

# **Stock Pledging and Firm-risk: Evidence from India**

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# **Stock Pledging and Firm-risk: Evidence from India**

## **Abstract**

We examine consequences on firm-risk, capital investment decisions and firm performance of stockholders' pledging stock as collateral using a sample of 1,119 Indian firms. Our sample displays concentrated ownership structures in India, where the dominate owner controls an average of 38% of a firm's equity. We find that stock pledging by dominate stockholders induces firm-risk and find an inverse relationship between stock pledging and capital investment in higher risk projects that, in turn, affects firm value through suboptimal investment decisions.

**Key words:** Stock Pledging, ownership, firm risk, investment decision.

**JEL Code:** G11, G32.

# Stock Pledging and Firm-risk: Evidence from India

## I. Introduction

We study implications of dominate or controlling owners pledging their stock on firm-risk and stock performance using a sample of 1,119 Indian firms covering the 2009 to 2014 time period. Stock pledging in India by large shareholders (founders) is and continues to be common practice facilitating controlling owners' debt acquisition and/or increasing personal liquidity without requiring the sale of stock.<sup>1,2</sup>

Jensen and Meckling (1976) find that concentrated equity ownership substantially resolves agency risk conflicts inherent in more widely held firms with significant separation of ownership and control. Concentrated ownership is particularly common in emerging markets, including India, where founders and family members tend to own at least a plurality of the outstanding stock. Various studies explore the benefits and costs associated with concentrated ownership (Grossman and Hart, 1980; Shleifer and Vishny, 1986, 1997; Mitton, 2002; Gul et al., 2010; Jameson et al., 2014); however, the common practice of controlling owners' stock pledging and its implications are under-explored. Controlling owners may pledge their stock as collateral to finance new capital investment projects or to liquidate capital for personal use.

Pertaining to controlling owners' stock pledging impact, we present two opposing views. First, when owners hold large controlling interests in a firm, human capital as well as financial capital are positively correlated with firm performance, thus facilitating a need for hedging. Existing studies support the importance of large shareholders' diversification

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<sup>1</sup> Share pledging rose 14% in the last quarter of 2015 by Indian promoters', with the value of pledged shares increasing to Rs2.03 trillion as on 31 December.

<http://www.livemint.com/Companies/gHuHleCW6pt689Q25FIliK/Pledging-of-shares-by-promoters-at-sevenyear-high.html>

<sup>2</sup> Also see, <http://www.thehindubusinessline.com/markets/pledging-of-shares-by-promoters-hits-7year-high-in-december-quarter/article8120029.ece>

(using hedging) and its subsequent impact on corporate risk-taking. Acemoglu and Zilibotti (1997), Baumol et al. (2007), and John et al. (2008) observe that firms' long-term economic growth depends on entrepreneurs' willingness to take risk in pursuing profitable opportunities. Also, Faccio et al. (2011) find that firms controlled by diversified large shareholders pursue riskier investments than firms controlled by non-diversified large shareholder.

Bettis et al. (2015) find that non-diversified insiders use mainly over-the-counter derivative securities for hedging purposes; whereas, stock pledging allows these owners to raise new capital for personal liquidity purposes without being required to liquidate shares. Controlling owners may use debt proceeds requiring stock pledging to invest in additional diversifying projects thus, reducing both their personal and their firm's risk. Alternatively, if controlling owners employ debt proceeds in more risky capital investments, pledging may increase firm-risk.

Second, stock pledging as lender collateral may require margin requirements; where, typical loan amounts for pledged shares range from 50% to 70% of stock values on the pledging date (Shetty, 2011). Stock values exceeding margin requirements serve as safety margins against stock price declines. However, if stock values decline sufficiently (30 to 50 percent), controlling owners generally are required to restore initial margin levels by either pledging additional shares or by depositing cash in the margin account. Thus, if controlling owners have insufficient liquid capital or additional shares to restore lenders' margin requirements, they may suffer substantial losses where lenders have legal rights to liquidate full or partial collateral at prevailing market prices, possibly leading to further price declines. Thus, controlling owners' stock pledging of large proportions of their stock may create a vicious circle of stock price declines, which in turn not only increases firm-risk, but also increases the risk of losing control of the firm (Brunnermeier and Pedersen, 2009). Thus, we

posit that stock pledging may increase firm-risk as a result of potential margin calls, but that is unrelated to its affect on the firm's fundamental value.

In our sample of 1,119 Indian firms, controlling owners hold an average ownership of 48% and on average pledge 38% of their stock. Having effective or actual ownership control, dominate stockholders generally exercise active and effective control of the firm's business activities. Consequently, firm-risk is, at least partially, impacted by controlling owners' share pledging. Our finding of a positive relationship between stock pledging and firm-risk is consistent with this argument.

We also find that stock pledging subsequently followed by significant stock price declines further exacerbates firm-risk. This may be caused by controlling owners being exposed to greater margin call pressure and downside volatility or tail risk. We also find negative margin call effects on skewed daily return distributions coupled with positive effects of kurtosis, implying that stock pledging increases the likelihood of extreme negative returns or downside risk.

We also address potential reverse causality where, increases in controlling owner pledging may not only increase firm-risk, but also require controlling owners to pledge additional stock if the firm is exposed to higher risk. We address reverse causality using a two-stage least square regression (2SLS) estimation following Laeven and Levine (2007, 2009), and Faccio et al. (2011). We use controlling owners' average stock pledging for all other firms in the same industry as an instrument variable that may explain firm-specific stock pledging by controlling owners. We find that reverse causality appear not to explain the margin call pressure hypothesis associated with stock pledging and firm-risk.

Our subsequent results collaborate our hypothesis that stock pledging increases firm-risk where, in the worst case scenario, controlling owners lose management control if lenders sell pledged stock. Therefore, we posit that pledging substantial proportions of controlling

owners stock increases margin call pressure and increased firm-specific risk making them more likely to engage in risk-reducing activities and safer investments avoiding typical R&D projects and thus exhibiting increased risk aversion. Consistent with this hypothesis, we find that stock pledging is negatively associated with R&D investment and asset growth.

We also examine whether risk-averse activities result in firm value losses due to rejections of more risky but profitable projects, and find a negative relationship between future firm performance (value) and stock pledging.

We find that controlling owner stock pledging tends to exploit control privileges by shifting the firm towards less risky (potentially less profitable) investments because of increased risk aversion. This is especially apparent when stock pledging increases firm-specific risk and controlling owners are in danger of losing management control. We provide evidential detrimental impacts of stock pledging on firm value.

Our study contributes to the literature in three ways. First, we find an expropriation of control privileges by controlling owners. For example, Claessens et al. (1999) addressed this issue, showing that the execution of control rights adversely affected minority shareholders in publicly-traded East Asia firms. Other studies indicate evidence of misuse of firm resources by controlling owners. For instance, Bertrand et al. (2002) disclose that controlling owners may redirect cash flows from firms in which they have smaller ownership interests to firms where they have high controlling interests. Bae et al. (2002) also indicate that controlling shareholders may use intra-group acquisitions to expropriate minority shareholder wealth. Cheung et al. (2006) provide evidence for preferences toward related-party transactions by controlling owners for Hong-Kong listed firms. Likewise, we support these findings demonstrating that controlling shareholders tend to reduce personal portfolio risk by exerting control privileges to adopt less risky projects and subsequently reducing firm performance levels.

A number of studies indicate that personal CEO attributes, such as past experience and social networking, influence corporate decisions (Malmendier et al., 2011; Fracassi and Tate, 2012; Kaplan et al., 1997). Also, Cronqvist et al. (2012) reveal that CEOs' personal home purchase leverage is positively related to corporate leverage. Thus, our second addition to the literature illustrates that controlling owners' personal borrowing due to share pledging as collateral, in turn, affects firm-risk. Third, we investigate determinants of firm-risk. Djankov et al. (2010) illustrate that corporate taxes have large adverse impacts on entrepreneurial activities, and they, in addition to John et al. (2008) show that more rigorous property rights protection tends to reduce firm-risk. Kim and Lu (2011) suggest a hump-shaped relationship between CEOs ownership and firm risk-taking where there is a sweet spot for controlling owner percentage interest. Acharya et al. (2011) document that stronger creditor restrictions discourage firms from adopting more risky projects. We contribute to this literature by providing evidence that controlling owner stock pledging, while controlling for firm fundamentals, increases firm-risk.

## **II. Stock Pledging in India**

Generally, stock pledging involves commercial banks or non-banking financial institutions secured lending, accepting, as collateral, controlling owners' pledge of personally owned stock. In India, stock pledging commenced being regulated when the Satyam Computer Services Ltd's scandal triggered numerous questions related to false accounting reporting, and misuse of controlling rights by controlling owners.<sup>3</sup> In January 2009, Mr. Ramalinga Raju, former chairman of Satyam Computer Services Ltd, admitted to falsifying

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<sup>3</sup>Also see article in Economics Times with title "Raju under lens for capital gains tax fraud"  
[http://articles.economictimes.indiatimes.com/2009-01-27/news/27635935\\_1\\_capital-gains-tax-satyam-shares-gains-from-such-sale](http://articles.economictimes.indiatimes.com/2009-01-27/news/27635935_1_capital-gains-tax-satyam-shares-gains-from-such-sale)

the firm's financial statements. During the week, preceding Mr. Raju's admission, lenders liquidated Satyam shares pledged by him, precipitating a significant stock price decline.<sup>4</sup>

Before the Satyam scandal, neither controlling owners nor their firms were required to reveal the existence or magnitude of pledged shares. However, the Satyam scandal highlighted the increased potential for price declines risk associated with pledged shares, Securities and Exchange Board of India (SEBI) announced disclosure requirements on January 28<sup>th</sup> 2009, requiring promoters and firms to promptly disclose the number of pledged shares before receiving loan proceeds. This regulation requirement was inserting regulation 8A, "Disclosure of Pledged Shares," as an amendment to the *Substantial Acquisition of Shares and Takeovers (Amendment) Regulations, 2007*.

Under Regulation 8A, promoters are required to inform their firms about a share pledge within 7 days. In addition to the initial disclosure requirement, the regulation also requires ongoing disclosures for promoters and their firms, where firms are required to disclose, within 7 days of the receipt of the information from promoters, stock pledging information to all stock exchanges on which the firm is listed. A firm-level disclosure requirement is triggered when the number of shares pledged by promoters exceeds the lower of, (a) 25,000 shares or (b) one percent of the firm's total shares outstanding. Additionally, SEBI amended clauses 35 and 41 of the Equity Listing Agreement between firms and stock exchanges. These clauses relate to the quarterly reporting of shareholding pattern of a company and its financial results. The format of these filings was amended to include details of shares pledged by promoters and promoter group entities.

### **III. Data and Descriptive Statistics**

#### *Sample Selection*

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<sup>4</sup> The sell-off by lenders was probably motivated by a significant decline in Satyam's share price in December 2008 and negative news related to Satyam in that month.



We obtain firm-level data and stock pledging information from the Prowess database maintained by the Center for Monitoring Indian Economy (CMIE). Since firms are required to disclose stock pledging information beginning in 2009, our data covers a time period from 2009 to 2014. We exclude financial and government owned firms because government policy may affect firm equity ownership. Our sample contains 1,119 firms and 4,215 firm-year observations.

#### *Variable construction*

We measure effects of stock pledging on firm-risk by employing two firm-risk proxies, standard deviation of daily stock returns for each stock for each year (*Firm Risk*) and the standard deviation of firm-specific daily returns (*Firm-Specific Risk*). We measure firm-specific returns using the daily residual of the Fama-French three factor model (1993) that decomposes total risk into three individual factors. Firm-specific risk provides further robustness tests to our main finding since we posit that stock pledging affects mainly firm-specific risk. Each risk variables is multiplying by 100 allowing for more meaningful interpretation. The variable (*Stock Pledge*) measures the percentage of ownership pledged by all controlling owners, where controlling owners include only the promoters (founders). These controlling owners are so defined since they may possess incentives and capacities to influence corporate policy (Jameson et al., 2014).

Unlike many developed countries, most of the Indian firms demonstrate concentrated ownership, therefore, variable (CO) measures the percentage of controlling ownership. We also control for the previous year's return (*Prior Returns*) since it is likely that the intensity of stock pledging would be higher subsequent to a previous stocks good performance. Also, we include control variables potentially affecting firm-risk including firm size (*Size*), since it is expected that larger firms are more transparent than smaller firms. Following Paligorova (2010), we control for each firm's affiliation with business group. *Group* variable takes a

value 1 if a firm is affiliated with a business group and 0 for standalone firms. Firm leverage may influence firm-risk and stock pledging; therefore, we control firm leverage (*Leverage*) measured by a ratio of total debt to total assets. Following Bettis et al. (2001), we control for firm age (*Firm Age*) using the natural logarithm of the number of years since the firm was founded.

Also, as suggested by John et al. (2008), we control for the effect of sales growth (*Sales Growth*) as measured by the change in firm's sales from the previous year, divided by the firm's sales of the previous year. Since it is expected that firm-risk is higher for growth firms and it is likely that controlling owners of these firms pledge more stocks to raise funds.

As a growth proxy, we use price to book ratio (*PB*) and also we use each stock's beta (*Beta*) to control for systematic risk. (*Beta*) is calculated for each stock using the previous five-year monthly stock returns. Firm-risk persistence is controlled by using lag values of firm-risk. To reduce the influence of extreme values in the sample, we winsorize the top and bottom 1% of each variable distribution.

### *Descriptive Statistics*

Table 2 provides descriptive statistics for each variable used in the study. The mean (median) value of *Stock Pledge* indicates that controlling owners of Indian firms pledge, on average, 38.91% (32.18%) of total ownership. The mean value for *CO* illustrates that controlling owners own or control approximately 50% of total issued stock. For our sample, the joint effect of *Stock Pledge* and *CO* indicates that, on average, approximately 20% of each firm's ownership is pledged thus, stock pledging may have significantly influenced past firm investment decisions. The mean (median) for *firm-specific risk* is 3.43% (3.32%) and has an interquartile range of 1.39%. Sample firms are highly leveraged (*Lev*), with a mean (median) of 0.47 (0.38) debt to asset ratios. Mean (median) values for *Firm age* of our sample firms is 25.53 (25.02) year, and mean (median) *Beta* values of 0.86 (0.85) indicate that, on

average, stock pledging firms have lower levels of systematic risk as compared to the overall market.

Table 3 reports the correlation matrix, where, as expected, the correlation between firm-risk and stock pledging is positive and significant at the 1% level (firm-specific risk=0.07, firm-risk=0.06). A high correlation (0.98) between firm-specific risk and firm-risk indicates that both proxies capture similar firm risk. We find a negative correlation between *Stock Pledge* and *CO*.

#### IV. Empirical Results

##### *The relationship between firm-risk and stock pledging*

Univariate empirical results are presented in Table 4, where, firm-risk is estimated for each stock for each year. Subsequently, stocks are sorted into three equal groups based on proportions of stock pledged using the *Stock Pledge* variable. Mean and median values of firm-risk values are then estimated for each group. We find that firms with controlling owners pledging a greater percentage of stock experience statistically significant higher firm-risk as compared to firms with controlling owners pledging lower percentages of stock. Paired difference statistics between the firms with the highest level of pledging compared to the lowest level of pledging indicate a significant mean difference (Diff = 0.20, t-value = 4.09). Thus, our initial results support our hypothesis that stock pledging increases firm-risk.

We also examine stock pledging effects on firm-risk in a multivariate framework and run the following regression:

$$Firm - risk_{i,t} = \alpha + \beta_1 StockPledge_{i,t} + Controlvariables + \varepsilon_{i,t} \quad (1)$$

Where,  $i$  and  $t$  denote firm  $i$  and year  $t$ . The dependent variable is stock pledging (*Stock Pledge*) our proxy for firm-risk and the main interest variable. We also include control variables as defined in Section III. Our specification also includes industry and time fixed

effects. The estimated standard errors are robust to heteroskedasticity and clustering effects at firm-year level. We follow the National Industry Classification (NIC) code level to define industry.

Equation (1) results are displayed in Table 5; where, in Panel A, the *Stock Pledge* is positive and significant at 1% level. The effect of *Stock Pledge* remains positive and significant even after control variables are included in Column (2), suggesting that higher stock pledging levels creates additional firm-risk. Economic effects of stock pledging are notable since firm-specific risk increases by 4.27% as *Stock Pledge* variable progresses from the first to the third quartile of the distribution. To measure this effect, we first multiply the interquartile range of *Stock Pledge*, from Table 2, with the coefficient of *Stock Pledge* from Column (2) of Table 5. This calculation ( $0.28 \times 52.37\% = 14.66\%$ ) provides an increase in firm-specific risk associated with an increase in *Stock Pledge* from the first to the third quartile of the distribution. We also compare interquartile increase in firm-specific risk with the average of firm-specific risk across all firms, 3.43. The comparison suggests that an increase in *Stock Pledge* from the first to the third quartile yields 4.27% ( $14.66\% / 3.43$ ) relative to the firm specific-risk average.

Also, we examine the impact of potential margin call pressure on firm-risk. Although, actual lender margin call data is unavailable, we posit that significant decline in stock price increases the likelihood of margin calls and commensurate pressures on controlling owners who pledge stock. Since, significant drops in stock prices decrease collateral values of pledged shares, this may require controlling owners to pledge additional stock or deposit equivalent cash amounts. As a proxy for margin call pressure, we employ a *low return dummy* that takes a value 1 if the prior year stock return is below -15%, and 0 otherwise.<sup>5</sup> We construct an interaction variable by multiplying the *Stock Pledge* variable with the *low return*

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<sup>5</sup> We check the sensitivity of results with various threshold of prior low returns, ranging from -10% to -20%, and results are similar to reported results.

*dummy*, to capture effects of potential stock pledging pressure on firm-risk when price pressure exits. As expected, Table 5, Panel B finds a positive and significant interaction variable coefficient, and, for firms with low prior returns, the *Stock Pledge* variable ( $0.25 + 0.20 = 0.45$ ) is approximately twice that of firms with higher prior returns (0.25). This result is consistent with the margin call pressure hypothesis. Thus, aggravated margin call pressure is found to exist for high controlling ownership pledging proportions along with sizable drops in stock prices. This leads to higher firm-risk.

We posit that margin call pressures drive a positive relationship between stock pledging and firm-risk. Thus, stock pledging may increase downside volatility, but not impact upside volatility. Margin call pressure on pledged stock amplifies downside tail-risk; however, our firm-risk proxies fail to capture firm-risk asymmetry since they include full return distributions. Thus, we examine stock pledging effects on stock return skewness (*Skew*) and kurtosis (*Kurt*). As expected, we find increasing tail risk for pledged stock displaying a negative (positive) effect for *Skew* (*Kurt*). Negative skewness (*Skew*) indicates that stock pledging induces left-skewed or skewed to the downside returns. Positive kurtosis (*Kurt*) suggests increased areas in both tails of the return distribution increasing the likelihood of more extreme returns. Overall, both coefficients for *Skew* and *Kurt* support increased downside tail-risk.

Results where dependent variables are either *Skew* or *Kurt* are reported in Table 5, Panel C. The interaction term, *Stock Pledge\*Low return dummy* is negative and significant for *Skew* and positive and significant for *Kurt*; however, the *Stock Pledge* coefficient is positive but insignificant. Thus, results suggest that increasing tail-risk for pledged stock is mainly driven by lower stock returns. This is consistent with our initial hypothesis that stock pledging increases firm-risk, and is exacerbated by margin call pressure.

Most control variables possess expected signs. Consistent with Amihud and Lev (1981), we find a positive, but not significant, coefficient for controlling ownership (*CO*) and support for the general opinion that, as compared to small firms, larger firms are more transparent and less risky. The firm size coefficient (*Size*) is negative and significant. The positive and significant *Prior firm risk* coefficient indicates persistence of firm-risk over time. The *Group dummy* coefficient is negative, but not significant, in most columns. We also examine, but do not report, the interaction term, *Group dummy\*Stock Pledged*, where coefficients are negative, but not significant.

Overall results indicate that controlling owners' stock pledging increases firm-risk, especially elevating the downside tail-risk.

#### *Reverse Causality*

Previous results suggest that stock pledging increases firm-risk; however, potential reverse causality, endogeneity, between pledged stock and firm-risk may exist. For example, we find that stock pledging causes increased firm-risk; however, it is possible that higher previous firm-risk levels induce controlling owners to pledge their stock for diversification reasons. Controlling owners may view new capital investments as potential sources of diversification. Thus, if reverse causality exists, we may also observe a positive relation between stock pledging and firm-risk. To alleviate reverse causality concerns, we apply a two-stage least square regression (2SLS) instrumental variable approach by identifying an exogenous stock pledging component that captures tendencies for controlling owners within the same industry to pledge stocks. Following Laeven and Levine (2007, 2009), and Faccio et al. (2011), we use the mean value of pledged stock for each firm-year across all other firms in the same industry as an instrumental variable.

The first stage regresses the instrumental variable and other control variables on the *Stock Pledge* dependent variable. The second stage employs fitted *Stock Pledge* values replacing the original *Stock Pledge* variable. In Table 6, Column (1), *Industry Stock Pledge* is highly correlated with firm-level stock pledging (*Stock Pledge*), suggesting that *Industry Stock Pledge* is not a weak instrument (Staiger and Stock, 1997). The coefficient of *Fitted Stock Pledge* is positive, but insignificant. Nevertheless, the coefficient of the interaction term, *Fitted Stock Pledge\*Low Returns Dummy* is positive, and significant at 5%, reinforcing previous findings that stock pledging increases firm-risk and that increased firm-risk is driven mainly by firms with low stock returns.

#### *Does stock pledging influence investment policy?*

We demonstrate above that stock pledging tends to increase firm-risk because of margin call pressure unrelated to each firm's fundamentals, where, increase in the firm-risk may cause additional margin requirement by the lender (Raju and Sapra, 2010). Hence, we also expect that controlling owners, to avoid further increases in firm-risk, likely avoid higher risk investments such as R&D since, R&D investments tends to be more discretionary with greater risk and uncertainty as compared to lower risk capital expenditures. Thus, to avoid a further increase in firm-risk, controlling owners may reduce R&D investments and therefore affecting firms' future potential asset growth. Furthermore, this relationship may be stronger for controlling owners exposed to a greater margin call pressures.

Examining this relationship, we introduce R&D investment and asset growth as new variables. R&D investment is defined as R&D investment divided by total assets ( $R\&D/TA$ ). We exclude observations with missing values,<sup>6</sup> reducing the R&D sample size to 864 firm-year observations. Also, we examine stock pledging influences on subsequent asset growth

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<sup>6</sup> We also run the regression while replacing missing value of R&D by zero, and find similar results.

by measuring the change in total assets from the previous year divided by previous year total assets. To examine these effects, we run the following regression:

$$(R\&D/TA)_{i,t+1} = \alpha + \beta_1 StockPledge_{i,t} + Controlvariables + \varepsilon_{i,t} \quad (2)$$

Since we posit that stock pledging will impact corporate investment policy, we assume that corporate investment policy should lead by, at least, one year following a stock pledging decision, thus *R&D/TA (Asset Growth)* for year  $t+1$  is the dependent variable. Also, we include control variables defined in Section III, and include within industry (National Industry Classification (NIC) codes) and time fixed effects. Standard errors are robust to clustered and heteroskedasticity effects at firm-year level.

Table 7 reports results for regression equation (2); where, Column (1), the coefficient of *Stock Pledge* is negative and significant at the 1% level, suggesting that higher stock pledging levels discourages R&D investment, and as we posit, indicates conscious attempts to avoid additional firm-risk increases. The coefficient of *Low Return Dummy\*Stock Pledge*, a proxy for margin call pressure, is negative, but insignificant. The coefficient for *Stock Pledge* in Column (2) is negative and significant, and the coefficient of *Low Return Dummy\*Stock Pledge* is negative and significant at 10% level. These results suggest that, in attempting to reduce margin call pressures, controlling owners intend to reduce longer-term growth by reducing corporate investment in risky projects. Asija et al. (2014) also observe that Indian firms with higher levels of stock pledging experience greater earning management, suggesting controlling owners' short-termism or emphasizing shorter-term results possibly at the expense of longer-term results.

#### *Does stock pledging influence firm performance?*

In previous subsections, we observe that margin call pressure, resulting from controlling owner stock pledging, increases firm-risk; therefore, to diversify and reduce firm-



risk, controlling owners cognitively fail to invest in risky projects that should, in turn, reduce future firm performance (value). This section examines whether stock pledging is detrimental to future firm performance.

We use both operating and market based methods to measure firm performance. *Tobin's Q*, a proxy of market based firm performance, is calculated as common stock market values plus book values of total liabilities divided by book value of total assets. Return on assets (*ROA*) is an operation based performance measured calculated from earnings before interest, taxes, and depreciation and amortization divided by total assets. We use the following regression to examine these relationships:

$$FP_{i,t+1} = \alpha + \beta_1 StockPledge_{i,t} + Controlvariables + \varepsilon_{i,t} \quad (3)$$

Subscripts  $i$ , and  $t$  indicate firm  $i$  and year  $t$ . The dependent variable is firm performance, either *Tobin's Q* or *ROA* for year  $t+1$ . We include all control variables defined in Section III and also include within industry and time fixed effects. Standard errors are robust to heteroskedasticity and clustering effects at firm-year level.

Table 8 illustrates that *Stock Pledge* coefficients for both *Tobin Q* and *ROA* are negative and significant, implying that stock pledging adversely impacts future firm performance. This effect is further exacerbated if controlling owners are exposed to margin call pressures due to lower performing stock as measured by the coefficient of *Low Return Dummy\* Stock Pledge*. This margin call pressure proxy coefficient is negative and marginally significant at the 10% level, providing evidence that controlling owners expropriate control rights to support private benefits.

#### *Additional analysis*

We strongly support the hypothesis that controlling owners' stock pledging increase firm-risk because of margin call pressure that, in turn, affects investment decisions and future

firm performance. This section provides a robustness check for this main hypothesis: the margin call pressure hypothesis.

One could assert that the *Stock Pledge\* Low Return dummy* variable measures margin call pressure resulting from stock pledging only if stock prices subsequently fall. Controlling owners may be expected to anticipate, at the time they pledge their stock, some stock price decline caused by additional induced market risk. Thus, stock pledgers should predict some price declines; however, margin call pressure may be an unanticipated risk resulting from unpredicted or unexpected price declines. Otherwise, stock pledgers would be reluctant to pledge stock in the first place. Thus, the *Stock Pledge\*Low Return dummy* variable measures margin call pressure risk only given the incident of stock price declines, which were unanticipated at the time the stock pledging occurred. Only with unanticipated stock price declines will controlling owners be required to pledge more stock or inject additional cash to restore margin requirement.

We address this issue by constructing a *Margin Risk* variable that likely captures this phenomenon. First, to ensure that controlling owners have pledged a substantial portion of their stock ownership, we create a dummy with a value 1 if controlling owners of the firm have pledged more than 50% ownership and 0 otherwise. We then construct another dummy for stock price pressure that takes a value 1 if stock prices drop exceeds -15% during the previous year.

To capture whether margin call pressure induces controlling owners to pledge additional stocks, we calculate a difference between the percentages of stock pledged by controlling owners from the previous year as compared to the current year. At last, we measure the margin call pressure (*Margin call-risk*) by multiplying all three variables. We

posit that the *Margin call-risk*<sup>7</sup> variable captures margin risk pressure. A high value for the *Margin call-risk* variable indicates that controlling owners pledged substantial ownership. Since we are systematically looking at only cases where stock prices have declined, we anticipate that owners are exposed to margin call pressure where they may have been required to pledge additional shares to restore margin and collateral requirements.

Table 9 reports the additional robustness results. As expected, we observe a positive and significant *Margin Risk* coefficient; whereas, performance and assets growth coefficients are negative and significant coefficient. Our results are consistent with the view that firms controlled by owners who have pledged a substantial proportion of their shares are exposed to higher firm-risk because of the margin call pressures as compared to other similar firms. As a result, controlling owners, who have pledged a substantial proportion of their stock, are reluctant to invest in risky projects that could exacerbate firm-risk; however, opportunity cost of not investing in more risky project hurt future firm performance.

## V. Conclusions

Controlling owners' stock pledging are popular in developing countries, especially in India, and has received attention by regulators and practitioners. However, the importance of stock pledging on corporate-level risk, firm valuation and investment policy has received little attention. Thus, we examine effects of stock pledging by controlling owner on firm-risk, stock values, investment policy and future firm performance. Our empirical results support the *margin call pressure hypothesis* indicating that margin call pressure is unrelated to firms' fundamental firm-risk, and that tail-risk, resulting from low return skewness, is a fundamental channel by which margin call pressures increases firm-risk. We also show that controlling owners tend to diversify firm-risk by investing in lower risk investments and adjusting

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<sup>7</sup>*Margin call-risk* variable also measures the threat of selling of pledged stocks by the lender since the threat of selling occurs when controlling owners have pledged a substantial ownership, and thereafter there is a downside crash of stock prices.

investment policies to avoid further firm-risk increases. Thus, opportunity losses, resulting from rejecting viable, but more risky projects, results in reduced future firm performance.

Overall, we find that controlling owner stock pledging, unrelated to a firm's fundamental risk, exposes minority investors to additional risk possibly leading to stock price declines that may be unjustified by firm fundamentals. Also, controlling owner diversification of personal and firm risk by rejecting riskier, but potentially more profitable capital investments may systematically reducing shareholder wealth even if firm fundamentals are strong.

We believe that our findings have significant implication with regard to corporate governance and ownership structure, especially for emerging markets where controlling owner stock pledging is common practice.

Regulation requires Indian firms to disclose information related to stock pledging, but the purpose of stock pledging is not required. For instance, increases in debt collateralized by personally owned pledged shares may be invested in the firm or may be used by the owner for other purposes outside the firm. We hypothesis that if firm-level governance required or encouraged controlling owners to disclose the use of proceeds from pledging, minority shareholders would be better able to make more informed decisions.

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**TABLE 1: Variable Definitions**

The table presents the definition of all variables used in the study.

Variable	Definitions
<i>Stock Pledge</i>	The percentage of ownership is pledged by controlling owners
<i>Firm Risk</i>	Standard deviation of daily stock returns during the year
<i>Firm-Specific Risk</i>	Standard deviation of daily residuals of the Fama-French three factor during the year
<i>Firm Size</i>	Natural logarithm of Total Assets
<i>Leverage</i>	Total borrowing divided by Total Assets
<i>CO</i>	The percentage of controlling owners' ownership.
<i>PB</i>	Market capitalization divided by Book value of total equity
<i>Firm Age</i>	Natural logarithm of firm age in years (fiscal year minus the year firm was founded)
<i>Sales Growth</i>	The percentage change in firm's sales from the previous year, divided by firm's sales of the previous year
<i>Beta</i>	Annual beta values
<i>Group</i>	It takes a value 1 if a firm is affiliated with business group, and otherwise 0
<i>Prior returns</i>	Yearly returns of stock for the previous year
<i>Skew</i>	A skewness of daily stock returns in a year
<i>Kurt</i>	A kurtosis of daily stock returns in a year
<i>Tobin Q</i>	The sum of market value of common stocks plus book value of total liabilities, divided by total book value of assets.
<i>R&amp;D/TA</i>	R&D investment divided by total assets
<i>Asset growth</i>	The change in total assets from previous year's total assets, divided by previous year's total assets
<i>Industry Stock Pledge</i>	The mean value of stock pledging across all other firms in the same industry.
<i>Industry Fixed Effects</i>	Two digit NIC code dummies
<i>Year Fixed Effects</i>	Year dummies



**TABLE2-Descriptive statistics**

<b>Variable</b>	<b>Mean</b>	<b>Median</b>	<b>Q1</b>	<b>Q3</b>	<b>Interquartile range</b>	<b>Std</b>
<i>Firm Risk</i>	3.66	3.60	2.94	4.16	1.22	1.33
<i>Firm-Specific Risk</i>	3.43	3.32	2.59	3.98	1.39	1.37
<i>Tobin Q</i>	1.06	0.73	0.54	1.00	0.46	1.62
<i>ROA(%)</i>	0.09	0.09	0.04	0.14	0.10	0.14
<i>Stock Pledge (%)</i>	38.91	32.18	10.88	63.25	52.37	31.28
<i>CO (%)</i>	48.63	50.31	37.04	62.27	25.23	18.05
<i>Leverage</i>	0.47	0.38	0.23	0.55	0.32	0.87
<i>Firm age</i>	3.24	3.22	2.94	3.5	0.56	0.56
<i>Firm size</i>	8.49	8.43	7.32	9.64	2.32	1.75
<i>Sales growth</i>	0.02	0.03	-0.03	0.20	0.23	0.59
<i>PB</i>	1.46	0.70	0.30	1.53	1.23	6.62
<i>Beta</i>	0.86	0.85	0.51	1.20	0.69	0.59
<i>Prior Returns</i>	-0.24	-0.17	-0.69	0.27	0.96	0.79

Note: The table presents the descriptive statistics for all variables used in the study. *Firm-Specific Risk* is the standard deviation of daily residuals of the Fama-French three factor during the year. *Firm Risk* is standard deviation of daily stock returns during the year. *Asset growth* is percent change in total assets from previous year's total assets, divided by previous year's total assets. *Tobin Q* is sum of market value of common stocks plus book value of total liabilities, divided by total book value of assets. *ROA* is return on asset. *Stock Pledge* is the percentage of ownership is pledged by controlling owners. *CO* is the percentage of controlling owners' ownership. *Leverage* is ratio of Total borrowing to Total Assets. *Firm age* is natural logarithm of firm age in years (fiscal year minus the year firm was founded). *Firm Size* is natural logarithm of total Assets. *Sales Growth* is percentage change in sales. *PB* is Market capitalization divided by Book value of total equity. *Beta* is annual beta values for stock. *Prior Return* is previous year stock return.

**TABLE3-Corrleation matrix**

Variable	Firm-Specific Risk	Firm Risk	Tobin Q	ROA	Pledging	CO	Leverage	Firm age	Firm size	Growth	PB	Beta
<i>Firm-Specific Risk</i>	1											
<i>Firm Risk</i>	0.98***	1										
<i>Tobin q</i>	-0.05***	-0.03*	1									
<i>ROA</i>	-0.08***	-0.09***	-0.02	1								
<i>Stock Pledge</i>	0.07***	0.06***	-0.12***	-0.13***	1							
<i>CO</i>	-0.07***	-0.05***	0.11***	0.09***	-0.18***	1						
<i>Leverage</i>	0.06***	0.07***	0.47***	-0.18***	0.07***	-0.03*	1					
<i>Firm age</i>	-0.08***	-0.09***	-0.02***	0.06***	-0.08***	-0.03*	0.03***	1				
<i>Firm size</i>	-0.26***	-0.33***	-0.06***	0.12***	0.04***	0.05***	-0.16***	0.06***	1			
<i>Sales growth</i>	-0.07***	-0.08***	0.01***	0.24***	-0.07***	0.09***	-0.11***	-0.03*	0.07***	1		
<i>PB</i>	-0.05***	-0.04***	0.33***	0.05***	-0.08***	0.07***	-0.05***	-0.05***	0.05***	0.05***	1	
<i>Beta</i>	-0.11***	-0.23***	-0.11***	0.03*	0.05***	-0.12***	-0.11***	0.01	0.44***	0.02	-0.01	1
<i>Prior return</i>	-06***	-0.11***	-0.06***	-0.11***	-0.10***	0.14***	-0.02***	0.04***	-0.01	0.11***	0.06***	-0.03*

Note: The table presents the correlation matrix for all variables used in the study. *Firm-Specific Risk* is standard deviation of daily residuals of the Fama-French three factor during the year. *Firm Risk* is standard deviation of daily stock returns during the year. *Asset growth* is percent change in total assets from previous year's total assets, divided by previous year's total assets. *Tobin Q* is sum of market value of common stocks plus book value of total liabilities, divided by total book value of assets. *ROA* is return on asset. *Stock Pledge* is the percentage of ownership is pledged by controlling owners. *CO* is the percentage of controlling owners' ownership. *Leverage* is ratio of Total borrowing to Total Assets. *Firm age* is natural logarithm of firm age in years (fiscal year minus the year firm was founded). *Firm Size* is natural logarithm of total Assets. *Sales Growth* is percentage change in sales. *PB* is Market capitalization divided by Book value of total equity. *Beta* is Annual beta values for stock. *Prior Return* is previous year stock return.

\*\*\* Significant at the 1% level.

\*\* Significant at the 5% level.

\* Significant at the 10% level.

**TABLE4: Univariate Results**

<b>Stock Pledging</b>	<b>Mean</b>		<b>Median</b>	
	<b>Firm -Risk</b>	<b>Firm-Specific</b>	<b>Firm-Risk</b>	<b>Firm-Specific</b>
	<b>Risk</b>		<b>Risk</b>	
<i>Small</i>	3.54	3.32	3.44	3.16
<i>Medium</i>	3.70	3.48	3.65	3.38
<i>Large</i>	3.74	3.49	3.73	3.42
<b><i>Diff</i></b>	<b>0.20***</b>	<b>0.17***</b>	<b>0.29***</b>	<b>0.26***</b>
<i>t-value</i>	(4.09)	(3.39)	(4.19)	(3.38)

Note: The table presents the univariate results. Each year, we estimate firm-risk for each stock. Stocks then are sorted into three groups- small, medium and large- based on their stock pledging. Thereafter, we estimate the mean and the median value of firm-risk for each group. Variable Diff is difference between large and small firm groups. The t- statistics are shown in the parentheses.

\*\*\* Significant at the 1% level.

\*\* Significant at the 5% level.

\* Significant at the 10% level.

**TABLE 5: The relationship between firm-risk and stock pledging**

Variable	Panel A				Panel B		Panel C	
	Firm-Specific risk		Firm-risk		Firm-Specific	Firm-risk	Skew	Kurt
<i>Intercept</i>	3.86*** (12.07)	5.75*** (14.88)	3.93*** (12.09)	5.42*** (13.44)	5.69*** (13.83)	5.36 (12.61)	107.51* (1.90)	-1,023.70 (-1.47)
<i>Stock Pledge</i>	0.32*** (5.3)	0.28*** (4.55)	0.36*** (4.38)	0.28*** (4.66)	(0.25*** (3.18)	0.25*** (3.36)	-16.83 (-1.36)	207.72 (1.30)
<i>LowReturn Dummy*Stock Pledge</i>					0.20** (2.25)	0.17** (2.02)	-42.46*** (-2.90)	422.64** (2.29)
<i>Prior Return</i>					0.38*** (5.62)	0.34*** (5.06)	-109.66*** (-9.35)	1185.46*** (6.80)
<i>CO</i>		-0.13 (-1.07)		-0.19 (-1.54)	-0.33*** (-2.73)	-0.37*** (-3.16)	28.78 (1.42)	-203.41 (-0.78)
<i>Group</i>		-0.07 (-1.53)		-0.05 (-1.24)	-0.08* (-1.82)	-0.06 (-1.44)	10.03 (1.39)	-102.95 (-1.12)
<i>Leverage</i>		0.12*** (2.6)		0.11** (2.38)	0.15*** (3.32)	0.14*** (3.16)	-0.92 (-0.17)	-128.16** (-1.99)
<i>Firm age</i>		-0.11*** (-2.66)		-0.10** (-2.49)	-0.12*** (-2.84)	-0.11*** (-2.68)	-0.11 (-0.01)	-126.24 (-1.25)
<i>Firm Size</i>		-0.22*** (-13.94)		-0.21*** (-13.16)	-0.22*** (-14.03)	-0.20*** (-13.02)	-18.17*** (-6.89)	245.42*** (7.12)
<i>Growth</i>		-0.03 (-0.82)		-0.02 (-0.75)	-0.05 (-1.59)	-0.05 (-1.58)	12.65** (2.03)	-77.59 (-0.93)
<i>PB</i>		-0.30* (-1.77)		-0.35** (-2.19)	-0.45*** (-2.84)	-0.45*** (-2.96)	-0.41 (-1.21)	6.69 (1.16)
<i>Beta</i>		-0.13*** (-2.81)		0.16*** (3.38)	-0.08** (-1.96)	0.21*** (4.66)	64.40*** (8.70)	-416.54*** (-4.34)
<i>Prior firm Risk</i>		0.07*** (4.37)		0.07*** (4.19)	0.11*** (6.27)	0.10*** (6.08)	-6.31*** (-2.18)	-45.15 (-1.23)
<i>Year effects</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Industry effects</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Adjusted R<sup>2</sup></i>	0.11	0.22	0.11	0.22	0.24	0.24	0.16	0.15
<i>N</i>	3,718	3,718	3,718	3,718	3,718	3,718	3,718	3,718

Note: This table presents relationship between firm-risk factors and stock pledging. *Firm-Specific Risk* is Standard deviation of daily residuals of the Fama-French three factor during the year. *Firm Risk* is standard deviation of daily stock returns during the year. *Stock*

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*Pledge* is the percentage of ownership is pledged by controlling owners. *Skew* is skewness of daily stock returns. *Kurt* is kurtosis of daily stock return. *Low Return Dummy* is a dummy variable takes a value 1 if the prior year stock return is below -15% and 0 otherwise. *Prior Return* is previous year stock return. *CO* is the percentage of controlling owners' ownership. *Group* is a dummy, equals 1 if a firm is affiliated with business group, and otherwise 0. *Leverage* is ratio of Total *borrowing* to Total Assets. *Firm age* is natural logarithm of firm age in years (fiscal year minus the year firm was founded. *Firm Size* is natural logarithm of total Assets. *Growth* is percentage change in sale. *PB* is Market capitalization divided by Book value of total equity. *Beta* is annual beta values for stock. *Lag Firm risk* is previous year standard deviation of stock return. The t- statistics are shown in the parentheses.

\*\*\* Significant at the 1% level.

\*\* Significant at the 5% level.

\* Significant at the 10% level.

**TABLE 6: The relationship between firm-risk and stock pledging (2SLS approach)**

Variable	First stage	Second Stage	
		Firm-Specific Risk	Firm Risk
<i>Intercept</i>	0.095 (2.35)	5.37*** (27.96)	5.31*** (26.57)
<i>Industry Stock Pledge</i>	0.93*** (37.11)		
<i>Fitted Stock Pledge</i>		0.16 (1.21)	0.13 (1.02)
<i>Fitted Stock Pledge*Low returns dummy</i>		0.26*** (3.05)	0.16** (1.99)
<i>Prior returns</i>	-0.02*** (-2.82)	-0.03 (-1.07)	-0.13*** (-4.18)
<i>CO</i>	-0.18*** (-7.63)	-0.13 (-1.57)	-0.19 (-1.54)
<i>Group</i>	-0.03*** (-3.41)	-0.07* (-1.69)	-0.21* (-2.19)
<i>Leverage</i>	0.05*** (5.59)	0.15*** (3.57)	0.15*** (3.45)
<i>Firm Age</i>	-0.03*** (-3.94)	-0.12*** (-3.11)	-0.12*** (-3.07)
<i>Firm size</i>	0.01*** (3.23)	-0.20*** (-13.6)	-0.18*** (-12.43)
<i>Growth</i>	-0.02*** (-1.93)	-0.07** (-1.99)	-0.06* (-1.67)
<i>PB</i>	-0.20*** (-2.55)	-0.44 (-1.38)	-0.32 (-1.02)
<i>Beta</i>	0 (0.62)	-0.28*** (-6.48)	0 (0.82)
<i>Prior firm risk</i>	0.01* (1.85)	0.07*** (4.35)	0.056 (3.66)
<i>Year effects</i>	No	No	No
<i>Industry effects</i>	No	No	No
<i>Adjusted R<sup>2</sup></i>	0.4	0.09	0.09
<i>N</i>	3,718	3,718	3,718

Note: The table presents the relationship between stock pledging and firm-risk. Following Laeven and Levine (2007, 2009), and Faccio et al. (2011), we use two stage least square approach (2SLS) to estimate the stock pledging and firm-risk relationship. In the first stage, we estimate predicted value of stock pledge by using *industry stock pledge* (average value of stock pledge in a related industry) as an instrument variable. Predicted values (*Fitted Stock Pledge*) of first stage are used in second stage. The t-statistics are shown in the parentheses.

\*\*\* Significant at the 1% level.

\*\* Significant at the 5% level.

\* Significant at the 10% level.

**TABLE 7: Relationship between stock pledging and firm investment**

<b>Variable</b>	<b>Assets Growth</b>	<b>R&amp;D/TA</b>
<i>Intercept</i>	0.16 (0.69)	0.06 (3.16)
<i>Stock Pledge</i>	(-0.04*** -2.46)	-0.02**** (-2.56)
<i>Low Return Dummy*Stock Pledge</i>	-0.05* (-1.74)	-0.01 (-0.36)
<i>Prior Return</i>	0.05** (2.05)	0.00** (1.82)
<i>CO</i>	0.10*** (1.97)	0.01 (1.36)
<i>Group</i>	0.05 (0.76)	0.01*** (2.46)
<i>Leverage</i>	-0.06** (-1.93)	0.00 (-0.34)
<i>Firm age</i>	-0.07 (-1.50)	-0.01*** (-2.65)
<i>Firm Size</i>	-0.01 (-0.70)	-0.01*** (-2.59)
<i>Sales Growth</i>	0.03* (1.67)	0.00 (0.56)
<i>PB</i>	-0.08 (-0.77)	0.19 (4.05)
<i>Beta</i>	-0.02 (-0.60)	0.01* (1.83)
<i>Lag firm performance</i>	0.02 (0.63)	-0.10* (-1.88)
<i>Year effects</i>	Yes	Yes
<i>Industry effects</i>	Yes	Yes
<i>Adjusted R<sup>2</sup></i>	0.03	0.50
<i>N</i>	3,006	864

Note: The table presents relationship between stock pledging and firm investment. *Assets Growth* is percentage change in sale. *R&D/TA* is R&D investment divided by total assets. *PB* is Market capitalization divided by Book value of total equity. *Stock Pledge* is the percentage of ownership is pledged by controlling owners. *Low Return Dummy* is a dummy variable takes a value 1 if the prior year stock return is below -15% and 0 otherwise. *Prior Return* is previous year stock return. *CO* is the percentage of controlling owners' ownership. *Group* is a dummy, equals 1 if a firm is affiliated with business group, and otherwise 0. *Leverage* is ratio of Total borrowing to Total Assets. *Firm age* is natural logarithm of firm age in years (fiscal year minus the year firm was founded). *Firm Size* is natural logarithm of total Assets. *Growth* is percentage change in sale. *PB* is Market capitalization divided by Book value of total equity. *Beta* is Annual beta values for stock. *Lag Firm performance* is previous year return on asset (ROA). The t-statistics are shown in the parentheses.

\*\*\* Significant at the 1% level.

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\*\* Significant at the 5% level.

\* Significant at the 10% level.

**TABLE 8: Firm performance and Stock pledging**

<i>Variable</i>	<b>Tobin <math>q_{t+1}</math></b>	<b>ROA <math>_{t+1}</math></b>
<i>Intercept</i>	-0.32 (-1.75)	-0.04 (-1.14)



<i>Stock Pledge</i>	-0.17** (-2.23)	-0.12* (-1.85)
<i>Low Return Dummy*Stock Pledge</i>	-0.07* (-1.83)	-0.02* (-1.84)
<i>Prior Return</i>	0.11* (1.83)	0.02*** (4.53)
<i>CO</i>	0.07 (0.52)	0.06*** (3.82)
<i>Group</i>	0.05 (1.40)	0.00 (-0.24)
<i>Leverage</i>	0.48*** (4.15)	0.00 (-0.09)
<i>Firm age</i>	0.00 (0.07)	0.01* (1.64)
<i>Firm Size</i>	0.03* (1.70)	0.01*** (2.16)
<i>Growth</i>	0.03 (1.01)	0.04*** (4.97)
<i>PB</i>	0.02 (1.04)	0.00 (-0.77)
<i>Beta</i>	-0.06 (-1.34)	0.01 (1.25)
<i>Lag Firm performance</i>	0.78*** (6.60)	0.08** (2.17)
<i>Year effects</i>	Yes	Yes
<i>Industry effects</i>	Yes	Yes
<i>Adjusted R<sup>2</sup></i>	0.66	0.12
<i>N</i>	3,006	3,006

Note: The table presents the relationship between stock pledging and firm future performance. *Tobin Q* is sum of market value of common stocks plus book value of total liabilities, divided by total book value of assets. *ROA* is return on asset. *Stock Pledge* is the percentage of ownership is pledged by controlling owners. *Low Return Dummy* is a dummy variable takes a value 1 if the prior year stock return is below -15% and 0 otherwise. *Prior Return* is previous year stock return. *CO* is the percentage of controlling owners' ownership. *Group* is a dummy, equals 1 if a firm is affiliated with business group, and otherwise 0. *Leverage* is ratio of Total borrowing to Total Assets. *Firm age* is natural logarithm of firm age in years (fiscal year minus the year firm was founded). *Firm Size* is natural logarithm of total Assets. *Growth* is percentage change in sale. *PB* is Market capitalization divided by Book value of total equity. *Beta* is Annual beta values for stock. *Lag Firm performance* is previous year return on asset (ROA). The t-statistics are shown in the parentheses.

\*\*\* Significant at the 1% level.

\*\* Significant at the 5% level.

\* Significant at the 10% level.



**TABLE9: Additional Robustness Analysis**

Variable	Firm Specific Risk	Firm Risk	Asset Growth	R&D/TA	Tobin Q <sub>t+1</sub>	ROA <sub>t+1</sub>
<i>Intercept</i>	6.08*** (14.97)	5.86*** (14.59)	-0.18*** (-2.62)	0.06*** (3.34)	-0.43** (-2.01)	-0.07 (-1.43)
<i>Margin Risk</i>	0.26** (2.09)	0.28** (2.30)	-0.06** (-2.14)	0.01 (1.04)	-0.15** (-2.10)	-0.07*** (-4.07)
<i>Prior returns</i>	-0.07** (-2.26)	-0.07** (-2.48)	0.03*** (3.34)	0.00 (0.58)	0.11 (1.51)	0.02*** (4.20)
<i>CO</i>	-0.28*** (-2.77)	- (-3.18)	0.08*** (3.70)	-0.02** (-2.09)	0.06 (0.39)	0.07*** (3.39)
<i>Group</i>	-0.05 (-1.45)	-0.04 (-1.00)	-0.01** (-1.65)	0.01*** (2.82)	0.05 (1.26)	0.00 (0.86)
<i>Leverage</i>	0.23*** (5.13)	0.23*** (5.27)	-0.03** (-2.28)	0.02** (2.80)	0.54*** (4.44)	0.00 (0.14)
<i>Firm Age</i>	-0.10*** (-2.34)	- (-2.18)	-0.02*** (-2.37)	-0.01*** (-2.07)	0.02 (0.50)	0.01 (1.58)
<i>Firm size</i>	-0.28*** (-21.43)	- (-20.22)	0.01*** (4.40)	-0.01*** (-4.55)	0.04* (1.65)	0.01*** (2.46)
<i>Growth</i>	-0.07*** (-2.30)	- (-2.27)	0.02*** (2.96)	0.01* (1.69)	0.05 (1.35)	0.03*** (5.01)
<i>PB</i>	-0.47*** (-2.80)	- (-2.79)	-0.05 (-0.74)	0.02 (0.45)	0.01 (0.92)	0.00 (-0.98)
<i>Beta</i>	0.00 (0.05)	0.27*** (6.42)	0.01 (1.08)	0.02*** (3.46)	-0.04 (-0.86)	0.01 (1.10)
<i>Lag Firm Risk</i>	0.11*** (7.12)	0.10*** (6.84)	0.00* (1.85)	-0.01 (-1.55)		
<i>Lag Firm performance</i>			0.01 (1.22)	0.02 (4.10)	0.75*** (6.01)	0.13* (1.75)
<i>Year effects</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Industry effects</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Adjusted R<sup>2</sup></i>	0.36	0.30	0.12	0.63	0.70	0.17

Note: The table presents the robustness analysis for five different models. *Firm-Specific Risk* is standard deviation of daily residuals of the Fama-French three factor during the year. *Firm Risk* is standard deviation of daily stock returns during the year. *Asset growth* is percent change in total assets from previous year's total assets, divided by previous year's total assets. *R&D/TA* is R&D investment divided by total assets. *Tobin Q* is sum of market value of common stocks plus book value of total liabilities, divided by total book value of assets. *ROA* is return on asset. *Margin-call risk* is interaction variable based on ownership dummy, low return dummy and percentage stock pledging by controlling owners'. *Prior Return* is previous year stock return. *CO*

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is the percentage of controlling owners' ownership. *Group* is a dummy, equals 1 if a firm is affiliated with business group, and otherwise 0. *Leverage* is ratio of Total *borrowing* to Total Assets. *Firm age* is natural logarithm of firm age in years (fiscal year minus the year firm was founded). *Firm Size* is natural logarithm of total Assets. *Growth* is percentage change in sale. *PB* is Market capitalization divided by Book value of total equity. *Beta* is annual beta values for stock. *Lag Firm risk* is previous year standard deviation of stock return.

The t- statistics are shown in the parentheses.

\*\*\* Significant at the 1% level.

\*\* Significant at the 5% level.

\* Significant at the 10% level.