

# CEO Incentives, Managerial Myopia, and Corporate Stock Repurchase

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## **Abstract**

In this paper, we investigate how the sensitivity of CEOs' pay-for-performance compensation to stock prices affects firms' payout and investment policies. In particular, we examine the impact of CEOs' compensation delta on firms' share repurchase activities. On the company's payout side, we find that higher delta CEOs tend to execute more share buybacks and pay fewer cash dividends. The evidence supports the notion that highly stock price sensitive executives particularly favor repurchases as the payout form. On the investment side, we find that higher delta CEOs allocate more money towards share buybacks, direct fewer investment resources to capital expenditures, and cut back employment. This is consistent with the argument that price-sensitive executives behave myopically due to the over focus on the stock performance. In addition, these repurchasing firms experience deterioration in operating performance subsequently following the repurchases. Our result suggests that the sensitivity of executives' compensation to stock price induces CEOs to favor short-term performance over long-term performance.

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## 1. Introduction

Unlike the traditional dividend payout practice for U.S. firms, share repurchases have become the dominant corporate payout form over the last two decades. In our sample period from 1992 to 2014, corporate share repurchases began to exceed the magnitude of cash dividends payment in 1995 with the aggregate share repurchase volume peaking at \$394 million in 2007 and starting to bounce back quickly in 2009 right after the financial crisis. With regard to the soaring business of share buybacks, there have been many critics of companies' massive shares investment.<sup>1</sup> Thus, it is crucial to understand various motives for firms to engage in such a large scale of share buybacks.

Firms repurchase stock when their stock is perceived undervalued (Ikenberry et al., 1995, Brockman and Chung, 2001; Peyer and Vermaelen, 2007) or when firms lack future growth opportunities (Grullon and Michaely, 2004). They also do so when they want to show signals of strong future performance (Lie, 2005), boost employee incentives (Babenko, 2009), mitigate the dilutive effect of stock option exercises (Kahle, 2002; Bens et al., 2003), distribute excess capital (Dittmar, 2000), and adjust capital structure (Bonaimé et al., 2014). Execution flexibility (Guay and Harford, 2000), tax efficiency (Jagannathan et al., 2000), and lack of dividend protection on executive options (Fenn and Liang, 2001) also explain firms' repurchasing activities. More recently, firms' earnings per share (EPS) boosting and price support motives to purchase their shares back have been investigated. Almeida et al. (2016) examine the real effects of EPS-motivated repurchases and find that these repurchases are followed by reductions in the employment, investments, and cash holdings. Liu and Swanson (2016) demonstrate that share repurchase affects the demand side of the market and thus can provide price support for a firm's

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<sup>1</sup> See, for example, the article "the repurchase revolution" in *The Economist* 2014

stock. If share repurchase can be used as an EPS boosting and price support tool, then CEOs whose compensation are highly tied to the stock price performance would particularly favor repurchases as the corporate payout form rather than dividend payout.

Agency problems have been at the center of corporate finance and governance for decades following the publication of the seminal paper by Jensen (1986). Firm managers, as the agents of shareholders, might maximize their interests at the cost of the firm owners'. Two major concerns in the conflicts of interest between managers and shareholders are free cash flow problem and CEOs' shirking their duties. Like dividend payout, share repurchase restrains cash under CEOs' control thus help alleviate free cash flow concerns. Pay-for-performance compensation is designed to deal with the executives' shirking and incentivizes managers to exert more efforts in maximizing shareholders' wealth using equity-based compensation. We observe rapid growth in the use of equity-based executive compensation and large variations in pay-for-performance sensitivity over our sample period.<sup>2</sup>

Although managerial equity-based compensation incentives can align interests of managers and shareholders since executives gain or lose along with shareholder, this mechanism may have its drawbacks. For example, Stein's myopia models (1988, 1989) show that managers who are concerned with their firm's stock price and with boosting current earnings will tend to forsake good investment opportunities and mislead the market about their firms' worth. We identify the delta, which is defined as the dollar change of CEOs' wealth for a 1% change in stock price, as the trigger of managerial myopia or CEO's short-termism. To price-sensitive CEOs, share buybacks become an ideal payout option in the sense that it has the potential to increase firms' earnings per

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<sup>2</sup> See Figure.1 in Appendix.

share and stock prices. To myopic CEOs, share repurchases serve as an optimal investment alternative in the sense that it is less risky and requires less efforts from executives than other investments.

In this paper, we explicitly examine the impact of CEO's compensation delta on firms' share repurchase activities. On the company's payout side, we find that higher delta CEOs execute more share buybacks and pay fewer cash dividends. This evidence supports the notion that stock price sensitive executives favor repurchases as the payout form. On the investment side, we find that higher delta CEOs allocate more money towards share buybacks, direct fewer investment resources to capital expenditures, and reduce employment. This result is consistent with the notion that price-sensitive executives behave myopically since these repurchasing firms experience deterioration in operating performance subsequently following the repurchases.

The link between CEO's compensation delta and buybacks comes from the notion that share repurchase becomes a particularly appealing payout form when executives' wealth is closely tied to stock price. Firm managers can use repurchase as an EPS boosting mechanism, and buybacks affect demand side of the market and potentially provides price support for their stock. Moreover, buybacks provide managers with flexibility in terms of execution, and firms do not get penalized when they do not actually conduct share buybacks even after making repurchase announcement. We also find that the total firm payout is negatively associated with CEOs' compensation delta. Thus stock price sensitive CEOs are reluctant to return capital to shareholders regardless of payout form. When it comes to the payout form choice between share repurchases and dividends, senior managers prioritize the linkage between their individual wealth and share price by shifting the preference from dividend payout to share repurchase payout, i.e., highly price sensitive CEOs

prefer using repurchases rather than cash dividends when they distribute excess capital back to shareholders. This preference shifting may explain the dramatic rising popularity of repurchases in the last two decades.

As stock repurchase is also regarded as firm investment alternative, we further investigate how CEOs' delta affects firms' investment policies. We find that higher delta CEOs allocate more investment resources toward buybacks and forgo firms' real investments simultaneously. By categorizing repurchase as a short-term investment, capital expenditures and employments as long-term investments, we demonstrate that high pay-for-performance sensitivity induces CEOs to behave myopically in their investment decision-makings. Additionally, CEOs' stock and option portfolios are not so diversified as other individual investors' portfolios and the extra risk exposure (indicated by delta) causes CEOs to seek less risky corporate policies. Thus, those CEOs whose compensation is highly sensitive to stock prices prefer repurchases as investment alternative since share buybacks entail fewer risks and require less effort in evaluating and selecting positive NPV projects. It is also possible that the shrinking of investment opportunities drives the reduction of investment and the increase of repurchases at the same time. In other words, the reduction in capital expenditures and employments might not be a suboptimal choice for repurchasing firms. However, we find that these repurchasing firms experience deteriorating operation performances following share repurchases, which is inconsistent with the assertion that repurchasing firms' investments cut is an efficient corporate policy.

Stock undervaluation plays a significant role in corporate repurchase decisions because firm managers often claim that the market undervalues their stocks and that repurchases provide them

with value-increasing investment opportunities.<sup>3</sup> An alternative interpretation of this claim is that firm managers are trying to provide price support for their stock through share buybacks. Boosting stock price is directly beneficial to CEOs whose wealth is closely linked to share prices. We use a relatively objective equity undervaluation measure based on the residual income model (RIM) to test this proposition, and our conclusion is that the effect of CEOs' delta on firms' repurchases is more pronounced when stocks are undervalued by the market. In other words, stock price sensitive CEOs are much more likely to engage in share buybacks when their firms' stock are undervalued by the market.

To further mitigate the endogeneity concerns, we rely on simultaneous systems of equations method to establish the causal relation between CEOs' compensation incentives and corporate payout and investment policies. In particular, we perform the three-stage-least-square (3SLS) regressions, by allowing simultaneous interactions between corporate policies and executive compensation structures, to examine the delta's influences on firms' various policies. The 3SLS results support our hypothesis that high delta CEOs prefer repurchases payout and that they reduce capital investments and cut employments to engage in more repurchases. In addition, our results are robust to an alternative actual repurchases measure based on Fama-French (2001) procedure.

In the subsample analysis, we show that the influence of CEOs' delta on firms' share repurchase decision varies across each delta quintile. For example, the CEO's delta significantly impacts their firms' repurchases (at the 1% significance level) only among top delta quintile firms. Thus, the driving factors for companies to conduct share buybacks differ across delta quintiles.

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<sup>3</sup> In his 1984 letter to shareholders, Warren Buffett wrote: "When companies with outstanding businesses and comfortable financial positions find their shares selling far below their intrinsic value in the market place, no alternative action can benefit shareholders as surely as repurchases."

Similar to Cheng et al. (2015), we examine three-year post-announcements abnormal returns and demonstrate that repurchasing companies in the bottom delta quintile experience higher long-run abnormal returns than the repurchasing firms in the top delta quintile. That is to say, the repurchasing decisions are more likely to be driven by the CEOs' individual wealth concerns than firms' economic situation in top quintile firms, and these companies experience lower abnormal returns afterward.

Our paper contributes to the literature in several ways. First of all, we link the corporate stock repurchases and CEO compensation characteristics based on more precise compensation incentive measures, i.e., delta and vega. Vega is defined as the dollar change in the CEO's wealth for a 0.01 change in standard deviation of stock returns. Although our primary investigation of executives' compensation incentive is the CEOs' delta, to the extent that vega affects the firm's risk-taking behavior, we include vega as an explanatory variable in all our analyses to isolate the delta's effect on firm's repurchase decisions as we categorize share repurchase as a less risky investment.<sup>4</sup> Prior studies focus on relatively rudimentary measures of CEO compensation characteristics such as the number of stock and option granted and the value of stocks and options holding to examine the influence of CEO incentives on various corporate policies (Fenn and Liang (2001)).<sup>5</sup> Such measures are noisy proxies for delta and vega (Core and Guay, 2002a). Secondly, we explicitly examine the effects of CEOs' compensation incentives on the repurchase in corporate investment context. By classifying share repurchase as less risky and short-term investment alternative, capital expenditures and employment as long-run investments, we show how CEOs' incentives induced

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<sup>4</sup> In case of vega, there is no consensus in the literature on the effect of executive's risk-taking. For example, the convexity of the payoff structure can be more than offset by the concavity of the utility function of the risk-averse managers (Guay,1999). Ross (2004) proves that there does not exist incentive schedule that will make all expected utility maximizers less risk averse.

<sup>5</sup> Although these measures capture certain aspects of CEO's compensation incentives, they ignore other characteristics of the option grants, such as, time to maturity, exercise price, and volatility etc.



myopia and risk-aversion behaviors evidence themselves in the corporate investment policies. We believe that this study is the first attempt to link the CEOs' myopia with corporate repurchase activities. Several studies establish causal relation between CEO's short-termism and reductions in firm's investments (e.g., Edmans (2013)), we here pinpoint the tradeoff between repurchases and real investments faced by top executives and the choices made by the myopic CEOs. Third, it is plausible to think that corporate policies and CEO compensation contracts are jointly determined, so we use simultaneous systems of equations to address the endogeneity issue and further establish the causality following Rajgopal and Shevlin (2002). Additionally, we contribute to the existing literature on firms' motives to conduct buybacks by documenting that CEOs' individual wealth concern plays a significant role in firms' repurchase decisions.

The remainder of the paper proceeds as follows. Section 2 briefly reviews stock buybacks and CEO compensation literature. Section 3 and 4 describes sample construction and hypothesis development, respectively. Section 5 discusses research design and empirical results. Section 6 is the concluding section.

## **2. Literature review**

This study belongs to the extensive literature on stock repurchases, especially the motivations for firms to execute share repurchases. Bens et al. (2003) show that firms are more likely to conduct share buybacks when they cannot achieve the expected growth or market expectation for EPS. According to the survey by Brav et al. (2005), improving EPS numbers is one of the most important motives for stock repurchases by firm managers. Hribar et al. (2006) investigate whether firms use stock repurchases to meet or beat analysts' EPS forecasts and find a disproportionately large number of accretive buybacks among firms that would have missed analysts' forecasts without the

repurchase. Almeida et al. (2016) examine the real effects of the EPS-motivated repurchases and find that these repurchases are followed by reductions in employment, investments, and cash holdings. These evidences support the notion that CEOs employ repurchases as a tool to increase the EPS. To the extent that investors react negatively to firms that miss analyst's EPS forecasts, highly stock price sensitive CEOs are more inclined to boost their company's EPS through share buybacks. Moreover, CEOs' attention to EPS is not only driven by its link to the stock price, but also its direct relation with their bonuses. Cheng et al. (2015) document that company is more likely to conduct a buyback when its CEO's bonus is directly tied to EPS. Liu and Swanson (2016)) provide evidence that price support is an important motive for increasing share repurchases. We shed additional light on the repurchase motives literature by documenting that CEOs' preference for share buybacks is intensified by the link between their individual compensation wealth and stock price.

Our paper is also related to rich literature on CEO compensation. One strand of the literature focuses on the association between the form of the CEO's compensation and firm's performance. The idea is that if a particular compensation policy incentivizes CEOs to make good decisions from shareholders' perspective, we should observe a relationship between compensation structure and corporate performance. For example, Morck et al. (1998), McConnell and Servaes (1990) and many others provide evidence that Tobin's  $q$  is related to the managerial performance sensitivity through ownership. Another strand of the compensation literature concentrates on the relation between CEO's compensation structure and corporate's financial and investment policy. Closer to our study, Jolls (1998) explores the relationship between managerial stock and/or option holdings and firms repurchases and finds a positive relation between the repurchase decision and magnitude of the executive stock option plan. Fenn and Liang (2001) document a negative relation between

stock option plans and dividends, a finding that supports the argument that the use of managerial incentive plans reduces managers' incentive to pay dividends. Rajgopal and Shevlin (2002) find that oil exploration risk is positively related to lagged vega. Similarly, Knopf et al. (2002) show that the use of derivatives is negatively (positively) related to vega (delta). Coles et al. (2006) provide evidence that higher compensation vega incentivizes firms to implement riskier policies. Since the mix of delta and vega varies substantially across firms, and both affect CEO's risk-taking behaviors, we include vega as a control variable in our regression analyses. Our findings are consistent with that of Jolls (1998) and Fenn and Liang (2001) with regard to the firms' payout policy, however, our analysis is based on more precise executives' incentive measures.

### **3. Data and sample construction**

We extract the data on CEO compensation over the period of 1992 to 2014 from the Standard & Poor's Execucomp database. Execucomp provides data on salary, bonus, and total compensation for the top five executives for firms in the S&P 500, S&P Midcap 400, and S&P Smallcap 600. We focus on the executives who are identified by Execucomp as CEOs since CEOs are the most influential decision makers within the firms. We obtain firm specific financial information from Compustat, and stock return information from CRSP. We exclude financial (SIC code: 6000-6999) and utility firms (SIC code: 4900-4999) following prior literature. The calculation of the delta and vega is firstly developed by Guay (1999) and Core and Guay (2002a), which use the Black-Scholes (1973) option valuation model as modified by Merton (1973) to account for dividends. We follow the procedure of Coles et al. (2013) to compute CEO's compensation delta and vega. In particular, the delta is defined as the change in dollar value of CEO's wealth with respect to 1% change of stock price for CEO's entire portfolio of stocks and options. Vega is the change in dollar value of

CEO's wealth with respect to 0.01 change of the stock return volatility for CEO's option portfolio since Guay (1999) shows that option vega is many times higher than stock vega.

We start with the Compustat data item purchase of common and preferred stock (item 115) to obtain our primary measure of firm's actual share repurchases during a fiscal year. This measure of stock repurchases has been used in Titman (1996), Dittmar (2000), Fenn and Liang (2001). The purchase of common and preferred stock includes following items: (1) conversion of class A, class B, and special stock into common stock; (2) conversions of preferred stock into common stock; (3) purchases of treasury stock; (4) retirement or redemption of common stock; (5) retirement of preferred stock; and (6) retirement or redemption of redeemable preferred stock. As discussed in Stephens and Weisbach (1998), these data tend to overstate stock repurchases due to the inclusion of above items. To exclude preferred stock items, we adjust the purchase of common and preferred stock amount by subtracting any decrease of preferred stock (item 56) from year  $t - 1$  to year  $t$  following Grullon and Michaely (2002). This restriction eliminates the noises caused by items (2), (5) and (6). Considering the frequency of events in items (1), (3) and (4), we believe our measure of actual repurchase activities are less subject to measurement errors. More importantly, Banyl et al. (2008) identify the Compustat's purchase of common and preferred stock minus any decrease in redeemable preferred stock to be the least problematic measure of firms' actual repurchases. As a robustness check, we also estimate the repurchases based on the Fama-French (2001) procedure. We extract information on dividend payments, capital expenditures, and a number of employees and other financial information from Compustat database. We require the firm to have positive actual share repurchases to be in our sample. We then merge the CEO compensation incentives data with the repurchasing firms. Our final sample has maximum 15,259 firm-year observations from 1992 to 2014, with 2,040 unique companies.

Table 1 presents summary statistics for the key policy and compensation variables. Specifically, Panel A reports firms payout and investment policy variables. On average, firms are repurchasing \$229.54 million, while cash dividend payments are approximately \$122 million over a fiscal year. We define the total payout as the summation of share repurchases and cash dividend payments. We observe that on average the magnitude of firm's total payout is approximately same as the company capital expenditures. There are on average about 22,870 employees in repurchasing firms. Panel B presents CEO compensation characteristics of these repurchasing firms. Following prior literature (Guay 1999, Core and Guay, 1999), we winsorize delta, vega, total current compensation and total compensation at the 1<sup>st</sup> and 99<sup>th</sup> percentiles.<sup>6</sup> In our sample, the mean delta for CEOs is about \$795,000. The average vega is about \$129,000, and average total current compensation is about \$1.082 million. On average, CEO's total compensation is about \$4.27 million. And Panel C presents firm characteristics. Specifically, cash is the ratio of cash and cash equivalents scaled by total assets. We compute the cash flow as the income before extraordinary items plus depreciation divided by total assets. The mean cash and cash flow ratio is about 0.15 and 0.12 respectively. The leverage ratio is long-term debt plus debt in current liabilities divided by total assets. The mean leverage ratio is approximately 0.21 in our sample. The ROA, net income divided by total assets, on average is about 7% for repurchasing firms in our sample. We compute Tobin's Q as the book value of asset minus book value of equity plus market value of equity scaled by total assets. The mean Tobin's Q is about 2.06 in the sample. The average total asset for our sample firms is about \$6,294 million. As of firm performance measures, we calculate the net profit margin as the income before extraordinary items divided by sales, operating profit margin as operation income after

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<sup>6</sup> Total current compensation includes the cash and bonus.

depreciation divided by sales, and gross profit margin as the gross profit divided by sales. The mean net profit margin is approximately 6%, and the average operating profit margin is about 12% of repurchasing firms.

Table 2 reports dividend payments and share repurchase volume across fiscal years. Compared to the relatively stable trend of dividends payout, share repurchases experienced drastic increases in the last twenty years. We note that the repurchase magnitude exceeded dividends payment ever since 1995 and peaked at \$394 million in 2007 right before the financial crisis. After a dramatic decrease during 2008 to 2009, share buybacks rebounded to \$301 million in 2011. Consistent with the results in previous studies, Table 2 shows that share repurchase has become the dominant firm payout form.

To construct the measure of equity mispricing, we extract EPS analyst forecasts information from I/B/E/S. To analyze firms' long-run abnormal return after share repurchase announcements, we collect the repurchase announcements data from the Thomson SDC Mergers & Acquisitions database, which provides the most comprehensive share repurchase announcements information since 1984. Following the prior literature, we include the open market repurchase announcements and exclude announcing firms in financial and utility industries.<sup>7</sup>

#### **4. Hypothesis development**

Due to the appealing features of share repurchase, such as EPS boosting and price support mechanism, execution flexibility, compared to the dividend payout, we conjecture that CEO's

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<sup>7</sup> We exclude the block, joint-authorization and self-tender repurchase announcements.

wealth sensitivity to share price enhances his preference for repurchases over dividends as the firm payout form, which leads to the following hypotheses:

*H1(a): The higher sensitivity of CEO's compensation wealth to stock price, the more repurchases executed by the firm.*

*H1(b): The higher sensitivity of CEO's compensation wealth to stock price, the fewer dividends paid by the firm.*

Turning to company's investment policy, we hypothesize that higher sensitivity of CEOs' wealth to stock price induces them to behave in a myopic and more risk-averse manner. Edmans et al. (2013) show that executives' short-termism causes them to cut real investments, and these firms tend to have more positive earnings guidance. Our hypothesis is that myopic managers are cutting real investments to conduct more repurchase, which has the potential to boost earnings. Thus higher delta CEOs may allocate more investment dollars toward share repurchases and spend less money on capital expenditures and cut firm's employments. In addition, share buybacks involve less risks and requires fewer efforts from managers, compared with the long-term capital investments. We thus develop the following hypotheses.

*H2(a): The higher sensitivity of CEO's compensation wealth to stock price, the less capital expenditures spent by the firm.*

*H2(b): The higher sensitivity of CEO's compensation wealth to stock price, the fewer employees hired by the firm.*

It has been well established in share repurchases literature that equity undervaluation plays a significant role when companies making repurchase decisions. In particular, much prior research

concentrates on the undervaluation signaling effect when firms make repurchase announcements. Corporations send an undervaluation signal to the market by announcing share buyback program, anticipating that market will react positively to the signal (Ikenberry et al. (1995)). When a CEO's compensation wealth is closely tied to stock price, and the stock is perceived undervalued, he has much incentive to engage in share repurchases, claiming that purchasing the undervalued stocks is a value-increasing investment opportunity for the company. To the extent that buying shares back influences demand side of the market, share buybacks can enhance stock price, CEOs then directly benefit from the higher share price. Therefore, stock repurchase becomes the ideal investment option when CEO's compensation wealth fluctuates with share prices, conditional on stock being undervalued by the market. Therefore, higher delta CEOs particularly favor share buybacks given the stock is perceived undervalued. We then develop the following hypothesis.

*H3: The impact of CEO's compensation delta on firm's repurchasing activities is stronger when the stock is undervalued.*

Prior literature indicates that markets tend to underreact to the repurchase announcements in the short-run. Ikenberry et al. (1995) examine the abnormal return of repurchase announcing firms four years after their announcements. As for open market repurchase program, firms do not have commitment to actually conduct share buybacks following the announcements. It can take several years for companies to complete a repurchase program after the initial announcement (Stephens and Weisbach (1998)). So we believe that the execution of share repurchases should have an impact on the abnormal return in the long run after the announcements because the motives for firms to conduct buybacks can deviate from the reasons for companies to announce repurchase programs. In particular, we suppose that long-run abnormal return following the announcements



vary across each delta quintile because stock repurchases decisions are more likely affected by CEOs' individual wealth concerns among high delta firms, and not solely by the firms' economic conditions. We formalize our hypothesis as follows.

*H4: The post-announcement long-run abnormal return of bottom quintile delta repurchasing firms would be higher than that of top quintile delta repurchasing firms.*

Even though highly stock price sensitive CEOs redirect companies' resources toward share repurchases and reduce firms' capital investments and employments, we are interested in whether the investments cut is an efficient choice or a suboptimal option to the repurchasing firm. Since corporate repurchase decisions are significantly influenced by CEOs' individual wealth concerns, through the channel of either seeking less risky investments or exerting less efforts, we conjecture that future operating performance of repurchasing firms may deteriorate following the repurchases.

*H5: The post-repurchase firm operating performances are negatively associated with firm's stock repurchase activities.*

## **5. Research design and empirical results**

### *5.1 Baseline OLS regressions*

We begin with a univariate analysis to gain some insights about delta's impact on corporate share repurchases. Table 3 presents the distribution of repurchase volume across each quintile sorted by compensation delta. The mean repurchase volume in top (bottom) delta quintile is approximate \$723.09 (\$44.00) million. The repurchase amount increases monotonically from the bottom delta quintile to the top delta quintile, and the mean of repurchase amount is statistically different between top and bottom quintile. (*t-statistics* = -20.46).

To further test the basic findings in the univariate test, we perform baseline OLS regressions of firm's payout level and compositions on the CEO compensation incentives, i.e., delta and vega. Specifically, we employ the following models (1) - (3) to test our hypotheses H1(a) and H1(b).

$$Total\ payout_{i,t} = \alpha_{i,t} + \beta_1 * Delta_{i,t-1} + \beta_2 * Vega_{i,t-1} + \gamma_1 * Controls_{i,t-1} + \gamma_2 * FE + \varepsilon_{i,t} \quad (1)$$

$$Repurchase_{i,t} = \alpha_{i,t} + \beta_1 * Delta_{i,t-1} + \beta_2 * Vega_{i,t-1} + \gamma_1 * Controls_{i,t-1} + \gamma_2 * FE + \varepsilon_{i,t} \quad (2)$$

$$Dividend\ Pay_{i,t} = \alpha_{i,t} + \beta_1 * Delta_{i,t-1} + \beta_2 * Vega_{i,t-1} + \gamma_1 * Controls_{i,t-1} + \gamma_2 * FE + \varepsilon_{i,t} \quad (3)$$

To alleviate the endogeneity concern, we employ the lagged incentive measures (i.e., delta and vega) and numerous firm and CEO compensation characteristics as control variables. We also include industry and year fixed effects to account for unobserved heterogeneity across industries and years. In addition, we explicitly control for other motives for firms to execute share buybacks. For example, we use cash and cash flow to proxy the excess capital held by the repurchasing firms. To the extent that dividend payments and stock repurchases are substitutes, we include dividend payout ratio as explanatory variable in the regressions. We proxy firm's investment opportunity using Tobin's Q. Some studies use Tobin's Q as a measure for equity mispricing. We hypothesize that firms with fewer investment opportunities conduct more share buybacks. Since companies can use share buybacks as a tool to adjust the capital structure, we use leverage ratio to proxy firm's capital structure adjustment motive to buy shares back. We also include total compensation and total current compensation as additional explanatory variables in our analysis to control for other CEO compensation characteristics. We include the CEO age in the regression since prior research use CEO age as measures for CEO's skills and risk-aversion. And Standard errors are robust to heteroskedasticity and clustered at the firm level.

Table 4 reports the OLS regression results. We standardize all independent variables to simplify the interpretations and gauge the economic significances. We begin with the firm's total payout level in column (1). Our results indicate that CEOs' delta, controlling for vega, has a significant and negative impact on firm's total payout level. Regarding economic significance, one standard deviation increase in delta shifts the total payout amount by \$29.67 million, which is approximately 8% of the mean of total payout. The result suggests that higher delta CEOs tend to distribute less excess capital back to their shareholders. More importantly, we further look into the composition of firm's payout, the coefficient estimates on our variable of interest, delta, are statistically and positively significant in column (2). It implies that the sensitivity of CEOs' wealth to stock price induces them to execute more share buybacks, controlling for other determinants of share repurchases. For the economic significance, one-standard-deviation increase in delta leads to a 9.9% rise in share buybacks. In column (3), the coefficient estimate on the delta is negative and statistically significant, dividend payments decrease by over 41% with one standard deviation increase in delta. In sum, CEOs' compensation delta significantly influences firms' payout level and composition. Even though companies led by higher delta CEOs have a tendency to lower their companies' level of payout, these companies choose to execute more share buybacks when they do distribute excess capital to shareholders. It suggests that there is a shift of preference between repurchases and dividends caused by CEOs' incentives. The baseline regression results support the hypothesis H1(a) that CEOs' pay-for-performance sensitivity positively impacts the firms repurchasing activities as a form of payout. The results are also consistent with our hypothesis H1(b) that CEOs' delta negatively affects the company's cash dividend payout level. Therefore, higher delta CEOs tend to reduce the aggregate level of firm's payout, they prefer using share repurchases as the payout form rather than the traditional dividend payments. Concerning control

variables, the coefficient estimate on the market value of equity is positive and statistically significant across all specifications. For example, the coefficient estimate is 495.6 in model (2), with a p-value = 0.00. Thus larger corporations, indicated by their market capitalization, tend to execute higher dollar volume of repurchases. In addition, firms with higher sales growth rate have lower payout level, either in the form of repurchases or dividends. Intuitively, instead of returning excess cash to shareholder, these high sales growth firms tend to keep the additional capital within the firm to maintain their growth. We use Tobin's Q to proxy firms' investment opportunities. The sign of coefficient on Tobin's Q is negative but without statistical significance in model (2). The result in column (2) shows that cash abundant firms execute more repurchases, which is consistent with the excess capital hypothesis. In addition, the coefficient on variable dividend payout ratio is negative and statistically significant, which is consistent with the substitute hypothesis with regard to repurchases and dividends. Companies with fewer investment opportunities, indicated by Tobin's Q, pay more dividend according to model (3).

To gauge the effect of equity undervaluation in conducting share buybacks, we employ the following multivariate regression to test our hypothesis H (3).

$$\begin{aligned}
 \text{Repurchase}_{i,t} = & \alpha_{i,t} + \beta_1 * \text{Delta}_{i,t-1} + \beta_2 * \text{Undervalue} + \beta_3 * \text{Delta}_{i,t-1} * \text{Undervalue} + \\
 & \beta_4 * \text{Vega}_{i,t-1} + \gamma_1 * \text{Controls}_{i,t-1} + \gamma_2 * FE + \varepsilon_{i,t}
 \end{aligned} \tag{4}$$

To measure the impact of undervaluation, we need a relatively objective measure of equity mispricing since firm managers can always claim that their stocks are undervalued. It is not clear whether this claim is driven by their inside information or their overconfidence about the firms. We obtain the measure of equity misvaluation  $P/V$  by scaling the market price  $P$  by the intrinsic firm value estimated based on residual income model (RIM). The residual income model was

originally developed in the accounting literature (See Ohlson, 1991,1995) and has been widely used in the finance literature. Specifically, the RIM model relates firm's market equity value to its contemporaneous and future earnings, book values, and dividends assuming "clean surplus" accounting. Theoretically, the RIM model is equivalent to discounted cash flow (DCF) model so long as the "clean surplus" accounting satisfied. Penman and Sougiannis (1998) document that valuation errors are lower using accrual earnings techniques rather than cash flow and dividend discounting techniques. Thus, the RIM model provides us a useful benchmark to obtain firm's equity value based on accounting data and other information.

Prior studies suggest that  $V/P$  is a proxy for equity mispricing. Lee et al. (1999) provide evidence that aggregate residual income values has statistically reliable predictive power than other traditional market multiples. Frankel and Lee (1998) document that  $V/P$  is a predictor of the one-year-ahead cross-section returns. D'Mello and Shroff (2000) find that 74 percent of the firms that repurchase their shares via fixed-price tender offers are undervalued relative to their preannouncement economic value estimated using RIM valuation. In addition, Dong et al. (2012) document that  $V/P$  is a stronger predictor than  $B/P$  in Fama-MacBeth regressions returns on  $V/P$ ,  $B/P$ , size and one-year past return. There are two advantages employing  $V/P$  instead of  $B/P$  to capture the market equity mispricing. First of all, to the extent that "clean surplus" accounting identity obtained, the RIM value is invariant to accounting treatment (Ohlson 1995), in contrast to  $B/P$  since book value of equity is, at least to certain degree, subject to firm's choice of accounting treatment. More importantly, it supplements the current book value per share with the forward-looking information ( $FEPS$ ) into the valuation of the equity.

Our estimation procedure follows Lee et al. (1999). For each month  $t$ , we estimate firm's intrinsic value  $V(t)$  based on residual income model. Under the "clean surplus" accounting, the change of book value per share is equal to the difference between earnings per share and dividend per share; therefore, a firm's intrinsic value equals the book value plus the discounted value of an infinite sum of expected residual incomes (Ohlson 1995). The  $V(t)$  can be written in the following equation:

$$V(t) = B(t) + \sum_{i=1}^{\infty} \frac{E_t[\{ROE(t+i)-r_e(t)\}B(t+i-1)]}{[1+r_e(t)]^i}$$

where  $B(t)$  is the book value at time  $t$ . (We delete observations with missing value for  $B(t)$  or negative  $B(t)$ ).  $E_t[\ ]$  is the expectation operator at time  $t$ .  $ROE(t+i)$  is the return on equity for period  $(t+i)$ . And  $r_e(t)$  is the annualized cost of equity capital.

We choose to estimate firm's intrinsic value using three year's forecast horizon since Lee et al. (1999) show that the estimation quality of RIM value  $V(t)$  is not sensitive to the choice of forecast horizon once the forecast period exceeds three years.<sup>8</sup> We can rewrite the equation (1) as follows:

$$V(t) = B(t) + \frac{E_t[\{ROE(t+1)-r_e(t)\}B(t)]}{1+r_e(t)} + \frac{E_t[\{ROE(t+2)-r_e(t)\}B(t+1)]}{[1+r_e(t)]^2} + \frac{E_t[\{ROE(t+3)-r_e(t)\}B(t+2)]}{[1+r_e(t)]^2 r_e(t)}$$

We estimate  $E_t[\{ROE(t+i)\}]$  in above equation using forecast  $ROE$ :  $f^{ROE}(t+i)$ , which in turn is computed based on the following:

$$f^{ROE}(t+i) = \frac{f^{EPS}(t+i)}{B(t+i-1)}, \quad i = 1, 2, 3$$

I/B/E/S updates consensus forecasts  $EPS$  as of the third Thursday of each month. For month  $t$ , we obtain mean forecast  $EPS$  for three future fiscal years from I/B/E/S. We estimate the forecast book

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<sup>8</sup> The last period's residual income is considered as perpetuity.

value per share according to “clean surplus” accounting, i.e.,  $B(t + i) = B(t) + (1 - k)FEPS_{t+i}$ , where  $k$  is the dividend payout ratio determined by dividend per share to the earnings per share. We delete observations with negative forecasted future book value. Additionally, we require the forecasted  $ROE$  to be less than one.

Following D’Mello and Shroff (2000), we compute the discount rate based on the CAPM model to obtain the  $V(t)$ . In particular,  $r_e(t)$  is determined for each firm, where time  $t$  *beta* is estimated using trailing five years of monthly return or at least two years if data is not available, risk-free rate is the one-month Treasury bill rate. The market risk premium is the average premium over the risk-free rate for the CRSP value-weighted index over the preceding twenty years. Lastly, we scale the current monthly stock price  $P(t)$  with  $V(t)$  to obtain our misvaluation measure  $P/V$  ratio, with higher (lower)  $P/V$  indicating relative overvaluation (undervaluation).

We are interested in the impact of pay-for-performance sensitivity on firms’ share repurchases conditional on the stock being undervalued, indicated by the equity mispricing measure  $P/V$  ratio. Therefore, we define an indicator variable, *undervalue*, that takes value of one if the firm’s  $P/V$  ratio lies below the median of  $P/V$  ratio in the sample, and zero otherwise. We then interact the indicator variable (*undervalue*) with the lagged CEOs’ compensation delta to examine if the delta’s effect on stock repurchase is more pronounced when stocks are undervalued.

The results in Table 5 indicate that the stock undervaluation itself plays a significant role when firms making repurchase decisions. The coefficient on the indicator variable, *undervaluation* is positive and statistically significant (coefficient = 45.28, p-value = 0.002). Thus, if the firm’s stock is undervalued, companies tend to conduct more share buybacks. Moreover, when the market undervalues the stock, and CEOs’ compensation wealth is highly sensitive to the stock price, these

firms tend to engage in the much larger volume of repurchases. The coefficient estimate on the interaction term is about 166.9 in the regression with a p-value of 0.00. Thus, conditional on stock undervaluation, one-standard-deviation increase in delta causes about 72% rise in dollar volume of repurchase. We observe the positive coefficient estimate on variable vega but no statistical significance. In Table 5, we also show that cash and cash flow abundant firms tend to execute more share repurchases, which is consistent with the excess capital hypothesis. In addition, the dividend payout ratio is statistically negatively associated with companies repurchase activities, which implies that managers consider share repurchases as a substitute of dividends. We do not find a significant association between other compensation characteristics, i.e., total compensation and total current compensation, and corporate share repurchases. Thus, the baseline results support our hypothesis H3 that the delta's impact on firm's stock repurchases is much stronger when the stock is undervalued. It implies that highly price sensitive CEOs engage in more repurchases due to their wealth concerns, especially so when stocks are undervalued.

The CEO's shift in preference towards stock repurchase regarding corporate payout form does not necessarily indicate CEO's short-termism or myopia. We then examine the influence of CEOs' compensation delta on firm's capital expenditures and employments, which are viewed as real long term corporate investments.

$$Capex_{i,t} = \alpha_{i,t} + \beta_1 Delta_{i,t-1} + \beta_2 Vega_{i,t-1} + \gamma_1 * Controls_{i,t-1} + \gamma_2 * FE + \varepsilon_{i,t} \quad (4)$$

$$Employee_{i,t} = \alpha_{i,t} + \beta_1 Delta_{i,t-1} + \beta_2 Vega_{i,t-1} + \gamma_1 * Controls_{i,t-1} + \gamma_2 * FE + \varepsilon_{i,t} \quad (5)$$

Table 6 presents the OLS regression results. For model (1), the coefficient estimate on the variable delta is negative and significant at the 1% level. Of the economic significance, there will be 80.03 million dollars decline in capital expenditures with one-standard-deviation increase of



the CEO's compensation delta, approximately 22.39% of the mean of capital spending in the sample. This result is consistent with Edmans et al. (2013), they establish the link between the CEO's concerns for the current stock price and reductions in real investments.<sup>9</sup> About employment, there is about a 2,375 decrease in the number of employees associated with one standard deviation increase in the delta, which is about 10.38% decline of the firms headcount. This is consistent with the conjecture that repurchasing firms are redirecting firm's cash resources away from real capital investments to conduct more share repurchases. To reinforce the argument, we include the share repurchase volume as an additional explanatory variable in the regressions. As we can see in Table 6 that the coefficient estimate on the variable repurchase is negative with a marginal significance in column (1) (coefficient = -176.8, p-value = 0.069). It suggests that the repurchasing firms treat repurchases as a substitute of capital expenditures. The results in Table 6 also show that companies with higher cash flow tend to spend more dollars on capital expenses and enlarge the company employments.

## *5.2 Simultaneous System of Equations*

To this point, we address the endogeneity issue by employing the lagged CEOs' incentives measures, numerous control variables, industry and year fixed effects. We still cannot rule out the possibility that there exist unobservable investment opportunities that drive the decline of real investments and the increase of stock repurchase simultaneously. To the extent that corporate policies and CEO's contract structures are jointly determined, we resolve the endogeneity problem by using the simultaneous system of equations method. In particular, we perform three-stage least square (3SLS) regressions to further establish the causal relation between managerial incentives

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<sup>9</sup> Edmans et al. (2013) measure real investments using capital expenditures and R&D investments.

and firm share repurchases and investment activities. In all regressions, we use contemporaneous incentive measures and corporate policy variables and lagged control variables as shown in the following models.

$$Policy_{i,t} = function\ of\ \{Delta_{i,t}, Vega_{i,t}, Controls_{i,t-1}\} \quad (6)$$

$$Delta_{i,t} = function\ of\ \{Policy_{i,t}, Vega_{i,t}, Controls_{i,t-1}\} \quad (7)$$

$$Vega_{i,t} = function\ of\ \{Policy_{i,t}, Delta_{i,t}, Controls_{i,t-1}\} \quad (8)$$

We first look at firm payout policy, i.e., stock repurchase and dividend payments. Table 7 shows that the coefficient estimate on delta remains significantly positive, which is consistent with the results in baseline OLS regressions. For column (2) and (3) in Table 7, the dependent variable is delta and vega respectively. The coefficient on variable dividend payout ratio is negative and significant, which is consistent with the substitution hypothesis in repurchase motivation literature. Again, larger firms tend to purchase their shares back in a greater volume, either indicated by the market value of equity or the total assets. In addition, firms with fewer investment opportunities execute more share buybacks, as shown by the negative and significant coefficient on variable Tobin's q. We do not find a significant relationship between CEO age and firm's stock repurchase activities in our analysis. For determinants of the delta, we include the CEO tenure and total compensation and other control variables, similar to Coles et al. (2006). With regard to the determinants of vega, we include CEO age and stock return volatility as additional explanatory variables. Specifically, volatility is the annualized standard deviation of stock return. Inconsistent with Coles et al. (2006), we do not find the significant association between the stock return volatility and compensation vega. We then look at the impact of CEO's compensation delta on corporate dividend payments policy based on the 3SLS method. Consistent with the results in

baseline regressions, we find a negative and significant association between the top executive's stock price sensitivity and firm's cash dividend payments in Table 8. That is, CEOs with higher stock price sensitivity tend to pay fewer cash dividends, controlling for vega and other factors that affect corporate dividend payment decisions. The regression coefficient on dividend payout ratio is significantly positive, which supports the notion that corporations are willing to keep the current dividends and reluctant to reduce dividend payments, acknowledging the potential negative market responses to the dividend cutting.

We then examine the impact of compensation incentives on firm's investment policies, i.e., capital expenditures and employments, relying on the econometric method of the simultaneous system of equations. The 3SLS results in Table 9 show that CEOs' compensation delta negatively and significantly affects firm's capital investment decisions, i.e., highly stock price sensitive CEOs allocate fewer investment dollars towards the company's capital expenditures. In addition, we find similar results regarding firm's human capital investments. Table 10 shows that higher delta CEOs reduce the company's number of employees significantly. In a sense, these CEOs divert their firm's financial resources towards repurchases instead of long term capital investments. To sum, the high compensation wealth sensitivity to stock prices induces CEOs to behave in myopia and/or more risk-averse manner. By cutting the real investments and redirecting more financial resources to share repurchases, CEOs exert fewer efforts on choosing positive NPV projects and have less exposure to the downside risk if the performance of investment projects turn out to be poor in the future.

### *5.3 Subsample analysis*

We further hypothesize that the impact of compensation delta on firms' repurchases maybe more pronounced in those firms whose CEOs' wealth are extremely sensitive to stock prices. To test our conjecture, we partition our sample into quintiles based on CEO's delta. We repeat our OLS regressions in each delta quintile. As shown in Table 11, consistent with our hypothesis, the delta has a positive and significant effect on firm's stock repurchase activities in the top delta quintile. And delta has a marginally significant impact on corporate share buybacks in the fourth quintile. We do not observe any significant influence of delta on the repurchases in other three quintiles. Since the delta affects the firm's repurchases differently across delta quintiles, we suppose the long-run abnormal return after repurchase announcements between top and bottom delta quintile would be different, specifically, we conjecture that the abnormal return after repurchase announcements should be higher for bottom delta quintile firms than top delta quintile companies. The rational is that the firms' repurchase decisions are more likely distorted by CEO's individual wealth consideration among top delta quintile companies. The impact of the delta on repurchasing decisions is much weaker in the bottom quintile, i.e., company's economic conditions primarily drive the repurchasing activities.

#### *5.4 Long-run abnormal return after repurchase announcements*

Motivated by Ikenberry et al. (1995), we investigate the post announcement long-run abnormal returns for the repurchasing firms. In particular, we examine the three-year post announcement abnormal return based on calendar-time portfolio approach. The calendar-time portfolio approach mitigates the problem of cross-sectional dependence among firms because the returns on firms are aggregated into a single portfolio. Loughran and Ritter (1995), Brav and Gompers (1997), and Brav et al. (1995) employ the Fama–French three-factor model to analyze returns on calendar-time

portfolios of firms that issue equity. Specifically, for each month  $t$ , we form a portfolio with announcing firms, the portfolio is rebalanced every month so the newly announcing firm will be added to the portfolio, and the company that announced share buybacks over three years ago will be dropped from the portfolio. Portfolio excess return is the portfolio raw returns subtract the one-month risk-free rate. We then regress portfolio excess return on Fama-French 4 factors to obtain the monthly abnormal return. We first form a portfolio for all the repurchasing firms and then the companies in top delta quintile and bottom delta quintile respectively. As we can see from Table 12, the monthly abnormal return for all repurchasing firms is approximately 0.34% at 0.1% significance level. This is consistent with the Ikenberry et al. (1995) in the sense that it takes several years for the market to react to the initial repurchase announcements. Moreover, we find that the abnormal return for announcing firms in bottom delta quintile is 0.45% at 1% significant level, and the abnormal return in the top delta quintile is approximately 0.26% at the 5% significance level. This supports the notion that ultimate motivation for firms to execute stock repurchases has an impact on the repurchase announcement firm's long-run abnormal return.

### *5.5 Post-repurchase firm performance*

We have established the argument that higher delta CEOs behave in a myopic way in the sense that they reduce firms' capital expenditures and employments. It remains unclear whether the investment cut in these repurchasing firms is an efficient decision or not. In other words, the reduction in real investments could be an optimal choice for these companies. We then examine the real effects of repurchases on the firm's future performances. If the CEOs' delta influences the firm's stock repurchases in a significant way, either through the myopic behavior or the less effort channel, we expect these company's performances to deteriorate following repurchase activities.

We employ several firms' performance measures to examine the post-repurchase performances of these repurchases. In particular, we look at the firm's operating profit margin and net profit margin and gross profit margin one year after they conduct the repurchase. As we can see from Table 13, repurchasing firms' operating performance and net profit margin are both negatively associated with the repurchase volume in the prior year at the 5% significance level. The gross profit margin is negatively related to the firm's repurchases in the previous year at the 10% significance level.

### *5.6 Robustness check*

To verify that our results are robust to another measure of firm's actual stock repurchases, we extract the repurchases information following the Fama-French (2001) procedure. In particular, we measure the company's net repurchases as the increase in common treasury stock (item 226) if treasury stock is not zero or missing. If the treasury stock is zero, we then estimate stock repurchase as the difference between stock repurchases (item 115) and stock issuances (item 108) from cash flow statement. We obtain a smaller sample for repurchasing firms when we use the Fama-French (2001) method to measure company's stock repurchase activities. Moreover, Table 14 shows that the results are quantitatively similar to the results based on the primary repurchase measure.

## 6. Conclusion

Given many critics on the recent rising popularity of corporate share repurchases, it is important to understand firms' motives to execute buybacks. We investigate the impact of CEOs' compensation delta on companies' stock repurchase activities, dividend payments, and capital investments. We provide evidence that highly price sensitive CEOs particularly prefer buybacks both as the payout form and the investment alternative. Consistent with the view that these CEOs behave in a myopic way and/or exert fewer efforts, these repurchasing firms suffer from poor

operating performances following the repurchases. In other words, these top executives' individual wealth considerations significantly affect their corporate policy decisions. The short-termism induced by their compensation contract causes CEOs to over focus on the stock price performance, thus allocate corporate resources to share buybacks instead of real capital investments. Therefore, the compensation contract should also consider the other side of the stock and option grants to these top executives. Although equity-based compensation help align interests between managers and shareholders, we should aware of the potential negative impacts induced by this compensation scheme.

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**Table 1. Summary statistics.**

Panel A

Payout and investment  
variables

	N	Mean	Std. Dev.	Min	Max
Total Payout (\$Mil)	15259	352.15	908	0.02	7,024
Repurchase Volume (\$Mil)	15259	229.54	593	0.02	4,014
Capital expenditures (\$Mil)	15168	357.45	1,302	0	29,333
Dividend Payments (\$Mil)	15259	122.61	405	0	3,010
Number of employees (# 000)	15184	22.87	46	0.16	299

Panel B

Compensation  
characteristics

		Mean	Std. Dev.	Min	Max
Delta(\$000)	15259	795	1,905	0	14,055
Vega(\$000)	15259	129	228	0	1,380
Total Current Compensation (\$000)	14637	1,082	1,014	110	6,326
Total Compensation(\$000)	14350	4,267	5,255	217	29,313
CEO Age (years)	14247	67	10	47	93

Panel C

Firm characteristics

		Mean	Std. Dev.	Min	Max
Cash	15256	0.15	0.16	0.00	0.69
Cash flow	15253	0.12	0.09	-0.24	0.41
Leverage ratio	15233	0.21	0.17	0	0.74
Return on Asset	15259	0.07	1.19	-0.29	0.35
Tobin's Q	15257	2.06	1.34	0.77	7.28
Total Assets(\$Mil)	15259	6,294	14,689	71.12	103,234
Operating profit margin	15245	0.12	0.10	-0.31	0.43
Net profit margin	15245	0.06	0.11	-0.54	0.33
Gross profit margin	15245	0.41	0.21	0.04	0.91

This table presents the summary statistics in the sample. We obtain CEO compensation data from Execucomp from 1992 to 2014. Panel A reports the firm's payout and investment variables, and dollar volumes are stated in 2002 dollars. Panel B reports the compensation characteristics of CEOs in our sample. Total current compensation includes cash and bonus in the compensation package. Delta is defined as the dollar change of CEO's compensation with respect to 1% change in stock price. Vega is the dollar change in CEO's compensation with respect to the 0.01 change of stock volatility. Panel C provides the firm characteristics. All variables are winsorized at the 1<sup>st</sup> and 99<sup>th</sup> percentiles.

**Table 2. Share repurchases and dividend payments across years.**

This table presents the mean of dividend payments and share repurchases in each fiscal year from 1992 to 2014. In particular, the dividend payments are the cash dividend paid to shareholders each year. Stock repurchase volume is computed as the purchase of common and preferred stock amount by subtracting any decrease of preferred stock from year t-1 to year t.

Fiscal year	# of Observations	Dividends Payment	Repurchases Volume
1992	299	157.32	105.92
1993	413	102.56	100.16
1994	439	107.18	93.72
1995	496	113.90	120.14
1996	589	104.56	134.06
1997	650	106.50	163.86
1998	781	97.03	166.44
1999	745	93.72	185.96
2000	739	95.51	181.30
2001	628	108.40	184.65
2002	618	83.34	155.01
2003	652	85.88	159.53
2004	637	127.49	249.59
2005	691	132.41	327.39
2006	750	129.99	345.87
2007	836	124.59	394.15
2008	867	119.40	244.48
2009	628	100.89	132.13
2010	711	139.04	249.82
2011	802	137.99	301.29
2012	792	157.83	276.15
2013	784	183.37	321.46
2014	712	190.51	372.90

**Table 3. Univariate analysis.**

This table presents the univariate analysis for repurchasing firms over the sample period 1992 to 2014. We partition firms into quintiles based on the CEO delta value. Companies with a highest (lowest) value of CEO delta are in the top (bottom) quintile group. For each quintile, we compute the mean of the dollar volume of stock repurchases. The dollar amount of repurchase is consumer price index adjusted to 2002 dollars. *T-statistics* are reported in parentheses.

Quintile_Delta	N	CEO's delta (\$000)	Repurchase Volume (\$Mil)
1 (Bottom Quintile)	3052	26.70	44.00
2	3052	97.32	85.11
3	3052	225.77	171.82
4	3052	531.23	306.55
5 (Top Quintile)	3051	6,499.69	723.09
Difference 1-5 (t-statistics)		-6,472.99	-679.09 -20.46

**Table 4. Baseline OLS regressions of payout policy on CEO's compensation incentives.**

This table reports the OLS regression of firm's payout policy on CEO's compensation incentives. Delta is the dollar change in CEO's wealth for a 1% change in stock price. Vega is the dollar change in the CEO's wealth for a 0.01 change in standard deviation of returns. The dependent variable is the total payout dollar amount over a fiscal year for column (1). The dependent variable is the repurchase dollar volume over a fiscal year for column (2). The dependent variable is the dividend dollar amount over a fiscal year for column (3). All independent variables are standardized and lagged unless otherwise stated. Dollar amounts are reported in 2002 dollars. All regressions include industry fixed effects (Fama-French 48 industry classifications) and year fixed effects. Standard errors are clustered at the firm level and robust to heteroscedasticity. Numbers in parentheses are *p-values*. \*\*\*, \*\*, and \* represent 1%, 5% and 10% levels of significance, respectively.

Dep. variable	(1) Total payout	(2) Repurchase volume	(3) Dividend payments
Delta <sub>t-1</sub>	-29.67*** (0.000)	22.69*** (0.000)	-50.77*** (0.000)
Vega <sub>t-1</sub>	30.46 (0.101)	43.88** (0.018)	-13.94 (0.345)
Cash	10.53* (0.051)	13.99*** (0.005)	0.675 (0.821)
Cash flow	-607.9 (0.111)	-737.9* (0.056)	255.5 (0.188)
ROA	148.5* (0.054)	184.9** (0.014)	-42.69 (0.259)
Tobin's Q		-0.349 (0.952)	-21.67*** (0.000)
Market Cap	914.5*** (0.000)	495.6*** (0.000)	424.0*** (0.000)

Ln (total assets)	62.79*** (0.000)	73.17*** (0.000)	-12.77* (0.088)
Leverage ratio		-3.546 (0.476)	
Dividend ratio	35.78*** (0)	-28.81*** (0.000)	64.63*** (0.000)
Sales Growth	-24.99*** (0.000)	-16.21*** (0.000)	-5.784*** (0.004)
Sale	132.8*** (0.000)	75.05*** (0.000)	56.19*** (0.000)
CEO age	1.010 (0.853)	-1.362 (0.797)	1.731 (0.589)
Total compensation	-18.04 (0.174)	-7.334 (0.507)	-8.679 (0.159)
Cash + bonus	-13.08* (0.069)	-3.169 (0.649)	-10.00 (0.187)
Constant	288.3*** (0.000)	224.0*** (0.000)	69.61 (0.136)
Observations	13,206	13,206	13,206
R-squared	0.831	0.674	0.802
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

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**Table 5. Undervaluation effects on stock repurchase.**

This table reports the OLS regression of repurchase volume on CEO's compensation incentives. Delta is the dollar change in CEO's wealth for a 1% change in stock price. Vega is the dollar change in the CEO's wealth for a 0.01 change in standard deviation of returns. The dependent variable is the stock repurchase dollar volume over a fiscal year. Undervalue is an indicator variable which takes the value of one if the p/v ratio lies below the median p/v ratio in the sample, and zero otherwise. P/V ratio is obtained by normalizing stock price with the estimated residual income model value of the stock. All independent variables are standardized and lagged unless otherwise stated. The repurchase dollar volume is reported in 2002 dollars. All regressions include industry fixed effects (Fama-French 48 industry classifications) and year fixed effects. Standard errors are clustered at the firm level and robust to heteroscedasticity. Numbers in parentheses are *p-values*. \*\*\*, \*\*, and \* represent 1%,5% and 10% levels of significance, respectively.

Dep. variable	(1) Repurchase Dollar Volume
Delta <sub>t-1</sub>	31.18* (0.061)
Vega <sub>t-1</sub>	31.62 (0.448)
Undervalue	45.28*** (0.002)
Delta <sub>t-1</sub> * Undervalue	166.9*** (0.000)
Cash	15.23* (0.066)
Cash flow	463.4** (0.029)
Market Capitalization	656.1*** (0.000)
Ln(total assets)	-24.93 (0.554)
Tobin's Q	-13.70 (0.247)
Leverage	7.408 (0.518)
Dividend ratio	-37.96*** (0.000)
Sales growth	-27.80*** (0.000)
Sale	335.1** (0.048)
CEO age	-1.206 (0.882)
Total compensation	-22.37 (0.237)
Cash + Bonus	2.807 (0.856)
Constant	321.9*** (0.000)

Observations	13,206
R-squared	0.5623
Year FE	Yes
Industry FE	Yes

**Table 6. OLS regressions of investment policies on CEO compensation incentives**

This table reports the OLS regression of capital expenditures and the number of employees on CEO's compensation incentives. Delta is the dollar change in CEO's wealth for a 1% change in stock price. Vega is the dollar change in the CEO's wealth for a 0.01 change in standard deviation of returns. The dependent variable is the capital expenditures over a fiscal year in column (1). The dependent variable is the number of employees in the firm in column (2). All independent variables are standardized and lagged unless otherwise stated. The capital expenditures are reported in 2002 dollars. All regressions include industry fixed effects (Fama-French 48 industry classifications) and year fixed effects. Standard errors are clustered at the firm level and robust to heteroscedasticity. Numbers in parentheses are *p-values*. \*\*\*, \*\*, and \* represent 1%, 5% and 10% levels of significance, respectively.

	(1) Capital expenditures	(2) Number of Employees
Delta <sub>t-1</sub>	-80.03*** (0.000)	-2.375*** (0.000)
Vega <sub>t-1</sub>	-39.82 (0.171)	1.619 (0.138)
Cash	9.019 (0.363)	-0.134 (0.849)
Cash flow	4,698*** (0.000)	76.41** (0.032)
Ln (total assets)	38.21 (0.337)	16.27*** (0.000)
Leverage ratio	-22.36 (0.122)	0.182 (0.838)
ROA	-914.9*** (0.000)	-18.96*** (0.006)
Tobin's Q	-26.57* (0.088)	-0.095 (0.894)
Market cap.	574.8*** (0.000)	14.25*** (0.001)
Sales growth	-11.20	0.306

	(0.206)	(0.272)
Repurchase	-176.8*	-3.421
	(0.069)	(0.211)
Sale	718.0***	11.99***
	(0.000)	(0.001)
Total compensation	10.25	0.584
	(0.746)	(0.489)
Constant	376.3***	21.18**
	(0.002)	(0.012)
Observations	13,544	13,559
R-squared	0.683	0.551
Year FE	Yes	Yes
Industry FE	Yes	Yes

**Table 7. 3SLS regressions of repurchase policies on CEO's compensation incentives.**

This table reports the 3SLS regression of repurchase volume on CEO's compensation incentives. Delta is the dollar change in CEO's wealth for a 1% change in stock price. Vega is the dollar change in the CEO's wealth for a 0.01 change in standard deviation of returns. The dependent variable is the repurchase dollar volume over a fiscal year for column (1). The dependent variable is the CEO delta for column (2). The dependent variable is the CEO vega for column (3). All variables are standardized unless otherwise stated. The repurchase dollar volume is reported in 2002 dollars. All regressions include industry fixed effects (Fama-French 48 industry classifications) and year fixed effects. Standard errors are clustered at the firm level and robust to heteroscedasticity. Numbers in parentheses are *p-values*. \*\*\*, \*\*, and \* represent 1%, 5% and 10% levels of significance, respectively.

Dep. variable	(1) Repurchase volume	(2) Delta	(3) Vega
Delta	0.374*** (0.000)		0.269*** (0.001)
Vega	-0.457*** (0.000)	1.523*** (0.000)	
Cash	0.018***		



	(0.000)		
Cash flow	0.002		
	(0.518)		
Tobin's Q	-0.019***	0.044***	
	(0.003)	(0.000)	
Market Cap.	0.490***		
	(0.000)		
Ln(total asset)	0.165***	-0.267***	0.122***
	(0.000)	(0.000)	(0.000)
Leverage	-0.012**	0.017	-0.006
	(0.036)	(0.187)	(0.432)
Dividend ratio	-0.026***		
	(0.000)		
Sales growth	-0.018***		
	(0.000)		
Sale	0.095***		-0.078***
	(0.000)		(0.000)
CEO age	-0.001		
	(0.812)		
Total compensation	0.174***	-0.569***	0.412***
	(0.000)	(0)	(0)
Repurchase volume		0.067	0.421***
		(0.475)	(0.000)
CEO tenure		-0.032*	0.062***
		(0.051)	(0.000)
Capital Exp.		-0.124***	0.014
		(0.000)	(0.427)
Volatility			-0.033
			(0.287)
Constant	-0.172*	0.480**	-0.356***
	(0.081)	(0.036)	(0.009)
Observations	13,761	13,761	13,761
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

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**Table 8. 3SLS regressions of dividend policy on CEO's compensation incentives.**

This table reports the 3SLS regression of dividend payments on CEO's compensation incentives. Delta is the dollar change in CEO's wealth for a 1% change in stock price. Vega is the dollar change in the CEO's wealth for a 0.01 change in standard deviation of returns. The dependent variable is the dividend payout volume in a fiscal year in column (1). The dependent variable is the CEO delta in column (2). The dependent variable is the CEO vega in column (3). All variables are standardized unless otherwise stated. The dividend payments are reported in 2002 dollars. All regressions include industry fixed effects (Fama-French 48 industry classifications) and year fixed effects. Standard errors are clustered at the firm level and robust to heteroscedasticity. Numbers in parentheses are *p-values*. \*\*\*, \*\*, and \* represent 1%, 5% and 10% levels of significance, respectively.

	(1) Dividend payments	(2) Delta	(3) Vega
Delta	-0.659*** (0)		0.647*** (0)
Vega	-1.080*** (0.346)	1.140*** (0)	
Cash	0.083*** (0.000)		
Cash flow	-0.004 (0.459)		
Tobin's Q	0.066*** (0.002)	0.014 (0.107)	
Market Cap.	1.433*** (0.000)		0.149*** (0)
Leverage	0.031*** (0.000)		
Dividend Ratio	0.124*** (0.000)		
Sale	-0.189*** (0.000)	-0.113*** (0.000)	0.070*** (0.000)
Sales growth	-0.059*** (0.001)	-0.006 (0.393)	
CEO age	0.022** (0.024)		
Total Compensation	-0.092*** (0.002)	-0.320*** (0.000)	0.265*** (0.000)
Dividend payments		-0.092*** (0.000)	-0.041*** (0.001)
CEO tenure		-0.022* (0.065)	0.019** (0.012)
Ln(total asset)tm1		0.015 (0.227)	
Volatility			-0.040*** (0.002)
Constant	-0.422	0.429*	-0.380**

Observations	(0.145)	(0.080)	(0.024)
Year FE	14,098	14,098	14,098
Industry FE	Yes	Yes	Yes

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**Table 9. 3SLS regressions of capital expenditures on CEO's compensation incentives.**

This table reports the 3SLS regression of capital expenditures on CEO's compensation incentives. Delta is the dollar change in CEO's wealth for a 1% change in stock price. Vega is the dollar change in the CEO's wealth for a 0.01 change in standard deviation of returns. The dependent variable is the capital expenditures over a fiscal year in column (1). The dependent variable is the CEO delta in column (2). The dependent variable is the CEO vega in column (3). All variables are standardized unless otherwise stated. The capital expenditures are reported in 2002 dollars. All regressions include industry fixed effects (Fama-French 48 industry classifications) and year fixed effects. Standard errors are clustered at the firm level and robust to heteroscedasticity. Numbers in parentheses are *p-values*. \*\*\*, \*\*, and \* represent 1%, 5% and 10% levels of significance, respectively.

	(1) Capital Expenditures	(2) Delta	(3) Vega
Delta	-2.311*** (0.000)		1.090*** (0.000)
Vega	3.284*** (0.000)	0.611*** (0.000)	
Cash	-0.0202 (0.301)		
Cash flow	0.005 (0.299)		
Tobin's Q	0.005 (0.796)	0.029*** (0.000)	
Ln(total asset)	-0.572*** (0.001)		-0.061 (0.420)
Leverage	0.042** (0.010)	0.000 (0.971)	
Dividend Ratio	0.012 (0.378)		
Sale	0.067 (0.199)		-0.246** (0.012)
Sales growth	-0.014 (0.120)		
Cash + Bonus	-0.646*** (0.000)	-0.146*** (0.000)	0.206*** (0.000)
Capital Exp.		-0.860*** (0.000)	2.055*** (0.001)
CEO tenure		0.0753*** (0.000)	-0.040*** (0.000)
Market Cap		0.534*** (0.000)	-0.742*** (0.000)
Volatility			-0.124* (0.083)
Constant	1.094*** (0.005)	-0.029 (0.857)	-0.076 (0.659)
Observations	14,395	14,395	14,395
Year FE	Yes	Yes	Yes

Industry FE	Yes	Yes	Yes
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**Table 10. 3SLS regressions of the number of employees on CEO's compensation incentives.**

This table reports the 3SLS regression of the number of employees on CEO's compensation incentives. Delta is the dollar change in CEO's wealth for a 1% change in stock price. Vega is the dollar change in the CEO's wealth for a 0.01 change in standard deviation of returns. The dependent variable is the number of employees in a fiscal year in column (1). The dependent variable is the CEO delta in column (2). The dependent variable is the CEO Vega in column (3). All variables are standardized unless otherwise stated. All regressions include industry fixed effects (Fama-French 48 industry classifications) and year fixed effects. Standard errors are clustered at the firm level and robust to heteroscedasticity. Numbers in parentheses are *p-values*. \*\*\*, \*\*, and \* represent 1%, 5% and 10% levels of significance, respectively.

Dep. Variable:	(1) Number of employees	(2) Delta	(3) Vega
Delta	-0.591*** (0)		0.959*** (0)
Vega	0.637*** (0)	1.205*** (0)	
Cash	-0.002 (0.808)		
Cash flow	0.000 (0.956)		
Tobin's Q	0.002 (0.768)	0.004 (0.697)	
Market Cap	0.0492 (0.214)		-0.085 (0.210)
Leverage	0.01** (0.031)		
Dividend ratio	0.005 (0.396)		
Sale	0.587*** (0)	0.509*** (0.000)	-0.810*** (0)
Sales growth	0.0003 (0.898)	-0.004 (0.545)	
CEO age	0.009*** (0.000)		
Cash + Bonus	-0.155*** (0)	-0.266*** (0)	0.244*** (0)
# of Employees		-0.918*** (4.10e-10)	1.412*** (0)

CEO tenure		-0.002 (0.869)	-0.007 (0.674)
Ln(total asset)		-0.118*** (0.000)	
Volatility			-0.003 (0.855)
Constant	0.230 (0.100)	0.457** (0.029)	-0.366 (0.119)
Observations	14,029	14,029	14,029
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

**Table 11. OLS regressions of repurchase on CEO's compensation incentives across delta quintiles.**

This table reports the OLS regression of repurchase volume on CEO's compensation incentives across delta quintiles. Delta is the dollar change in CEO's wealth for a 1% change in stock price. Vega is the dollar change in the CEO's wealth for a 0.01 change in standard deviation of returns. The dependent variable is the repurchase dollar volume over a fiscal year. We partition the delta into quintiles. All independent variables are standardized unless otherwise stated. The buyback dollar amount is reported in 2002 dollars. All regressions include industry fixed effects (Fama-French 48 industry classifications) and year fixed effects. Standard errors are clustered at the firm level and robust to heteroscedasticity. Numbers in parentheses are *p-values*. \*\*\*, \*\*, and \* represent 1%, 5% and 10% levels of significance, respectively.

Dep. Variable	Repurchase amount Delta_Q1	Repurchase amount Delta_Q2	Repurchase amount Delta_Q3	Repurchase amount Delta_Q4	Repurchase amount Delta_Q5
Delta <sub>t-1</sub>	-1,468 (3,460)	-1,243 (0.539)	1,936 (0.229)	1,528* (0.0909)	52.46*** (5.06e-07)
Vega <sub>t-1</sub>	-147.3	84.93	-14.62	27.01	39.61*
Controls	Yes	Yes	Yes	Yes	Yes
Observations	2,704	2,721	2,723	2,745	2,716
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

**Table 12. Calendar Time Portfolio Long-run abnormal returns.**

This table reports 3-year post announcement calendar time portfolio abnormal returns. We collect the repurchase announcements from the Thomson SDC Platinum database. Using the calendar-time portfolio approach, we perform the following 4-factor regressions of monthly returns. We require all the repurchasing firms that announce the share buyback within previous three years.  $R_{buy,t}$  is the value-weighted portfolio return of repurchasing firms in month  $t$ . The numbers in parentheses are t-statistics computed based on standard errors that are robust to heteroscedasticity. \*\*\*, \*\*, and \* represent 0.1%, 1% and 5% levels of significance, respectively.

$$R_{buy,t} - R_{f,t} = \alpha_0 + \alpha_1(R_{m,t} - R_{f,t}) + \alpha_2SMB + \alpha_3HML + \alpha_4UMD + \varepsilon_{i,t}.$$

	Intercept	Excess Market Return	Size	Book-to-Market	Momentum	Adjusted R-squared
All repurchasing firms						
$R_{buy,t} - R_{f,t}$	0.0034*** (3.68)	0.84*** (39.72)	-0.11*** (-4.64)	0.08*** (3.00)	-0.19*** (-11.68)	87.70%
Repurchasing firms in bottom $\Delta$ quintile						
$R_{buy,t} - R_{f,t}$	0.0045*** (3.94)	1.01*** (38.39)	0.59*** (19.00)	0.44*** (12.63)	-0.27*** (-13.35)	89.47%
Repurchasing firms in top $\Delta$ quintile						
$R_{buy,t} - R_{f,t}$	0.0026* (2.24)	0.86*** (32.87)	-0.19*** (-5.90)	-0.17*** (-4.75)	-0.09*** (-4.29)	83.89%

**Table 13. The effect of share repurchases on firm performance.**

This table reports the OLS regression of firm performance on companies' performances. Delta is the dollar change in CEO's wealth for a 1% change in stock price. Vega is the dollar change in the CEO's wealth for a 0.01 change in standard deviation of returns. Dependent variables are firm performance measures in the next fiscal year. All regressions include industry fixed effects (Fama-French 48 industry classifications) and year fixed effects. Standard errors are clustered at the firm level and robust to heteroscedasticity. Numbers in parentheses are *p-values*. \*\*\*, \*\*, and \* represent 1%, 5% and 10% levels of significance, respectively.

Dep. variable	(1) Operating Profit Margin (t+1)	(2) Net Profit Margin (t+1)	(3) Gross Profit Margin (t+1)
Repurchases (\$)	-0.131** (0.041)	-0.128** (0.037)	-0.119* (0.095)
Delta	-0.007 (0.549)	-0.008 (0.538)	-0.008 (0.441)
Vega	-0.003 (0.762)	-0.002 (0.870)	0.001 (0.926)
Cash	-0.215 (0.126)	-0.226 (0.135)	-0.152 (0.271)
Cash flow	0.622* (0.093)	0.749* (0.094)	0.434 (0.169)
ROA	0.658* (0.093)	0.793* (0.094)	0.458 (0.171)
Market Value of Equity	0.222** (0.047)	0.207* (0.053)	0.209* (0.051)
Ln (total assets)	0.160** (0.025)	0.171** (0.039)	0.095 (0.165)
Dividend Payout Ratio	-0.043	-0.036	-0.033

	(0.113)	(0.196)	(0.158)
Capital Exp.	-0.074*	-0.073	-0.044
	(0.093)	(0.111)	(0.306)
# of employees	-0.043	-0.044	-0.029
	(0.251)	(0.253)	(0.438)
Sales growth	-0.340**	-0.307*	-0.248*
	(0.042)	(0.058)	(0.095)
Sales	-0.033	-0.025	-0.066***
	(0.125)	(0.231)	(0.002)
CEO Age	-0.062	-0.070	-0.071
	(0.296)	(0.284)	(0.226)
Total Compensation	-0.004	-0.013	0.005
	(0.677)	(0.270)	(0.482)
Current compensation	-0.036	-0.039	-0.039
	(0.191)	(0.220)	(0.156)
Constant	0.237*	0.166	0.479***
	(0.071)	(0.224)	(1.31e-06)
Observations	13,714	13,714	13,714
R-squared	0.042	0.042	0.058
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

**Table 14. Alternative share repurchases measure**

This table reports the OLS regression of share repurchases on CEO incentives. Delta is the dollar change in CEO's wealth for a 1% change in stock price. Vega is the dollar change in the CEO's wealth for a 0.01 change in standard deviation of returns. The dependent variable is the share repurchases volume in a fiscal year using the procedure of Fama-French (2001). All regressions include industry fixed effects (Fama-French 48 industry classifications) and year fixed effects. Standard errors are clustered at the firm level and robust to heteroscedasticity. Numbers in parentheses are *p-values*. \*\*\*, \*\*, and \* represent 1%, 5% and 10% levels of significance, respectively.

Dep. variable	(1) Repurchase volume_FF(2001)	(2) Repurchase volume_FF(2001)	(3) Repurchase volume_FF(2001)
Delta <sub>t-1</sub>	16.10*** (0.008)	18.02*** (0.002)	17.62*** (0.002)
Vega <sub>t-1</sub>	43.21*** (0.007)	35.99** (0.020)	35.75** (0.021)
Cash	4.199 (0.354)	19.00*** (0.0001)	18.57*** (0.0002)
Cash flow	175.7* (0.064)	197.4** (0.0417)	201.5** (0.035)
Tobin's Q	-12.15* (0.058)	-4.475 (0.454)	-1.892 (0.753)
Market cap	327.8***	298.7***	300.0***



	(0)	(0)	(0)
Ln (total assets)		78.73***	78.33***
		(0)	(0)
Leverage ratio	6.486	-6.386	-6.240
	(0.193)	(0.212)	(0.221)
Dividend payout	-13.07***	-21.71***	-23.69***
	(0.008)	(0.000)	(0.000)
CEO tenure		-9.775**	-9.287**
		(0.017)	(0.023)
CEO age	6.060	4.707	4.298
	(0.319)	(0.445)	(0.485)
Sales	89.88***	82.40***	81.56***
	(0.001)	(0.000)	(0.000)
Sales growth			-14.57***
			(0.000)
Total compensation	9.160	-2.462	-2.367
	(0.381)	(0.815)	(0.822)
Constant	168.0***	166.0***	169.0***
	(0.000)	(0.000)	(0.000)
Observations	10,488	10,488	10,483
R-squared	0.651	0.658	0.659
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

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#### Appendix A1. Variable definitions.

Variable name	Variable definitions and data sources
Repurchase volume (\$)	Dollar amount of stock repurchases in a fiscal year (prstkrc – any decrease of preferred stock redemption value $\Delta$ of pstkrv) (Compustat)
Dividend payment (\$)	Dividend payment to common stocks (Compustat dvc)
Capital Expenditure (\$)	Capital expenditures from income statement (Compustat capx)
Number of Employees(#)	Number of employees (Compustat emp)
Delta	The dollar change in CEO's wealth for a 1% change in stock price. See Coles Daniel and Naveen (2013) for computation.(Execucomp)
Vega	The dollar change in the CEO's wealth for a 0.01 change in standard deviation of returns See Coles Daniel and Naveen (2013) for computation. (Execucomp)
CEO tenure	Number of years that the CEO has been in the CEO position at the firm (Execucomp)
CEO age	CEO age (Execucomp)
Salary + bonus	Salary + Bonus, (ExecuComp total_curr)
Total compensation	Total compensation=Salary+ Bonus+ Other annual+ Restricted stock grants+ LTIP payouts+ All other +Value of options granted (ExecuComp tdc1)
P/V ratio	Price to RIM valuation of stock based on CAPM discount rate(IBES, Compustat, CRSP)
Ln(total assets)	Logarithm of total assets (Compustat at)
Sales	Total sales revenue (Compustat sale)
Cash	cash and cash equivalents scaled by lagged total assets (Compustat che/attm1)
Cash flow	income before extraordinary items plus depreciation scaled by lagged assets (Compustat ib+dp)/attm1)
Dividend ratio	Dividend Per share/Earnings per share (Compustat dvpsx _f/epsfx/dpr=dvc/ibadj; )
ROA	Return on Asset: net income scaled by total assets (Compustat ni/at)
Leverage	Book leverage: long-term debt plus debt in current liabilities divided by total asset (Compustat dlft+dlc/at)
Tobin's Q	Tobin's Q calculated as book value of asset minus book value of equity plus market value of equity to total assets (Compustat (at-ceq+scho*prcc_f/at))
Net profit margin	Income before extraordinary items scaled by sales (Compustat ib/sale)
Operating profit margin	Operating income after depreciation scaled by sales (Compustat oibdp-dp/sale)

**Appendix A2. Share repurchase volume across FF10 industries**

This table reports the repurchase dollar volume across different industries in our sample.

Fama-French 10 Industry Classifications	Number of observations	Repurchase volume
Consumer Nondurables: Food, Tobacco, Textiles, Apparel, Leather, Toys	1373	242.38
Consumer Durables: Cars, TV's, Furniture, Household Appliances	553	101.62
Manufacturing: Machinery, Trucks, Planes, Chemicals, Office Furniture, Paper, Com Printing	3179	178.08
Energy: Oil, Gas, and Coal Extraction and Products	723	316.48
High tech: Business Equipment, Computers, Software, and Electronic Equipment	3265	252.63
Telecom: Telephone and Television Transmission	496	588.61
Shops: Wholesale, Retail, and Some Services	2279	220.64
Health: Healthcare, Medical Equipment, and Drugs	1363	291.36
Other: Mines, Construction, Trans, Hotels, Bus Services, Entertainment	2028	148.61

Figure 1. Share repurchase and Dividend Payout across years.

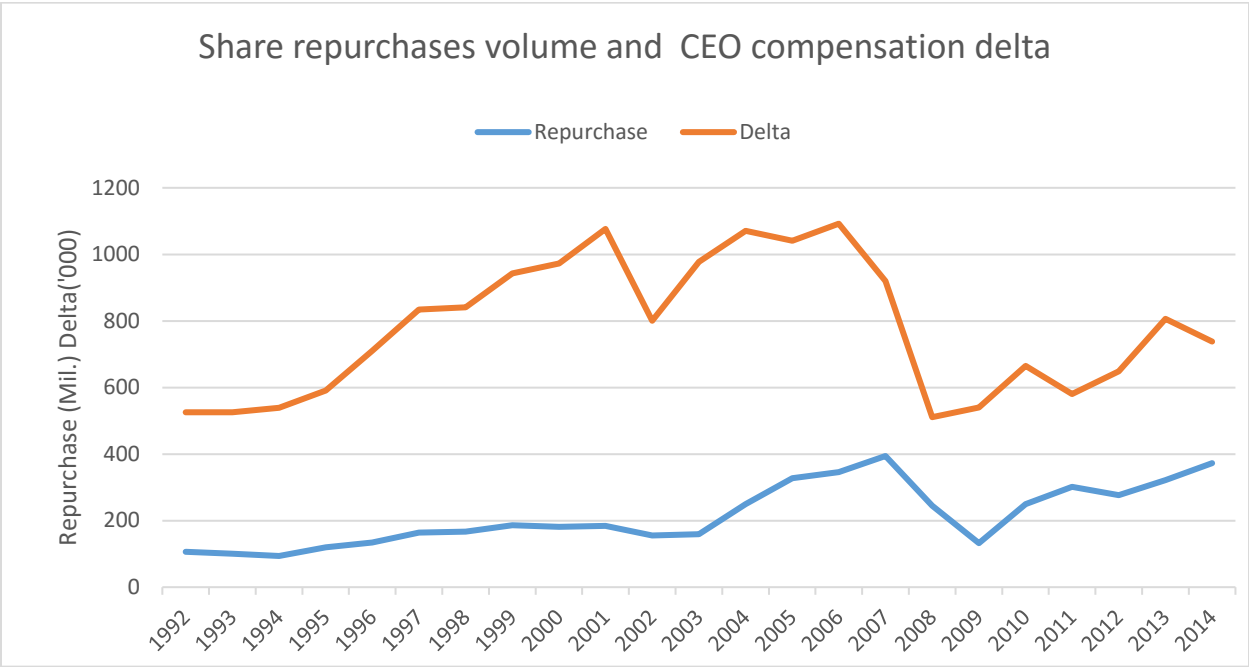
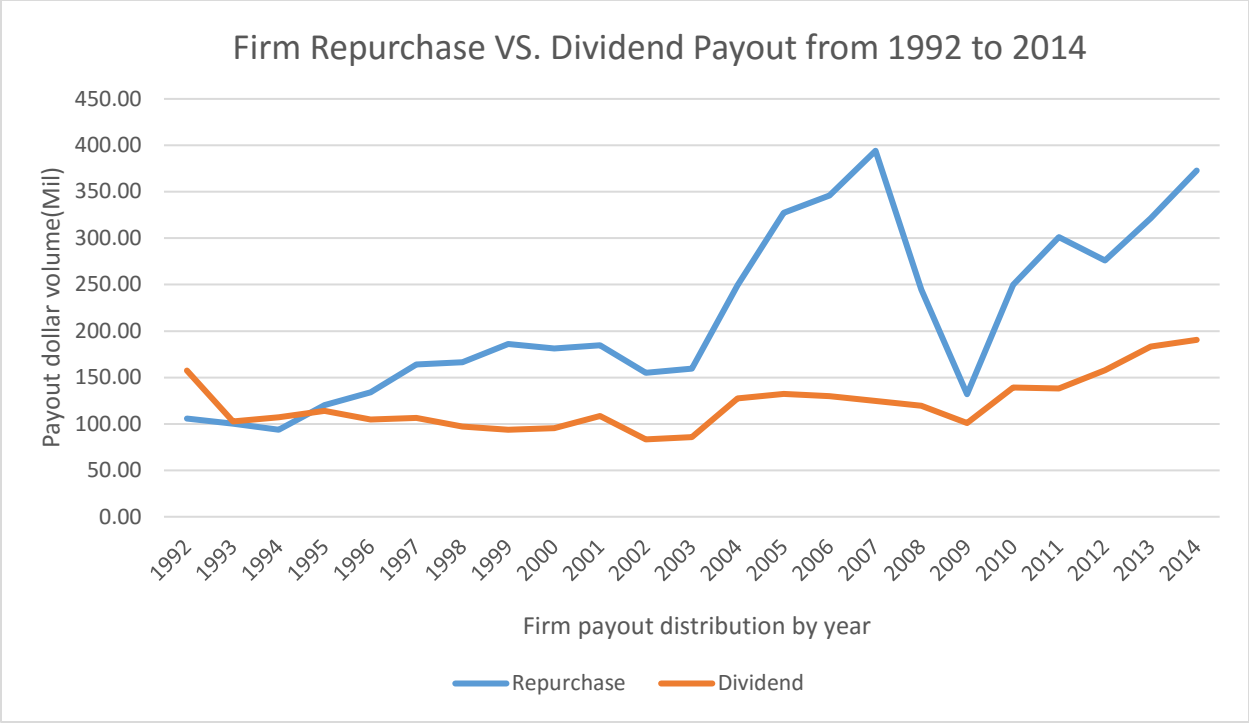


Figure2. Share repurchase and compensation delta yearly distribution.