform investors*”

From the behavioural/psychological perspective, optimistic disclosure tone can be a product of managerial optimism/hubris (Merkl-Davies and Brennan, 2011). In this case, irrational managers “unintentionally misinform” investors. However, this behavioural interpretation of tone is largely neglected by existing literature of corporate disclosure (Brennan and Conroy, 2013). Amernic and Craig (2007) emphasize the importance of monitoring excessive narcissist-like language used by narcissist CEOs in their letters to shareholders. Several studies report evidence of cognitive bias detected using manual and computational linguistic analysis of corporate disclosures. For example, Craig and Amernic (2011) detect destructive narcissism of CEOs of Enron, Starbucks and General Motors based on CEO’s letter to shareholders. In a similar vein, Brennan and Conroy (2013) also conduct manual content analysis of narratives in bank CEO letters to shareholders to reveal CEO personality traits (e.g. narcissism, hubris, CEO-attribution). Furthermore, computational content analysis of earnings press releases (Hilary et al., 2016) and CEO tweets and earnings conference calls (Lee, Hwang and Chen, 2017) is employed to measure managerial optimism. Davis et al. (2015) examine the effect of managerial style on the tone of earnings conference calls. This body of recent evidence supports the notion that tone used in corporate disclosures is potentially influenced by unintentional, manager-specific tendencies¹⁰ to be overly optimistic or pessimistic (Davis et al., 2015). From this perspective, optimistic tone can be regarded as a proxy for managerial optimism. Li (2010a, p. 157) suggests that one of the promising areas of corporate disclosures research lies in “measuring management (behavioral) characteristics and

¹⁰ It is considered as managerial bias that is closely related to their personalities, experience and values (Davis, Ge, Matsumoto and Zhang, 2015).

examining their implications for corporate policies”. Our study thus makes an important contribution by examining whether leverage is robustly related to optimistic tone and if this can help explain the low leverage puzzle; this adds considerably to the under-researched behavioural perspective of disclosure tone.

2.2 TESTABLE HYPOTHESES

2.2.1 Standard theories of corporate financing

The trade-off theory (Modigliani and Miller, 1958, 1963) and pecking order theory (Myers and Majluf, 1984) are two predominant theories of financing decisions. The standard trade-off theory suggests that financing decisions are based on the trade-off between tax benefits and bankruptcy costs of debt financing, which implies that there is an optimal leverage where the marginal benefits of debt equal its marginal costs. Pecking order theory posits that there is a preference for internal over external financing and if internal financing is not sufficient debt is preferred to equity. This is because internal financing is subject to zero information cost, while equity is more likely to be undervalued by outside investors and has higher information cost than debt. Much effort has been devoted to run empirical horse races between these two competing theories.

However, these two traditional approaches to capital structure are not particularly useful for understanding some of the important puzzles in the literature. One such puzzle is the low-leverage puzzle, which refers to the stylized fact that firms often maintain relatively low debt levels (see e.g., Graham, 2000; Strebulaev and Yang, 2013). This empirical pattern is puzzling because it contradicts the prediction of the trade-off theory that firms should use more debt to take tax benefits especially when firm’s leverage is below its optimal level. Moreover, from the pecking order perspective, low-leverage firms should use equity even more conservatively. This prediction is however often inconsistent with the empirical

evidence and this theory often fails to account for many important determinants of leverage (Fama and French, 2002; Frank and Goyal, 2003). Thus, Graham (2000) conclude that both theories fail to provide a complete explanation for the low-leverage puzzle.

The limited explanatory power of the standard theories can be partly attributed to a strict assumption that managers are not subject to any behavioural biases. Our subsequent discussion focuses on the role of a well-documented psychological bias, namely managerial optimism, in a firm's financing decision. This important managerial trait is often neglected in the standard capital structure literature. We contribute to the literature by empirically testing two competing hypotheses on the relationship between managerial optimism and leverage, which in turn may help explain debt conservatism. Our main hypotheses are based on behavioural finance models that relate managerial optimism to financing decisions (Heaton, 2002; Hackbarth, 2008; Malmendier et al., 2011).

2.2.2 Optimistic tone and leverage

This section first develops the link between optimistic tone, a proxy for managerial optimism, and firm's leverage, and then discusses the interaction effects between insider trading patterns and optimistic tone. According to recent studies (Rogers et al., 2011; Davis et al., 2015), optimistic tone reflects "a manager-specific tendency to be optimistic or pessimistic" (Davis et al., 2015, p. 639). In other words, as discussed above, optimistic managers may unintentionally misinform investors by using more optimistic words in their corporate disclosure. Consistent with this argument, Hilary et al. (2016) and Lee, Hwang and Chen (2017) conduct tone analysis of managerial statements to gauge optimism of managers. Therefore, we believe that optimistic tone is able to capture a particular trait or biased belief of managers, namely, optimism. Our hypothesis development thus focuses on the role of this particular characteristic of managers (not of firms or markets).

We first discuss the effects of managerial optimism on leverage. On one hand, as pointed out by Malmendier et al. (2011), managerial optimism can lead to higher leverage. This is because managerial optimism may enhance the preference for debt over equity financing. Put differently, optimistic managers, who overestimate the mean returns to investment, tend to issue equity even more conservatively than debt. Similarly, an earlier model by Heaton (2002) also suggests that optimistic managers, who overestimate the probability of good firm performance, believe that equity is undervalued by outside investors and therefore prefer debt to equity. Furthermore, from the trade-off perspective, optimistic managers, who overestimate the earnings growth, will underestimate financial distress costs associated with debt and hence tend to use more debt than their rational counterparts (Hackbarth, 2008). From these perspectives, managerial optimism could be positively related to leverage and we have the following hypothesis:

Hypothesis 1a: Optimistic tone is positively related to leverage.

In contrast, based on the model by Malmendier et al. (2011), managerial optimism may lead to lower level of debt (i.e. debt conservatism) if the firm has sufficient internal finance (i.e. retained earnings), which is particularly true because optimistic managers may retain cash for future investment.¹¹ Huang-Meier et al. (2016) find that optimistic managers hold more cash than their rational counterparts. Their evidence is consistent with Malmendier et al.'s (2011) argument that optimistic managers are reluctant to use external financing and therefore hold more cash. In brief, managerial optimism could make the firm forgo tax benefits and

¹¹ Another explanation for the negative overconfidence-leverage relation is related to “perceived financing costs”. More specifically, overconfident managers tend to overestimate the information costs associated with external financing including both debt and equity. In this case, it is possible that overconfident manager’s perceived financing costs outweigh investment returns (Malmendier et al., 2011). Consequently, if internal financing is not sufficient, overconfident managers are likely to forgo investment opportunities. In brief, managerial overconfidence may lead to underinvestment and lower financing needs.

therefore be underleveraged relative to the optimal target debt ratio. To empirically examine the proposition that managerial optimism may lead to a conservative debt policy, we test the following hypothesis:

Hypothesis 1b: Optimistic tone is negatively related to leverage.

To sum up, the theoretical relation between managerial optimism and leverage can be either positive or negative (Malmendier et al., 2011) and thus the effect of optimism on leverage is an empirical question.

2.2.3 Joint effect of optimistic tone and insider trading on leverage

Tone can be used to either intentionally or unintentionally misinform investors. To empirically distinguish alternative interpretations of tone, we compare managers' personal beliefs about firms' prospects gauged from their action and words respectively. More specifically, we double check managers' optimistic beliefs as indicated by their optimistic tone using their insider trading patterns, which serves as another window into their beliefs. The idea is that insider selling may indicate that optimistic tone is used to "hyping the stock", while insider purchase may indicate that optimistic tone is driven by managerial optimism.

Specifically, to further distinguish whether managerial words are used to "intentionally misinform" and "unintentionally misinform" investors, we investigate the interaction between insider trading and tone. In the context of shareholder litigation, Rogers, Buskirk and Zechman (2011) find that litigation risk is greater when managers use optimistic language and engage in insider selling. This is because insider selling signals managers' intent to mislead investors using optimistic language. Following the same logic, the combination of insider purchases and optimistic tone will be stronger evidence of managerial optimism as stated in

hypothesis 2. In contrast, we expect that insider selling that coincides with optimistic tone will indicate a tendency to “intentionally misinform” investors (i.e. impression management) as stated in hypothesis 3. Therefore, we expect the following moderating effects of insider trading on the tone-leverage relation:

Hypothesis 2: The interaction between tone and directors’ purchases will intensify the tone-leverage relation, when insider purchase confirms optimistic tone.

Hypothesis 3: The interaction between tone and directors’ sales will weaken the tone-leverage relation, when insider selling contradicts optimistic tone.

3. Methodology and Data

This section first introduces our measures of managerial optimism and then describes our sampling procedures and presents summary statistics and correlation analysis.

3.1 MEASUREMENT OF MANAGERIAL OPTIMISM

The fact that managerial optimism, a well-documented psychological attribute, is unobservable and cannot be directly measured makes it challenging to empirically test the effect of this theoretically important managerial trait on corporate decisions. Before introducing our time-varying measures of managerial optimism, we first briefly discuss the limitations of some existing optimism measures and then explain why it is more appropriate and beneficial to use a time-varying optimism measure.

Empirical studies on managerial optimism often use indirect and more specifically “revealed beliefs” measures, in which case optimism is inferred from the observed managerial

behaviours and decisions that are potentially driven by their optimism bias (Libby and Rennekamp, 2012). Two commonly used indirect measures of optimism developed by Malmendier and Tate (2005, 2008) are based on executive stock options and media portrayal respectively. Both option-based and press-based optimism measures are subject to criticisms. The option-based measure is based on the idea that optimistic managers tend to exercise their in-the-money options too late due to their (biased) belief that the firm stock price will continue to increase in the future. However, it is argued that persistent holding of options can be affected by “a myriad of economic factors” (Jin and Kothari, 2008) and thus may not only reflect managerial optimism. The press-based optimism measure is based on how the business press portrays managers. The reliability of the press-based measure is also questionable due to the highly subjective nature of the judgements made by journalists (Doukas and Petmezas, 2007). Previous studies also use survey-based measures (e.g., Graham et al., 2013), which are however often costly to construct and are measured at one point in time, which means they are poorly suited to investigate time-variation in optimism.

It is worth noting that most of the optimism measures used in the prior research are static in the sense that optimism is treated as a habitual behaviour. It is, however, plausible that the level of managerial optimism can be time-varying. There are both theoretically and empirically based reasons for using a time-varying optimism measure. In the positive psychology literature, Seligman (2006) proposes the idea of “learned optimism” which suggests that even pessimists can learn to become optimists. Hilary et al. (2016, p. 48) study dynamic over-optimism and demonstrate that “a representative individual becomes dynamically over-optimistic following a series of successes”. This is probably why the studies on investor optimism are based on time-varying measures, namely investor sentiment (Baker and Wurgler, 2006). In contrast, the existing studies on managerial optimism largely rely on static measures. Our empirical analysis is based on time-varying optimism measures.

Empirically, an important benefit of having a time-varying optimism measure is that it makes it much easier to control for time-invariant firm and/or managerial heterogeneity, which could potentially drive both managerial optimism and financing decisions, using fixed effects estimators.

3.1.1 Words-based measure of optimism: optimistic tone

Next, we describe how our measures of managerial optimism are constructed. Our measure of managerial optimism is based on tone analysis of the UK Chairman's Statement¹². We use the Chairman's Statement for several reasons. Chairman's Statement is not heavily regulated. Thus, the language used in Chairman's Statement is much less standard than the UK Director's Report which is subject to regulatory requirements. In addition, disclosure-related litigation is rare in the UK relative to the US, and therefore the UK accounting narratives (e.g. Chairman's Statement) are relatively less constrained compared with the MD&A in the US 10-K filings. Moreover, the existing literature¹³ seems to agree that Chairman's Statement is an organizational rather than individual communication, meaning that the chief executives might also have influences on the choice of language in the Chairman's Statement. In our robustness tests, we construct alternative tone measures using CEO's Reviews.

We construct optimistic tone measures, as proxies for managerial optimism, by counting both optimism-increasing and optimism-decreasing words. Koonce et al. (2011, p. 220) argue that the optimism bias occurs because "individuals use and interpret facts, reports, events, and perceptions according to what they would like to be the case rather than according to the

¹² Many previous studies on UK accounting narratives focus on Chairman's Statement (see e.g., Smith and Taffler, 2000, Clatworthy and Jones, 2003; Clatworthy and Jones, 2006). Smith and Taffler (2000) use Chairman's Statement to predict firm bankruptcy. A more recent study (Schleicher and Walker, 2010) conduct manual content analysis of the tone of forward-looking statements (i.e. outlook sections) in the UK annual report (most of which are located at the end of Chairman's Statement).

¹³ For example, Clatworthy and Jones (2003) argue that accounting narratives such as UK Chairman's Statement allow "management" to describe corporate financial performance. In addition, Schleicher and Walker (2010) attribute the bias in the tone of outlook statements to "managers". In particular, they argue that "managers with a willingness to engage in impression management are likely to target forward-looking statements", while 73.5 percent of the forward-looking narratives are located in Chairman's Statement (Schleicher and Walker, 2010).

actual evidence”. The psychology literature also suggests that optimism is associated with “positive reframing” and “constructive thinking” of the adverse situations and past experience. This implies that optimistic managers may focus more on the positive aspects of, and have a more positive interpretation and description of, their firms’ performance and environment in their corporate disclosures. It is also worth mentioning a cognate of optimism, namely “optimistic explanatory style”, which refers to “how people habitually explain the causes of events that occur to them” (Peterson and Steen, 2002, p. 244). For instance, Dykema et al. (1995) find that people with an optimistic explanatory style tend to see the world as less filled with hassles than do the pessimists. It is thus plausible to assume that optimistic managers tend to use more positive words and fewer negative words, which is supported by the evidence that the tone of optimistic CEOs’ language on Twitter and during earnings conference calls is more positive (Lee, Hwang and Chen, 2017).

To construct tone-based optimism measures, we use four individual wordlists. Our first three wordlists are the same as those in Rogers, Buskirk and Zechman (2011) and Davis, Ge, Matsumoto and Zhang (2015), namely Optimism, Tone_H and Tone_LM. Optimism is a measure of net optimism¹⁴ counted using a dictionary in Diction 6.¹⁵ Hilary et al. (2016) use Diction to construct Optimism scores for earnings press releases in 8-K filings as a measure of managerial optimism. Tone_H and Tone_LM are two wordlists developed by Henry (2008) and Loughran and McDonald (LM) (2011) respectively to measure positive and negative words especially in a financial context. In particular, Tone_H and Tone_LM are calculated as the ratio of the difference between positive and negative words to the sum of positive and

¹⁴ In Diction, optimism is defined as “language endorsing some person, group, concept or event, or highlighting their positive entailments”.

¹⁵ As a unique feature of Diction software, there is standardization procedure when calculating a particular item. In particular, we compare our collected Chairman’s Statements to three alternative norms in Diction including (1) all cases, (2) corporate financial reports and (3) corporate public relations. Our empirical results are qualitatively similar using alternative norms.

negative words.¹⁶ Lee, Hwang and Chen (2017) use the LM wordlist to measure managerial optimism based on CEO tweets and earnings conference calls. Besides, we also use another tone measure, namely Net_Emotion¹⁷, which is measured using dictionaries in Linguistic Inquiry and Word Count (LIWC) 2007.

Our individual tone measures are based on two types of word lists, namely business and non-business word lists. Among these lists, Tone_H and Tone_LM are designed for business communication and thus might be more appropriate in the accounting and finance fields, while the Diction and LIWC word lists are widely used in the literature (e.g., Rogers et al., 2011; Davis et al., 2015). Loughran and McDonald (2015) argue that the Diction word lists are inappropriate for measuring tone of business communication, although they find that the Diction and LM negative words are highly correlated. However, strictly speaking, the LM lists are not perfect either because they are developed based on the US 10-K filings which include mandatory disclosures and are subject to various disclosure requirements, while our content analysis focuses on the voluntary disclosures in the UK annual reports which are relatively less regulated. Another potential limitation of the LM lists is that their negative words may capture financial constraints (Bodnaruk et al., 2015) which could potentially drive the tone-leverage relation.

Considering the potential limitations of the above individual tone measures, it might not be a good idea to rely heavily on a single tone measure in our empirical analysis. Baker and Wurgler (2006) form a composite index of investor sentiment based on six individual sentiment proxies. Investor sentiment is an equally difficult to quantify construct as managerial optimism, and as argued by Baker and Wurgler (2006) there are no perfect and uncontroversial individual sentiment proxies. For a similar reason, we form a composite index

¹⁶ The terms “positive/negative” and “optimistic/pessimistic” are often used interchangeably in the literature (e.g., Davis, Piger and Sedor, 2012). Li (2010b) standardize the terms to “positive/negative” instead of “optimistic/pessimistic”.

¹⁷ An earlier version of LIWC has a category named “optimism”, however in the 2007 version words are classified more broadly into “positive emotion” and “negative emotion”.

of optimistic tone using principal component analysis (PCA). Specifically, we define $Tone Index_{it}$ as the first principal components of the correlation matrix of four raw tone measures. The first component, with an eigenvalue of 2.55,¹⁸ explains 63.7 percent of our sample variance.

$$Tone Index_{it} = \sum_{j=1}^4 Loading_{ij} * Tone_X_{ijt} \quad (1)$$

where, $Tone_X_{ijt}$ represent individual tone measure j of firm i in fiscal year t . $Loading_{ij}$ is the loading for individual tone measure j of firm i . The loadings for Net_Emotion, Optimism, Tone_H, and Tone_LM are 0.50, 0.44, 0.50, and 0.55 respectively.

It is worth noting that, following most studies on disclosure tone (e.g., Rogers et al., 2011; Davis et al., 2015)¹⁹, our tone measures are equal-weighted. Loughran and McDonald (2011) implement a term weighting scheme (i.e. term frequency-inverse document frequency (tf-idf)) to construct the weighted tone measures. However, this is not always necessary. The term weighting, commonly used in the information retrieval literature, modifies the impact of a word based on its frequency not only within a document but also within the entire corpus, in which case the impact of a word that appears in most of the documents will be significantly attenuated. The weighted tone measures are thus sample-dependent, meaning that the tone measure of a given document depends on the other documents in the sample.²⁰ This is considered as the most negative aspect of the weighting scheme partly because it impedes replication (Henry and Leone, 2016). Henry and Leone (2016) further argue that “studies that

¹⁸ The eigenvalue indicates the amount of variation explained by each principal component (PC). The eigenvalue of the first PC is the highest. A PC with an eigenvalue above one suggests that the PC accounts for more variance than one of the individual tone measures. The eigenvalue of our first PC is well above one. The eigenvalue of second component is below one (i.e. 0.66).

¹⁹ Also see footnote 1 in Henry and Leone (2016) for a list of studies using tone measures with equal weighting.

²⁰ If we use a weighted tone measure as our proxy for overconfidence, we implicitly assume that the degree of overconfidence of one manager, indicated by his/her own words, depends on the words used by other managers in other documents. This assumption is, however, difficult to justify.

focus on analysing the content of an already-identified set of documents obviously do not need to employ tools aimed at locating the documents and ranking their relevance” and conclude that term weighting advocated in Loughran and McDonald (2011) is “arguably less relevant and potentially distorts tone scores”.

3.2 THE SAMPLE AND STATISTICS

Data used in this study are from the following sources. The UK firms’ financial data is obtained from Thomson Worldscope database. Chairman’s Statements are manually collected from the company annual reports which are downloaded either through Northcote website or directly from company websites. Insider trading data is from Hemmington Scott database. Our sample of unbalanced panel data is constructed as follows. The selection of sample period is guided by data availability. All financial and utility firms are excluded. Firm observations with missing financial data are excluded. To conduct tone analysis, we need the digital version of the UK company annual reports, so that the Chairman’s Statement can be readable by the content analysis software (i.e. LIWC 2007 and Diction 6)²¹. In addition, to construct insider trading-based measure of optimism, only those firms with insider transactions in any year during our sample period are selected. All variables are winsorized at the 1st and 99th percentile to eliminate the effect of outliers. The final sample comprises 452 firms and 2236 observations during the period 1998-2011.

Table 1 Panel A presents summary statistics of our main variables. The means of book and market leverage are 0.177 and 0.135, respectively. The mean of firm size (i.e. logarithm of sales) is 12.307 with a standard deviation of 2.250. Our sample seems to be representative in terms of firm size. Table 1 Panel B shows the pairwise Pearson correlations matrix. TONE

²¹ In terms of the procedure of content analysis, we first extract Chairman’s Statements from annual report. Next, we detect transformation errors in the combined text file using the Spelling & Grammar function in Microsoft Word 2010. Finally, various types of errors are corrected before the texts are inputted in the LIWC and Diction software.

is strongly positively correlated with the four individual tone measures, Net_Emotion, Optimism, Tone_H, and Tone_LM. Regarding the correlations between optimism measures and leverage, TONE is negatively related to book and market leverage. Cash is positively associated with TONE and negatively associated with both book and market leverage. Dividend yield and dividend payout are negatively associated with TONE and positively associated with both book and market leverage.

[Insert Table 1 here]

4. Empirical Results

4.1 OPTIMISTIC TONE AND LEVERAGE

This section examines the influence of managerial optimism, as measured by managerial optimistic tone, on leverage, controlling for standard capital structure determinants. In particular, we use the following model to test the impact of the level of optimism on leverage:

$$LEV_{it} = a + b_1 MO_{it} + B_2 X_{it} + v_i + \mu_t + e_{it} \quad (2)$$

where, LEV_{it} is book or market leverage ratio.²² MO_{it} is a proxy for managerial optimism. Following previous studies on capital structure (e.g. Frank and Goyal, 2003; Frank and Goyal, 2009; Malmendier, Tate and Yan, 2011), X_{it} is a vector of an extensive set of determinants of leverage including market-to-book ratio (MB), firm size, tangibility, profitability, non-debt tax shields, tax rate, price performance, firm age, dividend dummy, Capex, R&D intensity, and positive and negative financing deficits (PDEF/NA and NDEF/NA). The measure of financing deficits (DEF) is proposed by Shyam-Sunder and Myers (1999). In particular, the positive DEF (PDEF) measures financing deficits and indicates the need for external

²² Our results are robust to an alternative leverage measure (i.e. long-term debt/total assets).

financing, while negative DEF (NDEF) measures financing surplus and suggests that there is sufficient internal funds. All the variables are defined in Appendix A. v_i is time-invariant firm-specific effects. μ_t is year fixed effects. e_{it} is the error term. We use fixed effects (FE) within estimator to control for unobserved firm heterogeneity.

Table 2 reports the results for leverage regressions (Equation (2)). All the tone-based optimism measures are negatively associated with both market leverage (see Panel A in Table 2) and book leverage (see Panel B in Table 2). The coefficients on the tone index, TONE, and four individual tone measures, Tone_H, Tone_LM, Net_Emotion and Optimism, are all negative and statistically significant at 1% or 5% level in all specifications. The estimated effect of tone on leverage is sizable. For example, if Tone_LM increases from 0 to 1, indicating a higher level of managerial optimism, market leverage and book leverage will decrease by around 2.9 and 1.5 percent respectively. This observation is consistent with the proposition that managerial optimism may cause debt conservatism (hypothesis 1b). Our subsequent subsample analysis (see Section 4.3) investigates whether the negative tone-leverage relation is subject to alternative interpretations (e.g. information asymmetry, impression management and financial constraints).

One may ask whether the negative relation between tone and leverage can be explained by reverse causality. In particular, high leverage (or overleveraged) firms, according to trade-off theory, will probably need to adjust down their leverage by issuing equity in the next fiscal year. In this case, overleveraged firms will use optimistic tone to reduce the information cost of equity. Another form of reverse causality is that overleveraged firms, in order to counteract potential unfavourable analyst reports and credit rating downgrade associated with high leverage, will use optimistic tone. These two forms of reverse causality imply that high leverage may cause more optimistic tone, suggesting a positive tone-leverage relation, which is however not consistent with our empirical finding.

Among the firm-level controls, the coefficients on tangibility and firm size are positive, while the coefficients on profitability, non-debt tax shields, price performance, dividend dummy, and Capex are negative. Tangibility is positively related to leverage, which can be explained by the fact that collateral makes debt financing easier. Firm size is also positively related to leverage, which is consistent with the notion that large firms have better reputations and lower bankruptcy risk and are therefore use more debt. However, this finding is inconsistent with pecking order prediction that firm size, as a proxy for information cost, should be positively related to equity issuance. The negative effect of profitability on leverage can be attributed to profitable firms' pecking order preference for internal financing over debt financing. Non-debt tax shields significantly reduces leverage, because it substitutes for the tax shield benefits of debt. Price performance significantly reduces leverage, consistent with market timing argument that firms tend to issue more equities when the stock price is high. Dividend dummy significantly reduces leverage, largely because dividend payments reduce information asymmetry and thus increases equity financing. Capex also significantly reduces leverage, consistent with the view that capital expenditures as a proxy for growth opportunities may exacerbate debt-related agency costs and thus reduces debt financing.

[Insert Table 2 here]

4.2 OPTIMISTIC TONE AND LEVERAGE IN FIRST DIFFERENCES

Next, we provide further evidence on hypothesis 1b by examining the impacts of changes in managerial optimism (i.e. the time-varying component of optimistic tone) on the changes of leverage. We run Equation (2) in first differences²³, where, all variables are fiscal year-on-year changes of the level variables in Equation (2). Table 3 reports the results from leverage regression in first differences. The dependent variables are market leverage and book leverage

²³ Similarly, Frank and Goyal (2003) also run leverage regressions in first differences. However, they point out that this specification may bias the coefficient estimates towards zero and has a lower R².

respectively in Panel A and B. The coefficients on the changes of all the tone-based optimism measures are negative and statistically significant at 1% or 5% level, except Columns (2) and (3) in Panel B where the coefficients are negative but insignificant. These findings largely confirm the negative relation between the level of optimistic tone and leverage. In addition, we find consistent results with our previous findings (in Section 4.1) for most of the control variables including Δ PDEF/NA (+), Δ NDEF/NA (+), Δ firm size (+), Δ tangibility (+), Δ profitability (-), Δ non-debt tax shields (-), and Δ price performance (-).

[Insert Table 3 here]

4.3 IS THE NEGATIVE TONE-LEVERAGE RELATION SUBJECT TO ALTERNATIVE INTERPRETATIONS?

This section mainly attempts to distinguish between rational and behavioural interpretations of optimistic tone: information asymmetry and impression management vs. managerial optimism. We examine the extent to which the significance of tone-leverage relation varies with proxies for information asymmetry and information environment. Firm size is closely related to both information asymmetry and impression management. Small firms have higher information asymmetry problem and are followed by fewer analysts. Lang and Lundholm (2000) examine whether voluntary disclosure prior to equity offerings are used to reduce information asymmetry or hype the stock. For this research purpose, their sample is limited to small firms. The reason is that small firms followed by fewer analysts are more likely to use disclosure to “influence market perceptions”²⁴ (Lang and Lundholm, 2000). In contrast, large firms followed by many analysts are expected to provide more transparent and high-quality disclosures (García Osma and Guillamón-Saorín, 2011). This proposition is supported by

²⁴ Another reason why small firms are more likely to engage in impression management is related to Baker and Wurgler’s (2006) proposition that smaller firms are relatively more “hard-to-value” and are therefore more influenced by investor sentiment. The implication is that investment decisions of irrational investors with high sentiment are more easily influenced by impression management. This is because irrational investors are less able to undo biased reporting, which offers small firms more scope for impression management.

García Osma and Guillamón-Saorín's (2011) empirical evidence that firm size and number of analysts following the firm, as proxies for information environment, are negatively associated with impression management (e.g. manually coded disclosure tone). In brief, small firms have more incentive to not only reduce information asymmetry but also manipulate investors' impression, using unbiased and biased reporting respectively.

Therefore, considering the relation between firm size and the two rational explanations of tone (i.e. information asymmetry and impression management) discussed above, if our optimistic tone influences leverage through these two rational channels, we would expect that the negative tone-leverage relation will be much stronger for smaller firms. Inconsistent with this conjecture, in Table 4 Panel A we find that the negative relation between tone and market leverage is statistically more significant for the large (i.e. top quartile) firms, although the magnitude of the coefficients on the tone index is slightly higher for the small (i.e. bottom quartile) firms. However, it should be noted that firm size is not a perfect proxy for information asymmetry. Therefore, in what follows we attempt to use several alternative, albeit imperfect, measures of information asymmetry to further investigate whether the tone-leverage relation is subject to alternative explanations especially information asymmetry.

In Panel B-F of Table 4, we split the sample based on firm age, MB, R&D, and dividend. We believe that the firms that are younger, have higher MB, are more R&D intensive, and do not pay dividend have higher information asymmetry problem. If information asymmetry is the main channel through which tone reduces leverage, we would expect that the tone-leverage relation is much more statistically and economically significant for these types of firms. This is however not the case. In particular, Panel B shows that the tone index is only statistically significant for old firms in Column (2). In Panel C, the effect of tone is more significant for the low growth firms. In Panel D, the tone-leverage relation is much more significant for firms with zero R&D investments. In Panel E, the negative tone-leverage

relation is statistically more significant for dividend payers. These findings from Panel B-E are all inconsistent with the information asymmetry channel.

To sum up, the subsample analysis in Table 4 seems to suggest that the significant tone-leverage relation is less likely to be driven by either information asymmetry or impression management.²⁵ In other words, our results from the subsample analysis favour the managerial optimism perspective of tone.²⁶

[Insert Table 4 here]

5. Further Analysis and Robustness Checks

5.1 OPTIMISTIC TONE AND CASH HOLDINGS

We further investigate the potential channel through which managerial optimism leads to lower leverage. A key mechanism in hypothesis 1b is that optimistic managers who believe that external financing is unduly costly tend to hold more cash for future investment. The resulting higher cash holdings in turn makes firms with optimistic managers rely less on debt financing and thus have lower leverage. We test the effect of our tone-based measures of managerial optimism on cash holdings using the following model:

$$CASH_{it} = a + b_1MO_{it} + B_2X_{it} + v_i + \mu_t + e_{it} \quad (3)$$

²⁵ In addition, to further mitigate the concern that our tone measures capture soft information about future firm performance, we control for future performance by including the profitability of year t+1 and t+2 in our regression. In untabulated results, we find that the negative tone-leverage relation is still significant, suggesting that this relation is almost unlikely to be driven by soft information.

²⁶ One may argue that investors and analysts may not read Chairman's Statement once they have started to invest or follow. If this is the case, it may help to rule out the two alternative interpretations of tone that are related to information asymmetry and impression management respectively. This is because tone would not be effective in reducing information asymmetry or be used for manipulation of investors' impression if investors do not closely read and analyse the Chairman's Statements. In contrast, the Chairman's Statements (and other corporate disclosure) can still be used to gauge biased managerial beliefs even if investors do not read them.

where, $CASH_{it}$ is cash divided by total assets. MO_{it} is a proxy for managerial optimism. X_{it} is a vector of firm-level control variables including market-to-book ratio, firm size, tangibility, profitability, capital expenditure, dividend and firm age. v_i is time-invariant firm-specific effects. μ_t is year fixed effects. e_{it} is the error term. We use fixed effects (FE) within estimator. In Table 5 Panel A, we find that the tone index, TONE has a positive and statistically significant effect on cash holdings at 10% level. In addition, the coefficients on two individual tone measures, Tone_LM and Net_Emotion, are also positive and statistically significant at 1% or 5% level. The significant positive relation between the tone-based measures of managerial optimism and cash holdings suggests that a main reason why managerial optimism is negatively associated with leverage is that optimistic managers tend to hold more cash and therefore use debt conservatively.

[Insert Table 5 here]

5.2 OPTIMISTIC TONE AND DIVIDEND PAYMENT

Decreasing dividend payment can reduce a firm's demand for external financing. If a manager is optimistic about future investment opportunity, the manager will retain more earnings and reduce dividend payment to meet future financing needs. As predicted by Deshmukh, Goel and Howe's (2013) model, optimistic managers, who overestimate the value of new investments, view external financing as costly will try to build financial slack by decreasing dividend payment. The negative relation between managerial optimism and dividend payment can help explain the negative tone-leverage relation, because lower dividend payment can make the firm rely less on debt financing. We therefore test the effect of our tone-based measures of managerial optimism on dividend payment using the following model:

$$DIVIDEND_{it} = a + b_1MO_{it} + B_2X_{it} + v_i + \mu_t + e_{it} \quad (4)$$

where, $DIVIDEND_{it}$ is a proxy for dividend policy. We use dividend yield and dividend payout as two alternative dependent variables. MO_{it} is a proxy for managerial optimism. X_{it} is a vector of firm-level control variables including market-to-book ratio, firm size, tangibility, profitability, capital expenditure and firm age. v_i is time-invariant firm-specific effects. μ_t is year fixed effects. e_{it} is the error term. We use fixed effects (FE) within estimator. In Table 5, the dependent variables in Panel B and C are dividend yield and dividend payout respectively. In panel C, we exclude observations with negative earnings per share. Almost all the tone-based measures of managerial optimism have negative and statistically highly significant (at 1% level) effects on both dividend yield and dividend payout. The significant negative relation between optimism and dividend payment suggests that one reason why optimistic managers rely less on debt financing is that they pay lower dividend.

5.3 THE MODERATING EFFECTS OF INSIDER TRADING ON THE TONE-LEVERAGE RELATION²⁷

This section further explores the empirical implications of the interactions between optimistic tone and insider trading for leverage. The insider trading patterns of the managers may reflect their perceptions of firms' prospects (Jenter, 2005). Optimistic managers tend to overestimate the firm value and hence are more willing to purchase their own stocks. This trading behaviour can be considered as managers' market timing in their personal portfolios. The main purpose of examining the interactions between optimistic tone and insider trading is to

²⁷ This section focuses on the moderating effect of insider trading on the tone-leverage relation. In untabulated analysis, we also examine the direct effect of insider trading on leverage. The effects of CEO and CFO trading dummies on leverage are mixed. Only the coefficients on CFO_NPR(1) and CEO_NPR(-1) are significant at 10% level and the signs of the trading dummies are somewhat sensitive to the model specifications. These weak and mixed results related to the insider trading-leverage relation is perhaps not surprising considering the possibility that insider trading measures may be contaminated by information asymmetry. Untabulated subsample analysis shows that the insider trading-leverage relation is stronger for smaller, intangible and younger firms which have higher information costs, suggesting that insider trading may capture information asymmetry.

make an empirical distinction between impression management (i.e. intentionally misinform investors) and optimism (i.e. unintentionally misinform investors) perspectives of tone.

We follow the empirical strategies of Staw et al. (1983) and Abrahamson and Park (1994), in which the association between impression management and insider sales is examined. Specifically, if positive tone is associated with subsequent stock sales by firm directors, it is highly likely that positive tone is used consciously to manipulate investors' perception. On the other hand, the interaction between positive tone and high net purchase is an indication of managerial optimism, meaning that managerial optimism contributes to both positive tone and insider purchases. Put differently, a combination of highly optimistic tone and high net purchase indicates optimism. In this case, managerial optimism leads to managers misinforming investors unconsciously by using optimistic tone. To test the joint effect of optimistic tone and insider trading, similar to Rogers, Buskirk and Zechman (2011)²⁸ we interact tone measures with an indicator of abnormal insider trading as follows:

$$LEV_{it} = a + b_1TONE_{it} + b_2NPR_DUM_{it} + b_3NPR_DUM_{it} * TONE_{it} + B_4X_{it} + v_i + e_{it} \quad (5)$$

where, NPR_DUM_{it} is an indicator of either pure insider purchase or pure insider selling. To capture the insider trading patterns of the managers, we construct the net purchase ratio (NPR) as follows: $NPR_{it} = \frac{Buy_{it} - Sell_{it}}{Buy_{it} + Sell_{it}}$, where, NPR_{it} is the NPR of managers (i.e. CEO and CFO) of firm i in fiscal year t . Buy_{it} is the aggregate volume of insider purchases and $Sell_{it}$ are the aggregate volume of insider sales. The indicator of pure insider purchase takes the value one if the net purchase ratio is 1 and 0 otherwise. The indicator of pure insider selling takes the value one if the net purchase ratio is -1 and zero otherwise. We expect b_3 in Equation (5) to

²⁸ Rogers, Buskirk and Zechman (2011) examine the combined effects of optimistic tone of earnings announcements and insider trading in the context of shareholder litigation. They report that the interaction between optimism and abnormal insider selling will increase litigation risk. The reason for the increased likelihood of being sued is that insider selling contradicts optimistic disclosure tone.

be negative (hypothesis 2) if the NPR_DUM_{it} is an indicator of pure insider purchase, and b_3 to be positive (hypothesis 3) if the NPR_DUM_{it} is an indicator of pure insider selling. The variance inflation factors (VIFs) for the above regression models suggest that multicollinearity is not a concern.

Table 6 Panel A reports the results for leverage regressions with interaction effects of tone and an indicator of pure insider purchase. $CEO_NPR(1)$ and $CFO_NPR(1)$ are two dummy variables that take the value one if NPRs of CEO and CFO respectively are 1 and 0 otherwise. Consistent with hypothesis 2, the coefficients on the interaction between $CEO_NPR(1)$ and tone measures are negative and statistically significant. This finding suggests that optimistic tone has more negative impacts on leverage especially when CEOs engage in the pure purchase of their firm's stocks. The interaction between $CFO_NPR(1)$ and tone measures are also negative but statistically insignificant.

Table 6 Panel B reports the results for leverage regressions with interaction effects of tone and an indicator of pure insider selling. $CEO_NPR(-1)$ and $CFO_NPR(-1)$ are two dummy variables that take the value one if NPRs of CEO and CFO respectively are -1 and zero otherwise. Consistent with hypothesis 3, the coefficients on the interaction between $CEO_NPR(-1)$ and tone measures are positive and statistically significant. The above findings suggest that CEO selling could weaken the negative effects of optimistic tone on leverage.

To interpret the above interaction effects between insider trading and tone, the negative coefficients on the interaction between insider purchase dummy and tone support the managerial optimism channel: high insider purchase activities suggest that optimistic tone is a strong indicator of managerial optimism, and thus high insider purchase enhance the negative relation between optimistic tone and leverage (hypothesis 2). On the other hand, the positive coefficients on the interaction between insider selling dummy and tone are also consistent with the managerial optimism story: high insider selling activities suggest that optimistic tone

is a weak indicator of managerial optimism. In the presence of high insider selling, it is likely that optimistic tone is used to intentionally manage investors' impression rather than reflects managerial optimism. Consequently, the presence of high insider selling is associated with the weaker negative relation between optimistic tone and leverage (hypothesis 3). In brief, insider trading patterns indicate how strong optimistic tone is as a measure of managerial optimism and therefore have significant moderating effects on the tone-leverage relation.

[Insert Table 6 here]

5.4 EVIDENCE BASED ON ALTERNATIVE TONE MEASURES

This section examines whether our evidence is robust to alternative measures of optimistic tone in Table 7. The dependent variables are market leverage and book leverage respectively in Panel A and B. First, to address the concern that the raw tone measures might be contaminated by firm-specific variables²⁹, a composite index of the orthogonalized tone measures is constructed. We first regress each individual tone measure on a list of firm characteristics: $Tone_X_{ijt} = \alpha + B_1 X_{it} + \varepsilon_{ijt}$, where, $Tone_X_{ijt}$ represents four individual tone measures. X_{it} is a vector of the control variables in Equation (2). ε_{ijt} is the corresponding orthogonalized individual tone measures. Next, a composite index ($Tone\ Index_{it}^\perp$) is formed based on the first principal component of four residuals (i.e. $Tone_X_{ijt}^\perp = \varepsilon_{ijt}$) from the above regressions. The first component explains 61.8 percent of the sample variance.³⁰ In Column (1) of Panel A and B, we find that the orthogonalized tone index, TONE_RES, significantly decreases the market leverage and book leverage at 1% level.

²⁹ In terms of the determinants of tone (e.g., current performance, growth opportunities, operating risks and complexity), Huang, Teoh and Zhang (2014) find that tone, as measured using Loughran and McDonald (2011) wordlist, is positively related to market-to-book and volatility of stock returns and negatively related to firm size, age and number of business segments.

³⁰ The eigenvalues of first and second components are 2.47 and 0.68 respectively. The loadings for the four orthogonalized individual tone measures are similar to those in Equation (1).

In Columns (2) and (3), we examine the effects of positive and negative tone on leverage separately. This exercise is partly motivated by the fact that the Loughran and McDonald word lists include much more negative words and thus may be biased towards negative information. More importantly, these negative words may reflect financial constraints (Bodnaruk et al., 2015). Recall our subsample analysis in Table 4, the negative tone-leverage relation is statistically less significant for younger firms and non-dividend payers which tend to be financially constrained. This evidence suggests that our results are not driven by financial constraints. However, one may argue that firm age and dividend are not perfect indicators of financial constraints (Farre-Mensa and Ljungqvist, 2016).

To further address these concerns, we test the effects of positive words and negative words on leverage separately. We expect that positive tone significantly reduces leverage, while the negative tone has the opposite effect. As expected, Columns (2) and (3) show that the coefficients on positive tone (POS_Tone_LM) and negative tone (NEG_Tone_LM) are significantly negative and positive respectively.

In Columns (4)-(8), instead of using Chairman's Statement, we use an alternative corporate disclosure, that is, the texts written by CEOs (henceforth called CEO's Reviews), to derive proxies for managerial optimism.³¹ The purpose of using the alternative tone measures based on CEO's Reviews is to address the concern that the tone of Chairman's Statement may

³¹ We need to manually collect texts written by CEOs from the annual reports and save them as text files. This is a nontrivial and tedious task for several reasons. First, the titles of the texts written by CEOs are highly heterogeneous across firms and may even change over time for the same firm. Alternative titles frequently used by our sample firms include Chief Executive's Review/Report/Statement/Letter/Summary, Operating/Operational/Operations Review, Review of Operations, Operating/Operational and Financial Review, Business Review, Managing Director's Review/Report, among others, some of which (e.g. Operating/Operational Review, Review of Operations, Operating and Financial Review, Business Review) may or may not be written by CEOs. Second, it is difficult to identify the start and/or the end of the CEO's Reviews. For example, the signature of CEO does not always indicate the end of the Review. Third, not all texts on the pages of CEO's Reviews are written by CEOs. Some case studies or descriptions of pictures may be presented on the same pages but are not written by CEOs. Finally, some firms do not have CEO's Reviews. To accurately identify the texts written by the CEOs, we first check the content page of each annual report and then manually check each page of the CEO's Reviews to make sure that only the texts written by CEOs are included in our content analysis. In addition to the heterogeneous nature of the titles, the content, structure, and length of CEO's Reviews can also be highly heterogeneous both across and within firms, which could potentially make the tone of CEO's Reviews noisy.

only reflect the belief of the chairman but not the chief executives. The sample size becomes smaller using these alternative tone measure because some firms do not have CEO's Reviews. Columns (4)-(8) of Panel A show that all the composite and individual measures of the tone of the CEO's Reviews, CEO TONE, CEO Tone_H, CEO Tone_LM, CEO Net_emotion, and CEO Optimism significantly decreases the market leverage at 1% level. The effects of these tone measures on the book leverage in Panel B are relatively less significant. Specifically, CEO TONE and CEO Optimism significantly decrease book leverage at 5% level, and CEO Tone_LM significantly decrease book leverage at 10% level. Overall, the negative tone-leverage relation is highly robust to alternative tone measures.

[Insert Table 7 here]

5.5 FURTHER ROBUSTNESS CHECKS

Our main finding of a significant negative tone-leverage relation survives an extensive series of robustness checks presented in Table 8. The dependent variables in Panel A and B are market and book leverage respectively. In Column (1), to alleviate the concern that our tone measures might be endogenous, we use the two-step system Generalized Method of Moments (GMM) to estimate a dynamic partial adjustment model where we include a lagged dependent variable to take the dynamic adjustment of leverage into consideration. All the explanatory variables are treated as endogenous. The coefficient on TONE is negative and statistically significant at 5% level³². In Column (2), in an attempt to mitigate the concern of reverse causality that leverage drives tone, we regress leverage on the lagged tone and other lagged control variables. The coefficient on the lagged tone is negative and statistically significant at 1% level. In Column (3), we use logit model to test the impact of managerial optimism on the likelihood of firm-years with low leverage (i.e. below 5%). We find that the tone index

³² We check our model specifications using autocorrelation tests and Hansen test. In particular, the null of no second order autocorrelation fails to be rejected. Hansen test fails to reject the null of instrument validity.

significantly increases the probability of low leverage at 1% level. In Column (4), we use random-effects Tobit (RE-Tobit) estimator, which is superior since it accounts for the fractional nature of our dependent variable, and the result is qualitatively similar.

In Column (5), the result still holds if we re-run the leverage regression with double-clustered standard errors by firm and year to allow for correlations among different firms (years) in the same year (firm). In Column (6), we use Fama-MacBeth (F-M) cross-sectional regression to obtain a yearly average of the effect of tone on leverage, our tone index still has a significantly negative effect on leverage. Finally, around 31.8 percent of the sample firms are on the Alternative Investment Market (AIM), and are smaller and relatively less regulated than those on the Main Market. In Columns (7)-(8), we find consistent results across these two markets, suggesting that the results based on the full sample are not driven by the regulatory differences between these two markets. The above results in Panel A are confirmed using book leverage as a dependent variable in Panel B. Thus, the observed negative tone-leverage relation is highly robust.³³

[Insert Table 8 here]

6. Conclusions

This study contributes to the capital structure literature by i) examining the link between time-varying managerial optimism and leverage in detail and ii) providing evidence that high managerial optimism is associated with debt conservatism (i.e. the low leverage puzzle). Hence, time-varying managerial optimism can help explain the low leverage puzzle. We construct a time-varying managerial words-based optimism measure, namely optimistic tone, based on the computational linguistic analysis of UK corporate disclosure. We find that

³³ In addition, in untabulated results, controlling for CEO duality, a dummy variable that equals one if the CEO of a firm holds the position of the chairman and zero otherwise, the negative tone-leverage relation is still statistically highly significant, suggesting that our baseline results are not driven by CEO duality.

managerial optimistic tone has a highly significant and negative impact on leverage. Our new evidence supports Malmendier et al.'s (2011) proposition that managerial optimism, defined as the overestimation of mean future cash flows, is associated with debt conservatism. The evidence is highly robust to alternative tone measures constructed using CEO's Review. Further analysis shows that the negative tone-leverage relation seems not to be driven by information asymmetry, impression management or financial constraints. We also provide further evidence that supports the debt conservatism explanation for the negative tone-leverage relation. Optimistic tone has a significantly positive effect on cash holdings and a significantly negative effect on dividend payment, suggesting that a key reason why firms with optimistic managers have lower leverage is that these firms hold more cash and pay less dividend and thus rely less on external financing.

Finally, we further extend prior work by examining the effects of the interaction between managerial words (i.e. tone) and actions (i.e. insider trading) on leverage. When insider selling contradicts optimistic tone; this suggests that managers are not as optimistic as their tone suggests and are engaging in impression management; in such circumstances we find the negative tone-leverage relationship is weakened. In contrast, insider purchase, which confirms optimistic tone generally intensifies the negative tone-leverage relation further supporting the managerial optimism interpretation. Overall, this study suggests that time-varying managerial optimism, gauged from their words, is an important driver of conservative debt policy. This study has two major implications for future research. First, our composite tone-based measure of optimism can be adopted in studies on time-varying managerial optimism. Second, it will be interesting to examine the joint effect of managerial "words" and "actions" on other corporate financial policies and events.

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Table 1. Descriptive statistics and correlation matrix

Panel A presents the descriptive statistics of the main dependent and independent variables. Panel B shows Pearson correlation coefficients between all pairs of our main variables. All the variables are defined in Appendix A.

Panel A. Descriptive statistics						
Variable	Obs.	Mean	S.D.	Min.	Median	Max.
Market leverage	2236	0.135	0.129	0.000	0.108	0.523
Book leverage	2236	0.177	0.152	0.000	0.165	0.606
Cash	2223	0.105	0.121	0.000	0.062	0.628
Dividend yield	2236	0.029	0.031	0.000	0.024	0.163
Dividend payout	1762	0.542	0.605	0.000	0.414	3.857
PDEF/NA	2236	0.113	0.306	0.000	0.000	2.027
NDEF/NA	2236	-0.033	0.070	-0.430	0.000	0.000
MB	2236	1.768	1.267	0.562	1.404	8.786
Firm size	2236	12.307	2.250	6.144	12.487	16.870
Tangibility	2236	0.255	0.227	0.005	0.193	0.894
Profitability	2236	0.090	0.183	-0.884	0.121	0.386
Firm age	2236	5.654	1.016	3.526	5.568	7.286
Non-debt tax shields	2236	0.033	0.026	0.001	0.027	0.139
Tax rate	2236	0.225	0.350	-1.615	0.278	1.643
Price performance	2236	-0.004	0.537	-1.877	0.081	1.169
Dividend dummy	2236	0.765	0.424	0.000	1.000	1.000
Capex	2236	0.045	0.045	0.001	0.032	0.253
R&D intensity	2236	0.096	0.453	0.000	0.000	3.831
TONE	2236	-0.018	1.599	-5.679	0.162	3.614
Net_emotion	2236	0.733	0.168	0.223	0.752	1.000
Optimism	2236	53.501	2.063	49.430	53.320	60.160
Tone_H	2236	0.714	0.231	-0.056	0.765	1.000
Tone_LM	2236	0.554	0.293	-0.287	0.595	1.000
CEO_NPR(1)	1297	0.613	0.487	0.000	1.000	1.000
CEO_NPR(-1)	1297	0.186	0.389	0.000	0.000	1.000
CFO_NPR(1)	1046	0.675	0.469	0.000	1.000	1.000
CFO_NPR(-1)	1046	0.156	0.363	0.000	0.000	1.000

Panel B. Correlation matrix							
Variable	1	2	3	4	5	6	7
1. Market leverage	1.00						
2. Book leverage	0.88	1.00					
3. Cash	-0.43	-0.44	1.00				
4. Dividend yield	0.27	0.19	-0.19	1.00			
5. Dividend payout	0.09	0.11	-0.09	0.35	1.00		
6. TONE	-0.21	-0.06	0.04	-0.20	-0.16	1.00	
7. Net_emotion	-0.12	-0.02	-0.02	-0.08	-0.16	0.80	1.00
8. Optimism	-0.04	0.05	-0.05	-0.09	-0.06	0.70	0.45
9. Tone_H	-0.25	-0.10	0.10	-0.25	-0.15	0.80	0.50
10. Tone_LM	-0.22	-0.09	0.08	-0.21	-0.13	0.88	0.60
11. CEO_NPR(1)	0.08	-0.02	0.04	0.01	0.03	-0.14	-0.12
12. CEO_NPR(-1)	-0.17	-0.11	0.02	-0.08	-0.07	0.11	0.08
13. CFO_NPR(1)	0.11	0.03	0.01	-0.00	0.04	-0.10	-0.09
14. CFO_NPR(-1)	-0.14	-0.10	0.00	-0.06	-0.07	0.13	0.11
	8	9	10	11	12	13	14
8. Optimism	1.00						
9. Tone_H	0.36	1.00					
10. Tone_LM	0.51	0.66	1.00				
11. CEO_NPR(1)	-0.12	-0.09	-0.11	1.00			
12. CEO_NPR(-1)	0.07	0.09	0.10	-0.60	1.00		
13. CFO_NPR(1)	-0.05	-0.08	-0.10	0.60	-0.47	1.00	
14. CFO_NPR(-1)	0.07	0.10	0.13	-0.43	0.66	-0.62	1.00

Table 2. Optimistic tone and leverage

This table presents fixed effect (FE) regressions with market and book leverage as dependent variables in Panel A and B respectively. All the variables are defined in Appendix A. Constants are included but not reported. Standard errors are adjusted for firm-level clustering. P-values are given in parentheses. ***, **, and * indicate that coefficient is significant at 1%, 5%, and 10% levels, respectively.

Panel A. Dependent variable: market leverage					
Variables	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE
TONE	-0.007*** (0.000)				
Tone_H		-0.037*** (0.000)			
Tone_LM			-0.029*** (0.000)		
Net_emotion				-0.049*** (0.000)	
Optimism					-0.003*** (0.000)
PDEF/NA	0.022*** (0.001)	0.021*** (0.002)	0.021*** (0.002)	0.022*** (0.001)	0.022*** (0.001)
NDEF/NA	0.085*** (0.000)	0.087*** (0.000)	0.083*** (0.000)	0.081*** (0.001)	0.083*** (0.000)
MB	-0.003 (0.250)	-0.003 (0.178)	-0.003 (0.212)	-0.003 (0.256)	-0.003 (0.278)
Firm size	0.029*** (0.001)	0.026*** (0.002)	0.026*** (0.001)	0.026*** (0.001)	0.026*** (0.001)
Tangibility	0.158*** (0.001)	0.158*** (0.001)	0.161*** (0.000)	0.159*** (0.001)	0.159*** (0.001)
Profitability	-0.083*** (0.000)	-0.090*** (0.000)	-0.089*** (0.000)	-0.088*** (0.000)	-0.096*** (0.000)
Non-debt tax shields	-0.775*** (0.000)	-0.760*** (0.000)	-0.743*** (0.000)	-0.759*** (0.000)	-0.744*** (0.000)
Tax rate	-0.004 (0.239)	-0.004 (0.247)	-0.005 (0.199)	-0.004 (0.249)	-0.005 (0.186)
Price performance	-0.038*** (0.000)	-0.039*** (0.000)	-0.040*** (0.000)	-0.041*** (0.000)	-0.041*** (0.000)
Firm age	-0.001 (0.947)	-0.001 (0.940)	-0.002 (0.897)	-0.000 (0.997)	-0.000 (0.981)
Dividend dummy	-0.030*** (0.001)	-0.029*** (0.001)	-0.030*** (0.001)	-0.030*** (0.001)	-0.030*** (0.001)
Capex	-0.263*** (0.000)	-0.258*** (0.000)	-0.268*** (0.000)	-0.266*** (0.000)	-0.272*** (0.000)
R&D intensity	0.004 (0.628)	0.002 (0.782)	0.004 (0.644)	0.004 (0.641)	0.002 (0.838)
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
R ² (within)	0.318	0.311	0.311	0.309	0.308
Obs.	2236	2236	2236	2236	2236

(Continued from the previous page)

Panel B. Dependent variable: book leverage					
Variables	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE
TONE	-0.005*** (0.000)				
Tone_H		-0.018** (0.016)			
Tone_LM			-0.015*** (0.009)		
Net_emotion				-0.041*** (0.001)	
Optimism					-0.002*** (0.007)
PDEF/NA	0.033*** (0.000)	0.032*** (0.000)	0.032*** (0.000)	0.033*** (0.000)	0.033*** (0.000)
NDEF/NA	0.136*** (0.000)	0.136*** (0.000)	0.134*** (0.000)	0.133*** (0.000)	0.135*** (0.000)
MB	0.003 (0.406)	0.003 (0.447)	0.003 (0.429)	0.003 (0.391)	0.003 (0.388)
Firm size	0.023*** (0.009)	0.024*** (0.009)	0.024*** (0.009)	0.024*** (0.008)	0.023*** (0.010)
Tangibility	0.185*** (0.002)	0.185*** (0.002)	0.186*** (0.002)	0.185*** (0.002)	0.185*** (0.002)
Profitability	-0.066** (0.013)	-0.072*** (0.006)	-0.071*** (0.007)	-0.067** (0.012)	-0.073*** (0.005)
Non-debt tax shields	-0.472* (0.063)	-0.457* (0.077)	-0.450* (0.078)	-0.471* (0.060)	-0.455* (0.073)
Tax rate	-0.002 (0.604)	-0.002 (0.596)	-0.003 (0.560)	-0.002 (0.634)	-0.003 (0.546)
Price performance	-0.015*** (0.000)	-0.016*** (0.000)	-0.016*** (0.000)	-0.016*** (0.000)	-0.017*** (0.000)
Firm age	-0.026 (0.244)	-0.026 (0.246)	-0.027 (0.235)	-0.026 (0.262)	-0.026 (0.256)
Dividend dummy	-0.019** (0.037)	-0.019** (0.038)	-0.019** (0.036)	-0.019** (0.038)	-0.019** (0.033)
Capex	-0.182** (0.014)	-0.181** (0.015)	-0.186** (0.012)	-0.183** (0.013)	-0.189** (0.011)
R&D intensity	0.005 (0.351)	0.004 (0.435)	0.005 (0.370)	0.006 (0.310)	0.004 (0.481)
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
R ² (within)	0.136	0.131	0.131	0.136	0.133
Obs.	2236	2236	2236	2236	2236

Table 3. Leverage regression in first differences

This table presents leverage regressions in first differences with market and book leverage as dependent variables. All the variables are defined in Appendix A. Constants are included but not reported. Standard errors are adjusted for firm-level clustering. P-values are given in parentheses. ***, **, and * indicate that coefficient is significant at 1%, 5%, and 10% levels, respectively.

Panel A. Dependent variable: market leverage change					
	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS
Δ TONE	-0.004*** (0.000)				
Δ Tone_H		-0.022*** (0.000)			
Δ Tone_LM			-0.013*** (0.003)		
Δ Net_emotion				-0.032*** (0.000)	
Δ Optimism					-0.002*** (0.001)
Δ PDEF/NA	0.023*** (0.000)	0.023*** (0.000)	0.023*** (0.000)	0.024*** (0.000)	0.023*** (0.000)
Δ NDEF/NA	0.142*** (0.000)	0.142*** (0.000)	0.140*** (0.000)	0.140*** (0.000)	0.141*** (0.000)
Δ MB	0.003 (0.120)	0.003 (0.128)	0.003 (0.153)	0.003 (0.109)	0.003 (0.131)
Δ Firm size	0.019*** (0.008)	0.019*** (0.007)	0.019*** (0.008)	0.020*** (0.006)	0.018*** (0.008)
Δ Tangibility	0.133*** (0.001)	0.134*** (0.001)	0.138*** (0.001)	0.135*** (0.001)	0.137*** (0.001)
Δ Profitability	-0.060*** (0.000)	-0.064*** (0.000)	-0.066*** (0.000)	-0.062*** (0.000)	-0.068*** (0.000)
Δ Non-debt tax shields	-0.836*** (0.000)	-0.848*** (0.000)	-0.836*** (0.000)	-0.842*** (0.000)	-0.836*** (0.000)
Δ Tax rate	-0.004 (0.183)	-0.004 (0.227)	-0.004 (0.164)	-0.004 (0.219)	-0.004 (0.151)
Δ Price performance	-0.037*** (0.000)	-0.038*** (0.000)	-0.038*** (0.000)	-0.038*** (0.000)	-0.039*** (0.000)
Δ Firm age	0.008 (0.753)	0.011 (0.668)	0.010 (0.701)	0.009 (0.723)	0.011 (0.685)
Δ Dividend dummy	-0.014* (0.075)	-0.013* (0.090)	-0.013* (0.082)	-0.013* (0.084)	-0.014* (0.074)
Δ Capex	-0.183*** (0.004)	-0.172*** (0.006)	-0.184*** (0.003)	-0.186*** (0.003)	-0.186*** (0.003)
Δ R&D intensity	0.002 (0.742)	0.002 (0.741)	0.001 (0.859)	0.002 (0.767)	0.001 (0.917)
Year FE	Yes	Yes	Yes	Yes	Yes
Adj. R ²	0.365	0.363	0.359	0.362	0.360
Obs.	1609	1609	1609	1609	1609

(Continued from the previous page)

Panel B. Dependent variable: book leverage change					
	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS
Δ TONE	-0.002** (0.015)				
Δ Tone_H		-0.007 (0.186)			
Δ Tone_LM			-0.005 (0.242)		
Δ Net_emotion				-0.019** (0.023)	
Δ Optimism					-0.001** (0.028)
Δ PDEF/NA	0.029*** (0.000)	0.029*** (0.000)	0.029*** (0.000)	0.029*** (0.000)	0.029*** (0.000)
Δ NDEF/NA	0.182*** (0.000)	0.182*** (0.000)	0.181*** (0.000)	0.182*** (0.000)	0.182*** (0.000)
Δ MB	-0.002 (0.463)	-0.002 (0.451)	-0.002 (0.433)	-0.002 (0.485)	-0.002 (0.471)
Δ Firm size	0.013* (0.085)	0.013* (0.080)	0.013* (0.083)	0.013* (0.072)	0.012* (0.091)
Δ Tangibility	0.185*** (0.001)	0.187*** (0.001)	0.188*** (0.001)	0.186*** (0.001)	0.187*** (0.001)
Δ Profitability	-0.079*** (0.000)	-0.082*** (0.000)	-0.082*** (0.000)	-0.079*** (0.000)	-0.082*** (0.000)
Δ Non-debt tax shields	-0.629*** (0.004)	-0.634*** (0.004)	-0.629*** (0.004)	-0.632*** (0.004)	-0.627*** (0.004)
Δ Tax rate	-0.005 (0.108)	-0.005 (0.117)	-0.005 (0.103)	-0.005 (0.121)	-0.005* (0.093)
Δ Price performance	-0.007** (0.016)	-0.007** (0.012)	-0.007** (0.011)	-0.007*** (0.010)	-0.007** (0.009)
Δ Firm age	-0.014 (0.626)	-0.012 (0.669)	-0.013 (0.655)	-0.014 (0.628)	-0.013 (0.643)
Δ Dividend dummy	-0.004 (0.499)	-0.004 (0.526)	-0.004 (0.516)	-0.004 (0.517)	-0.005 (0.475)
Δ Capex	-0.096 (0.126)	-0.092 (0.142)	-0.096 (0.126)	-0.098 (0.120)	-0.098 (0.117)
Δ R&D intensity	0.004 (0.564)	0.004 (0.589)	0.003 (0.617)	0.004 (0.563)	0.003 (0.635)
Year FE	Yes	Yes	Yes	Yes	Yes
Adj. R ²	0.177	0.175	0.175	0.177	0.177
Obs.	1609	1609	1609	1609	1609

Table 4. Subsample analysis of the tone-leverage relation

This table presents fixed effect (FE) regressions with market and book leverage as dependent variables. Subsamples split based on firm size, firm age, market-to-book, R&D intensity, and dividend dummy respectively are estimated to examine the impacts of information asymmetry and information environment on the tone-leverage relation. In Panel A, “Small Quartile” and “Large Quartile” consist of the smallest and largest (in terms of total assets) observations from the bottom and top quartile respectively. In Panel B, “Young Quartile” and “Old Quartile” consist of the youngest and oldest observations from the bottom and top quartile respectively. In Panel C, “HighMB Quartile” and “LowMB Quartile” consist of observations with highest and lowest MB ratio from the top and bottom quartile respectively. In Panel D, “Positive R&D” and “Zero R&D” consist of observations with positive and zero R&D respectively. In Panel E, “Non-dividend payer” and “Dividend payer” consist of observations with zero and positive dividend payment respectively. All control variables and constants are included but not reported. All the variables are defined in Appendix A. Standard errors are adjusted for firm-level clustering. P-values are given in parentheses. ***, **, and * indicate that coefficient is significant at 1%, 5%, and 10% levels, respectively.

	Dependent variable: market leverage (Column 1-2)		Dependent variable: book leverage (Column 3-4)	
	(1) FE	(2) FE	(3) FE	(4) FE
Panel A. firm size	Small Quartile	Large Quartile	Small Quartile	Large Quartile
TONE	-0.007** (0.012)	-0.005*** (0.009)	-0.006** (0.018)	-0.004* (0.090)
Control variables	Yes	Yes	Yes	Yes
Year FE and Firm FE	Yes	Yes	Yes	Yes
R ² (within)	0.179	0.522	0.109	0.251
Obs.	559	559	559	559
Panel B. firm age	Young Quartile	Old Quartile	Young Quartile	Old Quartile
TONE	-0.004 (0.117)	-0.007*** (0.004)	-0.003 (0.245)	-0.004 (0.101)
Control variables	Yes	Yes	Yes	Yes
Year FE and Firm FE	Yes	Yes	Yes	Yes
R ² (within)	0.270	0.482	0.181	0.211
Obs.	561	559	561	559
Panel C. market-to-book	HighMB Quartile	LowMB Quartile	HighMB Quartile	LowMB Quartile
TONE	-0.002 (0.242)	-0.013*** (0.000)	-0.004** (0.010)	-0.010*** (0.001)
Control variables	Yes	Yes	Yes	Yes
Year FE and Firm FE	Yes	Yes	Yes	Yes
R ² (within)	0.198	0.316	0.160	0.234
Obs.	559	559	559	559
Panel D. R&D intensity	Positive R&D	Zero R&D	Positive R&D	Zero R&D
TONE	-0.005** (0.010)	-0.009*** (0.000)	-0.002 (0.180)	-0.005*** (0.002)
Control variables	Yes	Yes	Yes	Yes
Year FE and Firm FE	Yes	Yes	Yes	Yes
R ² (within)	0.304	0.364	0.139	0.191
Obs.	998	1238	998	1238
Panel E. dividend	Non-divined payer	Dividend payer	Non-divined payer	Dividend payer
TONE	-0.007** (0.010)	-0.006*** (0.000)	-0.006** (0.024)	-0.004*** (0.003)
Control variables	Yes	Yes	Yes	Yes
Year FE and Firm FE	Yes	Yes	Yes	Yes
R ² (within)	0.291	0.401	0.191	0.205
Obs.	526	1710	526	1710

Table 5. Optimistic tone and other firm policies

This table presents fixed effect (FE) regressions with cash/total assets, dividend yield, and dividend payout as dependent variables in Panel A, B, and C respectively. In Panel C, firm-year observations with negative earnings per share are excluded. The control variables in Panel A include MB, firm size, tangibility, profitability, Capex, firm age, and dividend dummy. In Panel B and C we control for all these variables except the dividend dummy. All the variables are defined in Appendix A. Constants are included but not reported. Standard errors are adjusted for firm-level clustering. P-values are given in parentheses. ***, **, and * indicate that coefficient is significant at 1%, 5%, and 10% levels, respectively.

Panel A. Dependent variable: cash/total assets					
Variables	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE
TONE	0.003*				
	(0.050)				
Tone_H		0.000			
		(0.991)			
Tone_LM			0.016**		
			(0.022)		
Net_emotion				0.040***	
				(0.005)	
Optimism					0.001
					(0.312)
Control variables	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
R ² (within)	0.088	0.086	0.088	0.091	0.086
Obs.	2223	2223	2223	2223	2223
Panel B. Dependent variable: dividend yield=common dividend/market capitalization					
Variables	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE
TONE	-0.004***				
	(0.000)				
Tone_H		-0.023***			
		(0.000)			
Tone_LM			-0.017***		
			(0.000)		
Net_emotion				-0.020***	
				(0.000)	
Optimism					-0.002***
					(0.000)
Control variables	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
R ² (within)	0.183	0.180	0.174	0.158	0.160
Obs.	2236	2236	2236	2236	2236
Panel C. Dependent variable: dividend payout=dividend per share/earnings per share					
Variables	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE
TONE	-0.052***				
	(0.000)				
Tone_H		-0.194**			
		(0.014)			
Tone_LM			-0.211***		
			(0.001)		
Net_emotion				-0.501***	
				(0.001)	
Optimism					-0.021***
					(0.002)
Control variables	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
R ² (within)	0.209	0.201	0.205	0.209	0.201
Obs.	1762	1762	1762	1762	1762

Table 6. The moderating effect of insider trading on the tone-leverage relation

This table presents fixed effect (FE) regressions with market and book leverage as dependent variables. In Panel A, interactions between indicators of pure insider purchase (i.e. CEO_NPR(1) and CFO_NPR(1)) and tone are included in all regressions. In Panel B, interactions between indicators of pure insider selling (i.e. CEO_NPR(-1) and CFO_NPR(-1)) and tone are included in all regressions. All the variables are defined in Appendix A. Constants are included but not reported. Standard errors are adjusted for firm-level clustering. P-values are given in parentheses. ***, **, and * indicate that coefficient is significant at 1%, 5%, and 10% levels, respectively.

Panel A. The moderating effect of insider purchase on the tone-leverage relation				
	Dependent variable: market leverage (Column 1-2)		Dependent variable: book leverage (Column 3-4)	
	(1) FE	(2) FE	(3) FE	(4) FE
TONE	-0.002 (0.326)	-0.005** (0.049)	-0.001 (0.679)	-0.003 (0.302)
CEO_NPR(1)	-0.001 (0.884)		0.000 (0.931)	
CEO_NPR(1)*TONE	-0.006*** (0.004)		-0.005** (0.027)	
CFO_NPR(1)		0.007 (0.215)		0.011* (0.077)
CFO_NPR(1)*TONE		-0.002 (0.412)		-0.002 (0.541)
Control variables	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
R ² (within)	0.413	0.432	0.171	0.205
Obs.	1297	1046	1297	1046
Panel B. The moderating effect of insider selling on the tone-leverage relation				
	Dependent variable: market leverage (Column 1-2)		Dependent variable: book leverage (Column 3-4)	
	(1) FE	(2) FE	(3) FE	(4) FE
TONE	-0.007*** (0.000)	-0.007*** (0.000)	-0.005*** (0.002)	-0.005*** (0.009)
CEO_NPR(-1)	-0.005 (0.262)		-0.000 (0.973)	
CEO_NPR(-1)*TONE	0.007*** (0.009)		0.008** (0.050)	
CFO_NPR(-1)		-0.010 (0.154)		-0.002 (0.759)
CFO_NPR(-1)*TONE		0.005 (0.207)		0.007 (0.174)
Control variables	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
R ² (within)	0.412	0.433	0.171	0.203
Obs.	1297	1046	1297	1046

Table 7. Alternative tone measures and leverage

This table presents fixed effect (FE) regressions with market and book leverage as dependent variables in Panel A and B respectively. The tone measures in Columns (1)-(3) are constructed using Chairman's Statement. TONE_RES is an orthogonalized tone index. POS_Tone_LM is based on the positive words in the LM word list. NEG_Tone_LM is based on the negative words in the LM word list. The tone measures in Columns (4)-(8) are constructed using CEO's Review. CEO TONE, CEO Tone_H, CEO Tone_LM, CEO Net_emotion, and CEO Optimism are equivalent to TONE, Tone_H, Tone_LM, Net_emotion, and Optimism respectively but are constructed using CEO's Review. All the variables are defined in Appendix A. Constants are included but not reported. Standard errors are adjusted for firm-level clustering. P-values are given in parentheses. ***, **, and * indicate that coefficient is significant at 1%, 5%, and 10% levels, respectively.

Panel A. Dependent variable: market leverage								
	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE	(7) FE	(8) FE
TONE_RES	-0.007*** (0.000)							
POS_Tone_LM		-0.001*** (0.000)						
NEG_Tone_LM			0.002*** (0.000)					
CEO TONE				-0.007*** (0.000)				
CEO Tone_H					-0.046*** (0.001)			
CEO Tone_LM						-0.031*** (0.002)		
CEO Net_emotion							-0.045*** (0.001)	
CEO Optimism								-0.002*** (0.004)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ² (within)	0.318	0.305	0.307	0.350	0.347	0.344	0.344	0.343
Obs.	2236	2236	2236	1695	1695	1695	1695	1695
Panel B. Dependent variable: book leverage								
	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE	(7) FE	(8) FE
TONE_RES	-0.004*** (0.000)							
POS_Tone_LM		-0.001** (0.015)						
NEG_Tone_LM			0.001* (0.080)					
CEO TONE				-0.004** (0.025)				
CEO Tone_H					-0.021 (0.155)			
CEO Tone_LM						-0.019* (0.071)		
CEO Net_emotion							-0.022 (0.195)	
CEO Optimism								-0.002** (0.014)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ² (within)	0.136	0.131	0.130	0.189	0.186	0.187	0.186	0.189
Obs.	2236	2236	2236	1695	1695	1695	1695	1695

Table 8. Further robustness tests

This table presents a series of robustness tests with market and book leverage as dependent variables. In model (1) we use two-step system Generalized Method of Moments (GMM) estimator. All explanatory variables are treated as endogenous, which are instrumented using lags 2 or 3. In model (2) we regress leverage on all the lagged independent variables (Lagged Xs). In model (3) we use logistic regression (Logit) where the dependent variable is one if the leverage ratio is below 5% and zero otherwise. In model (4) we use the random-effects Tobit regression (RE-Tobit). In model (5) the standard errors are adjusted for two-way clustering (Cluster2) within firm and year. In model (6) we use Fama-MacBeth (F-M) regression. In models (7) and (8) we compare two subsamples of firms in the Main Market and the Alternative Investment Market (AIM) respectively. All the variables are defined in Appendix A. Constants are included but not reported. P-values are given in parentheses. ***, **, and * indicate that coefficient is significant at 1%, 5%, and 10% levels, respectively.

Panel A. Dependent variable: market leverage				
	(1) GMM	(2) Lagged Xs	(3) Logit (low leverage)	(4) RE-Tobit
TONE	-0.004** (0.021)	-0.010*** (0.000)	0.125*** (0.003)	-0.008*** (0.000)
Lag leverage	0.775*** (0.000)			
Control variables	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	No
Industry FE	Yes	No	Yes	Yes
R ²		0.242		
Log likelihood			-949.19	2078.50
Obs.	1609	1609	2236	2236
	(5) Cluster2	(6) F-M	(7) Main Market	(8) AIM
TONE	-0.009*** (0.000)	-0.008*** (0.002)	-0.007*** (0.000)	-0.008*** (0.001)
Control variables	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	Yes
Firm FE	No	No	Yes	Yes
Industry FE	Yes	Yes	No	No
R ²	0.410	0.590	0.369	0.228
Obs.	2236	2236	1698	538
Panel B. Dependent variable: book leverage				
	(1) GMM	(2) Lagged Xs	(3) Logit (low leverage)	(4) RE-Tobit
TONE	-0.004*** (0.009)	-0.006*** (0.000)	0.100** (0.019)	-0.005*** (0.000)
Lag leverage	0.793*** (0.000)			
Control variables	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	No
Industry FE	Yes	No	Yes	Yes
R ²		0.109		
Log likelihood			-941.09	1812.96
Obs.	1609	1609	2236	2236
	(5) Cluster2	(6) F-M	(7) Main Market	(8) AIM
TONE	-0.007*** (0.003)	-0.010** (0.015)	-0.004*** (0.002)	-0.006** (0.011)
Control variables	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	Yes
Firm FE	No	No	Yes	Yes
Industry FE	Yes	Yes	No	No
R ²	0.374	0.555	0.154	0.169
Obs.	2236	2236	1698	538

Appendix A. Variable definitions

Variable	Definition
Book leverage	Total debt divided by total assets
Market leverage	Total debt divided by (total assets minus common equity plus market capitalization)
Cash	Cash divided by total assets
Dividend yield	Common dividend divided by market capitalization
Dividend payout	Dividend per share divided by earnings per share (observations with negative earnings per share are excluded)
DEF	Financing deficit is the sum of net debt issues (i.e. long-term borrowings minus reduction in long-term debt) and net equity issues (i.e. net proceeds from sale/issue of common and preferred stocks minus common/preferred redeemed, retired, converted).
PDEF/NA	PDEF divided by net assets (total assets-current liabilities), where PDEF equals DEF if the deficit is positive and zero otherwise
NDEF/NA	NDEF divided by net assets (total assets-current liabilities), where NDEF equals DEF if the deficit is negative and zero otherwise
Firm size	Natural logarithm of sales
M/B	The ratio of book value of total assets minus book value of equity plus market value of equity to book value of total assets
Profitability	Earnings before interest, taxes and depreciation divided by total assets
Tangibility	Net property, plant and equipment divided by total assets
Firm age	The natural logarithm of the number of months since the incorporation date
Non-debt tax shields	Depreciation divided by total assets
Tax rate	Income taxes divided by pre-tax income
Price performance	The difference of natural logarithm of fiscal year-end share prices
Dividend dummy	Dummy=1 if common dividend is positive, and 0 otherwise
R&D intensity	Research and development (R&D) divided by sales (missing R&D values are set equal to zero)
Capex	Capital expenditure divided by total assets
Net_emotion	(positive emotion-negative emotion)/(positive emotion+negative emotion) as defined by LIWC
Optimism	[praise+satisfaction+inspiration]-[blame+hardship+denial] as defined by Diction
Tone_H	(positive words-negative words)/(positive words+negative words), using Henry's (2008) word list
Tone_LM	(positive words-negative words)/(positive words+negative words), using Loughran and McDonald's (2011) word list
TONE	Composite tone index (see Section 3.1.1 for more descriptions) based on four individual tone measures
TONE_RES	Orthogonalized tone index (see Section 5.4 for more descriptions) based on four individual orthogonalized tone measures
POS_Tone_LM	The proportion of positive words from the Loughran and McDonald's (2011) word list, constructed using Chairman's Statement
NEG_Tone_LM	The proportion of negative words from the Loughran and McDonald's (2011) word list, constructed using Chairman's Statement
CEO_NPR(1)	Dummy=1 if the net purchase ratio ($NPR=(buy-sell)/(buy+sell)$) of CEO is 1, and 0 otherwise (see Section 3.1.2 for more descriptions)
CEO_NPR(-1)	Dummy=1 if the net purchase ratio ($NPR=(buy-sell)/(buy+sell)$) of CEO is -1, and 0 otherwise (see Section 3.1.2 for more descriptions)
CFO_NPR(1)	Dummy=1 if the net purchase ratio ($NPR=(buy-sell)/(buy+sell)$) of CFO is 1, and 0 otherwise (see Section 3.1.2 for more descriptions)
CFO_NPR(-1)	Dummy=1 if the net purchase ratio ($NPR=(buy-sell)/(buy+sell)$) of CFO is -1, and 0 otherwise (see Section 3.1.2 for more descriptions)