Actions Speak Louder Than Words: Optimistic Disclosure Tone, Insider Trading and Capital Structure

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Preliminary and Incomplete Draft

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This version: June 2013

Abstract: This paper examines the impacts of managerial belief (particularly overconfidence) on capital structure. We attempts to gauge managerial overconfidence adopting words-based (i.e. tone of Chairman's Statement) and action-based (i.e. insider trading) approaches. We find that optimistic tone is negatively related to leverage. This observation is consistent with several arguments that optimistic tone is associated with (1) "reducing information asymmetry", (2) "hyping the stock" and (3) managerial overconfidence (which in turn leads to debt conservatism). In contrast, CEO and especially CFO net purchase are positively related to leverage. This finding can be explained by either market timing or preference for debt over equity due to managerial overconfidence. More interestingly, we examine the joint effect of optimistic tone and insider selling. The coefficient on this interaction term is negative, suggesting that *insider selling contradicts optimistic tone* which makes equity investors less willing to buy the firm's shares.

Key words: managerial overconfidence, tone analysis, Chairman's Statement, insider trading, leverage.

JEL classification: G30, G32, G02

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I. INTRODUCTION

A growing literature shows the importance of the effect of managers on corporate policies (e.g., Bertrand and Schoar, 2003; Cadenillas *et al*., 2004) and in particular Frank and Goyal (2007) document a first order effect that the differences among CEOs and especially CFOs matters for firm's capital structure. More specifically, recent theoretical (Heaton, 2002; Hackbarth, 2008; Malmendier *et al*., 2011) and empirical studies (Graham *et al*., 2013; Ben-David *et al*., 2012; Malmendier *et al*., 2011; Malmendier and Zheng, 2012) examine a particular trait of managers (i.e. managerial overconfidence) on financing decisions. One limitation of the above empirical tests of the role of managerial overconfidence is that their empirical measures of overconfidence are time-invariant. The reason why overconfidence can be time-varying is that people who are subject to self-attribution bias [1], described as "endogenous overconfidence" (Hillary and Hsu, 2011), will learn to be overconfident (Hirshleifer, 2001). With this in mind, this study examines the impact time-varying managerial overconfidence as a determinant of leverage.

A unique feature of this study is that we use both words and actions of managers to gauge their time-varying overconfident beliefs. The words-based measure is based on computational content analysis of the tone of UK Chairman's Statement. To ensure the validity of our tone measures, we construct composite tone index using principle component analysis, which consists of six individual measures of optimistic tone [2]. The action-based measure is based on how firm managers trade their own firm's shares. The idea is that overconfident managers are more likely to buy and less likely to sell. One advantage of using this insider trading-based measure is that we can empirically compare the relative importance of CEO and CFO overconfidence. More interestingly, we can explore potential contradictions between managerial words and actions [3]. Recent study (Brockman, Li and Price, 2012) reports a reverse tone-insider trading pattern (i.e. positive (negative) conference call tone predicts net insider selling (purchase)). A key contribution of this paper is to empirically examine the implications of this type of contradiction for leverage.

The theoretical relationship between managerial overconfidence and leverage can be either positive or negative (Malmendier *et al*., 2011). Heaton's (2002) model suggests that

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1 Self-attribution bias can be defined as a tendency to attribute good (bad) outcomes to own abilities (external factors) (Miller and Ross, 1975).

2 These six tone measures are calculated using (1) the wordlists developed by finance and accounting researchers (Henry, 2008; Loughran and McDonald, 2011) for the analysis of financial narratives and (2) relevant dictionaries (i.e. wordlists used to define various dimensions of language) in two linguistic analysis software (Diction and LIWC) (e.g. optimism and certainty). More explanations on the tone measures are available in the methodology section.

3 For example, insider selling may contradict optimistic tone, suggesting the possibility that managers attempts to intentionally disinform investors. More discussions on the combined effects of tone and insider trading will be provided later.

overconfident managers believe that equity is undervalued by outside investors and are therefore reluctant to use equity financing. In other words, managerial overconfidence is associated with higher information cost, which in turn leads to higher leverage. Hackbarth (2008) incorporate managerial overconfidence in a trade-off framework and also predict that managerial overconfidence is positively related to leverage. This is because overconfident managers underestimate bankruptcy cost of debt and consequently use more debt to take tax benefits. However, Malmendier *et al.* (2011) show that managerial overconfidence may lead to either a preference for debt over equity financing, as predicted by Heaton's (2002) model, or debt conservatism. They argue that the net effect of managerial overconfidence on leverage depends on manager's perceived financing costs and investment returns as well as the availability of internal financing (more discussions on this model will be presented in Section II). The main purpose of this study is to empirically test the impacts of managerial overconfidence on leverage.

This study has three major findings. First, optimistic tone and net purchase of CEO and CFO have opposite impacts on leverage. This result is not surprising given the negative correlation between those two measures of overconfidence. In particular, optimistic tone is negatively related to leverage. This finding is consistent with the proposition that managerial overconfidence may lead to conservative debt policy especially when firms have sufficient retained earnings or perceived financing costs are higher than corresponding investment returns. An alternative explanation is that managers attempt to facilitate market timing by "hyping the stock". In contrast, net purchase of CEO and especially CFO are positively related to leverage. This result can be explained by managers' own market timing behaviour including insider sales prior to equity offerings and insider repurchases prior to share repurchases.

Second, we find interesting joint effect of optimistic tone and insider selling. The coefficient on this interaction term is negative, suggesting that high value or volume of insider (especially CEOs) sales weaken the negative impact of optimistic tone on leverage. This observation can be attributed to the fact that insider selling contradicts optimistic tone and thus makes investor less willing to buy firms' shares. In this case, we may conclude that "actions" of managers speak louder than "words".

Finally, we examine how insider trading affects investors' perception of high market-to-book ratio (MB), which in turn influences leverage. The coefficient on the interaction between insider selling and MB is positive, meaning that the relationship between MB and leverage becomes less negative due to insider selling. The reason is that insider selling reduces firm's

market timing opportunities (i.e. issuing overvalued equities). On the other hand, the coefficient on the interaction between insider purchase and MB is negative, meaning that the relationship between MB and leverage becomes more negative due to insider purchase. This is expected because insider purchase may reduce the information cost of equity of especially those high growth firms. In other words, insider purchase makes investors perceive high MB as growth opportunities rather than overvaluation.

We proceed as follows. Section II develops hypotheses regarding the effects of managerial overconfidence on leverage. Section III describes our two measures of managerial overconfidence, namely tone of Chairman's Statement and insider trading of CEO and CFO, and our sample. Section IV discusses main findings and alternative interpretations of our results and conducts robustness checks. Section V concludes.

II. HYPOTHESIS DEVELOPMENT

Managerial overconfidence and leverage

This section discusses the effects of managerial overconfidence on leverage. Based on a recent model by Malmendier *et al*. (2011), the theoretical relationship between managerial overconfidence and firm leverage depends on the relation between "overestimated investment returns, cash holdings and perceived financing costs".

In particular, managerial overconfidence may lead to lower level of debt (i.e. debt conservatism) if (1) overconfident manager's perceived financing costs outweigh investment returns, which in turn leads to underinvestment or (2) the firm has sufficient internal finance (i.e. retained earnings), which is particularly true because overconfident managers may retain cash for future investment. In brief, managerial overconfidence could make the firm forgo tax benefits and therefore underleveraged relative to the optimal target debt ratio. To empirically examine Malmendier *et al*.'s (2011) proposition that managerial overconfidence may lead to conservative debt policy, we test the following hypothesis:

> *Hypothesis 1a:* Managerial overconfidence can be *negatively* related to leverage. Put differently, managerial overconfidence may *increase* the likelihood of low (i.e. below 5%) or zero leverage.

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On the other hand, however, as pointed out by Malmendier *et al*. (2011), debt conservatism caused by overconfidence "can, but need not" leads to low leverage. This is because managerial overconfidence may enhance the preference for debt over equity financing. Put differently, overconfident managers tend to issue equity more conservatively than debt. Similarly, an earlier model by Heaton (2002) also suggests that optimistic managers believe that equity is undervalued by outside investors and therefore prefer debt to equity. Using Shyam-Sunder and Myers's (1999) financing deficit framework, Malmendier *et al*. (2011) and Malmendier and Zheng (2012) find supporting evidences that overconfident managers are more willing to use debt to meet external financing needs. Furthermore, from trade-off perspective, Hackbarth's (2008) model predicts that overconfident managers will underestimate financial distress costs associated with debt and hence tend to use more debt than their rational counterparts. Taken together, managerial overconfidence is also likely to be positively related to leverage.

> *Hypothesis 1b:* Managerial overconfidence can be *positively* related to leverage.

III. METHODOLOGY AND DATA

This section first introduces our two measures of managerial overconfidence and then describes our sampling procedures and presents summary statistics and correlation analysis. We postpone the description of various empirical model specifications until the next section.

A. Measurement of managerial overconfidence

We use both words-based and action-based measures of managerial overconfidence. Words-based overconfidence measure is based on tone analysis of Chairman's Statement. Action-based measures are overconfidence beliefs revealed from insider trading behaviour. Different from the static measures of overconfidence commonly employed in the literature, our overconfidence measures are time-varying[4].

A.1. Words-based measure of overconfidence: optimistic tone

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[4] Existing behavioural finance studies (e.g., Malmendier and Tate, 2005; Malmendier, Tate and Yan, 2011) tend to model managerial overconfidence as a habitual behaviour which is static. This static approach can be problematic because other behavioural biases, especially self-attribution bias, may affect the confidence level. In other words, although the level of overconfidence can be quite persistent over time, we should not examine overconfidence in isolation.

We construct two composite tone indices. One is based on the raw tone measures. The other is orthogonalized so that each component is not correlated with certain firm-specific variables (especially standard capital structure determinants).

Raw Tone Index

Our first measure of managerial overconfidence is based on tone analysis[5] of Chairman's Statement. We construct optimistic tone measures by counting both optimism-increasing and optimism-decreasing words. We use six individual wordlists. Our first three wordlists are the same as those in Rogers, Buskirk and Zechman (2011) and Davis, Matsumoto and Zhang (2012), namely *TONE_OPTIMISM*, *TONE_H* and *TONE_LM*. *TONE_OPTIMISM* is a measure of net optimism[6] counted using a dictionary in Diction 6[7]. *TONE_H* and *TONE_LM* are two wordlists developed by Henry (2008) and Loughran and McDonald (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 negative words [8] (i.e. $\frac{Positive_{it} - Negative_{it}}{Positive_{it} + Negative_{it}}$).

Besides, we also use another three tone measures, all of which are positively related to optimism, including *TONE_CERTAIN1*, *TONE_CERTAIN2* and *TONE_EMOTION*. *TONE_CERTAIN1* and *TONE_EMOTION*[9] are measured using dictionaries in Linguistic Inquiry and Word Count (LIWC) 2007. *TONE_CERTAIN2* is another measure of certainty[10] based on a dictionary in Diction 6. Similarly, Li (2010b) includes "uncertain tone", which is highly associated with negative tone, in his tone measure.

To address potential endogeneity issues associated with the above six individual tone measures, we form a composite tone index using principal component analysis (PCA). In particular, we define $Tone\ Index_{it}$ as the first principal components of the correlation matrix

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[5] Tone analysis (and more generally textual analysis) is becoming increasingly popular in recent accounting and finance studies. For example, Rogers, Buskirk and Zechman (2011) examine the relation between disclosure tone and shareholder litigation. For a review on studies of corporate disclosures, please see Li (2010a).

[6] In Diction, optimism is defined as "language endorsing some person, group, concept or event, or highlighting their positive entailments".

[7] 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.

[8] 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".

[9] 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".

[10] In Diction, certainty is defined as "language indicating resoluteness, inflexibility, and completeness and a tendency to speak ex cathedra".

of six raw tone measures. The first component, with an eigenvalue of 2.609[11], explains 43.5 percent of our sample variance.

$$Tone\ Index_{it} = \sum_{j=1}^{6} Loading_{ij} * Tone\_X_{ijt}$$
$$= 0.496 Emotion_{it} + 0.192 Certain1_{it} + 0.446 Optimism_{it}$$
$$+ 0.027 Certain2_{it} + 0.480 Tone\_H_{it} + 0.536 Tone\_LM_{it}$$

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 loading for *Certain1* and *Certain2* is much lower compared with other tone measures. However, our empirical results are qualitatively similar when we exclude those two measures of certainty tone.

Orthogonalized Tone Index

To address the concern that the raw tone might be contaminated by firm-specific variables[12], a composite index of the orthogonalized tone measures is constructed as follows. First, we regress each individual tone measure on standard determinants of capital structure as follows:

$$Tone\_X_{ijt} = \alpha + \beta_1 Profit_{it} + \beta_2 MB_{it} + \beta_3 Size_{it} + \beta_4 Tangibility_{it} + \varepsilon_{ijt}$$

where, $Tone\_X_{ijt}$ represents six individual tone measures. ε_{ijt} is the corresponding orthogonalized individual tone measures.

Next, a composite index ($Tone\ Index_{it}^{\perp}$) is formed based on the first principle component of six residuals (i.e. $Tone\_X_{ijt}^{\perp} = \varepsilon_{ijt}$) from the above regressions. The first component explains 41.8 percent of the sample variance[13].

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[11] The eigenvalue of second component is close to one (i.e. 1.135).

[12] In terms of the determinants of tone (e.g., current performance, growth opportunities, operating risks and complexity), Huang, Teoh and Zhang (2011) 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. Our first orthogonalized tone measure (*TONE_RES1*) controls for four standard determinants of capital structure (i.e. market-to-book, size, tangibility and profitability). Our second orthogonalized tone measure (*TONE_RES2*) further controls for stock price performance and firm age.

[13] The eigenvalues of first and second components are 2.509 and 1.139 respectively.

$$Tone\ Index^{\perp}_{it} = \sum_{j=1}^{6} Loading_{ij} * Tone_{X^{\perp}_{ijt}} = \sum_{j=1}^{6} Loading_{ij} * \varepsilon_{ijt}$$

$$= 0.495 Emotion^{\perp}_{it} + 0.154 Certain1^{\perp}_{it} + 0.440 Optimism^{\perp}_{it}$$

$$+ 0.036 Certain2^{\perp}_{it} + 0.490 Tone\_H^{\perp}_{it} + 0.545 Tone\_LM^{\perp}_{it}$$

The use of orthogonalized tone is also inspired by a paper on tone management by Huang, Teoh and Zhang (2011). They argue that disclosure tone can be used to either "inform" or "disinform" investors. On the one hand, positive tone may reflect firm's fundamental. For example, more profitable firms may use more positive tone. On the other hand, tone can be regarded as a form of impression management or strategic choice (i.e. "abnormal tone"[14]) to manipulate investors' perception of firm performance, which is complementary to earnings management.

A.2. Action-based measure of overconfidence: net purchase ratio

The insider trading patterns of the managers may reflect their perceptions of firms' prospects (Jenter, 2005). Overconfident 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. In the spirit of Jenter (2005) and Jin and Kothari (2008), we use insider trading-based measure of managerial overconfidence. In particular, following prior studies (e.g., John and Lang, 1991; Marciukaityte and Szewczyk, 2011) we construct the valued-based and volume-based net purchase ratio (NPR) using the value and volume of open market purchases and sales respectively as follows:

$$NPR1_{it} = \frac{Buy\_va_{it} - Sell\_va_{it}}{Buy\_va_{it} + Sell\_va_{it}}$$

where, $NPR1_{it}$ is the value-based NPR of CEO and CFO of firm i in fiscal year t. Buy_va_{it} is the aggregate value of insider purchases and $Sell\_va_{it}$ is the aggregate value of insider sales.

Alternatively, the NPR based on the number of trades can be calculated as follows:

$$NPR2_{it} = \frac{Buy\_vol_{it} - Sell\_vol_{it}}{Buy\_vol_{it} + Sell\_vol_{it}}$$

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[14] It is abnormal in the sense that the positive tone cannot be justified by firm's fundamentals.

where, $NPR2_{it}$ is the volume-based NPR of CEO and CFO of firm i in fiscal year t. Buy_vol_{it} is the aggregate volume of insider purchases. $Sell\_vol_{it}$ is the aggregate volume of insider sales. The NPR ranges from -1 to 1 and higher NPR indicates higher managerial overconfidence.[15] An important advantage of the insider trading-based measures is that they allow us to compare the roles of CEO and CFO overconfidence.

B. The sample

Data used in this study are from the following sources. The UK firms' financial data is obtained from *Thomson Worldscope* database. Insider trading data is from *Hemmington Scott* database. Chairman's Statements are manually collected from the company annual reports which are downloaded either through *Northcote* website or directly from company websites.

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. Observations with the length of fiscal period less than 11 months or over 13 months are excluded. To conduct tone analysis, we need the digital version of the UK company annual reports, so that the Chairman Statement can be readable by the content analysis software (i.e. *LIWC 2007* and *Diction 6*)[16]. In addition, to construct insider trading-based measure of overconfidence, 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 459 firms and 2283 observations during the period 1994-2011[17].

B.1. Descriptive statistics and correlation matrix

Table 1 presents summary statistics of our main variables. The mean of firm size (i.e. logarithm of sales) is 12.320 with a standard deviation of 2.240. Our sample seems to be representative in terms of firm size. The means of book and market leverage are 0.180 and 0.140 respectively. The mean of CEOs' NPRs are lower than those of CFOs, while CEOs' NPRs are relatively more volatile. We also report the distribution of the net purchase ratio

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[15] For a comparison of value-based and volume-based NPR, as measures of overconfidence, see Ataullah *et al.* (2012).

[16] 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.

[17] Most of the observations are after 2000 because machine readable annual reports are almost not available in the 1990s.

(NPR) of CEO and CFO in Panel D. Over 60 percent of their NPRs are 1, indicating that insider purchases are far more often than insider sales.

Table 2 shows the pairwise Pearson correlations matrix. Surprisingly, the correlation between tone-based measures of overconfidence (*TONE* and *TONE_RES*) and insider trading-based measures of CEO and CFO overconfidence (*VA_CEO*, *VOL_CEO*, *VA_CFO* and *VOL_CFO*) are negative and statistically significant. Therefore, we expect that empirical findings based on the above two measures of overconfidence are likely to be inconsistent. This is because either words-based or action-based measure is subject to alternative interpretations other than managerial overconfidence, which will be discussed later.

Regarding the correlations between overconfidence measures and leverage, both *TONE* and *TONE_RES* are negatively and significantly related to book and market leverage. In contrast, NPRs of CEO and CFO are positively and significantly related to book and especially market leverage. Market-to-book ratio is negatively related to leverage, while firm size, tangibility and profitability are positively related to leverage. Finally, multicollinearity is not a major concern given that the magnitudes of the correlations between independent variables are not large.

[Insert Table 1 and 2 here]

IV. RESULTS AND DISCUSSION

A. Univariate leverage regression

Table 3 summarizes univariate leverage regressions. We find that both *TONE* and *TONE_RES* explain a relatively large proportion of within firm variations in leverage (especially market leverage). The coefficients on both tone measures are negative and statistically significant at 1% level. Insider selling dummies, *CEO_NPR(-1)* and *CFO_NPR(-1)* (takes the value of one if the net purchase ratio is -1 and zero otherwise) are also negatively related to leverage. Firm size and tangibility are positively associated with leverage and account for a significant proportion of between firm variations in leverage (especially book leverage). Market-to-book ratio has negative coefficients and explains relatively high proportion of both within and between firm variations in market leverage. The signs and statistical significance of all explanatory variables will be further tested using subsequent multivariate regressions.

[Insert Table 3 here]

B. Multivariate leverage regression

This section examines the influence of managerial overconfidence on leverage, controlling for standard capital structure determinants. In particular, we use the following model to test the impact of the level of overconfidence on both market and book leverage:

$$LEV_{it} = a + b_1 MO_{it} + B_2 X_{it} + v_i + e_{it} \qquad (1)$$

where, LEV_{it} is book or market leverage ratio. X_{it} is a vector of firm-level control variables including *PDEF*, *NDEF*, market-to-book ratio, firm size, tangibility and profitability. v_i is time-invariant firm-specific effects. e_{it} is the error term. We use both fixed effects (FE) and random-effects Tobit (RE-Tobit) as the estimators. RE-Tobit estimator is superior in the sense that it accounts for the fractional nature of dependent variable (i.e. leverage ratio is bounded between zero and one).

Table 4 reports the results for leverage regressions (Equation 1). Both insider trading-based measures of CEO (*VOL_CEO*) and especially CFO overconfidence (*VA_CFO* and *VOL_CFO*) are positively and significantly related to leverage. Interestingly, CFO overconfidence is statistically and economically more significant than CEO overconfidence, which is consistent with the US evidence (Malmendier and Zheng, 2012). We therefore conclude that overconfidence of UK CFOs is more relevant to firm capital structure decisions.

On the other hand, the coefficients on both *TONE* and *TONE_RES* are negative and statistically significant at 1% level in all specifications[18]. To sum up, the action-based and words-based measures of overconfidence have opposite (i.e. positive and negative respectively) impacts on firm leverage. This conflicting result indicates that our measures of overconfidence might be subject to alternative interpretations, which will be discussed at length later.

Among the firm-level controls, the coefficients on tangibility and firm size are positive, while the coefficients on market-to-book ratio and profitability 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 reputation 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

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[18] The raw tone measure, *TONE*, is subject to endogeneity problem that positive tone might be driven by high profitability and good stock price performance. In this case, the negative coefficient on *TONE* can also be attributed to the negative effects of profitability and price performance on leverage. However, our finding that the coefficient on *TONE_RES* is also significantly negative can reduce the above endogeneity concern.

effect of market-to-book ratio on leverage is consistent with market timing argument that firms prefer equity financing when firm stock is overvalued. The negative effect of profitability on leverage can be attributed to profitable firms' pecking order preference for internal financing over debt financing. The above results are robust to alternative measures of leverage (i.e. book leverage (see panel A) vs. market leverage (see panel B)).

[Insert Table 4 here]

C. Multivariate leverage regression in first differences

Next, we examine the impacts of changes in managerial overconfidence on the changes of leverage by running Equation (1) in first differences as follows:

$$\Delta Lev_{it} = a + b_1 \Delta MO_{it} + B_2 \Delta \boldsymbol{X_{it}} + v_i + \varepsilon_{it} \tag{2}$$

where, all variables are fiscal year-on-year changes of the level variables in Equation (1).

Table 5 reports the results from leverage regression in first differences (Equation 2). The coefficients on both $\Delta TONE$ and $\Delta TONE\_RES$ are negative and significant at 1% level. This finding confirms the negative relationship between the level of tone and leverage ratio. However, the coefficients on changes of net purchase ratio (NPR) of CEO and CFO are all statistically insignificant and their signs vary across model specifications. This could be attributed to small within-firm variations of NPRs and a majority (i.e. more than 60 percent) of value and volume-based NPRs of CEO and CFO are one. We find consistent results for most of the control variables including $\Delta PDEF/NA$ (+), $\Delta NDEF/NA$ (+), ΔMB (-), Δfirm size (+) and Δprofitability (+), except Δtangibility which becomes less stable in terms of statistical significance and signs.

[Insert Table 5 here]

D. Logistic analysis of low/zero-leverage

Furthermore, we further examine the relationship between managerial overconfidence and debt conservatism. More specifically, we use logit models to test the impact of managerial overconfidence on the likelihood of firm-years with low leverage (i.e. below 5%) or zero leverage. This specification is closely related to recent studies on "zero-leverage puzzle" (e.g., Strebulaev and Yang, 2012; Devos *et al*., 2012). In our sample, around 34.3 and 14.3 percent of the firm-years have low and zero leverage respectively. We use the following logit models:

$$\Pr(LOW_{LEV_{it}} = 1) = f(a + b_1 MO_{it} + B_2 X_{it} + v_i + e_{it}) \qquad (3)$$

$$\Pr(ZERO_{LEV_{it}} = 1) = f(a + b_1 MO_{it} + B_2 X_{it} + v_i + e_{it}) \qquad (4)$$

where, LOW_LEV_{it} is a dummy variable that equals one if the market leverage of a particular firm-year is less than 5% and zero otherwise. $ZERO\_LEV_{it}$ is a dummy variable that equals one if the leverage of a particular firm-year is zero and zero otherwise. X_{it} is a vector of firm-level control variables including market-to-book ratio, firm size, tangibility and profitability. v_i is time-invariant firm-specific effects. e_{it} is the error term.

Table 6 reports logistic analysis of the determinants of the probability of low leverage (Equation 3). We find that insider trading-based measures of CEO and especially CFO overconfidence have negative and significant impacts on the probability of low leverage. In contrast, both *TONE* and *TONE_RES* are positively and significantly related to the probability of low leverage.

Table 7 reports logistic analysis of the determinants of the probability of zero leverage (Equation 4). Only CFO overconfidence has a negative and significant impact on the probability of zero leverage. The signs of the coefficients on *TONE* and *TONE_RES* are sensitive to estimation methods and statistically insignificant. To conclude, the results from logistic analysis further confirm our previous findings from leverage regressions (Equation 1 and 2) that tone-based measures of overconfidence is negatively associated with leverage, while insider trading-based measures of CEO and CFO overconfidence are positively associated with leverage.

[Insert Table 6 and 7 here]

E. Further analysis: indirect effects of insider trading

Having shown that optimistic tone and insider trading (i.e. net purchase ratio) have opposite direct impacts on leverage, this section further explores two indirect effects of insider trading. First, we examine the empirical implication of the contradiction between optimistic tone and insider trading for leverage. Second, we test whether and how insider trading will influence investors' perception of market-to-book ratio which in turn drives leverage.

E.1. Interaction between optimistic tone and insider trading

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The main purpose to examine the interaction between optimistic tone and insider trading is to empirically distinguish between two alternative types of impression management, namely "intentionally disinform" and "overconfidence (unintentionally disinform)" (see **Figure 1**). 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 overconfidence, meaning that managerial overconfidence contributes to both positive tone and insider purchases. In this case, managerial overconfidence makes managers disinform investors *unconsciously* by using optimistic tone.

In particular, to test the joint effect of optimistic tone of Chairman's Statement and insider trading, similar to Rogers, Buskirk and Zechman (2011)[19] we interact tone measures with an indicator of abnormal insider trading as follows:

$$LEV_{it} = a + b_1 TONE_{it} + b_2 NPR\_Dummy_{it} + b_3 TONE_{it} * NPR\_Dummy_{it} + b_4 MB_{it} \\ * NPR\_Dummy_{it} + B_5 X_{it} + v_i + e_{it}$$

(5)

where, NPR_Dummy_{it} is an indicator of pure insider selling that takes the value one if the net purchase ratio is -1 and zero otherwise.

Table 8 reports the results for leverage regressions with interaction effects of tone and indicator of pure insider selling (Equation 5). *CEO_NPR(-1)* and *CFO_NPR(-1)* are two dummy variables take on the value one if their net purchase ratio is -1 and zero otherwise. Both *CEO_NPR(-1)* and *CFO_NPR(-1)* are negatively correlated with leverage, while only the coefficients on *CFO_NPR(-1)* are statistically significant in all specifications. In terms of the combined effects, only the interaction between *CEO_NPR(-1)* and tone measures are statistically significant in most of the specifications. In brief, the above findings suggest that CEO selling could weaken the negative effects of optimistic tone on leverage, while CFO selling has a direct and significantly negative impact on leverage. One possible explanation for the negative coefficient on the interaction term is that insider (especially CEO) selling

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[19] 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.

contradicts optimistic tone and consequently makes equity investors less willing to buy the firm's shares.

E.2. Interaction between MB and insider trading

We further investigate whether the impacts of market-to-book (MB) ratio on leverage depend on insider trading. The idea is that investors' interpretation of high market-to-book ratio could be influenced by whether insiders of the high growth firm buy or sell their own shares. In particular, if insiders buy, high MB will be viewed favourably by investors as growth opportunities. In this case, insider purchases mitigate information asymmetry between managers and investors, which in turn reduce information cost of equity. In contrast, if insiders sell, investors may consider high MB as a sign of overpricing and consequently equity issuance becomes more costly.

Our empirical results show that the coefficient on both *CEO_NPR(-1)*MB* and *CFO_NPR(-1)*MB* are positive and statistically significant when the dependent variable is marker leverage. This finding indicates that insider selling by both CEO and CFO weakens market timing effect (i.e. firms issue new equity when the managers believe their firms are overvalued). This is because potential investors learn from insider sales that firm's equity is overvalued and the firm will take this market timing opportunity at the expense of new investors. In belief, we find that insider selling makes the relationship between MB and market leverage less negative.

On the other hand, the coefficient on *CEO_NPR(1)*MB* and *CFO_NPR(1)*MB* are negative and statistically significant when the dependent variable is marker leverage. This finding suggests that at the presence of insider purchase investors perceive high MB as growth opportunities and therefore are more willing to buy new shares. That is why insider purchase strengthens the negative relationship between MB and market leverage.

[Insert Table 8 here]

F. Robustness checks

We conduct several robustness checks using alternative model specifications, estimators and subsamples.

System-GMM: Our tone measures might be endogenous. We attempt to alleviate this concern using the system Generalized Method of Moments (sys-GMM) to estimate the following dynamic adjustment model: $LEV_{it} = a + b_1 MO_{it} + b_2 LEV_{it-1} + B_3 X_{it} + v_i + e_{it}$. We include a lagged dependent variable (i.e. LEV_{it-1}) to avoid potential "dynamic

misspecification". We report the results from GMM regressions in Table 9. All the explanatory variables as treated as endogenous. We check our model specifications using autocorrelation tests and two tests of instrument validity. In particular, the null of no second order autocorrelation fails to be rejected. In addition, Sargan test rejects the null of instrument validity while Hansen test does not. However, Hansen test is more robust than Sargan test, meaning that Sargan test is subject to false reject of the null. Our main empirical results are robust to this alternative estimator.

[Insert Table 9 here]

Lagged independent variables: Another way to address endogeneity concern is to use lagged independent variables as follows: $LEV_{it} = a + b_1 MO_{it-1} + B_2 X_{it-1} + v_i + e_{it}$. Using OLS estimator[20] we find highly consistent results with previous specifications (e.g. Equation 1). In particular, the coefficients on *TONE* and *TONE_RES* are negative and statistically significant at 1% level and all the lagged insider trading measures have significant and positive impacts on leverage.

Non-linear effect: we examine the non-linear effect of optimistic tone by including a quadratic term of tone in Equation (1). The relationship between optimistic tone and leverage is likely to be non-linear considering that the effects of moderate overconfidence might be different from extremely high overconfidence[21]. We find some evidences that support this proposition. Both *TONE*TONE* and *TONE_RES*TONE_RES* have positive and statistically significant (at 5% level) effects on market leverage using OLS estimator. However, this non-linear relationship becomes insignificant when using book leverage and fixed effects estimator.

Subsample (financing deficit vs. surplus): we divide our sample into two subgroups with financing deficit (PDEF) and surplus (NDEF) respectively and then run Equation (1). The purpose of this subsample analysis is to compare the effects of overconfidence measures on leverage in the following two situations: (1) when firms have external financing needs and (2) when firms have sufficient internal financing. Both optimistic tone and insider trading have consistent impacts (negative and positive respectively) on leverage with our previous findings no matter whether there is financing deficit or surplus.

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[20] We use fixed effects estimators as well. However, most of the lagged explanatory variables are insignificant and R-squared (both within and between) are very low. One important reason for the poor model fit is that we estimate a "shorter" panel relative to Equation (1) which leads to insufficient within firm variations.

[21] Campbell *et al*. (2011) is the first study that examines different effects of low, moderate, and high levels of CEO optimism in the context of forced turnover. They find a non-linear (i.e. inversed-U) relationship between optimism and the probability of forced turnover.

V. CONCLUSIONS

This paper compares the effects of managerial overconfident beliefs, as revealed in their words and actions respectively, on corporate capital structure. We construct words-based measure of managerial overconfidence based on the computational content analysis of the optimistic tone of UK Chairman's Statement. Insider trading activities of CEO and CFO are also used to gauge managerial overconfidence. Surprisingly, we find that optimistic tone and net purchase has opposite impacts on leverage. In particular, we find that optimistic tone has a negative and highly significant impact on leverage, while CEO and especially CFO net purchase ratios (NPRs) are positively related to leverage.

More interestingly, we further investigate the joint effect of tone and insider trading on leverage. We document that the coefficient on the interaction between an indicator of insider selling (i.e. NPR equals -1) and optimistic tone is negative and statistically significant. This observation confirms the idea that insider selling contradicts optimistic tone and consequently weakens the positive effect of tone on equity issuance. In this particular case, we may argue that *the actions of managers speak louder than their words*. This new insight is in line with some other evidences in accounting literature that the combined effect of optimistic tone and abnormal insider selling is associated with higher litigation risk (Rogers *et al.*, 2011). Furthermore, we document that insider trading may influence investors' perception of high market-to-book (MB) value: high level of insider purchase will make investors perceive high MB as growth opportunities and therefore are more willing to invest, while high level of insider sales will make investors consider high MB as an indication of overvaluation and consequently are less willing to buy firms' stock. This observation further confirms the importance of managerial actions.

This study has three major implications for future studies. First, our composite tone-based measure of overconfidence can be adopted in studies on managerial overconfidence. Second, it will be interesting to examine the joint effect of managerial "words" and "actions" on corporate financial policies and events, especially when there is a discrepancy between their words and actions. Third, it is worthwhile to empirically compare the roles of different firm directors (e.g., CEO and CFO) and in particular the effects of their behavioural biases on a wide range of corporate policies.

Appendix A. Variable definitions

Variable	Definition
Panel C: Standard dependent and independent variables	
DEF_CF	Financing deficit measured using aggregate cash flow data (i.e. $\Delta D + \Delta E$)
Net debt issues (ΔD)	Long term borrowings minus reduction in long term debt
Net equity issues (ΔE)	Net proceeds from sale/issue of common and preferred stocks minus common/preferred redeemed, retired, converted
PDEF	PDEF equals DEF if the deficit is positive and zero otherwise
NDEF	NDEF equals DEF if the deficit is negative and zero otherwise
Firm size	Natural logarithm of total assets
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
Price performance	The difference of natural logarithm of fiscal year-end share prices
Book leverage	Total debt/total assets
Market leverage	Total debt/(Total assets – common equity + market capitalization)
Net assets	Total assets minus current liabilities
Panel A: Measures of managerial overconfidence	
a) Content analysis-based measures (using Chairman's Statement)	
Net emotion	Positive emotion minus negative emotion including (anxiety, anger and sadness) as defined by *LIWC*
Certain1	Measure of certainty (e.g. always, never) as one aspect of cognitive processes as defined by *LIWC*
Net optimism	[praise+satisfaction+inspiration]-[blame+hardship+denial] as defined by *Diction*
Certain2	[tenacity+leveling+collectives+insistence]-[numerical terms+ambivalence+self reference+variety] as defined by *Diction*
Tone_H	(positive-negative)/(positive+negative), using Henry's (2006, 2008) word list
Tone_LM	(positive-negative)/(positive+negative), using Loughran and McDonald's (2011) word list
b) Insider trading-based measures (i.e. net purchase ratio=(buy - sell)/(buy + sell))	
VA_CEO	The value-based net purchase ratio of CEO
VA_CFO	The value-based net purchase ratio of CFO
VOL_CEO	The volume-based net purchase ratio of CEO
VOL_CFO	The volume-based net purchase ratio of CFO

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Table 1. Descriptive statistics

This table presents the descriptive statistics of the main dependent and independent variables.

Variable	Obs.	Mean	S.D.	Min.	Median	Max.
Panel A: standard dependent and independent variables						
Book leverage	2283	0.180	0.150	0.000	0.170	0.610
Market leverage	2283	0.140	0.130	0.000	0.110	0.520
PDEF_CF/NA	2283	0.110	0.310	0.000	0.000	2.030
NDEF_CF/NA	2283	-0.030	0.070	-0.430	0.000	0.000
MB	2283	1.760	1.260	0.560	1.400	8.790
Log(sales)	2283	12.320	2.240	6.140	12.510	16.870
Tangibility	2283	0.260	0.230	0.000	0.200	0.890
Profitability	2283	0.090	0.180	-0.880	0.120	0.390
Effective tax rate	2283	0.230	0.350	-1.620	0.280	1.640
Price performance	2283	0.000	0.530	-1.880	0.080	1.170
Panel B: words-based measures of managerial overconfidence (i.e. tone of Chairman's Statement)						
TONE	2283	-0.000	1.615	-5.693	0.150	3.676
TONE_RES	2283	-0.000	1.584	-5.034	0.165	4.988
NET_EMOTION	2283	0.740	0.170	0.220	0.760	1.000
CERTAIN1	2283	1.030	0.430	0.210	0.970	2.330
OPTIMISM	2283	53.520	2.070	49.430	53.330	60.160
CERTAIN2	2283	45.630	3.130	32.610	46.040	51.880
TONE_H	2283	0.720	0.230	-0.060	0.770	1.000
TONE_LM	2283	0.560	0.290	-0.290	0.600	1.000
Panel C: action-based measures of managerial overconfidence (i.e. net purchase ratio)						
VA_CEO	1327	0.330	0.890	-1.000	1.000	1.000
VA_CFO	1071	0.460	0.830	-1.000	1.000	1.000
VOL_CEO	1327	0.480	0.790	-1.000	1.000	1.000
VOL_CFO	1071	0.570	0.740	-1.000	1.000	1.000

Panel D: distribution of NPRs of CEO and CFO

Intervals	VA_CEO Obs.	VA_CEO Percentage	VA_CFO Obs.	VA_CFO Percentage	VOL_CEO Obs.	VOL_CEO Percentage	VOL_CFO Obs.	VOL_CFO Percentage
-1	249	18.76%	166	15.50%	249	18.76%	166	15.50%
(-1, -0.8]	104	7.84%	61	5.70%	0	0.00%	0	0.00%
(-0.8, -0.6]	34	2.56%	16	1.49%	5	0.38%	1	0.09%
(-0.6, -0.4]	24	1.81%	19	1.77%	6	0.45%	3	0.28%
(-0.4, -0.2]	22	1.66%	18	1.68%	26	1.96%	19	1.77%
(-0.2, 0]	20	1.51%	19	1.77%	84	6.33%	66	6.16%
(0, 0.2)	21	1.58%	12	1.12%	2	0.15%	3	0.28%
[0.2, 0.4)	13	0.98%	11	1.03%	48	3.62%	18	1.68%
[0.4, 0.6)	14	1.06%	14	1.31%	19	1.43%	17	1.59%
[0.6, 0.8)	9	0.68%	5	0.47%	31	2.34%	12	1.12%
[0.8, 1)	9	0.68%	7	0.65%	49	3.69%	43	4.01%
1	808	60.89%	723	67.51%	808	60.89%	723	67.51%
Total	1327	100%	1071	100%	1327	100%	1071	100%

Table 2. Correlation matrix

This table shows Pearson correlation coefficients between all pairs of our main variables, as defined in Table 1. ***, ** and * indicate that the correlation coefficient is significant at 1% 5% and 10% levels respectively.

		1	2	3	4	5	6	7	8	9	10
1.	PDEF_CF/NA	1									
2.	NDEF_CF/NA	0.176***	1								
3.	MB	0.187***	-0.040*	1							
4.	Log(sales)	-0.260***	-0.118***	-0.179***	1						
5.	Tangibility	-0.126***	-0.018	-0.118***	0.238***	1					
6.	Profitability	-0.345***	-0.169***	-0.053**	0.460***	0.203***	1				
7.	Effective tax rate	-0.029	0.002	-0.002	0.183***	0.063***	0.171***	1			
8.	Price performance	0.038*	-0.092***	0.253***	0.104***	0.071***	0.275***	0.062***	1		
9.	Book leverage	-0.006	-0.025	-0.194***	0.409***	0.394***	0.135***	0.065***	-0.045**	1	
10.	Market leverage	-0.037*	0.007	-0.380***	0.295***	0.357***	0.026	0.014	-0.209***	0.883***	1
11.	TONE	0.064***	-0.048**	0.197***	0.196***	-0.004	0.228***	0.058***	0.309***	-0.043**	-0.192***
12.	TONE_RES	0.128***	0.011	0.000	0.000	0.000	0.000	0.001	0.204***	-0.076***	-0.150***
13.	NET_EMOTION	0.025	-0.071***	0.110***	0.228***	0.013	0.261***	0.087***	0.242***	-0.021	-0.122***
14.	CERTAIN1	-0.092***	-0.059***	0.021	0.261***	0.042**	0.117***	0.032	0.035*	0.090***	0.043**
15.	OPTIMISM	0.023	-0.032	0.104***	0.229***	0.054***	0.155***	0.015	0.162***	0.051**	-0.044**
16.	CERTAIN2	0.023	-0.011	-0.005	0.006	-0.013	-0.05**	-0.039*	0.010	0.000	-0.004
17.	TONE_H	0.110***	0.012	0.227***	0.010	-0.052**	0.142***	0.035*	0.311***	-0.103***	-0.253***
18.	TONE_LM	0.083***	-0.041**	0.194***	0.086***	-0.039*	0.151***	0.039*	0.282***	-0.093***	-0.216***
19.	VA_CEO	0.058**	0.055**	-0.224***	-0.171***	-0.044	-0.182***	-0.038	-0.168***	0.017	0.120***
20.	VA_CFO	0.060**	-0.029	-0.203***	-0.178***	-0.028	-0.171***	-0.033	-0.163***	0.056*	0.139***
21.	VOL_CEO	0.040	0.065**	-0.217***	-0.058**	-0.032	-0.149***	-0.012	-0.149***	0.072***	0.140***
22.	VOL_CFO	0.051*	-0.018	-0.204***	-0.087***	-0.017	-0.14***	-0.011	-0.148***	0.083***	0.136***

		11	12	13	14	15	16	17	18	19	20	21	22
11.	TONE	1											
12.	TONE_RES	0.938***	1										
13.	NET_EMOTION	0.801***	0.740***	1									
14.	CERTAIN1	0.310***	0.235***	0.175***	1								
15.	OPTIMISM	0.721***	0.670***	0.451***	0.275***	1							
16.	CERTAIN2	0.043**	0.056***	0.000	0.128***	0.042**	1						
17.	TONE_H	0.774***	0.744***	0.503***	0.064***	0.353***	0.010	1					
18.	TONE_LM	0.865***	0.831***	0.600***	0.121***	0.505***	-0.009	0.657***	1				
19.	VA_CEO	-0.155***	-0.056**	-0.127***	-0.084***	-0.119***	0.008	-0.110***	-0.122***	1			
20.	VA_CFO	-0.141***	-0.047	-0.113***	-0.120***	-0.076**	-0.052*	-0.087***	-0.126***	0.670***	1		
21.	VOL_CEO	-0.145***	-0.071***	-0.110***	-0.073***	-0.108***	0.011	-0.098***	-0.130***	0.876***	0.644***	1	
22.	VOL_CFO	-0.142***	-0.068**	-0.108***	-0.099***	-0.078***	-0.029	-0.092***	-0.137***	0.595***	0.898***	0.723***	1

Table 3. Univariate leverage regressions: fixed effects

This table reports estimated coefficients and within, between and overall R-squared of univariate fixed effects (FE) regressions where the dependent variables are book (Panel A) and market (Panel B) leverage respectively. All variables are defined in Appendix A. Standard errors are adjusted for firm-level clustering. ***, **, and * indicate that coefficient is significant at 1%, 5%, and 10% levels, respectively.

Variables	Panel A. Dependent variable: book leverage					Panel B. Dependent variable: market leverage				
	Estimated coefficients	t-stat	R^2 (within)	R^2 (between)	R^2 (overall)	Estimated coefficients	t-stat	R^2 (within)	R^2 (between)	R^2 (overall)
TONE	**-0.007***	**-5.79**	**0.020**	0.001	0.002	**-0.015***	**-11.26**	**0.101**	0.029	0.037
TONE_RES	**-0.006***	**-4.99**	**0.015**	0.004	0.006	**-0.012***	**-9.47**	**0.068**	0.015	0.023
CEO_NPR(-1)	-0.002	-0.35	0.000	0.009	0.003	-0.012***	-2.85	0.003	0.020	0.010
CFO_NPR(-1)	-0.008	-1.57	0.001	0.001	0.001	-0.015***	-2.85	0.003	0.007	0.004
CEO_NPR(1)	-0.000	-0.02	0.000	0.007	0.002	0.010**	2.08	0.004	0.029	0.010
CFO_NPR(1)	-0.000	-0.02	0.000	0.040	0.012	0.002	0.42	0.000	0.054	0.014
PDEF/NA	0.035***	4.26	0.020	0.008	0.000	0.010	1.37	0.002	0.015	0.001
NDEF/NA	0.176***	5.00	0.029	0.009	0.001	0.137***	5.12	0.017	0.003	0.000
MB	-0.004	-1.12	0.003	0.048	0.038	-0.023***	**-6.02**	**0.078**	**0.152**	0.144
Firm size	0.013*	1.70	0.007	**0.171**	0.168	0.025***	3.93	0.022	**0.091**	0.087
Tangibility	0.083	1.53	0.006	**0.210**	0.156	0.028	0.59	0.001	**0.179**	0.128
Profitability	-0.089***	-3.44	0.018	0.016	0.018	-0.152***	-5.62	0.051	0.004	0.001

Table 4. Leverage

This table presents fixed effect (FE) and random-effect Tobit (RE-Tobit) regressions with book leverage and market leverage as dependent variables in Panel A and B respectively. 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.

					Panel A. Dependent variable: book leverage							
Variables	(1) FE	(2) RE-Tobit	(3) FE	(4) RE-Tobit	(5) FE	(6) RE-Tobit	(7) FE	(8) RE-Tobit	(9) FE	(10) RE-Tobit	(11) FE	(12) RE-Tobit
VA_CEO	0.000	0.001										
	(0.883)	(0.798)										
VOL_CEO			0.002	0.004								
			(0.502)	(0.229)								
VA_CFO					0.006**	0.010***						
					(0.050)	(0.005)						
VOL_CFO							0.005	0.009**				
							(0.211)	(0.020)				
TONE									-0.006***	-0.006***		
									(0.000)	(0.000)		
TONE_RES											-0.005***	-0.006***
											(0.000)	(0.000)
PDEF	0.043***	0.053***	0.043***	0.053***	0.055***	0.060***	0.055***	0.060***	0.035***	0.048***	0.035***	0.048***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NDEF	0.168***	0.149***	0.167***	0.148***	0.170***	0.155***	0.169***	0.155***	0.276***	0.246***	0.276***	0.246***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MB	-0.001	-0.004	0.000	-0.004	0.000	-0.002	-0.001	-0.002	-0.002	-0.004*	-0.003	-0.006***
	(0.908)	(0.167)	(0.974)	(0.219)	(0.956)	(0.539)	(0.947)	(0.556)	(0.653)	(0.064)	(0.334)	(0.008)
Firm size	0.017	0.034***	0.018*	0.034***	0.009	0.031***	0.008	0.030***	0.019***	0.032***	0.019**	0.031***
	(0.111)	(0.000)	(0.093)	(0.000)	(0.481)	(0.000)	(0.529)	(0.000)	(0.009)	(0.000)	(0.012)	(0.000)
Tangibility	0.039	0.186***	0.038	0.184***	0.102	0.241***	0.106	0.243***	0.110*	0.196***	0.112**	0.198***
	(0.628)	(0.000)	(0.633)	(0.000)	(0.208)	(0.000)	(0.190)	(0.000)	(0.051)	(0.000)	(0.047)	(0.000)
Profitability	-0.106**	-0.099***	-0.105**	-0.098***	-0.165***	-0.149***	-0.165***	-0.148***	-0.069***	-0.073***	-0.077***	-0.082***
	(0.019)	(0.000)	(0.020)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.005)	(0.000)	(0.001)	(0.000)
Constant	-0.027	-0.285***	-0.039	-0.289***	0.079	-0.265***	0.091	-0.260***	-0.077	-0.262***	-0.066	-0.250***
	(0.844)	(0.000)	(0.775)	(0.000)	(0.617)	(0.000)	(0.561)	(0.000)	(0.405)	(0.000)	(0.481)	(0.000)
R-squared	0.088		0.089		0.123		0.120		0.100		0.097	
Log-likelihood		1027.310		1027.999		826.417		825.255		1800.010		
Obs.	1327	1327	1327	1327	1071	1071	1071	1071	2283	2283	2283	2283
Firms	377	377	377	377	340	340	340	340	459	459	459	459

Table 4. (Continued)

Panel B. Dependent variable: market leverage

Variables	(1) FE	(2) RE-Tobit	(3) FE	(4) RE-Tobit	(5) FE	(6) RE-Tobit	(7) FE	(8) RE-Tobit	(9) FE	(10) RE-Tobit	(11) FE	(12) RE-Tobit
VA_CEO	0.003	0.003										
	(0.235)	(0.244)										
VOL_CEO			0.005*	0.006*								
			(0.081)	(0.081)								
VA_CFO					0.009***	0.010***						
					(0.009)	(0.001)						
VOL_CFO							0.008*	0.011***				
							(0.052)	(0.005)				
TONE									-0.012***	-0.012***		
									(0.000)	(0.000)		
TONE_RES											-0.011***	-0.011***
											(0.000)	(0.000)
PDEF	0.018**	0.025**	0.018**	0.025**	0.027**	0.031***	0.027**	0.031***	0.021***	0.030***	0.021***	0.030***
	(0.021)	(0.012)	(0.021)	(0.012)	(0.015)	(0.007)	(0.015)	(0.007)	(0.003)	(0.000)	(0.003)	(0.000)
NDEF	0.123***	0.101***	0.123***	0.100***	0.130***	0.108***	0.130***	0.108***	0.109***	0.092***	0.109***	0.092***
	(0.001)	(0.003)	(0.001)	(0.004)	(0.002)	(0.004)	(0.003)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)
MB	-0.021***	-0.033***	-0.020***	-0.033***	-0.026***	-0.038***	-0.026***	-0.038***	-0.016***	-0.028***	-0.020***	-0.032***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm size	0.039***	0.028***	0.039***	0.028***	0.028***	0.025***	0.026***	0.025***	0.024***	0.026***	0.022***	0.024***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Tangibility	0.062	0.154***	0.060	0.152***	0.095	0.191***	0.100	0.193***	0.073*	0.145***	0.077*	0.149***
	(0.294)	(0.000)	(0.302)	(0.000)	(0.176)	(0.000)	(0.151)	(0.000)	(0.093)	(0.000)	(0.075)	(0.000)
Profitability	-0.171***	-0.148***	-0.171***	-0.148***	-0.247***	-0.194***	-0.247***	-0.193***	-0.096***	-0.092***	-0.113***	-0.110***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.313***	-0.187***	-0.317***	-0.189***	-0.160	-0.154***	-0.147	-0.150***	-0.139*	-0.170***	-0.115	-0.145***
	(0.002)	(0.000)	(0.001)	(0.000)	(0.210)	(0.000)	(0.250)	(0.000)	(0.100)	(0.000)	(0.175)	(0.000)
R-squared	0.210		0.212		0.263		0.260		0.203		0.204	
Log-likelihood		1106.644		1107.490		919.337		918.252		1983.342		
Obs.	1327	1327	1327	1327	1071	1071	1071	1071	2283	2283	2283	2283
Firms	377	377	377	377	340	340	340	340	459	459	459	459

Table 5. Leverage regressions in first differences: fixed effects

This table presents fixed effect (FE) leverage regressions in first differences with book leverage and market leverage as dependent variables in Panel A and B respectively. 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.

	Panel A. Dependent variable: book leverage change (model 1-6)						*Panel B. Dependent variable: market leverage change (model 7-12)*					
	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE	(7) FE	(8) FE	(9) FE	(10) FE	(11) FE	(12) FE
ΔVA_CEO	-0.005						-0.001					
	(0.114)						(0.712)					
ΔVOL_CEO		-0.005						0.000				
		(0.309)						(0.965)				
ΔVA_CFO			0.002						0.003			
			(0.513)						(0.437)			
ΔVOL_CFO				0.002						0.004		
				(0.708)						(0.463)		
ΔTONE					-0.002***						-0.007***	
					(0.008)						(0.000)	
ΔTONE_RES						-0.002***						-0.007***
						(0.008)						(0.000)
ΔPDEF/NA	0.038***	0.037***	0.042**	0.042***	0.034***	0.034***	0.022**	0.022**	0.020*	0.020*	0.024***	0.024***
	(0.004)	(0.005)	(0.011)	(0.009)	(0.000)	(0.000)	(0.029)	(0.029)	(0.069)	(0.070)	(0.000)	(0.000)
ΔNDEF/NA	0.207***	0.206***	0.143**	0.143**	0.191***	0.191***	0.151***	0.151***	0.117***	0.118***	0.173***	0.173***
	(0.000)	(0.000)	(0.045)	(0.045)	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)	(0.005)	(0.000)	(0.000)
ΔMB	-0.011*	-0.010*	-0.006	-0.006	-0.006***	-0.007***	-0.033***	-0.033***	-0.027***	-0.027***	-0.019***	-0.022***
	(0.059)	(0.069)	(0.172)	(0.176)	(0.006)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔFirm size	0.043**	0.044**	0.043	0.044	0.021*	0.021*	0.099***	0.100***	0.104***	0.105***	0.039***	0.038***
	(0.026)	(0.022)	(0.157)	(0.155)	(0.058)	(0.061)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔTangibility	-0.018	-0.016	0.106	0.104	0.158**	0.159**	0.077	0.079	0.078	0.077	0.100**	0.103**
	(0.840)	(0.858)	(0.434)	(0.440)	(0.021)	(0.020)	(0.263)	(0.252)	(0.437)	(0.442)	(0.039)	(0.035)
ΔProfitability	-0.103***	-0.103***	-0.208***	-0.209***	-0.079***	-0.083***	-0.140***	-0.139***	-0.289***	-0.288***	-0.089***	-0.100***
	(0.004)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.004**	-0.004**	-0.003	-0.003	-0.003**	-0.003**	-0.007***	-0.007***	-0.007***	-0.007***	-0.004***	-0.004***
	(0.012)	(0.012)	(0.204)	(0.198)	(0.014)	(0.014)	(0.002)	(0.002)	(0.005)	(0.004)	(0.000)	(0.000)
R-squared (within)	0.196	0.193	0.196	0.195	0.173	0.173	0.243	0.242	0.284	0.284	0.233	0.233
R-squared (between)	0.115	0.113	0.142	0.139	0.132	0.132	0.141	0.142	0.088	0.087	0.139	0.139
Firms	256	256	206	206	421	421	256	256	206	206	421	421
Obs.	754	754	569	569	1645	1645	754	754	569	569	1645	1645

Table 6. Low leverage

This table presents fixed effect logit (FE-logit) and pooled logit (P-logit) regressions where coefficients reported as log odds ratios. The dependent variable is low leverage dummy that equals one if market leverage is less than 5% and zero otherwise. All the variables are defined in Appendix A. Standard errors are adjusted for firm-level clustering. Log-likelihood and log pseudolikelihood are reported for FE-logit and P-logit respectively. P-values are given in parentheses. ***, **, and * indicate that coefficient is significant at 1%, 5%, and 10% levels, respectively.

	Dependent variable: low leverage dummy=1 if market leverage is below 5%.										
	(1) FE-logit	(2) P-logit	(3) FE-logit	(4) P-logit	(5) FE-logit	(6) P-logit	(7) FE-logit	(8) P-logit	(9) FE-logit	(10) P-logit	(11) FE-logit	(12) P-logit
VA_CEO	-0.043 (0.853)	-0.277*** (0.001)										
VOL_CEO			-0.266 (0.334)	-0.350*** (0.000)								
VA_CFO					-0.607* (0.056)	-0.399*** (0.000)						
VOL_CFO							-0.753* (0.087)	-0.409*** (0.000)				
TONE									0.231*** (0.008)	0.086** (0.016)		
TONE_RES											0.223*** (0.007)	0.083** (0.015)
MB	2.669*** (0.000)	1.033*** (0.000)	2.571*** (0.000)	1.032*** (0.000)	2.709*** (0.000)	0.858*** (0.000)	2.772*** (0.000)	0.873*** (0.000)	1.688*** (0.000)	0.882*** (0.000)	1.754*** (0.000)	0.908*** (0.000)
Firm size	-0.946 (0.103)	-0.525*** (0.000)	-1.042* (0.077)	-0.518*** (0.000)	0.570 (0.302)	-0.504*** (0.000)	0.590 (0.282)	-0.491*** (0.000)	-0.755** (0.011)	-0.501*** (0.000)	-0.725** (0.014)	-0.491*** (0.000)
Tangibility	-7.426 (0.101)	-2.837*** (0.000)	-7.637* (0.092)	-2.863*** (0.000)	1.553 (0.689)	-2.639*** (0.000)	1.365 (0.728)	-2.665*** (0.000)	-3.765** (0.044)	-2.239*** (0.000)	-3.853** (0.039)	-2.270*** (0.000)
Profitability	3.234 (0.277)	0.642 (0.254)	3.623 (0.228)	0.619 (0.270)	0.303 (0.912)	0.811 (0.207)	0.174 (0.949)	0.815 (0.207)	1.283 (0.343)	0.883** (0.025)	1.630 (0.222)	1.016*** (0.009)
Constant		4.701*** (0.000)		4.687*** (0.000)		4.586*** (0.000)		4.453*** (0.000)		4.340*** (0.000)		4.161*** (0.000)
Log-likelihood	-74.486	-571.006	-74.030	-569.151	-49.612	-473.518	-49.866	-474.371	-196.607	-1067.232	-196.538	-1067.158
Obs.	300	1327	300	1327	201	1071	201	1071	656	2283	656	2283
Firms	64	377	64	377	43	340	43	340	111	459	111	459

Table 7. Zero leverage

This table presents fixed effect logit (FE-logit) and pooled logit (P-logit) regressions where coefficients reported as log odds ratios. The dependent variable is zero leverage dummy that equals one if market leverage is 0% and zero otherwise. All the variables are defined in Appendix A. Standard errors are adjusted for firm-level clustering. Log-likelihood and log pseudolikelihood are reported for FE-logit and P-logit respectively. P-values are given in parentheses. ***, **, and * indicate that coefficient is significant at 1%, 5%, and 10% levels, respectively.

	(1) FE-logit	(2) P-logit	(3) FE-logit	(4) P-logit	(5) FE-logit	(6) P-logit	(7) FE-logit	(8) P-logit	(9) FE-logit	(10) P-logit	(11) FE-logit	(12) P-logit
					Dependent variable: zero leverage dummy=1 if market leverage is 0%.							
VA_CEO	0.036	-0.134										
	(0.916)	(0.248)										
VOL_CEO			-0.121	-0.110								
			(0.710)	(0.381)								
VA_CFO					-1.089*	-0.379***						
					(0.089)	(0.003)						
VOL_CFO							-1.418*	-0.327**				
							(0.080)	(0.015)				
TONE									0.100	-0.008		
									(0.317)	(0.865)		
TONE_RES											0.097	-0.008
											(-0.311)	(0.855)
MB	-0.076	0.191***	-0.093	0.198***	-0.626	0.248***	-0.760	0.256***	-0.142	0.224***	-0.112	0.221***
	(0.759)	(0.003)	(0.704)	(0.003)	(0.161)	(0.003)	(0.127)	(0.002)	(0.302)	(0.000)	(-0.402)	(0.000)
Firm size	-1.641**	-0.522***	-1.652**	-0.518***	-0.323	-0.511***	-0.188	-0.495***	-0.699**	-0.561***	-0.686**	-0.561***
	(0.035)	(0.000)	(0.034)	(0.000)	(0.762)	(0.000)	(0.863)	(0.000)	(0.017)	(0.000)	(-0.019)	(0.000)
Tangibility	2.726	-1.270***	3.066	-1.274***	14.804**	-1.028	15.318**	-1.047*	-2.326	-1.189***	-2.367	-1.187***
	(0.565)	(0.007)	(0.518)	(0.007)	(0.038)	(0.104)	(0.04)	(0.097)	(0.315)	(0.003)	(-0.307)	(0.003)
Profitability	2.161	1.236**	1.978	1.251**	6.355*	0.852	6.210*	0.888	1.085	1.558***	1.237	1.546***
	(0.328)	(0.024)	(0.354)	(0.023)	(0.094)	(0.236)	(0.086)	(0.216)	(0.304)	(0.000)	(-0.232)	(0.000)
Constant		4.194***		4.131***		3.969***		3.779***		4.354***		4.37***
		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)
Log-likelihood	-37.993	-420.333	-37.930	-420.637	-22.836	-311.907	-22.605	-313.335	-118.848	-740.171	-118.835	-740.169
Obs.	115	1327	115	1327	80	1071	80	1071	317	2283	317	2283
Firms	26	377	26	377	18	340	18	340	54	459	54	459

Table 8. Leverage regression with indirect effects of insider selling

	Panel A. Dependent variable: market leverage (model 1-4)				Panel B. Dependent variable: book leverage (model 5-8)			
	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE	(7) FE	(8) FE
TONE	-0.012***		-0.012***		-0.006***		-0.006***	
	(0.000)		(0.000)		(0.000)		(0.000)	
TONE_RES		-0.012***		-0.011***		-0.006***		-0.005***
		(0.000)		(0.000)		(0.000)		(0.000)
CEO_NPR(-1)	-0.026***	-0.028***			-0.005	-0.007		
	(0.000)	(0.000)			(0.548)	(0.332)		
CFO_NPR(-1)			-0.031***	-0.032***			-0.015*	-0.016**
			(0.008)	(0.007)			(0.053)	(0.049)
CEO_NPR(-1)*MB	0.009***	0.011***			0.001	0.003		
	(0.001)	(0.000)			(0.724)	(0.331)		
CFO_NPR(-1)*MB			0.009*	0.009**			0.002	0.003
			(0.061)	(0.046)			(0.414)	(0.294)
CEO_NPR(-1)*TONE	**0.006****				**0.006****			
	(0.022)				**(0.027)**			
CFO_NPR(-1)*TONE			0.002				0.002	
			(0.568)				(0.563)	
CEO_NPR(-1)*TONE_RES		**0.006****				**0.005***		
		(0.020)				**(0.079)**		
CFO_NPR(-1)*TONE_RES				0.003				0.003
				(0.439)				(0.498)
PDEF/NA	0.021***	0.021***	0.020***	0.021***	0.036***	0.036***	0.036***	0.036***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
NDEF/NA	0.107***	0.107***	0.110***	0.110***	0.141***	0.141***	0.143***	0.143***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MB	-0.018***	-0.021***	-0.017***	-0.020***	-0.002	-0.003	-0.001	-0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.657)	(0.346)	(0.689)	(0.376)
Firm size	0.023***	0.021***	0.024***	0.022***	0.019**	0.018**	0.019***	0.019**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.011)	(0.014)	(0.009)	(0.012)
Tangibility	0.075*	0.078*	0.072*	0.076*	0.111**	0.112**	0.108*	0.110*
	(0.083)	(0.069)	(0.097)	(0.080)	(0.050)	(0.047)	(0.056)	(0.052)
Profitability	-0.096***	-0.114***	-0.095***	-0.113***	-0.070***	-0.078***	-0.069***	-0.077***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.001)	(0.005)	(0.001)
Constant	-0.124	-0.100	-0.135	-0.110	-0.073	-0.062	-0.079	-0.067
	(0.137)	(0.233)	(0.105)	(0.184)	(0.431)	(0.509)	(0.402)	(0.475)

Table 9. Dynamic leverage adjustment: system and difference GMM

This table presents leverage regressions with book leverage and market leverage as dependent variables in Panel A and B respectively. All the variables are defined in Appendix A. The models are estimated using two-step system and difference GMM. All explanatory variables are treated as endogeneous, which are instrumented using lags 2 or 3. Asymptotic standard errors robust to heteroscedasticity are reported in parentheses. P-values are given in parentheses. AR(1) and AR(2) are first and second order autocorrelation of residuals, asymptotically distributed as standard normal under the null of no serial correlation. Sargan test and Hansen test are tests of instrument validity. F test is a test of overall model fit. P-values of the above diagnostic tests are reported. Number of instruments is also reported. ***, **, and * indicate that coefficient is significant at 1%, 5%, and 10% levels, respectively.

	Panel A. Dependent variable: book leverage (model 1-4)				Panel B. Dependent variable: market leverage (model 5-8)			
	(1) SYS-GMM	(2) SYS-GMM	(3) DIF-GMM	(4) DIF-GMM	(5) SYS-GMM	(6) SYS-GMM	(7) DIF-GMM	(8) DIF-GMM
Lagged leverage	0.842***	0.843***	0.320***	0.320***	0.627***	0.627***	0.225***	0.080
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.252)
TONE	**-0.005****		**-0.009*****		**-0.016*****		**-0.019*****	
	(0.028)		**(0.000)**		**(0.000)**		**(0.000)**	
TONE_RES		**-0.004****		**-0.008*****		**-0.013*****		**-0.019*****
		(0.027)		**(0.000)**		**(0.000)**		**(0.000)**
PDEF/NA	0.006	0.007	0.021	0.021	0.021	0.034**	0.023*	0.019
	(0.565)	(0.562)	(0.308)	(0.319)	(0.121)	(0.014)	(0.066)	(0.236)
NDEF/NA	0.308***	0.308***	0.246***	0.246***	0.225***	0.318***	0.225***	0.229***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.004)
MB	0.001	0.000	0.003	0.000	-0.017***	-0.014***	-0.008***	-0.014***
	(0.663)	(0.846)	(0.337)	(0.961)	(0.000)	(0.000)	(0.002)	(0.000)
Firm size	0.009***	0.008***	0.010	0.009	0.008***	0.015***	0.033**	0.038**
	(0.000)	(0.001)	(0.489)	(0.531)	(0.006)	(0.000)	(0.017)	(0.011)
Tangibility	0.060**	0.062**	-0.060	-0.058	0.018	0.016	0.068	0.076
	(0.021)	(0.017)	(0.704)	(0.719)	(0.524)	(0.571)	(0.536)	(0.508)
Profitability	-0.015	-0.022	-0.022	-0.036	-0.082***	-0.061**	-0.048	-0.071**
	(0.537)	(0.350)	(0.379)	(0.153)	(0.002)	(0.016)	(0.192)	(0.013)
Constant	-0.092***	-0.082***			-0.036	-0.101***		
	(0.001)	(0.002)			(0.274)	(0.001)		
AR(1) (*p-value*)	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
AR(2) (*p-value*)	0.835	0.837	0.444	0.446	0.292	0.722	0.190	0.159
Sargan test (*p-value*)	0.000***	0.000***	0.003***	0.002***	0.000***	0.000***	0.000***	0.000***
Hansen test (*p-value*)	0.628	0.637	0.352	0.360	0.389	0.464	0.238	0.171
F test (*p-value*)	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Number of instruments	284	284	185	185	284	284	185	185
Firms	421	421	359	359	421	421	359	359
Obs.	1645	1645	1141	1141	1645	1645	1141	1141

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