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CEO PENSION AND SELLING, GENERAL AND ADMINISTRATIVE COST STICKINESS

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ABSTRACT

Using CEO pension as inside debt, we show how inside debt affects cost stickiness. Inside debt was recently recognized as debt-based compensation that increases managers' risk aversion. More risk adverse managers will reduce cost stickiness if it suits their self-interest. We empirically find that inside debt decreases cost stickiness, which implies that cost stickiness is mainly driven by overconfident CEOs' intentions to benefit them. Our results show that inside debt can mitigate the agency problem in cost stickiness.

Keywords: CEO Pension, Cost stickiness, Agency problem, Inside Debt.

INTRODUCTION

As a firm has equity-financing and debt-financing, Chief Executive Officer (CEO) compensation also consists of equity-and debt-based components. Stocks and options granted to CEOs are examples of equity-based compensation, which is the subject of many studies and received a lot of attention from researchers. However, debt-based compensation has been less examined. Recently, some researchers are focusing on the Defined Benefit (DB) retirement pension plan as the CEO's debt-based compensation because it is viewed as unsecured and unfunded liabilities against the firm. The CEO's debt-based compensation, or "inside debt", impacts the firm in various ways, primarily by increasing the CEO's risk aversion, as debt does for creditors. A more risk-averse CEO will lead the firm as a firm with a high debt ratio, as many empirical studies show. Firms with more inside debt file bankruptcy less often (Sundaram & Yermack, 2007), enjoy a lower cost of debt, but embrace a higher cost of equity (Wei & Yermack, 2011; Anantharaman et al., 2013); engage in more diverse activities and less risky activities, such as R&D; and have with lower stock volatility, lower leverage and higher liquidity (Cassell et al., 2012); and adopt more conservative accounting policies (Wang et al., 2017).

In this study, we document one potential path through which inside debt affects the agency problem. Specifically, we examine whether inside debt mitigates the cost stickiness induced by managerial overconfidence. We find that costs to respond differently to sales increases and decrease (Anderson et al., 2003). More exactly, when sales decrease, costs decline by an amount less than that by which costs rise when the sales increase. This phenomenon is termed "cost stickiness" and supported by subsequent research (Anderson et al., 2007; Banker & Chen, 2006; Banker et al., 2014; Chen et al., 2012; Via & Perego, 2014; Kuang et al., 2015).

Among these studies, some argue that this asymmetry in cost behavior arises from the firm's optimal decision. This can be true when the sales drop is temporary and retaining slack resources is less expensive than reducing the costs immediately and increasing them later. For example, if the cost of breaking the incumbent contract is more expensive than the cost of maintaining slack resources, then it can be optimal to retain the contract and the transitory slack resources despite the sales drop. On the contrary, other researches find that the main reason for the cost stickiness in the agency problem is that self-interested managers seek to build their empires by maintaining slack resources, thereby benefiting themselves. Especially, managerial overconfidence demonstrates a higher degree of cost stickiness (Chen et al., 2013; Kuang et al., 2015), as they positively posit that the sales drop is temporary.

As prior studies find mixed results for the reasons for cost stickiness, to determine the dominant reason, we introduce inside debt into cost stickiness analysis. Since an increase in inside debt has similar effects to those of an increase in the debt ratio, the manager will be more risk averse. We hypothesize that cost stickiness arises primarily from the manager's self-interest, or agency problem; in this case, a more risk adverse manager will choose more conservative policies. This will lead the manager to reduce cost stickiness and lower costs as sales fall.

Using a U.S. sample from 2006 to 2015, we empirically show that the existence of inside debt decreases the cost stickiness, with both Anderson et al. (2007) and Homburg & Nasev's (2008) cost-stickiness models. Additional tests using an alternative measure of CEO overconfidence and institutional monitoring as a manager-disciplining factor also confirm our hypotheses and main results.

Our study contributes to the cost stickiness literature, as we add supporting evidence for agency problem as a driving factor in cost stickiness. Existing cost-stickiness studies have not yet reached a conclusion as to whether to view the cost stickiness phenomenon as benefiting the firm and shareholder, or only the managers. Our study provides an additional result to clarify and better understand cost stickiness.

Our study also contributes to inside debt studies. Compared to CEOs' equity-based compensation, fewer studies exist on debt-based compensation. Using CEO pension as inside debt, we examine how inside debt affects manager's behavior related to costs, especially cost stickiness. Our results of inside debt's significant association with cost stickiness shed light on inside debt's additional impact on corporation which has been unexplored so far. Although Im et al. (2018) examine the relationship between CEO inside debt holdings and asymmetric cost behavior, our paper uses different and various cost behavior models.

THEORY AND HYPOTHESIS

Cost Stickiness

Since Anderson et al. (2003) argued the empirical existence of cost stickiness, a large stream of literature documented why this asymmetric phenomenon happens. The reasons mentioned in this stream of literature can primarily be divided into the economic and agency factors (Chen et al., 2012; Kuang et al., 2015). The economic factor as a driver of cost stickiness indicates that the managers maintain corporate costs, even if sales decrease because it is considered optimal to retain the costs rather than reducing them. This interpretation can be valid if the sales drop is expected to be temporary and adjusting the costs downward and recovering the cutback is expensive, and/or this decision maximizes firm value (Abel & Eberly, 1994). In

contrast, the agency factor as a driver of cost stickiness implies that maintaining slack resources for a sales drop benefits the manager, not the firm and especially benefits the manager's intention of empire building. These self-interested managers pursue their private interests by refraining from cutbacks in size such as in the labor force or resources. Thus, the extent of cost stickiness in this case can be considered as the degree of agency problem between managers and shareholders. Prior studies already show that the level of the Sales, General and Administrative (SG&A) cost stickiness was reduced and the SG&A cost approached the optimal level from the shareholders' viewpoint. Various studies find evidence of the agency factor in cost stickiness, either empirically or through case analyses (Banker & Chen, 2006; Chen et al., 2012; Balakrishnan & Gruca, 2008; Cohen et al., 2008; Diervnck et al., 2012; Kama & Weiss, 2013; Roychowdhury, 2006). Interdisciplinary studies combined with psychology theory also find that overconfident CEOs tend to enlarge the degree of cost stickiness or deviate from the optimal cost level (Chen et al., 2013; Kuang et al., 2015). This cost stickiness as an agency problem is prominent in overconfident CEOs, as they delude themselves that the sales drop will be temporary.

In summary, the economic factor as a driver of cost stickiness aims to enhance firm value, whereas the agency factor as a driver of cost stickiness worsens firm value. Controversies remain concerning whether cost stickiness harms shareholders or not. We introduce CEO pensions in order to clarify the dominant factor and the net effect of cost stickiness on firm.

CEO Pension

According to agency theory, CEO compensation is supposed to have a structure similar to the debt-to-equity ratio of the firm he or she manages. This theoretical justification for a similarity in the debt-to-equity ratio between CEO compensation and the firm stems from the ideal alignment of both sides' interests. This alignment enables an alignment between the manager's incentives and those of shareholders and debt holders based on the firm's financial structure (Jensen & Meckling, 1976; Edmans & Liu, 2011). An extensive literature documents equity-based CEO compensation (Murphy, 1985; Lambert & Larcker, 1987; Morck et al., 1988; McConnell & Servaes, 1990; Hanlon et al., 2003; Coles et al., 2006; Yan & Zhang, 2009; Brockman et al., 2010) but there are relatively fewer studies of debt-based CEO compensation, as there are differences in the specific characteristics between the firm's debt and debt-based compensation.

Regarding debt-based compensation, recent studies suggest CEO pensions as an adequate example. Indeed, financial statement record CEO pensions as liabilities at the point when the future payment is determined and these liabilities are removed when the actual payment is implemented. Because future payments of CEO pensions are determined periodically, CEO pensions carry features similar to the firm's debt (Kwak & Mo, 2017). Furthermore, empirical studies show that firms with more CEO pensions behave similarly to firms with a higher debt ratio. As with higher-debt-ratio firms, higher-CEO-pension firms behave more conservatively; they also have lower bankruptcy risk (Sundaram & Yermack, 2007); a lower cost of debt and higher cost of equity (Wei & Yermack, 2011; Anantharaman et al., 2013), less risky behaviors, such as lower volatility in stock returns, R&D expenditures and leverage ratio; a higher degree of diversification and liquidity (Cassell et al., 2012); fewer mergers and acquisitions activities which may lead to higher default risk (Phan, 2014); more conservative accounting policies (Wang et al., 2017); less participation in earnings management (He, 2015);

and less engagement in tax shelter transactions, which may lead to higher volatility in cash flows (Chi et al., 2017).

Hypothesis Development

In this study, we intend to relate cost stickiness and CEO pensions to investigate whether cost stickiness benefits only managers at the sacrifice of shareholders, or affects shareholders positively by increasing firm value, in net effect.

As noted above, the CEO compensation structure affects the conservatism of managers' corporate decisions. For example, Bruggen & Zehnder (2014) observe that managers with only equity-based compensation incurred greater SG&A cost stickiness. They interpreted this result as a supporting evidence for the positive (or economic) factor of cost stickiness, as fully equity-based compensation should lead managers to faithfully serve the shareholders for his/her identical financial structure.

Similarly, CEO pensions can correspond to an increase in liabilities, and can then be expected to lead to a higher default risk, and thereby increase managers' risk aversion. If cost stickiness arises mainly from the manager's good intention of enhancing firm value, then the increased default risk will induce the manager to raise cost stickiness, as higher cost stickiness in this case is expected to improve firm value and lower the default risk. In short, the economic factor of cost stickiness predicts a positive association between CEO pensions and cost stickiness. On the contrary, if cost stickiness is due primarily to the manager's self-interest, then a manager with increased risk aversion will be more conservative and pessimistic about the firm's future performance. This will lead the manager to adopt a more conservative accounting policy and provides him/her with less incentive to retain slack resources if sales drop. This will reduce cost stickiness. In short, the agency factor of cost stickiness implies a negative association between CEO pensions and cost stickiness. In this way, we can determine whether the cost stickiness benefits or harms shareholders using CEO pensions.

We formally state our hypothesis as the following two contradictory statements:

H1: If the economic factor exceeds the agency factor, CEO pensions have a positive relation with SG&A cost stickiness.

H2: If the agency factor exceeds the economic factor, CEO pensions have a negative relation with SG&A cost stickiness.

RESEARCH METHODOLOGY

Data

To examine the impact of CEO risk averseness caused by CEO pensions on cost stickiness, we extract SG&A cost and firm characteristics data from COMPUSTAT and CEO pension's data from ExecuComp databases. Combining these two databases generates 12,714 firm-year observations ranging from 2006 to 2015, after excluding financial firms with Standard Industrial Classification (SIC) codes 6000-6999. Our sample period starts from 2006 because the Securities and Exchange Commission (SEC) forced the U.S.-listed firms to announce the information about CEO pension plans from 2006. Since then, ExecuComp has provided the electronic pensions data.

Cost Stickiness Specification

We estimate cost stickiness using two specification models devised by Anderson et al. (2007) and Homburg & Nasev (2008).

First, we follow Anderson et al.'s (2007) time-series regression model, as follows.

$$\Delta Cost_{it} = \beta_0 + \beta_1 \Delta Sale_{it} + \beta_2 DD_{it} + \beta_3 \Delta Sale_{it} * DD_{it} + \epsilon_{it} \quad (1)$$

Where,

$\Delta Cost_{i,t}$: natural logarithm of change ($Cost_{i,t}/Cost_{i,t-1}$) in the cost elements of firm i in year t relative to year $t-1$.

$\Delta Sale_{i,t}$: natural logarithm of change ($Sale_{i,t}/Sale_{i,t-1}$) in the sales of firm i in year t relative to year $t-1$.

$DD_{i,t}$: 1 if sales decrease ($Sale_{i,t} < Sale_{i,t-1}$) and 0 otherwise.

In this equation, β_1 captures change in costs in response to a change in sales, and we expect a positive value; as sales increase (decrease) will lead to a rise (fall) in costs. However, if a difference in the extent of change exists according to whether it is an increase or decrease in sales, or the asymmetric cost stickiness, as prior studies observe, β_3 will have a significantly positive value. In other words, β_3 measures the degree of cost stickiness.

Second, we alternatively employ Homburg & Nasev's (2008) cost stickiness model, in which they define cost stickiness as follows:

$$Stickiness_{it} = SG\&A\ ratio_{it} * D_{it}^{Sales} * D_{it}^{SG\&A} = \left(\frac{SG\&A_t}{Sales_t} - \frac{SG\&A_{t-1}}{Sales_{t-1}} \right) * D_{it}^{Sales} * D_{it}^{SG\&A} \quad (2)$$

Where:

$$D_{it}^{Sales} = \begin{cases} 1 & \text{if } \frac{Sales_{it}}{Sales_{it-1}} < 1 \\ 0 & \text{otherwise} \end{cases}$$

$$D_{it}^{SG\&A} = \begin{cases} 1 & \text{if } SG\&A\ ratio_t = \frac{SG\&A_t}{Sales_t} - \frac{SG\&A_{t-1}}{Sales_{t-1}} > 0 \\ 0 & \text{otherwise} \end{cases}$$

In this model, a positive value of Stickiness measures the degree of cost stickiness. This method, based on the conditional cost-to-sales ratio (SG&A ratio), differs from Anderson et al. (2007) model in that it can estimate cost stickiness for each firm-year level.

CEO risk averseness specification

Following the prior literature (Sundaram & Yermack, 2007; Campbell et al., 2011; Cassell et al., 2012; Wang et al., 2017; Phan, 2014), we calculate the level of CEO risk aversion induced by CEO pensions in three steps. First, we calculate CEO leverage as the ratio of CEO pensions to equity-based compensation. The amount of CEO pension is the sum of the present values of the CEO pension and deferred compensation reported in ExecuComp. The CEO's equity-based compensation is calculated by adding the total value of options-based and stock-based compensations. Second, we measure the ratio of CEO leverage to firm leverage as the firm's total debt-to-equity ratio. Finally, we create a dummy variable (INSDEBT) that takes the

value of 1 if the ratio of CEO leverage to firm leverage is greater than 1 and 0 otherwise. CEOs whose $INSDEBT=1$ are classified as risk averse.

Main regression model

To examine the impact of CEO pensions on cost stickiness, we use regression analyses with modifications to the cost stickiness models mentioned above. First, we modify Anderson et al.'s (2007) cost stickiness model by including $INSDEBT$ and interact it with the other independent variables.

$$\begin{aligned} \Delta Cost_{it} = & \beta_0 + \beta_1 \Delta Sale_{it} + \beta_2 DD_{it} + \beta_3 \Delta Sale_{it} * DD_{it} + \beta_4 INSDEBT_{it} + \beta_5 \Delta Sale_{it} \\ & * INSDEBT_{it} + \beta_6 DD_{it} * INSDEBT_{it} + \beta_7 \Delta Sale_{it} * DD_{it} * INSDEBT_{it} \\ & + \beta_8 \Delta LEV_{it} + \beta_9 \Delta SIZE_{it} + \beta_{10} \Delta MTB_{it} + \beta_{11} \Delta INT_{it} + \sum Year\ fixed\ effect \\ & + \sum Industry\ fixed\ effect + \epsilon_{it} \quad (3) \end{aligned}$$

In this model, since a negative coefficient on $\Delta Sale_{it} * DD_{it}$, β_3 implies cost-stickiness, a positive coefficient on $\Delta Sale_{it} * DD_{it} * INSDEBT_{it}$, β_7 implies that CEO risk aversion reduces cost-stickiness, supporting the agency factor over the economic factor of cost stickiness ($H2$). In contrast, a negative β_7 value supports the economic factor over the agency factor of cost stickiness ($H1$). Following prior studies (Anderson et al., 2003; Chen et al., 2012; Chen et al., 2013; Wang et al., 2017; Bruggen & Zehnder, 2014; Kuang et al., 2015), we control for the one-year change in leverage (ΔLEV_{it}), firm size ($\Delta SIZE_{it}$), market-to-book ratio (ΔMTB_{it}), and inventory turnover (ΔINT_{it}). We convert the control variables to the natural logarithm value to be normally standardized.

Second, by using *Stickiness* obtained from Homburg & Nasev's (2008) model as the dependent variable, we develop the following ordinary least square (OLS) regression model:

$$\begin{aligned} Stickiness_{it} = & \beta_0 + \beta_1 INSDEBT_{it} + \beta_2 \Delta LEV_{it} + \beta_3 \Delta SIZE_{it} + \beta_4 \Delta MTB_{it} + \beta_5 \Delta INT_{it} \\ & + \sum Year\ fixed\ effect + \sum Industry\ fixed\ effect + \epsilon_{it} \quad (4) \end{aligned}$$

If the economic factor surpasses managers' self-interest intention in cost stickiness, CEO risk aversion will increase the cost stickiness as hypothesized in $H1$, and thus the coefficient on $INSDEBT_{it}$, β_1 will be positive. However, if the agency factor dominates the economic factor in cost stickiness, CEO risk aversion will reduce cost stickiness as hypothesized in $H2$, leading to a negative β_1 value. We include the four control variables, the one-year change in leverage (ΔLEV_{it}), firm size ($\Delta SIZE_{it}$), market-to-book ratio (ΔMTB_{it}), and inventory turnover (ΔINT_{it}), in this equation as in the modification of Anderson et al.'s (2007) cost stickiness model above.

Additionally, to alleviate concerns about the year dependencies in our hypothesized relationship, we computed Fama-MacBeth coefficients for a more robust analysis. The Fama-MacBeth analysis is less influenced by a potential spurious time trend. Finally, we winsorized all continuous variables at the top and bottom 1% to eliminate the impact of outliers.

RESULTS

Descriptive Statistics

Table 1 presents the summary statistics for the dependent and independent variables in the final sample of 12,714 firm-years. The mean of Stickiness is 0.012 with high frequency of zero observations as it is defined. The means of Δ Cost and Δ Sale are 0.063 and 0.059, respectively. The positive means of Δ Cost and Δ Sale imply that our sample firms' costs and sales generally increase during our sample period. Our main independent variable of interest, INSDEBT, has a mean of 0.266, implying that, on average, 26.6% of our sample firms provide CEO pensions large enough to induce risk aversion within the CEO. However, it is low compared to the ratios reported by Sundaram & Yermack (2007) and Bebchuk & Jackson Jr. (2005), possibly because the sample from the ExecuComp database includes S&P 1500 companies, and is smaller than those used in these previous studies are. The summary statistics of the other variables are generally similar to those in the prior literature mentioned above.

Variables	Mean	Median	S.D.	Q1	Q3
Stickiness	0.012	0	0.289	0	0
ΔCost	0.063	0.058	0.158	-0.013	0.135
ΔSale	0.059	0.061	0.194	-0.018	0.146
INSDEBT	0.266	0	0.442	0	1
ΔLEV	-0.039	-0.002	0.399	-0.188	0.15
ΔSIZE	0.069	0.05	0.2	-0.024	0.136
ΔMTB	-0.018	0.008	0.434	-0.23	0.214
ΔINT	0.011	-0.001	0.191	-0.076	0.082

Correlation

Table 2 presents the Pearson (upper-right triangle) and Spearman (lower-left triangle) correlations among the dependent and independent variables in the final sample of 12,714 firm-years.

In this Table 2, especially the correlation between CEO's risk aversion (INSDEBT) and Stickiness draws our attention. However, we see different signs between the Pearson and Spearman correlation coefficients of these two variables. The correlation coefficient between INSDEBT and Stickiness is significantly negative according to Pearson's method, while it is significantly positive according to Spearman's method. This mixed result may arise from each correlation coefficient method's defects. The Pearson method might be vulnerable to outlier's effects, while the Spearman method may ignore the not exceedingly, but still extant, differences among observations that should be considered. This result rather requires more deliberate and carefully designed statistical analysis in this empirical research. Not to ignore the extant difference among observations, in the multivariate regression analysis, we do not replace the original value with the rank-dependent values as in the Spearman coefficient, and to control for the extreme outliers' effect, we winsorize at the one percent level as mentioned before.

	Variables	1	2	3	4	5	6	7	8
1	Stickiness	0	0.011	-0.094	-0.015	-0.032	-0.049	-0.009	0.066
		0	-0.232	0	-0.1	0	0	-0.315	0
2	ΔCost	-0.347	0	0.695	-0.087	-0.08	0.495	-0.096	-0.187
		0	0	0	0	0	0	0	0
3	ΔSale	-0.668	0.719	0	-0.074	-0.024	0.551	-0.065	-0.441
		0	0	0	0	-0.007	0	0	0
4	INSDEB T	0.015	-0.091	-0.09	0	0.034	-0.083	0.007	-0.013
		-0.096	0	0	0	0	0	-0.455	-0.141
5	ΔLEV	-0.009	-0.065	-0.031	0.029	0	-0.079	-0.192	-0.056
		-0.285	0	0	-0.001	0	0	0	0
6	ΔSIZE	-0.36	0.501	0.574	-0.075	-0.065	0	-0.101	0.485
		0	0	0	0	0	0	0	0
7	ΔMTB	-0.014	-0.078	-0.043	0.001	-0.102	-0.058	0	-0.047
		-0.124	0	0	-0.907	0	0	0	0
8	ΔINT	0.337	-0.209	-0.404	-0.004	-0.029	0.385	-0.033	0
		0	0	0	-0.688	-0.001	0	0	0

Note: This table presents the Pearson (upper-right triangle) and Spearman (down-left triangle) correlations among the dependent/independent variables in the final sample of 12,714 firm-years. The numbers in parentheses represents p-values.

Regression Analysis

Table 3 displays our main regression results using the modified Anderson et al. (2007) model. Our empirical analysis uses various models, all of which indicate the existence of cost stickiness, as we see in the significantly negative coefficient of $\Delta\text{Sale}^*\text{DD}$. Looking at the impact of CEO's inside debt or CEO pensions, we observe a substantial difference in the coefficient of $\Delta\text{Sale}^*\text{DD}$ between models (3) and (4). The coefficient of $\Delta\text{Sale}^*\text{DD}$ is -0.086 for the sample with CEO pensions (model (3)) and -0.213 for the sample without CEO pensions (model (4)). This implies a potential difference in the extent of cost stickiness according to whether CEO pensions exist or not. The result in model (5) confirms our hypothesis. As expected, the coefficient of $\Delta\text{Sale}^*\text{DD}^*\text{INSDEBT}$ has a significant value; we therefore observe that CEO pensions are significantly correlated with cost stickiness. The significant positive value of this coefficient supports $H2$, or the agency factor of cost stickiness, as this means that CEO pensions reduce cost stickiness. This indicates that the agency factor exceeds the economic factor in SG&A cost stickiness.

	Dependent variable = ΔCost				
	Baseline Model	Baseline Model	INSDEBT=1	INSDEBT=0	Pooling Model
Independent variable	(1)	(2)	(3)	(4)	(5)
Intercept	-0.012 (-0.63)	-0.009 (-0.50)	-0.008 (-0.29)	-0.008 (-0.33)	-0.010 (-0.53)
ΔSale	0.620*** (68.77)	0.526*** (20.07)	0.387*** (6.59)	0.543*** (18.28)	0.539*** (20.33)
DD	-0.022***	-0.023***	-0.027***	-0.022***	-0.022***

	(-7.20)	(-7.64)	(-5.38)	(-6.09)	(-6.26)
ΔSale*DD	-0.232***	-0.199***	-0.086***	-0.213***	-0.211***
	(-15.35)	(-13.20)	(-2.91)	(-11.89)	(-12.50)
INSDEBT					0.004
					(0.94)
ΔSale*INSDEBT					-0.096***
					(-4.08)
DD*INSDEBT					-0.006
					(-0.95)
ΔSale*DD*INSDEBT					0.103***
					(2.96)
ΔLEV		-0.024***	-0.012**	-0.026***	-0.024***
		(-9.23)	(-2.08)	(-8.66)	(-9.07)
ΔSIZE		0.121***	0.162***	0.114***	0.119***
		(4.73)	(2.80)	(3.93)	(4.66)
ΔMTB		-0.021***	0.001	-0.026***	-0.021***
		(-7.89)	(0.23)	(-8.36)	(-7.82)
ΔINT		-0.019	-0.055	-0.015	-0.018
		(-0.74)	(-0.99)	(-0.54)	(-0.73)
Year-fixed effect	Yes	Yes	Yes	Yes	Yes
Industry-fixed effect	Yes	Yes	Yes	Yes	Yes
Adj. R2	0.505	0.524	0.453	0.536	0.524
F-value	(186.28)***	(189.76)***	(537.56)***	(146.74)***	(180.65)***
N	12,714	12,714	3,388	9,326	12,714

Note: This table reports the regression results of the impact of CEO pensions on cost stickiness according to Anderson et al.'s (2007) model using 12,714 firm-year observations for 2006-2015. The t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 4 shows empirical results using the alternative cost stickiness measure of Homburg & Nasev (2008). Both the OLS and Fama-MacBeth methods provide significantly negative coefficients, implying that CEO pensions decrease SG&A cost stickiness. This result also supports H2, or the agency factor of cost stickiness, and is consistent with the results in Table 3.

Independent variable	Dependent variable: Stickiness	
	OLS	Fama-MacBeth
	(1)	(2)
Intercept	0.007	0.018
	(0.15)	(1.06)
INSDEBT	-0.016***	-0.015*
	(-2.67)	(-1.93)
ΔLEV	-0.023***	-0.015
	(-3.33)	(-1.00)
ΔSIZE	-0.178***	-0.169*
	(-11.50)	(-2.18)
ΔMTB	-0.003	0.000
	(-0.40)	(0.07)
ΔINT	0.198***	0.198**
	(12.21)	(2.37)
Year-fixed effect	Yes	No
Industry-fixed effect	Yes	Yes

Adj. R²	0.015	
F-value	(3.65) ***	
N	12,714	12,714

Note: This table reports the regression results of the impact of CEO pensions on cost stickiness according to Homburg & Nasev's (2008) model. The t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Additional tests

Overconfident CEO

We additionally analyzed the impact of overconfident CEO on cost stickiness. As we noted above, overconfident CEOs assume that a sales drop will be temporary, so they tend to increase the extent of cost stickiness further from the optimal level. Consistent with the previous results in support of the agency factor over the economic factor of cost stickiness, we expect overconfident CEO to increase cost stickiness, and we expect CEO pensions to decrease this increase in cost stickiness induced by CEOs' overconfidence. This is consistent with *H2*, and the contrary result would support *H1*.

We measure CEO overconfidence following Campbell et al. (2011). They measured CEO optimism based on CEOs' stock options holding (Malmendier & Tate, 2005). Their study views CEOs as optimistic if more than 100 percent of the stock options holdings is in the money. The 100 percent cut-off determines the CEO overconfidence dummy variable (OC); we use this variable to construct regression models based on the two cost stickiness models mentioned above to examine the associations among CEO pensions, CEO overconfidence, and cost stickiness.

$$\begin{aligned} \Delta Cost_{it} = & \beta_0 + \beta_1 \Delta Sale_{it} + \beta_2 DD_{it} + \beta_3 \Delta Sale_{it} * DD_{it} + \beta_4 OC_{it} + \beta_5 \Delta Sale_{it} * OC_{it} \\ & + \beta_6 DD_{it} * OC_{it} + \beta_7 \Delta Sale_{it} * DD_{it} * OC_{it} + \beta_8 \Delta LEV_{it} + \beta_9 \Delta SIZE_{it} \\ & + \beta_{10} \Delta MTB_{it} + \beta_{11} \Delta INT_{it} + \sum Year\ fixed\ effect \\ & + \sum Industry\ fixed\ effect + \epsilon_{it} \quad (5) \end{aligned}$$

Similar to equation (3), a negative β_3 captures the extent of cost stickiness and a negative β_7 indicates that CEO overconfidence increases cost stickiness. For the impact of CEO pensions, we divide the sample into two groups: one with inside debt and the other without it. We expect β_7 to be significantly negative for the sample without inside debt and a non-negative value for the sample with inside debt. This implies that without inside debt, overconfident CEO will increase cost stickiness, but CEO pensions can restrict overconfident CEOs' desire to deviate further from the optimal level of cost stickiness.

Panel A of Table 5 reports the analysis with CEO overconfidence and inside debt together with the first cost-stickiness model. As expected, the coefficient of $\Delta Sale * DD$, or β_3 , is significantly negative for all three samples, confirming the existence of cost-stickiness. More importantly, we see a significantly negative coefficient of $\Delta Sale * DD * OC$, or β_7 for the total sample and the sample without inside debt, but an insignificantly positive coefficient for the sample with inside debt. This is consistent with our prediction and the previous results, as this implies that overconfident CEOs, who have a higher tendency for agency problems, raise cost-stickiness, which arises more from the agency factor as our previous results indicate. However, CEO pensions can mitigate the association between CEO overconfidence and cost-stickiness.

Thus, CEO pensions can limit the deviation from the optimal cost-stickiness level and the agency cost.

We performed a similar analysis concerning CEO overconfidence using the second cost-stickiness model with the following equation:

$$\begin{aligned} Stickiness_{it} = & \beta_0 + \beta_1 INSDEBT_{it} + \beta_2 OC_{it} + \beta_3 INSDEBT * OC_{it} + \beta_4 \Delta LEV_{it} + \beta_5 \Delta SIZE_{it} \\ & + \beta_6 \Delta MTB_{it} + \beta_7 \Delta INT_{it} + \sum Year\ fixed\ effect \\ & + \sum Industry\ fixed\ effect + \epsilon_{it} \quad (6) \end{aligned}$$

In this equation, we expect a negative value for β_1 , as CEO pensions decrease cost-stickiness, and a positive value for β_2 , as we expect CEO overconfidence to raise cost-stickiness. We anticipate a negative value for β_3 , as we expect inside debt to mitigate the association between CEO overconfidence and cost-stickiness.

Panel B of Table 5a & b shows that the results are consistent with our expectations. The significantly positive coefficients of *OC* and negative coefficients of *INSDEBT*OC* together support the agency factor of cost-stickiness over the economic factor.

Panel A: CEO Overconfidence with Anderson et al.'s (2007) cost-stickiness model			
Independent variable	Dependent variable=ΔCost		
	Baseline model	INSDEBT=1	INSDEBT=0
	(1)	(2)	(3)
Intercept	0.003 (0.17)	-0.023 (-0.77)	0.020 (0.78)
ΔSale	0.439*** (12.21)	0.442*** (5.95)	0.421*** (10.13)
DD	-0.021 (-5.29)	-0.028*** (-4.14)	-0.021*** (-4.13)
ΔSale*DD	-0.172*** (-8.28)	-0.072* (-1.80)	-0.188*** (-7.59)
OC	0.008 (1.60)	0.009 (0.95)	0.008 (1.43)
ΔSale*OC	0.062*** (2.78)	0.035 (0.61)	0.055** (2.19)
DD*OC	0.001 (0.09)	-0.002 (-0.08)	0.001 (0.08)
ΔSale*DD*OC	-0.187*** (-3.40)	0.003 (0.02)	-0.218*** (-3.46)
ΔLEV	-0.027*** (-8.19)	0.002 (0.24)	-0.032*** (-8.57)
ΔSIZE	0.174*** (5.02)	0.053 (0.72)	0.210*** (5.29)
ΔMTB	-0.025*** (-7.36)	0.005 (0.66)	-0.031*** (-7.94)
ΔINT	-0.088*** (-2.63)	0.045 (0.65)	-0.132*** (-3.42)
Year-fixed effect	Yes	Yes	Yes
Industry-fixed effect	Yes	Yes	Yes

Adj. R2	0.529	0.414	0.554
F-value	(119.99)***	(23.65)***	(97.75)***
N	8,171	2,245	5,926

Table 5b		
CEO Overconfidence		
Panel B: CEO Overconfidence with Homburg & Nasev's (2008) cost-stickiness model		
Independent variable	Dependent variable: Stickiness	
	(1)	(2)
Intercept	0.030***	0.031***
	(4.13)	(4.29)
INSDEBT		-0.004***
		(-3.55)
OC	0.002**	0.002*
	(2.06)	(1.91)
INSDEBT*OC		-0.004**
		(-2.18)
ΔLEV	-0.002*	-0.002
	(-1.94)	(-1.30)
ΔSIZE	-0.082***	-0.081***
	(-29.66)	(-28.99)
ΔMTB	-0.001	0.000
	(-0.57)	(0.06)
ΔINT	0.091***	0.091***
	(32.23)	(32.22)
Year-fixed effect	Yes	Yes
Industry-fixed effect	Yes	Yes
Adj. R2	0.153	0.157
F-value	(21.82)***	(21.83)***
N	8,171	8,171

Note: This table reports the regression results of the impact of CEO pensions on the association between CEO overconfidence and cost stickiness. The t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Institutional Monitoring

For a further analysis, we also examine the associations among institutional monitoring, CEO pensions, and cost-stickiness. Qualitatively and quantitatively, a significant existence of institutional investors can function as active monitors for shareholders (Brickley et al., 1988; Almazan et al., 2005; Chen et al., 2007; Ferreira & Matos, 2008). The institutional monitoring literature shows that institutional investments differ, and that long-term institutional investors are more active and effective in monitoring the firm for the shareholders' benefit (Chen et al., 2007; Yan & Zhang, 2009; Chung et al., 2015). Following this stream of literature, we also divided Institutional Ownership (IO) into short- and long-term institutional ownership (SIO and LIO). As a proxy for institutional monitoring, we calculate IO as the number of shares held by institutions at the year-end divided by the total number of shares outstanding for stock i . Further, to define SIO and LIO, we focus on portfolio turnover following Yan and Zhang (2009). We compute the quarterly portfolio turnover as

$$Turnover_{k,t} = \frac{\min(Buy_{k,t}, Sell_{k,t})}{\sum_{i=1}^{N_k} \frac{S_{k,i,t} P_{i,t} + S_{k,i,t-1} P_{i,t-1}}{2}}$$

Where, $Buy_{k,t}$ and $Sell_{k,t}$ are the aggregate purchases and sales by investor k for quarter t ; $P_{i,t-1}$ and $P_{i,t}$ are the share prices for stock i at the end of quarters $t - 1$ and t , respectively; and $S_{k,i,t-1}$ and $S_{k,i,t}$ are the number of shares of stock i held by investor k at the end of quarters $t-1$ and t , respectively. Institutional ownership with higher portfolio turnover can be classified as short-term institutional ownership (*SIO*), and ownership with lower turnover can be classified as long-term institutional ownership (*LIO*). We set terciles as criteria dividing *SIO* and *LIO*. More specifically, we define the stock ownership in the top tercile of portfolio turnover as *SIO*, and the ownership in the bottom tercile of portfolio turnover as *LIO*.

With these measures, we examine the associations among institutional ownership, CEO insider debt, and cost-stickiness. We employ the two cost-stickiness models for this analysis as well. We modify Anderson et al.'s (2007) cost-stickiness model to reach this equation.

$$\begin{aligned} \Delta Cost_{it} = & \beta_0 + \beta_1 \Delta Sale_{it} + \beta_2 DD_{it} + \beta_3 \Delta Sale_{it} * DD_{it} + \beta_4 IO_{it} + \beta_5 \Delta Sale_{it} * IO_{it} + \beta_6 DD_{it} \\ & * IO_{it} + \beta_7 \Delta Sale_{it} * DD_{it} * IO_{it} + \beta_8 \Delta LEV_{it} + \beta_9 \Delta SIZE_{it} + \beta_{10} \Delta MTB_{it} \\ & + \beta_{11} \Delta INT_{it} + \sum Year\ fixed\ effect + \sum Industry\ fixed\ effect + \epsilon_{it} \quad (7) \end{aligned}$$

With this equation, we perform analyses using *IO*, *SIO*, and *LIO*. Since long-term institutional investors have a long-term investment horizon, we expect that they will more actively monitor the firm to benefit shareholders and try to mitigate the CEO's agency problems. Consistent with the previous hypothesis and results, we expect *LIO* to reduce cost-stickiness since cost-stickiness is mainly driven by the agency factor. Hence, for the *LIO* model, we expect the coefficient of $\Delta Sale_{it} * DD_{it} * LIO_{it}$, or β_7 , to be significantly positive for the entire sample. We further hypothesize that CEO pensions function to mitigate the agency problem, but under the existence of *LIO*, there remains little to reduce in the cost-stickiness, as *LIO* would already narrow the deviation from the optimal cost-stickiness level. Hence, we expect β_7 not to be significantly positive for the sample with insider debt and that it will be significantly positive for the sample without insider debt.

We consider that the impact of *SIO* will focus only on short-term profit and selling the stock within a short horizon, and they will thus less actively monitor managers and not align with the shareholder's view. Then, we expect that *SIO* will increase cost-stickiness, so the coefficient of $\Delta Sale_{it} * DD_{it} * SIO_{it}$, or β_7 should be significantly negative for the entire sample and for the sample without insider debt. This implies that *SIO* does not mitigate the agency problem. In this case, the existence of CEO pensions can help reduce this agency cost. Thus, for the sample with insider debt, we expect that β_7 will not to be significantly negative, as *SIO* would not worsen the agency cost of cost-stickiness in the presence of CEO insider debt.

Panel A of Table 6 demonstrates our anticipated results using Anderson et al.'s (2007) cost-stickiness model. When *IO* is not decomposed into *SIO* and *LIO*, the direction and significance are not clear. However, for the *SIO* and *LIO* analyses, we can confirm that β_7 follows our prediction, consistent with our hypothesis and previous results.

We perform the institutional monitoring analysis using Homburg & Nasev's (2008) cost-stickiness model as well using the following equation to investigate the associations among institutional monitoring, CEO pensions, and cost-stickiness:

$$\begin{aligned}
 \text{Stickiness}_{it} = & \beta_0 + \beta_1 \text{INSDEBT}_{it} + \beta_2 \text{IO}_{it} + \beta_3 \text{INSDEBT} * \text{IO}_{it} + \beta_4 \Delta \text{LEV}_{it} + \beta_5 \Delta \text{SIZE}_{it} \\
 & + \beta_6 \Delta \text{MTB}_{it} + \beta_7 \Delta \text{INT}_{it} + \sum \text{Year fixed effect} \\
 & + \sum \text{Industry fixed effect} + \epsilon_{it} \quad (8)
 \end{aligned}$$

As in the previous IO analysis with Anderson et al.'s (2007) model, we expect LIO to reduce cost-stickiness, and as LIO would already reduce the agency costs in cost-stickiness, insider debt will not affect anything. Thus, we expect the coefficient of LIO, or β_2 , to be significantly negative, while the coefficient of $\text{INSDEBT} * \text{LIO}$, or β_3 should show no significance. In contrast, we expect SIO to worsen the agency problem; hence, it will increase cost-stickiness, and insider debt will mitigate this agency problem induced by SIO. Thus, the coefficient of SIO, or β_2 , will be significantly positive, while the coefficient of $\text{INSDEBT} * \text{SIO}$, or β_3 , will be significantly negative. We do not predict any directions for the coefficients using IO because IO includes the two conflicting undecomposed elements, SIO and LIO.

Panel B of Table 6 shows institutional monitoring analysis results using Homburg & Nasev's (2008) model. The coefficients of SIO and LIO are consistent with our predictions and support our hypothesis

Table 6a									
INSTITUTIONAL MONITORING									
Panel A: Institutional Monitoring with Anderson et al.'s (2007) cost-stickiness model									
Dependent variable = ΔCost									
	Baseline model	INSDEB T = 1	INSDEB T = 0	Baseline model	INSDEB T = 1	INSDEB T = 0	Baseline model	INSDEB BT = 1	INSDEB BT = 0
Independent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.033*	-0.054	-0.021	-0.013	-0.019	-0.008	-0.008	-0.010	-0.004
	(-1.73)	(-1.74)	(-0.83)	(-0.75)	(-0.75)	(-0.33)	(-0.41)	(-0.37)	(-0.17)
ΔSale	0.570***	0.477***	0.555**	0.538***	0.363***	0.555***	0.577***	0.299**	0.587**
	(11.44)	(3.26)	(10.13)	(15.65)	(4.17)	(14.45)	(16.01)	(3.03)	(14.70)
DD	-0.018	-0.041	-0.013	-0.013*	-	-0.005	-0.035***	-0.029	-
	(-1.18)	(-1.37)	(-0.72)	(-1.95)	0.035***	(-0.57)	(-3.90)	(-1.56)	0.040**
$\Delta \text{Sale} * \text{DD}$	-0.216***	-	-0.105	-0.101***	-0.138*	-0.076*	-0.296***	-0.046	-
	(-3.02)	0.760***	(-1.31)	(-2.93)	(-1.91)	(-1.87)	(-7.09)	(-0.44)	0.309**
IO	0.037***	0.045**	0.033***						
	(3.62)	(2.06)	(2.85)						
$\Delta \text{Sale} * \text{IO}$	-0.009	-0.158	0.030						
	(-0.20)	(-1.13)	(0.60)						
DD*IO	-0.004	0.015	-0.009						
	(-0.24)	(0.44)	(-0.45)						
$\Delta \text{Sale} * \text{DD} * \text{IO}$	0.023	0.784***	-0.127						
	(0.28)	(3.69)	(-1.38)						
SIO				0.041**	0.031	0.044***			
				(3.30)	(1.25)	(3.01)			

Δ Sale*SIO				0.060	-0.046	0.055			
				(1.12)	(-0.34)	(0.90)			
DD*SIO				-0.030	0.025	-0.056**			
				(-1.38)	(0.62)	(-2.14)			
Δ Sale*DD*SIO				-0.259***	0.245	-0.390***			
				(-2.70)	(1.20)	(-3.46)			
LIO							-0.018	-0.022	-0.025
							(-0.89)	(-0.54)	(-1.03)
Δ Sale*LIO							-0.067	0.338	-0.033
							(-0.68)	(1.19)	(-0.30)
DD*LIO							0.052	0.009	0.074*
							(1.57)	(0.14)	(1.92)
Δ Sale*DD*LIO							0.444***	-0.127	0.449**
							(2.63)	(-0.31)	(2.33)
Δ LEV	-0.021***	-0.011*	-0.022***	-0.022***	-0.011*	-0.023***	-0.022***	-0.011*	-
	(-7.47)	(-1.73)	(-6.88)	(-7.66)	(-1.83)	(-7.01)	(-7.60)	(-1.76)	0.023**
Δ FSize	0.078***	0.177**	0.071**	0.071**	0.161**	0.068**	0.075***	0.140**	0.069**
	(2.78)	(2.50)	(2.31)	(2.53)	(2.18)	(2.21)	(2.69)	(1.98)	(2.25)
Δ MTB	-0.019***	-0.001	-0.023***	-0.019***	0.000	-0.023***	-0.020***	-0.001	-
	(-6.64)	(-0.09)	(-6.88)	(-6.83)	(-0.07)	(-7.16)	(-6.99)	(-0.11)	0.024**
Δ INT	0.021	-0.086	0.023	0.026	-0.070	0.026	0.025	-0.049	0.029
	(0.77)	(-1.25)	(0.78)	(0.97)	(-0.98)	(0.85)	(0.94)	(-0.71)	(0.96)
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2	0.523	0.435	0.541	0.524	0.432	0.541	0.523	0.432	0.539
F-value	(158.95)	(33.75)	(124.05)	(159.46)	(33.36)	(124.48)	(158.45)	(33.32)	(123.44)
			***	***	***	***	***	***	***
N	11,080	3,024	8,056	11,080	3,024	8,056	11,080	3,024	8,056

Table 6b						
INSTITUTIONAL MONITORING						
Panel B: Institutional Monitoring with Homburg & Nasev's (2008) cost-stickiness model						
Dependent variable: Stickiness						
Independent variable	-1	-2	-3	-4	-5	-6
Intercept	-0.011	-0.009	-0.019	-0.025	0.025	0.03
	(-0.22)	(-0.16)	(-0.37)	(-0.49)	-0.48	-0.58
INSDEBT		-0.005		0.021		-0.029
		(-0.12)		-1.44		(-1.34)
IO	0.024	0.028				
	-1.36	-1.45				
INSDEBT*IO		-0.015				
		(-0.35)				

SIO			0.145* **	0.168***		
			-6.67	-6.95		
INSDEBT*SIO				-0.126		
				(-2.61)		
LIO					-0.099***	-0.099***
					(-2.78)	(-2.52)
INSDEBT*LIO						0.053
						-0.67
ΔLEV	-0.031***	-	-	-0.031***	-0.032***	-0.032***
	(-3.81)	0.031* **	0.032* **	(-3.91)	(-3.80)	(-3.96)
ΔSIZE	-0.188	-	-	-0.21	-0.192	-0.195
	(-10.25)	0.192* **	-0.206	(-11.31)	(-10.45)	(-10.60)
ΔMTB	-0.005	(-10.45)	(-11.14)	(-0.004)	(-0.006)	(-0.006)
	(-0.59)	-0.005	(-0.53)	(-0.50)	(-0.71)	(-0.70)
ΔINT	0.205***	0.206* **	0.213* **	0.214***	0.209***	0.210***
	-10.64	-10.73	-11.08	-11.14	-10.83	-10.9
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2	0.013	0.014	0.017	0.018	0.014	0.014
F-value	(3.11)***	(3.12)* **	(3.72)* **	(3.77)***	(3.20)***	(3.18)***
N	11,080	11,080	11,080	11,080	11,080	11,080

Note: This table reports the regression results of the impact of CEO pensions on the association between institutional monitoring and cost stickiness. The t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively

CONCLUSION

CEO debt-based compensation, such as a CEO pension plan can make CEO's decisions the same as those of creditors. In other words, it can serve as an incentive to select risk-averse and conservative management policies (Sundaram & Yermack, 2007; Wei & Yermack, 2011; Anantharaman et al., 2013; Wang et al., 2017). This suggests that debt-based compensation may solve the agency problem of creditors and managers because it attempts to mitigate shareholders' and managers' agency problems with equity-based compensation such as stock options. We proved the hypothesis with the phenomenon of cost stickiness.

Cost stickiness can occur in a more optimal way to maintain existing costs, despite reduced sales. To address agency problems arising from managerial overconfidence, providing CEO pensions can encourage conservative views about the future to reduce cost stickiness. Our results show that CEO pensions induced CEOs to make risk averse choices and suppress the choice of increasing cost stickiness due to managerial overconfidence because they are pensioned according to the future state of the company rather than the current state of the company. Our study not only presents additional results to help solve the controversy in the existing cost stickiness literature, but also suggests that inside debt can affect managers' behavior related to cost, which can be a means to solve the agency problem among creditors and managers.

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APPENDIX

Variable names	Definitions
Stickiness	Firm-year level cost-stickiness obtained from the cost stickiness model developed by Homburg & Nasev (2008). Specifically, it is the positive cost-to-sale ratio (SG&A ratio) conditional on decreasing sales.
ΔCost	Natural logarithm of the one-year change in SG&A cost elements of firm i in year t .
ΔSale	Natural logarithm of the one-year change in sales in year t relative to year $t-1$.
DD	1 if ΔSale is positive and 0 otherwise.
INSDEBT	1 if the ratio of CEO to firm leverage is greater than 1 and 0 otherwise. CEO leverage is the relative ratio of the CEO's debt-to-equity holdings calculated as the sum of the present value of the CEO's supplemental executive retirement plan and the total value of the deferred compensation plan, divided by the total value of the CEO's stock and options holdings. Firm leverage is the firm's total debt-to-equity ratio.
OC	1 if more than 100 percent of a CEO's stock options holdings are in the money and 0 otherwise.
IO	The number of shares held by institutions at the year-end divided by the total number of shares outstanding for the stock.
Quarterly Portfolio Turnover	$\text{Turnover}_{k,t} = \frac{\min(\text{Buy}_{k,t}, \text{Sell}_{k,t})}{\sum_{i=1}^{N_k} \frac{S_{k,i,t}P_{i,t} + S_{k,i,t-1}P_{i,t-1}}{2}}$ <p>where $\text{Buy}_{k,t}$ and $\text{Sell}_{k,t}$ are the aggregate purchases and sales by investor k for quarter t, respectively; $P_{i,t-1}$ and $P_{i,t}$ are the share prices for stock i at the end of quarters $t-1$ and t, respectively; and $S_{k,i,t-1}$ and $S_{k,i,t}$ are the number of shares of stock i held by investor k at the end of quarters $t-1$ and t, respectively.</p>
SIO	1 if the stock ownership belongs to the top tercile of the quarterly portfolio turnover and 0 otherwise.
LIO	1 if the stock ownership belongs to the bottom tercile of the quarterly portfolio turnover and 0 otherwise.
ΔLEV	Natural logarithm of the one-year change in leverage (book equity value to debt ratio) in year t relative to year $t-1$.
ΔSIZE	Natural logarithm of one-year change in total assets in year t relative to year $t-1$.
ΔMTB	Natural logarithm of the one-year change in market-to-book ratio (market value of total equity to book equity value) in year t relative to year $t-1$.
ΔINT	Natural logarithm of the one-year change in inventory turnover ratio (total asset to sale) in year t relative to year $t-1$.