

# CEO Overconfidence and Repurchases\*

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## Abstract

This paper analyzes how CEO overconfidence influences repurchase-decisions, dividend-repurchase substitution, and the market's reaction to repurchases. Overconfident CEOs tend to over-estimate the value of investments and under-estimate their risk. We show that overconfident CEOs prefer repurchases to dividends as they represent less of a drain on future cash flows, reflecting overconfident CEOs' positive beliefs about future projects and the need for cash to support them. This manifests in a substitution from dividends to repurchases. Further, consistent with the idea that an overconfident CEO believes their company to be under-valued, overconfident CEOs are even more likely to substitute CAPEX for repurchases. Overconfident CEOs are also more sensitive to a stock market decline than are other CEOs and are less sensitive to the company's cash/cash-flow decision when making repurchases. Overconfident CEOs who are more insulated from internal or external discipline are more likely to act on these behavioral biases. We also find that overconfident CEOs' excessive optimism results in repurchases conveying a weaker signal about the firm's quality, leading the market to react less strongly to overconfident CEOs' repurchases.

*Keywords:* Overconfidence, Repurchases, Dividends

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# 1 Introduction

This paper examines the role of CEO overconfidence in shaping repurchase-decisions and the market's reaction to those repurchases. We hypothesize and show that overconfident CEOs prefer repurchases to dividends as repurchases involve less of an implicit draw on future cash flows. Overconfident CEOs are more likely to divert funds from CAPEX towards repurchases, suggesting that overconfident CEOs are more likely to view their shares as under-priced. We also show that overconfident CEOs, who, by definition, are excessively positive about their company's share price, convey a weaker signal about the firm's quality; and thus, can partially drive the market's under-reaction to repurchases. In so doing, we contribute to the literature on CEO overconfidence, dividend-repurchase substitution, and the drivers of the market's under-reaction to share repurchases.

Overconfident CEOs tend to over-estimate project-value and under-estimate project-risk. Ben-David et al. (Forthcoming) indicate that many executives have miscalibrated risk/return distributions. Graham et al. (2013) indicate that CEOs tend to be more optimistic and less risk averse than the non-CEO population. This can manifest in CEO overconfidence. Overconfidence can be beneficial and can encourage risk-taking (Galasso and Simcoe, 2011; Hirshleifer et al., 2012). However, overconfident CEOs tend to over-invest resulting in a reduction in shareholder wealth (Kim, Forthcoming; Kolasinski and Li, Forthcoming; Malmendier and Tate, 2005a, 2008). Further, overconfident CEOs tend to over-estimate their firm's value; and thus, view external financing as costly, causing them to lower dividend payout ratios (Deshmukh et al., Forthcoming). This raises the issue of whether overconfident CEOs (who are more likely to perceive their stock as under-priced) are more likely to repurchase stock and whether these repurchases convey a weaker signal about firm value.

The first research question is whether overconfident CEOs are more likely to repurchase stock. We use option-based and press-based measures of overconfidence. We use a firm-year panel of 20,000 observations between 1992 and 2011. We find that overconfident managers are significantly more likely to repurchase stock and spend significantly more

money doing so. We also find that overconfident managers are more sensitive to stock-price movements, being even more likely than other CEOs to purchase stock following a price-decline. These results are consistent with the idea that overconfident CEOs tend to believe that the market under-prices their stock; and thus, that a repurchase is warranted.

We next examine whether overconfident CEOs are more likely to trade-off CAPEX or dividends to repurchase stock. We find that overconfident managers are more inclined to reduce CAPEX in order to repurchase shares. We find that overconfident managers tend to pay lower dividends on average. We then extend the dividend-substitution framework in Grullon and Michaely (2002) to show that overconfident managers are significantly more likely to reduce ‘discretionary’ dividends than are other managers. This result is consistent with the idea that if overconfident managers decide to pay-out cash to shareholders, they prefer to do so via a repurchase than via a dividend.

We next examine how overconfidence influences the market’s reaction to repurchases. Prior literature suggests that the market tends to under-react to share repurchases (Ikenberry et al., 1995; Lakonishok and Vermaelen, 1990). Grullon and Michaely (2004) confirm that the market’ underreacts to repurchases, on average, and show that one driver of the market’s under-reaction to repurchases is that the market underestimates the extent to which the repurchase reduces the firm’s cost of capital. Peyer and Vermaelen (2009) argue that the under-reaction arises because the market reacts to repurchases on the incorrect assumption that all shareholders tender their shares, which is empirically incorrect and creates the appearance of an under-reaction. We hypothesize that the market reacts less strongly to over-confident CEOs’ repurchases, suggesting that a partial driver of the market’s under-reaction could be that some repurchases convey a weaker signal about firm-value; and thus, manifest in a weaker stock-market reaction. Using a sample of 4500 repurchase announcements from SDC Platinum, we find that the market reacts less favorably to overconfident CEOs’ repurchases. This implies that the market’s appraisal of CEO overconfidence can partially explain the market’s under-reaction to share repurchases.

These results allow us to contribute to several strands of literature. First, we contribute

to the literature on managerial overconfidence. Prior literature shows that overconfidence can distort investment-decisions. Deshmukh et al. (Forthcoming) shows that this can lead to lower dividend payouts. We extend the overconfidence literature to show that overconfidence can distort the manner in which firms payout excess cash and how it can influence the substitution between dividends and repurchases. Second, we contribute to the literature on repurchases. We introduce a new motive for repurchases: CEO overconfidence. Further, we provide an additional explanation for the well-documented market-under-reaction to share repurchases. Namely, the market discounts the signaling effect of repurchases that are made by overconfident CEOs.

There is some prior literature on the relationship between CEO overconfidence and repurchases. Andriopoulos et al. (Forthcoming) use an option-based measure of CEO overconfidence and find that overconfident CEOs are more likely to complete a repurchase plan once initiated. Shu et al. (2013) examine overconfident managers in Taiwan (using a press-based measure of overconfidence), and find that they are more likely to initiate a repurchase. We add to the literature by examining how overconfident CEOs' decisions are influenced by the firm's cash position and stock performance. We also examine the substitution between dividends, CAPEX, and repurchases while analyzing the market's reaction to repurchase decisions. This also enables us to examine whether overconfident CEOs' repurchases, while conveying a weaker signal about the firm's value, may nonetheless benefit shareholders by inhibiting overconfident CEOs' propensity to over-invest.

## 2 Hypotheses

We expect that overconfident managers will be more likely to repurchase stock. This is premised on the idea that overconfident managers are more likely to believe that the company's shares are underpriced. This follows from prior evidence that overconfidence can induce faulty assessments of risk and value (Dittrich et al., 2005), thereby causing managers to over-estimate their firm's value. Consistent with this is evidence that overconfident CEOs are less likely to pay for an acquisition with stock (Malmendier and Tate,

2008), suggesting that they believe their stock might be underpriced. Further, there is evidence consistent with the idea that managers sometimes repurchase stock to signal that it is underpriced (Guthart, 1967; Jagannathan et al., 2000; Liljeblom and Pasternack, 2006). Therefore, we expect that overconfident managers will be more likely to repurchase stock. Consistent with our prediction is prior evidence from Taiwan that overconfident managers tend to spend more repurchasing stock (Shu et al., 2013).

**Hypothesis 1.** *Overconfident managers are more likely to repurchase stock.*

We expect that overconfident managers will be more likely to respond to stock-price movements when repurchasing stock. Jagannathan et al. (2000) and Chan et al. (2004) show that managers are more likely to repurchase stock after a period of negative stock returns. Chan et al. (2007) suggest that managers attempt to time the market when undertaking share repurchases. Given that overconfident managers are more likely to believe their stock to be underpriced in general, we would expect them to react more to a reduction in share price.

**Hypothesis 2.** *Overconfident managers are more sensitive to stock price movements when making repurchases.*

We anticipate that overconfident CEOs will be less sensitive to the firm's cash position when making a repurchase. The foregoing discussion suggests that overconfident CEOs have a more positive belief about their firm's value (and are more likely to believe the company is under-priced). Thus, for a given level of cash, an overconfident CEO will believe it to be more worthwhile to repurchase stock than will a non-overconfident CEO. Therefore we make the following hypothesis:

**Hypothesis 3.** *Overconfident CEOs are less sensitive to the firm's cash position when making repurchases.*

We also expect that overconfident CEOs who have more power within the company will be more likely to repurchase stock. The foregoing hypotheses indicate that overconfident CEOs will be more likely to repurchase stock. A CEO who has more 'power' (i.e. subject

to less outside scrutiny or discipline) will be more likely to act on his/her behavioral biases. Two ways to increase CEO-power are through insulation from ‘internal’ discipline (i.e. by the CEO also being the chairperson of the board (see e.g. Fahlenbrach, 2009; Rechner and Dalton, 1991)) and through insulation from ‘external’ discipline from the market for corporate control (i.e. through the presence of anti-takeover provisions (see e.g. Bebchuk et al., 2009; Gompers et al., 2003)). Thus, CEOs with more power, as evidenced by CEO-Chair duality and/or a preponderance of anti-takeover provisions (ATPs) will be more likely to repurchase stock. Thus, we make the following hypothesis.

**Hypothesis 4.** *Overconfident CEOs with more power (i.e. who are also board-chairs or who are at companies with more anti-takeover provisions) will be more likely to repurchase stock and to spend more on repurchases.*

We further expect that overconfident managers will prefer using repurchases to using dividends if they decide to distribute cash to shareholders. Prior evidence indicates that overconfident managers prefer not to pay dividends, preferring to retain cash internally (Deshmukh et al., Forthcoming). However, it is also important to distinguish between ‘expected’/stable dividends (which the company would pay every year) and ‘unexpected’ dividends (which are over and above the stable level of dividends). We do not have a strong prediction about how overconfident CEOs would pay out excess cash as ‘special’ dividends. However, given that overconfident managers are more likely to view the firm as underpriced, we do expect that they would prefer to pay out cash as repurchases. That is, we expect overconfidence to increase the substitution from dividends to repurchases.

**Hypothesis 5.** *Overconfident managers are more likely to substitute repurchases for dividends.*

The expectation is that overconfident CEOs’ repurchases will reduce their expenditure on CAPEX. Overconfident CEOs tend to over-invest in capital (Malmendier and Tate, 2005a). However, as indicated above, overconfident CEOs are more likely to perceive their company to be under-priced. Further, given the expectation that overconfident CEOs

are less sensitive to the firm’s cash position, this would imply that overconfident CEOs would have to reduce over-investment in CAPEX in order to undertake the repurchase. Therefore, we expect that overconfident CEOs will reduce CAPEX in order to repurchase stock. We capture this in the following hypothesis.

**Hypothesis 6.** *Overconfident CEOs will reduce CAPEX when doing repurchases.*

We anticipate that the market will react less strongly to overconfident managers’ stock repurchases. The market generally interprets stock repurchases as a positive signal and of reflecting the manager’s belief that the firm is underpriced (Chan et al., 2004; Chhachhi and Davidson, 1997; Grullon and Michaely, 2004; Ikenberry et al., 1995). However, Ikenberry et al. (1995, 2000) show that the market reaction is more muted for ‘glamor’ stocks, which are less likely to be underpriced. Further, there is evidence that the market responds less positively to buybacks by managers who are more likely to intentionally use a buyback to mislead the market by conveying a false signal of the firm’s profitability (Chan et al., 2010). Given that overconfident managers are more likely to have an excessively positive view of their company’s stock (and to falsely believe the company is underpriced when it is not), we expect that the market-response to overconfident managers’ repurchases will be more muted.

**Hypothesis 7.** *The market-response to overconfident managers’ repurchases is more muted.*

### 3 Data

The objectives of this paper are to examine whether overconfident CEOs are more prone to repurchase stock (and in so doing, substitute repurchases for CAPEX or dividends) and whether the market reacts less strongly to overconfident CEOs’ repurchases.

We examine everything but the market’s reaction to repurchases by using a firm-year panel dataset. We construct this dataset by starting with the set of CEOs in Execucomp for which we can obtain option data necessary to construct the option-based measure

of overconfidence. We then obtain a set of control variables that might influence the repurchase decision. The panel data-set contains about 20,000 observations, with the precise number of observations varying slightly between models based upon the required variables. We collect data from Compustat (as per Grullon and Michaely, 2002) on whether the company spends money on repurchasing stock in a given year (allowing us to create a repurchase-indicator and to examine the dollar amount spent on repurchases). In order to examine the substitution between CAPEX, dividends, and repurchases, we also collect data on capital expenditures and dividends. When examining the repurchase-dividend substitution decision, we compute a measure of ‘unexpected’ dividends (as in Grullon and Michaely, 2002), which we describe in Section 4.5.

We examine the market’s reaction to repurchases by using a cross-sectional dataset of repurchase announcements from SDC. We exclude any repurchases in which the firm seeks to purchase more than 25% of the outstanding shares (as such a repurchase could also be seen as a defensive measure). We then match the acquiring firms with data on CEO overconfidence (as described below) and other control variables that might influence the market’s reaction to the repurchase. The event-study dataset contains 3,492 observations. In this data-set, we collect data on the market’s reaction to repurchase decisions. We examine longer-run cumulative abnormal returns (as per Peyer and Vermaelen, 2009), focusing on returns from five days before (or ten days after) the repurchase announcement to 200, 250, or 300 days after the repurchase announcement. We base the abnormal returns on an OLS estimate of the market model, with parameters computed over the previous year.

### **3.1 Overconfidence measures**

We use two definitions of managerial over-confidence. First, we define managerial over-confidence in a similar way to Malmendier and Tate (2005a, 2008). Specifically, we collect the number of unexercised, but vested, options that a CEO has in year  $t$  and the value of those options in year  $t$  (both from Execucomp). We then construct the value-per-option



by dividing the value of the CEO’s vested-but-unexercised option holdings by the number of such options. We then construct the ‘Confidence’ measure as a measure of how in-the-money the CEO’s options are, which we obtain by dividing the value-per-option by the share price at the end of the fiscal year. We use a continuous variable due to prior evidence that many managers are, to some extent, operating under faulty beliefs about the distribution of returns (Ben-David et al., Forthcoming).

Second, we use a press-based measure of managerial overconfidence (similarly to Hirshleifer et al., 2012; Malmendier and Tate, 2005b; Shu et al., 2013). Specifically, for the years 2000, 2002, and 2006, we collect perform a factiva search as in Hirshleifer et al. (2012) for articles that refer to the manager as confident or not confident. We then calculate the net number of positive references and negative (i.e. not confident) references. Next, we construct the scaled measure, ‘Net News’/‘(Confident News + Non-Confident News)’, allowing us to examine what proportion of news refers to the manager as confident. We then take the natural log of one plus this number.

### **3.2 Control variables**

We collect data on various control variables that might influence the decision to repurchase stock and the market’s reaction to those repurchases. The firm-level factors include the firm’s size, stock return, stock return standard deviation, stock illiquidity (as proxied by the proportion of days in which there is no trade, as per Lesmond et al. (1999)), the firm’s cash holdings and free cash flow, its leverage, R&D expenses, and the amount it spends on dividends. We also control for the firm’s level of institutional ownership as institutions can influence corporate governance; and thus, the tendency to repurchase stock.

We also control for other CEO-level characteristics. Both CEO age (Yim, Forthcoming) and CEO tenure (Simsek, 2007; Wu et al., 2005) can influence risk-taking; and thus, likely the tendency to repurchase stock. The CEO’s percentage ownership can also influence risk-taking and incentives, affecting the CEO’s incentives to repurchase shares.

### 3.3 Summary statistics

The summary statistics are in Table 1. The statistics are consistent with expectations. In particular, a similar proportion of companies do repurchases as in the later part of the sample in Grullon and Michaely (2002). Further, the statistics in Panel A versus Panel B indicate that the sample-composition of the event-study sample is similar to that in the full firm-year panel sample.

The proportion of companies who repurchase stock each year is in Figure 1. The statistics are from Compustat. The trend towards increasing repurchases is consistent with that documented in Grullon and Michaely (2002). The proportion of firms who repurchase stock is also similar to that documented in Grullon and Michaely (2002, Figure 2) for the portion of their sample-period that overlaps with ours.

## 4 Analysis

### 4.1 Are overconfident managers more likely to repurchase stock?

We expect that overconfident managers will be both more likely to do a repurchase and will spend more money on repurchases. We capture this first by using a logit model (Equation (1)) where the dependent variable is an indicator that equals one if the company spends money on repurchasing stock in year  $t + 1$  as reported in Compustat. Second, we use an OLS regression model to examine whether overconfident managers spend more money on repurchases, as reported in Compustat (see Equation (2)).

$$\text{Repurchase}_{i,t+1} = \alpha + \beta \text{Confidence}_{i,t} + \theta \mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k \quad (1)$$

$$\ln(\text{Repurchase Amt}_{i,t+1}) = \alpha + \beta \text{Confidence}_{i,t} + \theta \mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k \quad (2)$$

Where ‘Repurchase’ is an indicator that equals one if the company spends money on repurchases in year  $t + 1$  and equals zero otherwise, ‘Repurchase Amt’ is the dollar

amount that the company spends on repurchases in year  $t + 1$  as reported in Compustat. We also examine an indicator, ‘New Repo’, which equals one if the company does a repurchase in year  $t + 1$  when it did not do one in year  $t$ . ‘Confidence’ is a measure of managerial overconfidence,  $\mathbf{x}$  is a vector of control variables,  $\lambda_t$  is a set of year fixed effects, and  $\delta_{i(j)}$  is a set of SIC two-digit indicators for whether firm  $i$  is in industry  $j$ . We estimate the indicator-variable regressions using logit regressions, and the repurchase-amount regressions using tobit models with a lower bound of zero. All models include year dummies and two-digit SIC industry dummies (as indicated) and use standard errors clustered by firm.

The results are in Table 2. The main finding is that both measures overconfidence are associated with a significant increase in the likelihood of a ‘new’ repurchase (i.e. where the firm does a repurchase in year  $t + 1$  when it did not do one in year  $t$ , and are associated with significantly higher yearly dollar spends on repurchases. The press-based measure is associated with a significant increase in the likelihood of doing a repurchase.

The control variables are largely consistent with expectations. Larger companies and companies with more cash (or free cash flows) are more likely to repurchase stock, suggesting that such companies face fewer financial-constraint-related barriers to buying back stock. Conversely, companies with higher levels of financial leverage are less likely to buy back stock (and will buy back smaller amounts), indicating that such companies would prefer not to weaken their financial position by disgorging cash to shareholders (as opposed to paying down debt). Companies with a higher stock return standard deviation are less likely to repurchase stock, likely because such companies tend to be smaller and less liquid; and thus, less apt to have a repurchase. Firms that pay higher dividends are also more likely to repurchase stock and to spend more doing so, consistent with the observation in Grullon and Michaely (2002, p. 1682) that “many firms that have been paying dividends have also started to repurchase shares as well”.

## 4.2 Are overconfident managers sensitive to stock returns?

We hypothesize that overconfident managers are more sensitive to the firm’s stock returns. Overconfident managers tend to over-estimate their company’s value. Subsequently, they will be more sensitive to a stock-price decrease, believing that it represents a buying opportunity. We capture this by interacting the CEO-overconfidence variables with the firm’s stock return over the prior year. The models are of the following form

$$\begin{aligned} \text{Repurchase}_{i,t+1} = & \alpha + \beta^{(1)}\text{Confidence}_{i,t} + \beta^{(2)}\text{Return}_{i,t} \\ & + \beta^{(3)}(\text{Confidence}_{i,t} \times \text{Return}_{i,t}) + \theta\mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k \end{aligned} \quad (3)$$

$$\begin{aligned} \ln(\text{Repurchase Amt}_{i,t+1}) = & \alpha + \beta^{(1)}\text{Confidence}_{i,t} + \beta^{(2)}\text{Return}_{i,t} \\ & + \beta^{(3)}(\text{Confidence}_{i,t} \times \text{Return}_{i,t}) + \theta\mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k \end{aligned} \quad (4)$$

Where, ‘Confidence<sub>*i,t*</sub>’ is the measure of the CEO’s level of overconfidence, ‘Return<sub>*i,t*</sub>’ is the cumulative abnormal stock return over the year *t*, based on an OLS estimation of the market model over the year *t* – 1 using an equally weighted CRSP market index, **x** is a vector of controls,  $\lambda_t$  represents a set of year dummies, and  $\delta_{i(j)}$  represents a set of industry dummies. We estimate Equation (3) using logit and Equation (4) using a tobit model with a lower bound of zero. All models include year dummies, two-digit SIC industry dummies and use standard errors clustered by firm.

## 4.3 Are overconfident managers less sensitive to the firm’s cash position?

The hypothesis is that overconfident CEOs are less sensitive to the firm’s cash position. Overconfident CEOs are more likely to believe that the company is under-valued. They are also more likely to over-estimate the firm’s future growth prospects and under-estimate its risk. Therefore, they will be more prone to use cash holdings to engage in a repurchase and will be less sensitive to the level of cash holdings when doing so. We capture this by

interacting the CEO confidence measures with measures of cash holdings. The equations are as follows:

$$\begin{aligned} \text{Repurchase}_{i,t+1} = & \alpha + \beta^{(1)}\text{Confidence}_{i,t} + \beta^{(2)}\text{Cash}_{i,t} \\ & + \beta^{(3)} (\text{Confidence}_{i,t} \times \text{Cash}_{i,t}) + \theta\mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k \end{aligned} \quad (5)$$

$$\begin{aligned} \ln(\text{Repurchase Amt}_{i,t+1}) = & \alpha + \beta^{(1)}\text{Confidence}_{i,t} + \beta^{(2)}\text{Cash}_{i,t} \\ & + \beta^{(3)} (\text{Confidence}_{i,t} \times \text{Cash}_{i,t}) + \theta\mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k \end{aligned} \quad (6)$$

Where, ‘Confidence<sub>*i,t*</sub>’ is the measure of the CEO’s level of overconfidence, ‘Cash<sub>*i,t*</sub>’ is the firm’s Cash/Assets in *t*,  $\mathbf{x}$  is a vector of controls,  $\lambda_t$  represents a set of year dummies, and  $\delta_{i(j)}$  represents a set of industry dummies.

#### **4.4 Does CEO power facilitate repurchases by overconfident CEOs?**

We expect that overconfident CEOs who have more power (i.e. are insulated from internal or external discipline) will be more likely to act on their behavioral bias to do more repurchases. We capture insulation from internal discipline by identifying whether a CEO is also the chairperson of the board (as indicated in Execucomp’s executive title variable, ‘titleann’). We capture insulation from external discipline (i.e. the market for corporate control) by using the Bebchuk et al. (2009) index of six key anti-takeover provisions (‘ATPs’), which we denote ‘BCF Index’. We capture the role of such governance factors in the following models.

$$\begin{aligned} \text{Repurchase}_{i,t+1} = & \alpha + \beta^{(1)}\text{Confidence}_{i,t} + \beta^{(2)}g_{i,t} \\ & + \beta^{(3)}(\text{Confidence}_{i,t} \times g_{i,t}) + \theta\mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k \end{aligned} \quad (7)$$

$$\begin{aligned} \ln(\text{Repurchase Amt}_{i,t+1}) = & \alpha + \beta^{(1)}\text{Confidence}_{i,t} + \beta^{(2)}g_{i,t} \\ & + \beta^{(3)}(\text{Confidence}_{i,t} \times g_{i,t}) + \theta\mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k \end{aligned} \quad (8)$$

Where,  $g_{i,t}$  represents the relevant governance provision (i.e. CEO-Chair duality or the Bebchuk et al. (2009) index in year  $t$ ), ‘Confidence’ represents the two measures of CEO overconfidence,  $\mathbf{x}$  is a vector of controls,  $\lambda_t$  represents a set of year dummies, and  $\delta_{i(j)}$  denotes a set of industry dummies.

The results are in Table 5. The main finding is that the interaction terms of the confidence measures with the BCF index, or the CEO-Chair indicator are positive in all models. The interactions of option-based confidence with the CEO-power measures are all statistically significant. The interaction of press-based confidence with the BCF index is positive and significant. These results suggest that overconfidence CEOs who have more power (i.e. are insulated from internal or external discipline) are more prone to acting on their behavioral biases and repurchasing more stock.

#### **4.5 Are overconfident managers more prone to reducing ‘discretionary’ dividends to do a repurchase?**

We hypothesize that overconfident managers will prefer to payout excess cash through a repurchase than through a dividend payment. We analyze this within the dividend substitution framework of Grullon and Michaely (2002). The Grullon and Michaely (2002) framework functions by looking at the determinants of unexpected changes in dividends, which are broadly defined as the actual change in dividends and that which a Lintner (1956) based dividend-prediction model would predict. The idea is that dividends can be both ‘expected’ and ‘discretionary’. The ‘expected’ level of dividends is based upon

the company’s dividend policy (i.e. as manifested in the lagged level of dividends) and the company’s current level of earnings. The ‘discretionary’ dividends derive from factors other than earnings or the historic dividend policy, and could involve the company disgorging excess cash to shareholders. The Grullon and Michaely (2002) model looks at how managers choose between issuing ‘unexpected’/‘discretionary’ dividends and doing a repurchase. We augment their model by examining the role of overconfidence. Thus, we run the following model

$$\begin{aligned}
\text{Unexpected Dividends}_{i,t+1} = & \alpha + \beta^{(1)}\text{Confidence}_{i,t} + \beta^{(2)}\text{Repurchase}_{i,t+1} \\
& + \beta^{(3)} (\text{Confidence}_{i,t} \times \text{Repurchase}_{i,t+1}) \quad (9) \\
& + \theta\mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k
\end{aligned}$$

Where, we calculate the level of ‘unexpected dividends’ as in Equation (10), ‘confidence’ is our measure of managerial overconfidence, ‘Repurchase’ is an indicator for whether the company spends any money repurchasing stock in year  $t + 1$ , as reported in Compustat,  $\mathbf{x}$  denotes a vector of control variables,  $\delta_{i(j)}$  is a set of SIC two-digit indicators for whether firm  $i$  is in industry  $j$  and  $\lambda_t$  is a set of year fixed effects. The models use standard errors clustered by firm. . Following Grullon and Michaely (2002), we calculate the unexpected amount of dividends as follows:

$$\text{Unexpected Dividends}_{i,t} = [\Delta\text{Dividends}_{i,t} - \Delta\text{Dividends}_{i,t}^*] / \text{Market Capitalization}_{i,t} \quad (10)$$

Where,  $\text{Dividends}_{i,t}^*$  is the ‘expected’ change in dividends and comes from a Lintner (1956) type dividend adjustment model. Specifically, we compute it as the difference between the ‘expected’ level of dividends for year  $t$  and the actual level of dividends in year  $t - 1$ . We compute the expected level of dividends in year  $t$  using a Lintner (1956) mode which predicts the level of dividends in year  $t$  as a function of earnings in year  $t$

and the dividends paid in year  $t - 1$ .

## 4.6 Do overconfident managers reduce CAPEX to repurchase stock?

The expectation is that overconfident managers will reduce CAPEX in order to repurchase stock. Overconfident managers tend to over-invest (Malmendier and Tate, 2005a). However, overconfident managers tend to have a more optimistic view of their company's value. Therefore, we expect that repurchases will reduce over-investment by overconfident CEOs. We capture this in models of the following form:

$$\begin{aligned} \text{CAPEX/Sales}_{i,t+1} = & \alpha + \beta^{(1)}\text{Confidence}_{i,t} + \beta^{(2)}\text{Repo}_{i,t}\beta^{(3)} (\text{Confidence}_{i,t} \times \text{Repo}_{i,t}) \\ & + \theta\mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k \end{aligned} \quad (11)$$

$$\begin{aligned} \text{CAPEX/Sales}_{i,t+1} = & \alpha + \beta^{(1)}\text{Confidence}_{i,t} + \beta^{(2)}\text{Repo}_{i,t+1}\beta^{(3)} (\text{Confidence}_{i,t} \times \text{Repo}_{i,t+1}) \\ & + \theta\mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k \end{aligned} \quad (12)$$

Where, 'CAPEX/Sales <sub>$i,t+1$</sub> ' is the firm's capital expenditure scaled by its sales in year  $t+1$ , 'Confidence' is a measure of CEO overconfidence, 'Repo <sub>$i,t$</sub> ' is an indicator for whether the firm did a repurchase (according to Compustat) in year  $t$  (similarly for 'Repo <sub>$i,t+1$</sub> ' in year  $t+1$ ),  $\mathbf{x}$  is a vector of control variables,  $\lambda_t$  represents a set of year dummies and  $\delta_{i(j)}$  is a set of two-digit SIC industry dummies. We estimate the models using OLS, with year dummies and two-digit industry dummies and cluster standard errors by firm.

The results are in Table 7. The results indicate that overconfident CEOs (as proxied by the options-based measure or the press-based measure) spend more on CAPEX, consistent with prior evidence (Malmendier and Tate, 2005a). Companies that repurchase stock in year  $t$  or year  $t+1$  also spend more on CAPEX in year  $t+1$ , consistent with the idea that firms who do repurchases might be in a better cash position than non-repurchasing firms. However, we find that overconfident managers who repurchase stock spend less on CAPEX than do overconfident managers who do not repurchase stock. That is, repur-



chases reduce overconfident managers' over-investment on CAPEX. Further, overconfident managers appear willing to substitute over-investment for a repurchase, highlighting that overconfident managers (more than other managers) are likely to regard their firm as under-priced. These results suggest that while overconfident managers might repurchase stock more precipitously than other managers, these repurchases can have a benefit in reducing over-investment.

#### **4.7 Does the market react less favorably to overconfident managers' repurchases?**

We expect that the market's reaction to overconfident managers' repurchases will be more muted. We examine this by obtaining a set of repurchase announcement-dates from SDC platinum. We then obtain the cumulative abnormal return ('CAR') surrounding the announcement. Consistent with Peyer and Vermaelen (2009), we focus on long run returns (i.e. from 5-days before the repurchase announcement to 200, 250, or 300 days after the repurchase announcement). We estimate the following regressions.

$$\text{CAR}_{k(i,(\tau_1,\tau_2))} = \alpha + \beta \text{Confidence}_{i,t} + \theta \mathbf{x}_{i,t} + \lambda_t + \delta_{i(j)} + \varepsilon_k \quad (13)$$

Where,  $\text{CAR}_{k(\tau_1,\tau_2)}$  is the cumulative abnormal return from  $\tau_1$  days before the announcement to  $\tau_2$  days after the announcement of repurchase  $k$  done by firm  $i$ , Confidence is the confidence variable,  $\mathbf{x}$  is a vector of firm-specific controls,  $\lambda_t$  represents a set of year dummies and  $\delta_{i(j)}$  represents a set of SIC two-digit industry dummies for whether firm  $i$  is in industry  $j$ . The models are OLS regressions and use standard errors clustered by firm.

The results are in Table 8. The main finding is that both measures of CEO overconfidence are significantly and negatively related to long run CARs. These results are economically significant: a one-standard-deviation increase in option-based confidence is

associated with a 4.6 percentage point reduction in CARs over the window (-5,200).<sup>1</sup> Similarly, a one-standard-deviation increase in news-based confidence is associated with a 2.8 percentage point decrease in CARs over the window (-5,200). The average CAR over the window (-5,200) is 6.1% (see Panel B of Table 1). Thus, while managers who are relatively more overconfident still earn positive CARs, the CARs are not as high as for other managers. This suggests that overconfident managers' repurchases still increase shareholder wealth (perhaps by reducing the scope to over-invest, as documented in Section 4.6), but convey a weaker signal about the value of the company's shares.

## **4.8 Additional robustness tests**

### **4.8.1 The 2001 dividend tax cuts and the Sarbanes-Oxley Act of 2002**

The results are robust to the impact of the dividend tax cuts in 2001 and the Sarbanes-Oxley Act of 2002 ('SOX'). The 2001 cuts change the relative attractiveness of dividends and repurchases. SOX strengthened corporate governance and could influence the manager's incentives to undertake repurchases. Subsequently, we ensure that the results hold after 2003. We suppress most results for brevity, and report the results that examine dividend-repurchase substitution in Table 9. The main finding is that even after 2003, overconfident managers are more likely to substitute dividends for repurchases, suggesting that the results do not merely reflect the impact of the 2001 tax cut or SOX.

### **4.8.2 Systemic differences between repurchasers and non-repurchasers**

We ensure that the results (in relation to managerial confidence) do not merely reflect systemic differences between repurchasing companies and non-repurchasing companies. We do this by using a propensity score matching procedure. First, we estimate a first stage model to predict the likelihood that a firm undertakes a repurchase in year  $t + 1$ , as per Table 2. This model contains the same control variables as per Table 2. Second, we obtain the predicted values from this first-stage regression. Third, for the set of companies

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<sup>1</sup>We calculate this by multiplying the coefficient on the confidence variable in Column 1 of Table 8 by the standard deviation of the option-based confidence measure for the event-study sample from Table 1.

who do repurchase stock, we construct the distribution of predicted values and find the values that mark the 5<sup>th</sup> percentile. Fourth, we exclude from the sample non-repurchasers whose propensity score is below the 5<sup>th</sup> percentile. For brevity, we do not report all results; however, we report a set of the main models in Table 10. The main finding is that the results are robust to restricting the sample in this way.

#### **4.8.3 Additional measures of overconfidence**

The results are robust to examining different measures of CEO overconfidence. The results (suppressed for brevity) are qualitatively similar if we measure managerial overconfidence using the number of vested, but unexercised options that the CEO has, an indicator for whether the option-based measure of confidence is in the top quartile (similarly for the press based measure of overconfidence), and an indicator for whether the option-based measure of overconfidence exceeds 0.67 (in a similar vein to the ‘Holder67’ measure in Malmendier and Tate, 2005a).

#### **4.8.4 Panel regressions and Fama-Macbeth regressions**

Part of the analysis uses a firm-year panel dataset. The reported models use year dummies and two-digit SIC industry dummies (as per Becker et al., 2011; Cronqvist and Fahlenbrach, 2009). We report some of the results in Table 11 (for brevity, we do not report all results). Table 11 indicates that the results are robust to using firm fixed effects instead of industry fixed effects. The results are also robust to using a Fama-Macbeth regression technique. These results suggest that the reported results do not merely reflect unobserved firm effects or other panel-data characteristics.

#### **4.8.5 Outliers**

It is conceivable that the sample could contain outlying companies who make significant repurchases. The M&A literature indicates the importance of mitigating the presence of such (potential) outliers (see e.g. Fich et al., 2012; Moeller et al., 2005). The models

that examine ‘ln(\$ Repurchase)’ largely mitigate this concern by taking the log of the the dollar amount spent on repurchases. Nonetheless, the results robust regressions (which are designed to mitigate outliers).

#### **4.8.6 Anti-takeover provisions**

The results are robust to controlling for the presence of anti-takeover provisions (‘ATPs’). ATPs can enable managers to act self-interestedly (Harford et al., 2012; Masulis et al., 2007), which may enable managers to adjust payout behavior. Requiring data on anti-takeover provisions significantly reduces the sample size (by approximately 6000 observations). Subsequently, we do not include ATPs in the main models. However, the results are robust to controlling for the Gompers et al. (2003) index of 24 ATPs, the Bebchuk et al. (2009) index of six ATPs or the presence of a poison pill and/or classified board (on which, see Bebchuk. et al., 2002; Bebchuk and Cohen, 2005).

#### **4.8.7 CEO gender and Age**

CEO-age can often be associated with CEO-confidence. For example, younger CEOs tend to be more acquisitive (Yim, Forthcoming). The reported models control for the CEO’s age. However, the results (unreported) are also robust to splitting the sample into halves based on the CEO’s age. Other evidence indicates that gender might influence behavior that could arguably be overconfident/aggressive (Barber and Odean, 2001; Jia et al., 2013; Levi et al., 2010). However, our results (unreported) are robust to including a CEO-gender indicator and/or to omitting female CEOs from the sample; female CEOs only account for around 2% of our sample (about 450 observations), making it unreliable to conduct a separate analysis of companies run by female CEOs.

## **5 Conclusion**

This paper examines the impact of CEO overconfidence on repurchase decisions and the market’s reaction to those decisions. Overconfident CEOs tend to over-estimate the value

of their companies and projects and under-estimate the risk associated with these projects. Thus, we predict that overconfident CEOs are more likely to repurchase stock. We also predict that they will be less sensitive to the company's cash position when making repurchase decisions, but more sensitive to a stock-market decline. Further, given that overconfident CEOs tend to prefer not to pay dividends (Deshmukh et al., Forthcoming), we expect that overconfident CEOs will substitute dividends for stock. We additionally anticipate that because overconfident CEOs are more likely to over-estimate the value of their companies, their repurchases will convey a weaker signal about the firm's quality.

We use both press-based and option-based measures of overconfidence to test our predictions. We find that overconfident CEOs are more likely to repurchase stock and to spend more money on repurchases. They are less sensitive to the company's cash position but are more sensitive to stock-price declines. They are also more likely to substitute dividends for repurchases and to curb their (excess) capital expenditure in order to repurchase stock. Reflecting overconfident CEOs' over-estimation of stock-prices, the market also responds less strongly (albeit still positively) to overconfident CEOs' repurchases. This highlights that while overconfident CEOs might precipitously repurchase stock (hence the weaker reaction) their repurchases still curb excess investment and increase shareholder wealth.

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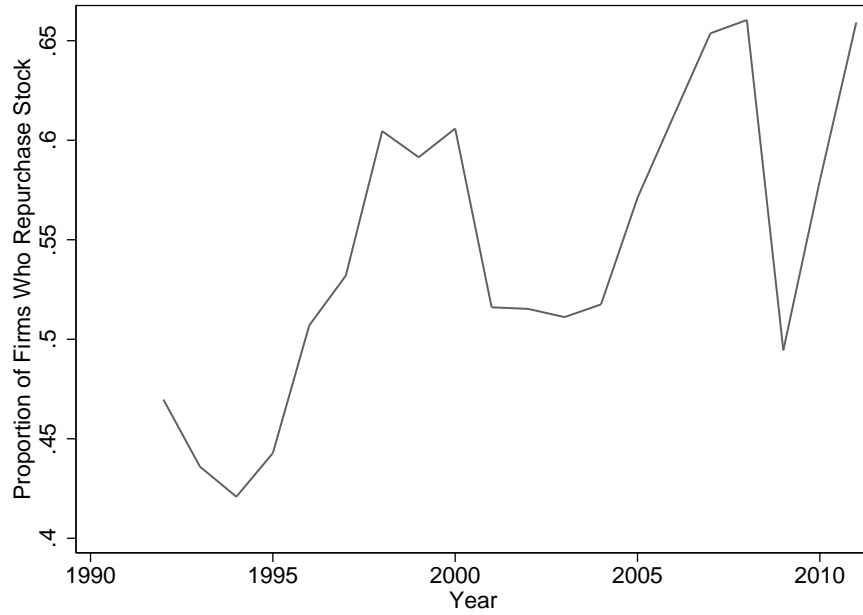
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## 6 Graphs

Figure 1: Repurchases by year

This graph plots the proportion of companies who repurchase stock (according to compustat) in a given year between 1992 and 2011.



## 7 Tables

Table 1: Summary Statistics

This table contains the summary statistics for the sample. The figures are means, medians, standard deviations, or 25th or 75th percentile cut-off points as indicated in the column title. Panel A presents summary statistics for the firm-year panel data. Panel B presents summary statistics for the sample used to conduct an event-study analysis of the market's reaction to repurchase decisions.

Variable	Mean	Median	Std Dev	25th Pctile	75th Pctile
Panel A: Panel Data Sample					
Repurchases	0.557	1.000	0.497	0.000	1.000
Repurchase Amount	134	1	419	0	52
Confidence Options	0.309	0.268	0.277	0.062	0.496
Confidence News	0.317	0.297	0.240	0.094	0.511
CAPEX/Sales	0.076	0.038	0.124	0.020	0.076
Assets	8702	1593	24983	528	5389
Stock Return	0.146	0.136	0.455	-0.088	0.365
Stock Return Std Dev	0.028	0.024	0.015	0.018	0.034
Prop No Trade Days	0.000	0.000	0.008	0.000	0.000
Toal Dividends/ Assets	0.010	0.002	0.016	0.000	0.015
Cash/Assets	0.093	0.050	0.109	0.016	0.131
Bonus/Salary	0.726	0.359	1.163	0.000	1.002
Tenure (Years)	6.726	5.000	7.167	2.000	9.000
Age (Years)	55.379	55.000	7.225	51.000	60.000
CEO%Own	0.020	0.003	0.048	0.001	0.012
Inst%Own	0.587	0.654	1.767	0.399	0.813
Debt/Assets	0.192	0.170	0.168	0.038	0.299
R&D/Sales	0.042	0.000	0.100	0.000	0.033
FCF/Assets	0.066	0.065	0.117	0.016	0.122
Panel B: Repurchase Event-Study Sample					
CAR(-5,200)	0.061	0.065	0.441	-0.171	0.280
CAR(-5,250)	0.067	0.077	0.517	-0.208	0.337
CAR(-5,300)	0.075	0.085	0.597	-0.235	0.390
CAR(10,200)	0.047	0.051	0.415	-0.176	0.260
CAR(10,250)	0.054	0.063	0.491	-0.212	0.315
CAR(10,300)	0.061	0.074	0.571	-0.236	0.362
Confidence Options	0.325	0.300	0.279	0.102	0.501
Confidence News	0.341	0.335	0.228	0.156	0.515
CAPEX/Sales	0.058	0.036	0.085	0.020	0.063
Assets	12954	2117	32587	669	7977
Stock Return	0.069	0.086	0.373	-0.128	0.283
Stock Return Std Dev	0.025	0.022	0.012	0.017	0.030
Prop No Trade Days	0.000	0.000	0.004	0.000	0.000
Toal Dividends/ Assets	0.012	0.005	0.017	0.000	0.018
Cash/Assets	0.093	0.056	0.102	0.019	0.132
Bonus/Salary	0.779	0.375	1.256	0.000	1.068
Tenure (Years)	6.735	5.000	7.361	2.000	9.000
Age (Years)	55.392	56.000	6.943	51.000	60.000
CEO%Own	0.019	0.003	0.048	0.001	0.011
Inst%Own	0.732	0.709	4.017	0.550	0.839
Debt/Assets	0.167	0.139	0.154	0.027	0.258
R&D/Sales	0.036	0.000	0.073	0.000	0.036
FCF/Assets	0.106	0.094	0.110	0.041	0.158

Table 2: Repurchase announcements and CEO overconfidence

This table contains regression models that examine the relationship between CEO overconfidence and announcement of new repurchase plans. The models in Columns 1, 2, 4, and 5 are *logit* regression models, and the models in Columns 3 and 6 are *tobit* models with a lower bound of zero. All models include year dummies and SIC two-digit industry dummies and cluster standard errors by firm. The appendix contains the detailed variable definitions. The significance levels at the 1%, 5%, and 10% are denoted by \*\*\*, \*\* and \*, respectively.

Dependent variable	Repurchase Indicator	New Repurchase Indicator	ln(\$ Repurchase)	Repurchase Indicator	New Repurchase Indicator	ln(\$ Repurchase)
Column	[1]	[2]	[3]	[4]	[5]	[6]
Confidence Options (t)	0.141 [0.136]	0.218*** [0.007]	0.508*** [0.000]			
Confidence Press (t)				0.350** [0.040]	0.292* [0.080]	0.873*** [0.000]
ln(Assets(t))	0.153*** [0.000]	0.044** [0.032]	0.849*** [0.000]	0.169*** [0.000]	0.071** [0.025]	0.877*** [0.000]
Stock Return (t)	-0.025 [0.561]	0.215*** [0.000]	0.199*** [0.003]	-0.017 [0.827]	0.251*** [0.007]	0.254** [0.027]
Stock Return S.D. (t)	-37.394*** [0.000]	-4.357** [0.047]	-65.495*** [0.000]	-41.740*** [0.000]	-1.311 [0.732]	-71.331*** [0.000]
Prop No Trade Days (t)	-5.201 [0.296]	-22.178* [0.062]	-5.129 [0.301]	-0.794 [0.881]	-21.627 [0.293]	-0.395 [0.960]
ln(Total Dividends (t))	0.080*** [0.000]	-0.083*** [0.000]	0.115*** [0.000]	0.079*** [0.003]	-0.096*** [0.000]	0.113*** [0.004]
Cash/assets (t)	1.682*** [0.000]	0.435* [0.082]	3.834*** [0.000]	2.330*** [0.000]	0.116 [0.778]	4.640*** [0.000]
Bonus / Salary (t)	0.095*** [0.001]	0.018 [0.378]	0.131*** [0.000]	0.168*** [0.000]	0.034 [0.273]	0.208*** [0.000]
ln(Tenure(t))	0.027 [0.402]	0.01 [0.728]	0.019 [0.675]	0.065 [0.177]	0.119** [0.012]	0.083 [0.239]
ln(CEO Age(t))	-0.151 [0.509]	0.059 [0.744]	-0.459 [0.168]	-0.503 [0.134]	-0.467 [0.120]	-0.882* [0.076]
CEO%Own	0.078 [0.901]	0.116 [0.814]	-0.117 [0.891]	-1.135 [0.264]	-1.414 [0.155]	-2.284* [0.091]
Inst%Own	0.058 [0.531]	-0.014 [0.845]	0.179 [0.173]	0.074 [0.576]	0.066 [0.581]	0.194 [0.308]
Debt/Assets (t)	-1.659*** [0.000]	-0.418*** [0.008]	-3.201*** [0.000]	-2.297*** [0.000]	-0.962*** [0.000]	-4.208*** [0.000]
R&D/Sales(t)	-0.688* [0.054]	-1.246*** [0.000]	0.35 [0.553]	-0.439 [0.374]	-1.128** [0.018]	0.526 [0.511]
FCF/Assets (t)	2.319*** [0.000]	-1.479*** [0.000]	5.054*** [0.000]	2.831*** [0.000]	-1.669*** [0.000]	5.692*** [0.000]
Industry FCF/Assets(t)	1.2 [0.131]	0.049 [0.957]	1.948* [0.095]	-1.409 [0.308]	-0.074 [0.972]	-1.246 [0.525]
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,319	19,795	18,329	7,034	7,456	7,048
Pseudo $R^2$	13.57%	2.85%	10.32%	16.91%	3.40%	11.54%

Table 3: Repurchase Announcements, Confidence &amp; Stock Return

This table contains regression models that examine the relationship between CEO overconfidence, stock returns and announcement of new repurchase plans. The models in Columns 1 and 3 are *logit* regression models, and the models in Columns 2 and 4 are *tobit* models with a lower bound of zero. All models include year dummies and SIC two-digit industry dummies and cluster standard errors by firm. The appendix contains the detailed variable definitions. The significance levels at the 1%, 5%, and 10% are denoted by \*\*\*, \*\* and \*, respectively.

Dependent variable Column	Repurchase Indicator [1]	ln(\$ Repurchase) [2]	Repurchase Indicator [3]	ln(\$ Repurchase) [4]
Confidence Options (t)	0.367*** [0.000]	0.891*** [0.000]		
Confidence Options (t) x Stock Return(t)	-0.930*** [0.000]	-1.573*** [0.000]		
Confidence Press (t)			0.503*** [0.004]	1.113*** [0.000]
Confidence Press (t) x Stock Return(t)			-0.804*** [0.003]	-1.283*** [0.001]
ln(Assets(t))	0.152*** [0.000]	0.847*** [0.000]	0.166*** [0.000]	0.874*** [0.000]
Stock Return (t)	0.276*** [0.000]	0.716*** [0.000]	0.239** [0.035]	0.674*** [0.000]
Stock Return S.D. (t)	-36.352*** [0.000]	-63.816*** [0.000]	-41.918*** [0.000]	-71.618*** [0.000]
Prop No Trade Days (t)	-5.918 [0.269]	-6.075 [0.261]	-1.269 [0.817]	-1.229 [0.879]
ln(Total Dividends (t))	0.082*** [0.000]	0.117*** [0.000]	0.080*** [0.003]	0.113*** [0.004]
Cash/assets (t)	1.733*** [0.000]	3.912*** [0.000]	2.355*** [0.000]	4.671*** [0.000]
Bonus / Salary (t)	0.095*** [0.001]	0.130*** [0.000]	0.167*** [0.000]	0.208*** [0.000]
ln(Tenure(t))	0.023 [0.475]	0.013 [0.777]	0.064 [0.183]	0.082 [0.242]
ln(CEO Age(t))	-0.174 [0.447]	-0.496 [0.136]	-0.516 [0.124]	-0.906* [0.069]
CEO%Own	0.115 [0.856]	-0.041 [0.961]	-1.127 [0.268]	-2.262* [0.094]
Inst%Own	0.053 [0.565]	0.17 [0.197]	0.071 [0.592]	0.19 [0.318]
Debt/Assets (t)	-1.663*** [0.000]	-3.190*** [0.000]	-2.294*** [0.000]	-4.196*** [0.000]
R&D/Sales(t)	-0.672* [0.060]	0.403 [0.495]	-0.443 [0.369]	0.547 [0.493]
FCF/Assets (t)	2.304*** [0.000]	5.003*** [0.000]	2.827*** [0.000]	5.676*** [0.000]
Industry FCF/Assets(t)	1.24 [0.122]	2.024* [0.085]	-1.508 [0.276]	-1.305 [0.505]
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
Observations	18,319	18,329	7,034	7,048
Pseudo $R^2$	13.79%	10.41%	17.00%	11.57%

Table 4: Repurchase Announcements and Cash Holdings

This table contains regression models that examine the relationship between CEO overconfidence, cash holdings and announcement of new repurchase plans. The models in Columns 1 and 3 are *logit* regression models, and the models in Columns 3 and 4 are *tobit* models with a lower bound of zero. All models include year dummies and SIC two-digit industry dummies and cluster standard errors by firm. The appendix contains the detailed variable definitions. The significance levels at the 1%, 5%, and 10% are denoted by \*\*\*, \*\* and \*, respectively.

Dependent variable Column	Repurchase Indicator [1]	ln(\$ Repurchase) [2]	Repurchase Indicator [3]	ln(\$ Repurchase) [4]
Confidence Options (t)	0.355*** [0.003]	0.818*** [0.000]		
Confidence Options (t) x Cash/Assets(t)	-1.957*** [0.002]	-3.060*** [0.000]		
Confidence Press (t)			0.583*** [0.008]	1.342*** [0.000]
Confidence Press (t) x Cash/Assets(t)			-2.208* [0.089]	-4.491*** [0.009]
ln(Assets(t))	0.153*** [0.000]	0.848*** [0.000]	0.170*** [0.000]	0.879*** [0.000]
Stock Return (t)	-0.019 [0.660]	0.213*** [0.002]	-0.013 [0.862]	0.260** [0.024]
Stock Return S.D. (t)	-36.979*** [0.000]	-64.817*** [0.000]	-41.642*** [0.000]	-71.118*** [0.000]
Prop No Trade Days (t)	-5.816 [0.275]	-5.97 [0.261]	-1.209 [0.819]	-1.959 [0.795]
ln(Total Dividends (t))	0.083*** [0.000]	0.119*** [0.000]	0.081*** [0.003]	0.115*** [0.004]
Cash/assets (t)	2.417*** [0.000]	4.994*** [0.000]	3.123*** [0.000]	6.290*** [0.000]
Bonus / Salary (t)	0.093*** [0.001]	0.129*** [0.000]	0.165*** [0.000]	0.206*** [0.000]
ln(Tenure(t))	0.028 [0.385]	0.022 [0.635]	0.07 [0.145]	0.093 [0.184]
ln(CEO Age(t))	-0.159 [0.487]	-0.479 [0.150]	-0.534 [0.112]	-0.949* [0.056]
CEO%Own	0.077 [0.902]	-0.126 [0.881]	-1.157 [0.253]	-2.346* [0.083]
Inst%Own	0.057 [0.537]	0.178 [0.177]	0.076 [0.567]	0.197 [0.301]
Debt/Assets (t)	-1.655*** [0.000]	-3.195*** [0.000]	-2.281*** [0.000]	-4.165*** [0.000]
R&D/Sales(t)	-0.760** [0.034]	0.247 [0.676]	-0.461 [0.350]	0.497 [0.533]
FCF/Assets (t)	2.309*** [0.000]	5.039*** [0.000]	2.837*** [0.000]	5.697*** [0.000]
Industry FCF/Assets(t)	1.113 [0.162]	1.821 [0.117]	-1.429 [0.302]	-1.3 [0.507]
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
Observations	18,319	18,329	7,034	7,048
Pseudo $R^2$	13.63%	10.34%	16.95%	11.57%

Table 5: CEO power, overconfidence, and repurchases

This table contains regression models that examine the relationship between CEO power, overconfidence, and repurchases. The column title states the dependent variable. The models in Columns 1-4 are logit models and the models in Columns 5-8 are tobit models with a lower bound of zero. All models include year dummies and SIC two-digit industry dummies and clustered standard errors by firm. The appendix contains the detailed variable definitions. The significance levels at the 1%, 5%, and 10% are denoted by \*\*\*, \*\*, and \*, respectively.

Dependent Variable	Repurchase Indicator							
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Confidence Options (t)	-0.052 [0.648]		-0.081 [0.688]		0.198 [0.238]		0.077 [0.753]	
Confidence Options (t) x CEO is Chair	0.490*** [0.003]				0.678*** [0.004]			
Confidence Options (t) x BCF (t)			0.201*** [0.010]				0.317*** [0.001]	
Confidence Press (t)		0.269 [0.269]		-0.794** [0.034]		0.811** [0.021]		-0.65 [0.196]
Confidence Press (t) x CEO is Chair		0.137 [0.644]				0.103 [0.805]		
Confidence Press (t) x BCF (t)				0.525*** [0.000]				0.677*** [0.000]
CEO is Chair	-0.222*** [0.007]	-0.151 [0.268]			-0.291** [0.014]	-0.145 [0.446]		
BCF (t)			-0.05 [0.150]	-0.126** [0.022]			-0.123*** [0.007]	-0.208*** [0.006]
ln(Assets(t))	0.158*** [0.000]	0.176*** [0.000]	0.116*** [0.001]	0.136*** [0.003]	0.855*** [0.000]	0.884*** [0.000]	0.828*** [0.000]	0.847*** [0.000]
Stock Return (t)	-0.014 [0.749]	-0.019 [0.804]	0.032 [0.569]	0.041 [0.653]	0.224*** [0.001]	0.252** [0.029]	0.328*** [0.000]	0.329** [0.016]
Stock Return S.D. (t)	-36.989*** [0.000]	-41.690*** [0.000]	-40.353*** [0.000]	-40.432*** [0.000]	-65.020*** [0.000]	-71.262*** [0.000]	-71.333*** [0.000]	-71.673*** [0.000]
Prop No Trade Days (t)	-5.333 [0.295]	-0.891 [0.868]	-4.042 [0.212]	-10.408 [0.381]	-5.345 [0.299]	-0.426 [0.958]	-5.561 [0.152]	-10.83 [0.511]
ln(Total Dividends (t))	0.083*** [0.000]	0.081*** [0.003]	0.088*** [0.000]	0.100*** [0.001]	0.118*** [0.000]	0.115*** [0.004]	0.114*** [0.001]	0.132*** [0.003]
Cash/assets (t)	1.673*** [0.000]	2.336*** [0.000]	2.224*** [0.000]	2.321*** [0.000]	3.826*** [0.000]	4.649*** [0.000]	4.524*** [0.000]	4.635*** [0.000]
Bonus / Salary (t)	0.095*** [0.001]	0.169*** [0.000]	0.129*** [0.001]	0.202*** [0.000]	0.130*** [0.000]	0.209*** [0.000]	0.169*** [0.000]	0.241*** [0.000]
ln(Tenure(t))	0.038 [0.250]	0.082 [0.101]	0.025 [0.514]	0.071 [0.191]	0.033 [0.490]	0.101 [0.172]	0.032 [0.547]	0.096 [0.213]
ln(CEO Age(t))	-0.141 [0.537]	-0.447 [0.191]	-0.352 [0.232]	-0.754* [0.060]	-0.46 [0.168]	-0.823 [0.102]	-0.812** [0.045]	-1.167** [0.040]
CEO%Own	0.103 [0.871]	-1.12 [0.268]	-0.063 [0.942]	-1.26 [0.305]	-0.105 [0.901]	-2.285* [0.090]	-0.461 [0.665]	-2.295 [0.134]
Inst%Own	0.061	0.082	0.049	0.121	0.184	0.203	0.14	0.17



Debt/Assets (t)	[0.508]	[0.539]	[0.727]	[0.541]	[0.163]	[0.288]	[0.464]	[0.533]
	-1.666***	-2.302***	-1.965***	-2.482***	-3.214***	-4.208***	-3.511***	-4.306***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
R&D/Sales(t)	-0.708**	-0.468	-0.238	-0.215	0.313	0.49	1.002	0.958
	[0.048]	[0.346]	[0.639]	[0.714]	[0.597]	[0.542]	[0.212]	[0.290]
FCF/Assets (t)	2.314***	2.832***	3.016***	3.052***	5.049***	5.696***	5.916***	5.995***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Industry FCF/Assets(t)	1.158	-1.41	1.089	-1.386	1.889	-1.234	1.73	-1.631
	[0.145]	[0.307]	[0.266]	[0.399]	[0.103]	[0.529]	[0.200]	[0.472]
Observations	18,319	7,034	13,099	5,623	18,329	7,048	13,109	5,634
R-squared	13.64%	16.94%	14.88%	18.05%	10.34%	11.54%	10.39%	11.72%

Table 6: Dividend-Repurchase Substitution

This table contains regression models that examine the relationship between CEO overconfidence and the substitution between dividends and repurchases. The dependent variable is the “unexpected” level of dividends, derived as per Equation (10). The models are OLS regression models that include year dummies and SIC two-digit industry dummies and clustered standard errors by firm. The appendix contains the detailed variable definitions. The significance levels at the 1%, 5%, and 10% are denoted by \*\*\*, \*\*, and \*, respectively.

Dependent Variable Column	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Confidence Options (t)	0.028*** [0.000]	0.043*** [0.000]	0.028*** [0.000]	0.045*** [0.000]				
Repurchases (t)	-0.001 [0.771]	0.008*** [0.007]						
Repurchases (t) x Confidence Options (t)		-0.028*** [0.000]						
Repurchases (t+1)			-0.002 [0.168]	0.007*** [0.005]				
Repurchases (t+1) x Confidence Options (t)				-0.030*** [0.000]				
Confidence Press (t)					0.044*** [0.000]	0.065*** [0.000]	0.045*** [0.000]	0.068*** [0.000]
Repurchases (t)					0.001 [0.674]	0.014*** [0.006]		
Repurchases (t) x Confidence Press (t)						-0.040*** [0.002]		
Repurchases (t+1)							-0.002 [0.277]	0.011** [0.012]
Repurchases (t+1) x Confidence Press (t)								-0.042*** [0.000]



Table 7: CAPEX-Repurchase Substitution

This table contains regression models that examine whether overconfident CEOs reduce CAPEX in order to repurchase stock. The dependent variable is the amount of CAPEX/Sales (multiplied by 100) in year  $t + 1$ . The models are OLS regression models that include year dummies and SIC two-digit industry dummies and clustered standard errors by firm. The appendix contains the detailed variable definitions. The significance levels at the 1%, 5%, and 10% are denoted by \*\*\*, \*\* and \*, respectively.

Dependent Variable Column	100 × CAPEX (t+1)/Sales (t+1)			
	[1]	[2]	[3]	[4]
Confidence Options (t)	5.000*** [0.000]	5.182*** [0.000]		
Repurchases (t)	0.760*** [0.007]		0.785** [0.045]	
Repurchases (t+1)		0.471* [0.094]		0.455 [0.286]
Confidence Options (t) x Repurchases (t)	-2.134*** [0.003]			
Confidence Options (t) x Repurchases (t+1)		-2.507*** [0.001]		
Confidence News (t)			6.554*** [0.000]	6.580*** [0.000]
Confidence News (t) x Repurchases (t)			-2.208* [0.066]	
Confidence News (t) x Repurchases (t+1)				-2.322* [0.072]
ln(Assets(t))	-0.125 [0.307]	-0.103 [0.412]	-0.072 [0.661]	-0.057 [0.733]
Stock Return (t)	0.446** [0.013]	0.413** [0.021]	0.777** [0.011]	0.803*** [0.008]
Stock Return S.D. (t)	-6.948 [0.499]	-9.967 [0.326]	-9.52 [0.588]	-11.564 [0.513]
Prop No Trade Days (t)	1.434 [0.574]	0.857 [0.826]	-2.33 [0.552]	-1.66 [0.724]
ln(Total Dividends (t))	-0.015 [0.879]	-0.021 [0.826]	-0.011 [0.922]	-0.014 [0.902]
Cash/assets (t)	-5.719*** [0.000]	-5.711*** [0.000]	-5.635*** [0.003]	-5.556*** [0.004]
Bonus / Salary (t)	0.16 [0.293]	0.157 [0.295]	0.181 [0.267]	0.196 [0.235]
ln(Tenure(t))	-0.099 [0.501]	-0.099 [0.507]	0.069 [0.748]	0.072 [0.738]
ln(CEO Age(t))	-2.312* [0.059]	-2.260* [0.069]	-3.399** [0.047]	-3.178* [0.068]
CEO%Own	6.718*** [0.002]	7.116*** [0.002]	6.697** [0.014]	6.673** [0.016]
Inst%Own	1.759*** [0.001]	1.762*** [0.001]	1.790*** [0.006]	1.805*** [0.005]
Debt/Assets (t)	2.213** [0.033]	1.839* [0.078]	3.105** [0.021]	2.841** [0.037]
R&D/Sales(t)	13.513*** [0.000]	13.455*** [0.000]	16.770*** [0.000]	16.926*** [0.000]
FCF/Assets (t)	-14.880*** [0.000]	-14.599*** [0.000]	-12.019*** [0.000]	-11.348*** [0.000]
Industry FCF/Assets(t)	-7.575** [0.023]	-6.661** [0.047]	-9.437** [0.047]	-8.179* [0.079]
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
Observations	18,690	18,297	7,131	7,037
R-squared	51%	51.2%	50.7%	50.8%

Table 8: CARs following Repurchases

This table contains regression models that examine the relationship between CEO overconfidence and CARs following the announcement of a repurchase. The dependent variable is the CAR between  $\tau_1$  and  $\tau_2$  as indicated in the column header. The models are OLS regression models that include year dummies and SIC two-digit industry dummies and cluster standard errors by firm. The appendix contains the detailed variable definitions. The significance levels at the 1%, 5%, and 10% are denoted by \*\*\*, \*\*, and \*, respectively.

CAR Window Column	[-5,200] [1]	[-5,250] [2]	[-5,300] [3]	[10,200] [4]	[10,250] [5]	[10,300] [6]	[-5,200] [7]	[-5,250] [8]	[-5,300] [9]	[10,200] [10]	[10,250] [11]	[10,300] [12]
ConfidenceOption(t)	-0.165*** [0.000]	-0.163*** [0.000]	-0.198*** [0.000]	-0.141*** [0.000]	-0.140*** [0.000]	-0.174*** [0.000]	-0.125* [0.074]	-0.219*** [0.007]	-0.273*** [0.003]	-0.108 [0.101]	-0.202*** [0.009]	-0.256*** [0.004]
ConfidencePress(t)												
ln(Assets(t))	-0.012 [0.102]	-0.013 [0.104]	-0.015 [0.106]	-0.009 [0.160]	-0.011 [0.155]	-0.013 [0.150]	0.012 [0.315]	0.006 [0.701]	0.013 [0.409]	0.013 [0.254]	0.006 [0.649]	0.014 [0.369]
ln(TotalDividends(t))	-0.001 [0.904]	-0.004 [0.474]	-0.004 [0.520]	0 [0.910]	-0.004 [0.457]	-0.004 [0.507]	-0.004 [0.617]	-0.003 [0.746]	-0.005 [0.606]	-0.002 [0.824]	-0.001 [0.934]	-0.003 [0.756]
Cash/Assets (t)	-0.094 [0.305]	-0.170* [0.100]	-0.19 [0.122]	-0.063 [0.448]	-0.139 [0.140]	-0.159 [0.165]	-0.232 [0.137]	-0.292* [0.078]	-0.273 [0.130]	-0.179 [0.198]	-0.24 [0.112]	-0.221 [0.191]
Bonus/Salary (t)	-0.010* [0.052]	-0.013** [0.047]	-0.019** [0.016]	-0.011** [0.028]	-0.014** [0.031]	-0.019*** [0.010]	-0.006 [0.489]	-0.002 [0.836]	-0.005 [0.661]	-0.008 [0.301]	-0.004 [0.632]	-0.007 [0.499]
ln(Tenure(t))	0.01 [0.308]	0.007 [0.538]	-0.002 [0.872]	0.01 [0.302]	0.007 [0.546]	-0.003 [0.836]	0.026 [0.137]	0.025 [0.195]	0.027 [0.213]	0.017 [0.289]	0.017 [0.368]	0.019 [0.377]
ln(CEO Age(t))	-0.003 [0.967]	-0.003 [0.970]	0.038 [0.674]	-0.013 [0.843]	-0.013 [0.863]	0.028 [0.745]	-0.104 [0.354]	-0.118 [0.343]	-0.127 [0.359]	-0.15 [0.164]	-0.164 [0.174]	-0.173 [0.203]
CEO%Own	-0.049 [0.800]	0.003 [0.988]	-0.032 [0.901]	-0.032 [0.863]	0.02 [0.933]	-0.016 [0.951]	-0.112 [0.802]	0.096 [0.856]	0.19 [0.746]	0.162 [0.695]	0.37 [0.461]	0.464 [0.411]
Inst%Own	0.028 [0.428]	0.029 [0.484]	0.051 [0.278]	0.034 [0.307]	0.035 [0.370]	0.058 [0.207]	0.055 [0.381]	0.092 [0.221]	0.135 [0.119]	0.106* [0.081]	0.142** [0.049]	0.186** [0.028]
Debt/Assets (t)	-0.092 [0.131]	-0.046 [0.511]	-0.032 [0.696]	-0.088 [0.118]	-0.042 [0.526]	-0.028 [0.722]	-0.151 [0.238]	-0.111 [0.433]	-0.078 [0.619]	-0.127 [0.274]	-0.087 [0.510]	-0.054 [0.721]
R&D/Sales(t)	0.117 [0.453]	0.168 [0.340]	0.325 [0.128]	0.139 [0.357]	0.189 [0.278]	0.346 [0.107]	-0.139 [0.518]	0.002 [0.993]	0.073 [0.816]	-0.03 [0.880]	0.111 [0.670]	0.182 [0.595]
FCF/Assets (t)	-0.041 [0.649]	-0.079 [0.443]	-0.067 [0.564]	-0.055 [0.516]	-0.093 [0.341]	-0.082 [0.466]	0.149 [0.288]	0.05 [0.767]	0.077 [0.705]	0.135 [0.341]	0.036 [0.831]	0.063 [0.757]
Ind FCF/Assets(t)	0.273 [0.446]	0.602 [0.138]	0.593 [0.205]	0.232 [0.494]	0.562 [0.149]	0.552 [0.220]	0.863 [0.332]	1.334 [0.184]	1.941* [0.094]	0.963 [0.254]	1.434 [0.142]	2.041* [0.073]
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,492	3,492	3,492	3,492	3,492	3,492	1,084	1,084	1,084	1,084	1,084	1,084
R-squared	9.20%	10.90%	12.70%	9.30%	11.20%	13.20%	19.80%	21.80%	23.10%	20.20%	22.30%	23.60%



Table 10: Propensity score restricted sample

This table contains regression models that restrict the sample based on propensity score methods, as described in Section 4.8.2. The column title states the dependent variable. The models in Columns 1-6 are Tobit models with a lower bound of zero and the models in Columns 7-10 are OLS regression models. All models include year dummies and SIC two-digit industry dummies and clustered standard errors by firm. The appendix contains the detailed variable definitions. The significance levels at the 1%, 5%, and 10% are denoted by \*\*\*, \*\*, and \*, respectively.

Dependent Variable	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
		$\ln(\$Repurchase)$		$\ln(\$Repurchase)$				Unexpected Dividends (t+1)		
Confidence Options (t)	0.523*** [0.000]		0.810*** [0.000]		0.958*** [0.000]		0.024*** [0.000]	0.022*** [0.000]		
Confidence Press (t)		0.951*** [0.000]		1.374*** [0.000]		1.251*** [0.000]			0.032*** [0.000]	0.031*** [0.000]
Confidence Options (t) x Cash/Assets(t)			-2.928*** [0.001]							
Confidence Press (t) x Cash/Assets(t)				-4.143** [0.017]						
Confidence Options (t) x Stock Return(t)					-1.829*** [0.000]					
Confidence Press (t) x Stock Return(t)						-1.606*** [0.000]				
Repurchases (t)							0.004 [0.110]	0.006 [0.119]		
Repurchases (t) x Confidence Options (t)							-0.012** [0.017]			
Repurchases (t+1)								0		0.002 [0.564]
Repurchases (t+1) x Confidence Options (t)								-0.007 [0.126]		
Repurchases (t) x Confidence Press (t)									-0.013* [0.099]	
Repurchases (t+1) x Confidence Press (t)										-0.009 [0.195]
Stock Return (t)	0.185** [0.010]	0.273** [0.025]	0.201*** [0.005]	0.278** [0.022]	0.795*** [0.000]	0.794*** [0.000]	0.018*** [0.000]	0.018*** [0.000]	0.015*** [0.000]	0.015*** [0.000]
Cash/assets (t)	3.465*** [0.000]	4.076*** [0.000]	4.575*** [0.000]	5.611*** [0.000]	3.557*** [0.000]	4.108*** [0.000]	0.01 [0.405]	0.01 [0.361]	-0.012 [0.603]	-0.011 [0.626]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,709	16,709	16,709	16,709	16,709	16,709	16,710	16,710	16,710	6,438
R-squared	7.42%	8.67%	7.44%	8.70%	7.54%	8.72%	22.60%	22.60%	25.50%	25.50%

Table 11: Fama-Macbeth regressions and firm/year panel regressions

This table contains Fama-Macbeth regressions (Panel A) and firm/year panel regressions (Panel B). The column title states the dependent variable. All models include fixed effects as stated in the table footer, and include control variables as per the main models (which are suppressed for brevity). The appendix contains the detailed variable definitions. The significance levels at the 1%, 5%, and 10% are denoted by \*\*\*, \*\*, and \*, respectively.

Dependent Variable	ln(\$Repurchase)		Unexpected Dividends (t+1)	
<b>Panel A: Fama-Macbeth Regressions</b>				
Confidence Options (t)	0.418*** [0.000]	0.704*** [0.000]	0.569*** [0.000]	0.038*** [0.000]
Confidence Press (t)	0.451** [0.017]	0.787*** [0.002]	0.727*** [0.003]	0.058** [0.028]
Confidence Options (t) x Cash/Assets (t)		-3.016*** [0.000]		
Confidence Press (t) x Cash/Assets (t)		-3.259*** [0.002]		
Confidence Options (t) x Stock Return (t)				
Confidence Press (t) x Stock Return (t)			-1.027** [0.034]	
Repurchases (t)				0.007* [0.058]
Repurchases (t) x Confidence Options (t)				-0.023*** [0.002]
Repurchases (t+1)				0.004* [0.071]
Repurchases (t+1) x Confidence Options (t)				-0.023*** [0.001]
Repurchases (t) x Confidence Press (t)				-0.037* [0.062]
Repurchases (t+1) x Confidence Press (t)				-0.039** [0.031]
Stock Return (t)	0.189* [0.065]	0.217** [0.027]	0.429*** [0.000]	0.017** [0.032]
Cash/assets (t)	2.405*** [0.000]	3.615*** [0.000]	2.413*** [0.000]	0.016 [0.039]
Controls	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	18,329	18,329	18,329	18,330
R-squared	36.40%	36.70%	36.60%	35.20%
<b>Panel B: Firm, Year Panel Fixed Effects</b>				
Confidence Options (t)	0.346*** [0.000]	0.552*** [0.000]	0.541*** [0.000]	0.036*** [0.000]
Confidence Press (t)	0.287** [0.037]	0.292* [0.094]	0.378*** [0.008]	0.066*** [0.000]
Confidence Options (t) x Cash/Assets (t)				
Confidence Press (t) x Cash/Assets (t)		-0.041 [0.967]		
Confidence Options (t) x Stock Return (t)				
Confidence Press (t) x Stock Return (t)			-0.451** [0.024]	
Repurchases (t+1)				0.008*** [0.001]
Repurchases (t+1) x Confidence Options (t)				-0.020*** [0.000]
Repurchases (t) x Confidence Press (t)				0.003 [0.134]
Repurchases (t+1) x Confidence Press (t)				-0.022***



