國立政治大學財務管理研究所

碩士學位論文

經理人自信程度與公司績效

The confidence level of CEOs and the performance of firms

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謝　誌

摘　　要

Anand M. Goel and Anjan V Thakor 於最近的財務學刊中提出理性且風險趨避的經理人會放棄部分正報酬但風險高的投資，造成投資不足問題，使得公司價值未能極大化。然而，極端過度自信的經理人投資正負報酬皆有的計畫，造成過度投資，使得公司價值遞減。只有中度自信的經理人能為公司價值帶來極大化效果。本篇研究採用台灣上市櫃公司近二十年資料，以公司經理人對公司持股的變化來衡量其過度自信的程度，探討公司經理人自信程度對公司獲利能力與公司價值的影響。實證研究發現，極端過度自信的經理人與極端保守的經理人使公司的績效與成長性減少，降低公司價值。此研究增加我們了解經理人自有特徵對公司價值的影響，並為公司理財課題帶來新的貢獻。

關鍵字：過度自信、公司績效、高階經理人持股變化

Abstract

Former literature theorized that excessively overconfident CEOs and excessively diffident CEOs reduce the firm value for underinvestment and overinvestment problems and moderate overconfident CEOs willing to take risky but positive NPV projects increase the firm value. This paper conducts an empirical research by using the change of purchase and sale on own company stocks took by CEOs to measure CEO overconfidence level in Taiwanese listing companies and find that the profitability and stock performance of firms led by excessively overconfident CEOs and excessively diffident CEOs decrease compared to by moderate overconfident CEOs. The result contributes to the understanding of the impact on firm valuation by CEO idiosyncratic characteristics and offers new evidence to behavior finance on corporate management.

Keywords: Excessively overconfident, Excessively diffident, Firm value, CEO shareholding.

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I.   Introduction

Former literature theorized firm value is higher with a moderately overconfident CEO than a rational risk adverse CEO. However, an extremely overconfident CEO decreases firm's value (e.g., Anand M. Goel and Anjan V. Thakor (2008)). I demonstrate the theory by conducting the research on the relationship between managers' confidence level and firms' valuations and stock market performances and find out the equation do exist.

Self-attributed bias, both in terms of "better than average effect" and "narrow confidence intervals" (Larwood and Whittaker (1997); Kidd (1970); Moore (1977)), is a prevalent characteristics in executives. In Malmendier and Tate (2005), overconfident CEOs are defined tend to overstate their acumen relative to the average and attribute good outcome to their success but bad outcomes to bad luck. Thus, they are too optimistic about the outcomes of their decision. Goel and Thakor (2008) review overconfident CEOs overestimate the precision of their information and underinvest in information acquisition. I follow the theory and model proposed by Goel and Thakor to hypothesize that the value of companies led by excessively overconfident CEOs and excessively diffident CEOs reduces and then make an empirical research on their new classification of CEO's confidence and the influence on firm value.

It has not been discussed until recently that personal behavior led by irrationality has vital influence on individual investment and financial management in academy. Furthermore, there are quite many literatures researching on the relationship between overconfident managers and corporate strategies in the recent decade but quite few papers studied the influence of CEO confidence level on firm performance directly. Also the former study results on corporate strategies are mixed and ambiguous.

Malmendier and Tate (2005) are precursors examining and discovering the personal characteristics of CEOs lead to distortion in corporate investment policies. They found overconfident managers have a heightened sensitivity of corporate investment to cash flow: they conduct more merger and acquisitions thus exacerbate the company's value without financial constraint. Hirshleifer, Low, and Teoh (2010) and Mueller (2009) certified that overconfident CEOs overcome investment constraints and achieve greater returns and innovation. The former mixed results make the theory grow scattered.

Goel and Thakor (2008) address new distinction within CEO confidence and its different impact on corporate strategies and firm performance. Under the optimal compensation, a rational, risk-adverse CEO forego some positive NPV but risky projects to shareholder profit maximum since increasing project risk increases the risk of the wage making CEO considered to be conservative without promotion concerns, causing underinvestment. However, a moderate overconfidence approaching to risk neutral reduces the underinvestment problem, leading value enhancing by exercising the risky but positive NPV projects. As CEO's overconfidence increases, he/she is willing to invest in portfolios that have low probabilities of the high payoff and produce smaller marginal increases in shareholders' wealth. Firm value increases with CEO overconfidence at a decreasing rate up to a point and eventually declines as overconfidence cause accept value destroying project leading to non-monotonic impact. In the same time, Hackbarth (2008) develops a trade-off model of capital structure decision and certified that overconfident CEOs commit cash flows to debt thus reduce suboptimal investment and agency problem to increase firm value. Excessively overconfident CEOs commit too much cash flow to debt payments, creating the debt overhang issue thus reduce firm value. Above models develop a non-monotonic relation between CEO confidence level and firm value.

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I hypothesize that CEOs who display excessive overconfidence and CEOs who display excessive diffidence cause firm performance declining. The sample consists of all CEOs in firms registered in Taiwan Stock exchange and Over-the-Counter from Taiwan Economic Journal database into three confidence level: excessive overconfidence, moderate overconfidence, and excessive diffidence. Wright and Philip (1980, 1978) discovered that Asia subjects are more overconfident than western subjects and the success of Taiwan exporting processing business is well-known makes me choose to study the behavior of Taiwanese managers.

I applied Net Stock Purchases proposed first by Malmendier and Tate (2005) and applied by Campbell, Johnson, Rutherford, and Stanley (2009) as the measure of confidence. As a CEO purchases his own company stock, he is considered confident on firm prospect under his leadership making him to use own money to buy the company stocks. Otherwise CEO is considered diffident or conservative on future return when he sells the company stocks. Different from Campbell et al. (2009), the measure is modified by setting several cutoffs to classify CEO confidence level but not just focus on a specific cutoff to understand the effect on firm profitability and stock performance. By classifying top (bottom) 40%, 30%, 20%, and 10% end of continuum of the distribution of Net Stock Purchases by all CEOs in a given year as excessive overconfidence (excessive diffidence), I testify the influence of CEO confidence on firm value when approaching to the extreme end of continuum.

Besides a simple calculation on the change of shares held by CEO, the activities such as pledge are needed to be considered in the calculation since it is popular among CEOs in Taiwan to avoid making an adverse signal from selling company stocks directly. The distribution of stock dividends and employee bonus as stock also affects the change of net stock purchases as these kinds of compensation are also general in Taiwan companies. After considering the pledge and stock dividends, the

measure of excessive overconfidence could be retrieved stronger and purer; nevertheless, the measure of excessive diffidence becomes biased much more for liquidity-motivated sale needs. When examining the results, those of Net Stock Purchases excluding stock dividends after pledge as excessive overconfidence measure and of Net Stock Purchase as excessive diffidence measure are emphasized.

My results strongly support Goel and Thakor's prediction and the hypothesis that firm value decreases when excessively overconfident CEO or excessively diffident CEO is in charge. Industry-adjusted Tobin's Q, ROA, and ROE are the proxies of firm probability. From the study, excessively overconfident CEOs measured by Net Stock Purchases excluding stock dividends after pledge are adverse to firm profitability and the adverse effect enlarges when closing to the top extreme end of e continuum: Q in excessively overconfident CEO firms by top 10% cutoff is 113% less than in moderate overconfident firms, ROA is 452% less, and ROE is 148% less. The excessively diffident CEOs measured by Net Stock Purchases are also adverse to firm value significantly though non-monotonic as close to the bottom end of continuum: Q in bottom 10% cutoff excessively diffident CEO firms is 27% less than in moderate overconfident firms, ROA is 164% less, and ROE is 47% less. As the results shown, the adverse effect on firm profitability is stronger in excessively overconfident CEO firms than in excessively diffident CEO firms.

I also identify the effect on stock performance by excessively overconfident CEOs firms and excessively diffident CEO firms and found that excessively overconfident and diffident CEOs measured by Net Stock Purchases excluding stock dividends after pledge are adverse to the company stock performance as compared to moderate overconfidence. From performance-attribution regression, the abnormal returns in excessively overconfident CEO portfolio and excessively diffident CEO portfolio are significantly negative more than that in moderate overconfident CEO

portfolio though the adverse effect is non-monotonic and reduced when approaching to the extreme cutoff. From Fama-Macbeth Regression, the adverse effect of excessively overconfident CEOs are significantly at 10% in the top 40% and 30% cutoffs of the distribution and the trend is downward: Stock return from top 40% end to 30% end excessively overconfident CEO firms is 68% less to 89% less than in moderate overconfident CEO firms. The adverse effect of excessively diffident CEOs are significantly at 1% in bottom 30% end of the distribution: Stock return in bottom 30% excessively diffident CEO firms is 112% less than moderate overconfident CEO firms. However, the pattern is not clear and the significance of excessively overconfident CEOs and diffident CEOs is smaller than Q, ROA, and ROE, manifesting that the personal characteristics of CEOs though do have some adverse impact on stock return but not a main driver in all round manner.

My results extend the literature on the influence of CEO overconfidence on firm value. Although there is a lot of literature discussing the relation between CEO overconfidence and firm's investment and financing activities, there is few to empirically study the effect on firm performance directly. My research directly reviewed the most important affair we care in investment and corporate management. We could make more sound investment and management when possibly discerning what factors influence firm value and applying good ones and disposing bad ones. As above, the impact from the characteristic of CEO, overconfidence and diffidence specifically, on firm value and performance is consistent with Goel and Thakor's and Hackbarth's theory. Also from the research CEO compensation may unable to completely offset suboptimal levels of managerial overconfidence proposed by Gervais, Heaton, and Odean (2007). So far there is no one discussing the relationship between CEO confidence and firm value by applying their new classification on confidence level of CEOs as I know. The measure of overconfidence by dividing

sample to excessive overconfidence and excessive diffidence as dynamic cutoffs on the distribution of their net stock purchases helps understand how excessively overconfident CEOs and excessively diffident CEOs are detrimental to the company. Finally, my research is quite comprehensive as considered the contingent factors such as stock pledge activities and/or stock dividends that will influence our confidence measure in Taiwan. Without considering those activities prevailing in Taiwan business market, the results may be bias and imprecise as conduct.

According to my research, there is some ambiguity needed to be solved or further defined. On the dimension of corporate finance, the future research could examine why the effect of excessive diffident CEOs on firm value is non-monotonic, which is the reason why the more extreme diffident CEOs are not harm the company that much. On the dimension on asset management, the further research could be conducted on the reason why there is no clear pattern when approaching to the extreme end of overconfidence and diffidence on stock performance and the results are less significant especially after proving that excessively overconfident CEOs and excessively diffident CEOs adversely affected the company profitability if the market is efficient. The questions are investors smart to sense the CEOs' characteristics and do they know the impact may be interesting extension in the future work.

The remainder of the paper is organized as follows. Section Ⅱ retraced some related literature and set up my hypothesis. Section Ⅲ describes the measures of excessive overconfident, moderate overconfidence, and excessive diffident, and the alternative explanation on the measure. In section Ⅳ, I elaborate sample data and statistic summary. At last, I presented the empirical results of firm profitability and stock performance influenced by CEO confidence level in section Ⅴ and made a conclusion in Section Ⅵ.

II. Literature review and hypothesis

Malmendier and Tate (2005) are precursors examining and discovering the personal characteristics of CEOs lead to distortion in corporate investment policies. Their paper studied on unique option dataset clarifying the exact strike price, the maturity, and number of underlying shares from 477 large publicly traded US firms from 1980 to 1994 and found overconfident managers overestimate the returns to their investment projects and have a heightened sensitivity of corporate investment to cash flow. They implied that overconfident CEO feeling undervalued by capital market and thus reluctant to issue risky securities to finance his project. So an influx of cash would enable overconfident CEO to undertake these forgone projects. In their research, overconfidence of CEOs helps to explain the "investment-cash flow sensitivity puzzle" in the corporate finance literature.

Malmendier and Tate (2005b) also provided the related evidence on real effects of overconfidence: In the absence of financial constraint, overconfident CEOs conduct more merger and acquisitions thus exacerbate the company's value. Mueller (2009) certified that corporate investment is positively related to free cash flows to the firms and overconfidence attributes to corporate investment variation along the business cycle: significant effect on higher corporate investments in early expansion phase, in upswing phase of the business cycle lead to overcome investment constraints, to bring corporate investment to optimal level and achieve positive returns. Ben-David, Graham, and Harvey (2007) show the evidence that managerial overconfidence is associated with aggressive corporate policies, including investments, financing and executive compensation. Hirshleifer, Low, and Teoh (2010) studied the overconfident CEO to innovation activities by examining the applied patent count and patent citation count, discovering that firms with overconfident

CEOs have greater return volatility, invest more in innovation and achieve greater innovation than non-overconfident managers only in innovation industries without inferior performance. From above, the former empirical studies presented differentiated and conflict results making me wonder the actual effect on firm value.

Goel and Thakor (2008) address further new distinction within overconfidence and its different impact on corporate strategies and performance. Their definition of overconfidence is related to the manager overestimates the precision of the forecast of the project payoff by overestimating the precision of the project signal. In their research, rational ability filtering process inside firm's promotion mechanism chooses the highest perceived ability manager. However, managerial ability cannot be observed and firms promote managers with the highest realized returns from the project. To show one's ability up, the managers take riskier projects to win the filtering tournament and believe the higher risk project presents their profound abilities than others. Thus confident managers have been selected and the characteristic also has been raised and strengthened through the promotion hierarchy. Then, a board of directors in a company selects qualified CEO from a small group of bias managers (overconfident managers) and appoints the one with highest perceived ability. In the whole process, the overconfident manager stands out in the process when competing with otherwise rational managers. Graham, Harvey, and Puri (2010) demonstrated that overconfident is prevalent attribute among CEOs than in the lay population.

Goel and Thakor then considered that board offers the CEO payoff-contingent compensation to incent him/her to develop an accepted portfolio at a personal cost. Under the optimal compensation, a rational, risk-adverse CEO forego some positive NPV but risky projects to shareholder profit maximum since increasing project risk increases the risk of the wage or even reduces the mean wage making CEO

considered to be conservative without promotion concerns, causing underinvestment. However, a moderate overconfidence approaching to risk neutral reduces the underinvestment problem, leading value enhancing by exercising the risky but positive NPV projects. Moderately confident CEO also caps the cost of compensation package down because he/she regarded himself destined to maximize the shareholders' profit so the inspiration activities lessen but maintain the effects. As CEO's overconfidence increases, he/she is willing to invest in portfolios that have low probabilities of the high payoff and produce smaller marginal increases in shareholders' wealth. Firm value increases with CEO overconfidence at a decreasing rate up to a point and eventually declines as overconfidence cause accept value destroying project leading to non-monotonic impact.

Gervais, Heaton, and Odean (2007) find CEO overconfidence naturally realigns his incentives with those of shareholders and as a result less convexity is required in compensation for him to make firm value increasing. Moderate levels of overconfidence lead firm to offer flatter compensation contracts providing with better insurance and resolve moral hazard problems with executive compensation and thereby enhancing firm value. Hackbarth (2008) develops a trade-off model of capital structure decision in which CEOs can have some degree of overconfidence. He certified that overconfident CEOs underestimate the risk associate with debt and commit larger amounts of cash flows to fixed payment thus reduce the ability of the CEO to make suboptimal investment and conflict between manager and shareholders enough to increase firm value. Excessively overconfident CEOs commit too much cash flow to debt payments, which increases bankruptcy risk and creates the debt overhang issue. Therefore, the expected costs of debt may exceed the benefits of debt in reducing managerial discretion and thereby lead to lower firm value. All leads to a non-monotonic relation between CEO overconfidence and firm value.

My confidence foundation is centered on the model proposed by Goel and Thakor (2008) and the hypothesis that CEOs who display excessively overconfident and CEOs who display excessively diffident reduce the firm performance.

III. Measures of CEO's confidence level

3.1 Measures of excessive overconfident, moderate overconfidence, and excessive diffident

Measuring CEO confidence level is quite difficult empirically because it cannot be observed directly thus the relative researches are conducted until recently. Malmendier and Tate (2005) take company stock-option as the measurement of the overconfidence. As CEOs persistently exercise options later though deep in the money, they are inferred to be overconfident in their abilities to keep companies' stock prices rising and then get profits from expected return by holding the options. In the same time, they take firms' equity increase by CEOs as the proxies of overconfidence since they underdiversified their investment in the company with their human capital. Malmendier and Tate (2008) developed a measure based on the CEO's portrayal in the media. Catherine and Zechman (2007) use the investment decisions of the firm or industry as overconfident CEOs might be attracted by riskier firms. Lin, Hu, Chen (2008) use the predictions made by the executive with regards to the firm's future prospect. Overconfident CEOs would release better than realized revenues since they overestimate their ability on firms' future prospects. Ben-David, Graham, and Harvey (2008) use detailed survey-response data on future market prospect to classify chief financial officers' overconfidence.

To construct the measure of overconfidence, I exploit the overexposure of typical

CEOs to the idiosyncratic risk of the firms. Since the value of their human capital is intimately linked to the firm's performance, the underdiversified CEOs should avoid acquiring additional equity, leading to classify CEOs who habitually increase their holdings of company stock as overconfident. CEOs believe their leadership more than they objectively should expect by overestimating the future returns of their investment projects, resulting in even buying additional company stock to benefit personally from expected future gains. The measure of overconfidence conducted by Malmendier and Tate (2005) is Net Stock Purchase units (purchase minus sales). They define a CEO as overconfident if the net purchases measure is positive over the first five years of ten or more tenure in the sample period. Campbell, Johnson, Rutherford, and Stanley (2009) further classified CEOs as excessively overconfident (diffident) if in a given year the net stock purchase number are in the top (bottom) quintile of the distribution of net purchases ranked by all CEOs and those purchase increases (decreases) ownership by at least 10% of their stock ownership in the firm. Rest of the CEOs not classified is classified as moderately overconfident.

As the purpose is to testify excessively overconfident CEOs and excessively diffident CEOs actually reduce the firm value, I use the progressive method to examine the influence of excessively overconfidence and diffidence. By applying the method proposed by Campbell et al. (2009), I classify the level of confidence of all CEOs in a year into three groups: excessive overconfidence, moderate overconfidence, and excessive diffidence. The upper end of continuum of the distribution of Net Stock Purchases would be defined as excessive overconfidence level as CEOs bought more firm share among all CEOs in a given year indicating he might overestimate the future value of own company under his leadership thus purchased relatively more shares of the company stocks than other CEOs. Contrarily, the bottom end of continuum of the distribution of Net Stock Purchases is defined as excessive diffidence indicating

CEOs bought less even sold firm's shares among all CEOs in a given year showing the CEOs might underestimate the future firm value due to conservatism thus reduce the more shareholding of his own company than other CEOs. The middle range of the distribution not classified as excessive overconfidence and excessive diffidence is defined as moderate overconfidence.

Difference from Campbell et al. (2009)'s method, the several cutoffs are set to classify CEO confidence level help examine the effect of confidence level on firm performance. By narrowing down the cutoffs from top 40%, 30%, 20%, to 10% of the distribution of Net Stock Purchases by all CEOs in a given year, CEO's overconfidence preference would be intense; in the same way, CEO's diffidence preference would be intense by narrowing down the cutoffs from bottom 40%, 30%, 20%, to 10% of the distribution of Net Stock Purchases by all CEOs in a given year. The dynamic examination could help understand the influence of CEO's confidence level thus demonstrate whether the characteristics of CEOs have the vital influence on the company. The advancing test avoids setting a restriction on CEO's ownership but still could understand the influence from CEO's overconfidence level on firm value.

As the sample restricted in Taiwan listing companies, distributing stock options is not a common compensation method in all industries such as food, retail, and cement. Also unlike the measure problem based of stock options such that some CEOs who have all of their options out of money or have no options at all in a given are not be classified, we classify all CEOs in our full sample. However, employee bonus as stock distributed by the companies every year is a kind of prevalent compensation method in Taiwan to reward for management team resulting in the change of shareholding of company stocks by CEOs. Also Taiwanese companies often distribute stock dividends per year to shareholders to make a positive signal generally thus CEOs who has company stocks would also get many stock dividends influencing the

change of shareholding in a year. Therefore, some stock purchases are related to stock dividend acquisition. In constructing an indicator of CEO confidence, there are potential advantages and disadvantages to including these. If CEOs who get the dividends but not sell immediately in the year lead to the increase of net purchase unit, it might express the CEOs consider the stock price could rise up to the level they optimistically expect manifesting their optimistic expectation on future firm value. While calculating Net Stock Purchase excluding the stock dividend could extract purer overconfidence level of CEOs since the CEOs must have high level of confidence to the outlook of the company making them to purchase company's shares besides the stock dividends. In sum, the measure of Net Stock Purchase including the stock dividends could show the confidence level of CEOs while that excluding stock dividends shows much stronger evidence on CEO overconfidence.

Besides stock dividends, I construct separate measures considering the effect of pledge. Pledge could be considered a widespread method to sell company stocks by CEOs in Taiwan because they could transfer the stocks to the third parties usually banks getting the money but prevent from making a negative signal when selling shares directly. If a CEO were set more own stock as pledge, CEO may be considered take conservative idea on company's outlook. As CEOs reduced the pledge level, it would be considered having more confidence on future firm value making them to hold the company stocks to the expected condition. However, in same conditions it may be considered CEOs sense the stock reaching the selling point making them redeem the pledged shares and sell in the market in the same time. Rather than trying to resolve whether inclusion or exclusion of such pledge activities is best, I construct separate measures including and excluding the pledge related transactions. However, after considering the stock dividends and pledge took by CEOs, personal liquidity-motivated sale needs let the excessively diffident sample biased to positive

effect on firm value since misperceiving liquidity-motivated sales as excessive diffidence introduces measurement error.

As Campbell et al. (2009), I tighten the classification rules to stress the persistency of the behavior, besides applying the confidence classification to every CEO every year in the sample. If the years of a CEO classified as excessively overconfident are more than half of tenure within the sample and he had never been distributed to excessively diffident, the classification keeps going forward. Contrarily, if the years of a CEO classified as excessively diffident are more than half and had never been distributed to excessively overconfident, the classification keeps going forward.

One may argue that CEO actions underlying my overconfidence measure are endogenously related to selection and/or retention on CEO position boards made. Boards may even take overconfidence into account in choosing a CEO. However, endogeneity does not affect the adverse influence on corporate performance.

3.2 Alternative Explanation

Consider some alternatives explanation on the measure of overconfidence:

1) Inside information. A CEO may not decrease exposure to company risk even increase because of private information about future stock prices. Since the information has not been incorporated into the market price, the firm's stock is undervalued being attractive.

   The key distinction between overconfidence and information is persistence. Information is likely to be short term and transitory. The short term effect on positive information is unlikely that the same CEO would repeat buy the stocks. While the characteristic of extreme overconfidence and diffidence maintains persistently on CEO. Moreover, the factor leading CEO to purchase additional

company stock still affects the company performance in a disjoint future time period. However, the return of stock prices does not enhance, actually the average return of the company forward one year led by overconfident CEOs are minus 5% around but that of full sample is minus 2%, and the return forward one month led by overconfident CEOs is as same minus 2% as that of full sample, showing that inside information is not the reason why the CEO increase the company's stocks.

2) Signaling. CEO may hold company risk is to convey a costly signal to capital market that the firm's prospects are better than the prospects of similar firms. However, this would not inspire them to increase company exposure by purchase additional company shares, just remain the same shareholdings.

3) Risk tolerance. One might said my measure of overconfidence as measure of risk attitude. However, CEO would not habitually buy additional stocks of his company as high risk tolerance and would need to be risk seeking but justified high investment – cash flow sensitivity to overconfidence (Malmendier and Tate (2005)) should not be in the same case. Any level of overconfidence no matter within risk-neutral or risk loving will lead to excessive risk and reduce firm value (Goel and Thakor (2008)). There are already a lot of empirical evidence saying managers are risk adverse (Grund and Sliwka (2006), Khambata and Liu (2006), Suto, Menkhoff, and Beckmann (2005)). However, firm value decreases monotonically in CEO risk aversion, while overconfidence affects shareholder wealth non-monotonically when CEOs are risk aversion. As risk aversion decreases, the cost of bearing risk decreases, because it enables contracts with greater payoff-dependence and better incentives, and is being cheaper for the shareholders to incent the CEO to accept good portfolios, thus increasing the firm value. In addition, overconfidence exerts an independence effect on outcomes. Grinblatt and Keloharju (2006) find that overconfidence has a large effect on

investors' decisions on trading but this is not driven by risk aversion difference. Barber and Odean (2001) document men trades with greater overconfidence than women but not risk aversion level.

4) Procrastination. Inertia on CEOs' personal account my carry over to the corporate account of the firm in a reluctance to conduct equity issues so CEO should not habitually purchase company equity under my measure.

5) Tax consideration: Jin and Kothari (2008) find the tax burden is a major factor inducing CEOs to sell stocks. However, there is only security trading taxes levied by trading stocks in our sample Taiwan market reducing the tax problem. Moreover, to purchase a stock would also be taxed over showing the confidence level of the CEOs.

IV. Sample description and summary statistics

4.1 Sample

The sample is selected from public traded Taiwanese companies listing on Taiwan Stock Exchange (TSE) and Over-the-Counter (OTC) market. Since Wright and Philip (1980, 1978) discovered that Asia subjects are more overconfident than western subjects and the success of Taiwan exporting processing business is well-known makes me choose to study the behavior of Taiwanese managers. To measure a persistent characteristic on CEOs, I first collect CEOs shareholding data of their own companies from 1990 to 2010 from the Taiwan Economic Journal (TEJ), a special complete Taiwan database, and compute the Net Stock Purchase every year every CEOs in every firms. TEJ also consist CEOs' pledge activities and employee bonus as stock dividends distribution statements. As distributed stock dividends for

shareholders each year in each firm, they are computed by announced stock dividends per share multiplying the original shares got by CEOs. There are 11,802 total CEO-year observations over a maximum time period of 20 years for any individual CEO.

The financial information of the companies, including sales revenues, research and development expense (R&D), book assets, book common stocks, deferred taxes, earnings before interest and taxes and depreciation and amortizations, and cash dividends are from TEJ- Finance DB. The stock price, return, shares outstanding and institutional ownership are from TEJ- Equity DB. The personal data of CEO and basic information of companies are from TEJ- Company DB. The factor premium data of equity market are from TEJ- Multiple equity factor DB. Excluding the missing data for any of the above measures yields a sample of 10,258 CEO-year observations across 1,217 firms over a maximum of 18 years for any individual CEOs.

4.2 Statistic Summary

Table1 presents summary statistics for the confidence measure. Panel A of Table 1 contains the results where the units and the percentage of excessively overconfident and excessively diffident CEOs measured as top and bottom 20% cutoff of distribution of Net Stock Purchase is a CEO-firm-year and Panel B contains the results where the units and percentage of excessively overconfident and excessive diffident CEOs is a CEO-industry.

As shown in Panel A, the average of frequency of excessive overconfident CEOs in fiscal years is 25% measured by Net Stock Purchases (EO_raw), 26% measured by Net stock purchases after pledge (EO_pledge), 29% measured by Net stock purchases excluding stock dividends (EO_div) and 30% measured by Net stock purchases excluding stock dividends after pledge (EO_pledge& div). The average of frequency

of excessive diffident CEOs in fiscal years is 48% by Net stock purchases (ED_raw), 43% by Net stock purchases after pledge (ED_pledge), 33% by Net stock purchases excluding stock dividends (ED_div), and 28% by Net stock purchases excluding stock dividends after pledge (ED_pledge& div). Despite the fact that we use upper and lower quintile cutoffs to define excessive overconfidence and excessive diffidence respectively, the resulting sample distribution should not necessarily be 20% each because the quintile breakpoints are computed using CEO-year observations each year but the excessive overconfidence (diffidence) would remain forward unless they are be classified to opposite group. From the panel, excessive overconfidence persists more in Net stock purchases excluding stock dividends after pledge (EO_pledge& div) than in rest measures since the average frequency deviates largest from quintile cutoff, certifying that the purer trait of CEO's overconfidence is measured out. However, the trait of CEO's diffidence is blurred by liquidity-motivated sale bias when the measure considers stock dividends and pledge, resulting in excessive diffidence persists more in Net stock purchases. While compared the frequency of excessive diffidence to of excessive overconfidence, higher frequency of excessive diffidence may indicate the sample is biased to moderate overconfident group, making the results may also bias.

In panel B, Taiwanese listed companies are divided into 26 industry groups based on Taiwan Stock Exchange's classification and found out that excessively overconfident CEOs are higher in Electronics industry: 14% in Electronic Components, 13% in Semiconductors, and 11% in PC Electronics and excessively diffident CEOs are higher in Traditional industry: 9% in Textile and 7% in Construction. As we know, riskier industries such as electronics need overconfident CEOs to take more risk in investment thus attract overconfident CEOs to do the job.

Table 2 shows the summary statistics of sample firm and CEO characteristic on firm profitability as industry-adjusted Q, ROA, and ROE. Panel A shows the mean,

median, standard deviation, minimum, and maximum of full sample, Panel B shows that of excessively overconfident and excessively diffident CEOs sample measured by Net stock purchases, Panel C shows that of those measured by Net stock purchases after pledge sample, and Panel D shows that of measured by Net stock purchases excluding stock dividends after pledge. Considering the different characteristic existing in different level of excessive overconfidence and excessive diffidence, Rows 1 show the statistics of excessive overconfident and diffident CEOs by top and bottom 40% end of the distribution of Net stock purchases and rows 2 show those by top and bottom 10% end. As shown in Panel A, B and C, the means and medians of Q, ROA, and ROE in excessively overconfident CEO sample are statistically over than those in excessively diffident CEO sample and full sample, so as Sales, R&D, and CEO ownership and Firm age is smaller, manifesting that excessively overconfident CEOs are centered in young companies help value creation consistent with Mueller's predictions but excessively diffident CEOs reduce the profitability same as Goel and Thakor's prediction.

In addition, profitability measure decreases when approaching to the extreme end top 10% of the continuum, certifying the prediction that more extremely overconfident CEO reduce firm profitability, but the situation does not exist in excessively diffident CEO firms. However, the means and medians of Q, ROA, and ROE in excessive overconfident CEO firms in Panel D are lower than those of Q, ROA, and ROE in full sample and in excessively diffident CEO sample, showing that excessively overconfident CEOs might harm the company after using stricter measure on overconfidence classification. Nevertheless the results of excessively diffident CEO sample in Panel D are affected by liquidity selling problems.

Table 3 presents the summary statistics of sample firm and CEO characteristic on stock performance and related control variables. Panel A, B, C and D of Table 3 are

defined as same as Table 2. The total stock return of excessively overconfident CEO firms is worse than of full sample in all confidence measure method indicating that excessively overconfident CEO may let the company value go down but the effect seems lessen when approaching to the extreme cutoff. Contrarily, the total return of excessively diffident CEO firms is higher than of full sample maybe due that the excessively diffident CEOs are not really diffident as the measure is bias by liquidity-motivated sale activities. However, the trend is going down when approaching to the extreme cutoff, showing the extremely diffident CEOs make the value downward moving. In addition, excessively overconfident CEOs are centered in growth-oriented companies with lower book-to-market value, higher market value, and younger firms.

To understand the difference among my four measures of confidence level: Confidence including stock dividends (confidence raw), Confidence including stock dividends after pledge (confidence pledge), Confidence excluding stock dividends (confidence div), and Confidence excluding stock dividends after pledge (confidence pledge& div), a correlation of four measures by top and bottom 20% cutoff is described in Table 4. As shown in table, the difference among four measures enlarged after considering stock dividends. Moreover, higher correlation among excessive overconfidence measures than excessive diffidence manifests CEOs have different consideration between purchases and sales of firm stocks.

Table 5 reports the correlation of excessive overconfidence, excessive diffidence and profitability measure and other related control variables. As shown in the tables, industry-adjusted Q, ROA, and ROE have certain positive correlation as same as finance theories. Confidence measure no matter excessive overconfidence or excessive diffidence does not have significant correlation with other variables. Excessive overconfidence measured including stock dividends no matter before or

after pledge are positive to the profitability but excessive diffidence negative while that measured considered stock dividends are reverse consistent the results from statistics summary. Sales and R&D are positive correlated with Q, ROA and ROE and firm age are negative. Table 6 also reports the correlation of excessive overconfidence, excessive diffidence and stock performance and other related control variables. Between the excessive overconfidence and excessive diffident, the total return is negative correlated with excessive overconfidence but positive with excessive diffidence no matter before or after pledge but excessive overconfidence and excessive diffidence are all negative correlated to total return after excluding stock dividends, moving to my prediction.

V. Results

In this section, I conduct regressions to examine the relationship between excessively overconfident CEOs /excessively diffident CEOs and firm profitability and stock performance.

5.1 Firm valuation

To understand the influence of CEO characteristic on firm value, I therefore examine the effect of confidence on future Tobin's Q, Return on Assets, and Return on Equity (used by Hirshleifer, Low, and Teoh (2010), Fahlenbrach (2007)). Earlier study found that overconfidence increases R&D, which is expensed and therefore mechanically reduces the book value of assets in the short term. Since my three proxies contain assets and equities in the denominator, it is important to control for lagged related expenses in test with these dependent variables. Also factors would not affect firm profitability immediately thus all independent variables are lagged one

period with respect to dependent variables. Considered there is differential effect from varies industries, three dependent variables are industry-adjusted to manifesting the idiosyncratic effect of CEOs.

Three regression specifications are defined as:

$$Q_t = \alpha + \beta_1 EO_{t-1} + \beta_2 ED_{t-1} + \beta_3 Sales_{t-1} + \beta_4 R\&D_{t-1} + \beta_5 FA_{t-1} + \beta_6 COW_{t-1}$$
$$+Year\& \text{ industry effect}$$

$$ROA_t = \alpha + \beta_1 EO_{t-1} + \beta_2 ED_{t-1} + \beta_3 Sales_{t-1} + \beta_4 R\&D_{t-1} + \beta_5 FA_{t-1} + \beta_6 COW_{t-1}$$
$$+Year\& \text{ industry effect}$$

$$ROE_t = \alpha + \beta_1 EO_{t-1} + \beta_2 ED_{t-1} + \beta_3 Sales_{t-1} + \beta_4 R\&D_{t-1} + \beta_5 FA_{t-1} + \beta_6 COW_{t-1}$$
$$+Year\& \text{ industry effect}$$

For test industry-adjusted Q I approximated by the ratio of the market value of assets to the book value of assets and then deduct industry's median Q. The market value of assets is calculated as the sum of the book value of assets in the end of current fiscal year and the market value of common stocks that stock prices in the end of working day of current calendar year less the book value of common stocks and deferred taxes. The end of a fiscal year is similar to the end of working day of calendar year thus there is no deviation. The variable measuring the excessively overconfident CEOs (EO) (excessively diffident CEOs (ED)) is dummy variable that is one if the CEO of the firm is classified as excessive overconfidence (diffidence) and zero otherwise. To testify different influence of different excessive overconfidence (diffidence) level, I set top (bottom) 40%, 30%, 20%, and 10% end cutoffs on the distribution of Net Stock Purchases to examine the influencing trend of confidence level.

I show the results in Table 7 where I control the firm characteristic as the natural logarithm of sales and firm age (FA) and R&D scaled by book assets in the beginning of the year in column 1 to 4 and then control for the CEO characteristics as CEO share

ownership (COW) and conduct year-fixed effect and industry-fixed effect in column 5 to 8. Panel A of Table 7 shows the regression results of Net Stock Purchases, Panel B of Net Stock Purchases after Pledge, Panel C of Net Stock Purchases excluding stock dividends, and Panel D of Net Stock Purchases excluding stock dividends after pledge.

As shown in Panel A and B, the coefficients of excessively overconfident CEOs are positive to negative large scale but non-monotonic: the effect of excessive overconfidence rebounds in top 20% cutoff and then goes deeply negative after controlling CEO characteristics. Nevertheless, after strictly measure CEO's confidence by excluding stock dividends, the trend of excessively overconfident CEOs on Q conform to the expectation that the coefficients go down to deeply negative straight and significant at 1% level in panel C and D. For excessive diffidence, the coefficients are negative significantly at 1% but non-monotonic when approaching to the extreme cutoffs in Panel A and B and those migrates from positive to negative significantly at 10% in Panel C and D after considering the stock dividends.

The excessive overconfident and excessively diffident CEOs are adversely affected firms' potential growth. The stricter measure of excessively overconfident CEOs measured by Net stock purchases excluding stock dividends after pledge tells the coefficients of top 10% is -0.1632 significant at 1%, which suggests that Q in excessively overconfident CEO firms is 113% less than in moderate overconfident CEO firms. The reasonable measure of excessive diffident CEOs measured by Net stock purchases tells the coefficient of bottom 10% is -0.0396 significant at 5%, which suggests that Q in excessively diffident CEO firms is 27% less than in moderate overconfident firms. Moreover, adverse effect on Q is bigger in excessively overconfident CEO firms than excessively diffident CEO firms.

For the second profitability measure industry-adjusted ROA, it is calculated as the ratio of earnings before interests, taxes, depreciation and amortization to book

value of asset in the beginning of the year and then adjusted by deducting industry median ROA. All control variables are the same as above of Q and the results are shown in Table 8 with panel A to D. As same as the effect on Q, the coefficients of excessively overconfident CEO are negative to large scale and significantly at 1% but non-monotonic in panel A and B, but those are negative downward straight to large scale and significantly at 1% in panel C and D after considering stock dividends. Also the coefficients of excessively diffident CEO are all negative significantly at 1% but non-monotonic in panel A and B and those moves from positive to negative straight and significant at 5% in panel C and D.

As shown in Table 8, the excessive overconfident and excessively diffident CEOs are adversely affected firms' ROA. The stricter measure of excessively overconfident CEOs measured by Net stock purchases excluding stock dividends after pledge tells the coefficient of top 10% is -0.0185 significant at 1%, which suggests that ROA in excessively overconfident CEO firms is 452% less than in moderate overconfident CEO firms. The reasonable measure of excessive diffident CEOs measured by Net stock purchases tells the coefficient of bottom 10% is -0.0067 significant at 1%, which suggests that ROA in excessively diffident CEO firms is 164% less than in moderate overconfident CEO firms. Same as Q that adverse effect on ROA is bigger in excessively overconfident CEO firms than excessively diffident CEO firms.

Third measure of firm profitability, industry-adjusted ROE, is defined as the ratio of earnings before interests, taxes, depreciation and amortization in the end of the year to the book value of equities in the beginning of the year and then adjusted by industry median ROE. The coefficients of excessively overconfident CEOs are negative monotonic to large scale significant at 1% in Panel B to D and those of excessively diffident CEOs are downward moving significant at 1% but

non-monotonic same as the effect on industry-adjusted ROA.

From Table 9, the excessive overconfident and excessively diffident CEOs are adversely affected firms' ROE. The stricter measure of excessively overconfident CEOs measured by Net stock purchases excluding stock dividends after pledge tells the coefficient of top 10% is -0.0312 significantly at 1% which suggests that ROE in excessively overconfident CEO firms is 148% less than in moderate overconfident CEO firms. The reasonable measure of excessive diffident CEOs measured by Net stock purchases tells the coefficient of bottom 10% is -0.01 significantly at 1%, which suggests that ROE in excessively diffident CEO firms is 47% less than in moderate overconfident CEO firms. Same as Q and ROA that adverse effect on ROE is bigger in excessively overconfident CEO firms than excessively diffident CEO firms.

From the above three measures of firm profitability, the excessively overconfident CEOs do harm the companies and the adverse effect enlarges when approaching the extreme cutoffs. Like Goel and Thakor (2008)'s prediction, drastic overconfident CEOs would overinvest in the projects no matter the positive or negative NPV by overestimate their ability and future firm value under their leadership. In the same way, excessive diffident CEOs also decrease firm profitability. However, there is weaker effect of excessively diffident CEOs on firm performance, indicating that the underinvestment problem may not obvious or the results are positively biased for liquidity-motivated sales need.

5.2 Stock performance

To understand the performance led by excessively overconfident CEOs and excessively diffident CEOs, two methods Fama-French portfolio and Fama-Macbeth Regression are used in the paper ever applied by Fahlenbrach (2007).

$$ER_t = \alpha + \beta_1 RMRF_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 Momentum_t$$

First, Performance-attribution regression is applied by examining monthly excess return over risk free rate of three equal-weighted portfolios, excessive overconfident CEO portfolio, moderate overconfident CEO portfolio, and excessively diffident CEO portfolio, in the sample from 1992 to 2010. The method to classify CEO confident level is the same as that to proxy firm valuation and described in Appendix A and then assigned firm having one specific confident level CEO measured by lagged one year to the portfolio of that confident level CEO. The portfolio is reset annually.

Former literature contributes that several equity characteristics of firms have been certified to be significant in forecasting future returns, including market factor, size, book-to-market ratio and past returns (Fama and French (1992), Fama and French (1993), and Carhart (1997)). Thus I estimate above four factor model and focus on the estimated intercept coefficient as the abnormal return to demonstrate whether there is a CEO characteristic factor to influence firm stock performance. The four factor premium data is collected from multiple equity factor database of TEJ and calculated by the method used by Fama and French (1993), and Carhart (1997). Market factor (RMRF) is the market premium calculated by gross market return over risk-free rate per month, size factor (SMB) the market capitalization premium per month, book-to-market factor (HML) the book-to-market ratio premium per month, and past return factor (Momentum) the annual stock return premium before past two months per month. The dependent variable Excess Return (ER) is the monthly gross return in excess of the risk-free rate, one month time deposit saving rate, from equal-weighted investment portfolios.

The simplified result is shown in Table 10 with columns 1 to 4 describing the results of three confidence level portfolios measured by Net Stock Purchases, columns 5 to 8 describing that of three confidence level portfolios measured by Net Stock

Purchases after pledge, columns 9 to 12 describing that measured by Net Stock Purchases excluding stock dividends, and columns 13 to 16 describing that measured by Net Stock Purchases excluding stock dividends after pledge. As the results shown in Table 10, monthly alphas in excessive overconfident CEO portfolio are significantly smaller than that in moderate overconfident CEO portfolio, and go down though non-monotonic when approaching the extreme cutoff of CEO confidence measure by Net stock purchase and Net stock purchase after pledge. However, alphas in excessively diffident CEO portfolio are bigger than that in moderate overconfident CEO portfolio but insignificant and also go down non-monotonically. The results from above confidence measure indicate the excessively overconfident CEOs have adverse impact on firm stock performance but the influence of excessively diffident CEOs is not obvious. Moreover, the monthly alphas in moderate overconfident CEO portfolio are significant manifesting that there are other factors to influence portfolio performance.

After considering stock dividends in measuring CEO confident level, monthly alphas in excessively overconfident CEO portfolio and in excessively diffident CEO portfolio are significantly smaller than that in moderate overconfident CEO portfolio and part of those in moderate overconfident CEO portfolio becomes insignificant, indicating excessively overconfident and excessively diffident CEOs do have some adverse impact on firm stock performance. However, the coefficients in excessively overconfident CEO portfolio are negative but down to zero against to my hypothesis that the adverse influence would be bigger when approaching extreme cutoff of excessively overconfident level measure. The coefficients in excessively diffident CEO portfolio are negative to large scale but then lessened when approaching to extreme cutoff corresponding to my prediction in some manner.

From Table 10, the excessive overconfident and excessively diffident CEOs

adversely affect firm stock performance, especially when considering contingent factors to influence the measure of CEO's confidence level. However, the trend is not going down monotonically when approaching to extreme cutoff of CEO confidence level. Moreover, significant monthly alpha in moderate overconfident CEO portfolio tells that there are definitely other factors to influence the returns of these three portfolios.

To find out the possible influencing factors other than above factors on firm stock performance and understand the performance led by excessively overconfident CEOs and excessively diffident CEOs, the Fama-Macbeth regression of annual stock return is then conducted for from 1992 to 2010. The Fama-Macbeth regression is followed:

$$R_{it} = \alpha + \beta_1 EO_{i,t-1} + \beta_2 ED_{i,t-1} + \beta_3 Beta_i + \beta_4 \frac{B}{M_{i,t-1}} + \beta_5 MV_{i,t-1} + \beta_6 Return_{i,t-1}$$
$$+ \beta_7 DY_{i,t-1} + \beta_8 IOW_{i,t-1} + \beta_9 FA_{i,t-1} + \beta_{10} COW_{i,t-1}$$

The dependent variable is the annual stock compound gross return (R) of firm for year t. The excessively overconfident CEO and excessive diffident CEO dummies are assigned to the firms by lagged one year. Beta is the systematic risk of a company regressed by annual individual stock excess returns and market excess returns. Excess return is the gross return per year less risk-free rate, one year time deposit saving rate averaged from five major Taiwanese financial institutions. Market return is the return of TSEC weighted index. The book-to-market ratio is calculated by book value of common stock in the end of prior one year plus deferred taxes over market value of common stock in the end of prior year. The market value (MV) is calculated by stock price in the end of last fiscal year multiplying shares outstanding, the return (Return) is compound gross return in the end of last year. All above are proxies as four factors

of Fama-French three factors model and one momentum and plus the dummy measured confidence level the results are shown in columns 1 to 4 in Table 10.

Then I add related independent variables to the extensive list of characteristics in (Fahlenbrach (2007), Brennan, Chordia, and Subrahmanyam (1998), and Gompers and Metrick (2001)) including Institutional Ownership (IOW) in last fiscal year, Dividend Yield (DY) the ratio of dividends in previous fiscal year to market capitalization of the year, Firm Age (FA) the number of years passed from the year of the firm founded to the last fiscal year, and CEO Ownership (COW) calculated in last year summarized in columns 5 to 8. Same as Fahlenbrach (2007), cross-sectional Fama-Macbeth (1973) regressions is used by estimating an equal weighted cross-sectional regression of total return on explanatory control variables and my confidence dummy first and then count the mean of each year as coefficients and a time-series standard deviation adjusted by Newey-West method of 18 year coefficients.

To understand the performance led by excessively overconfident CEOs and excessively diffident CEOs, the regression of annual stock return is conducted for from 1992 to 2010 ever applied by Fahlenbrach (2007). The dependent variable is the annual stock compound gross return (R) of firm for year t. The excessively overconfident CEO and excessive diffident CEO dummies are assigned to the firms by lagged one year. Beta is the systematic risk of a company regressed by annual individual stock excess returns and market excess returns. Excess return is the gross return per year less risk-free rate, one year time deposit saving rate averaged from five major Taiwanese financial institutions. Market return is the return of TSEC weighted index. The book-to-market ratio is calculated by book value of common stock in the end of prior one year plus deferred taxes over market value of common stock in the end of prior year. The market value (MV) is calculated by stock price in the end of

last fiscal year multiplying shares outstanding, the return (Return) is compound gross return in the end of last year. All above are proxies as four factors of Fama-French three factors model and one momentum and plus the dummy measured confidence level the results are shown in columns 1 to 4 in Table 11. Then I add related independent variables to the extensive list of characteristics in (Fahlenbrach (2007), Brennan, Chordia, and Subrahmanyam (1998), and Gompers and Metrick (2001)) including Institutional Ownership (IOW) in last fiscal year, Dividend Yield (DY) the ratio of dividends in previous fiscal year to market capitalization of the year, Firm Age (FA) the number of years passed from the year of the firm founded to the last fiscal year, and CEO Ownership (COW) calculated in last year summarized in columns 5 to 8. Same as Fahlenbrach (2007), cross-sectional Fama-Macbeth (1973) regressions is used by estimating an equal weighted cross-sectional regression of total return on explanatory control variables and my confidence dummy first and then count the mean of each year as coefficients and a time-series standard deviation adjusted by Newey-West method of 18 year coefficients.

Table 11 presents the results with panel A describing the confidence measured by Net Stock Purchases, Panel B that by Net Stock Purchases after Pledge, Panel C by Net Stock Purchases excluding stock dividends, and Panel D by Net Stock Purchases excluding stock dividends after pledge. As shown in Table 11, the trend of excessive overconfident CEOs and excessively diffident CEOs on stock performance is non-monotonic. The coefficients of excessive overconfident CEO went down to negative first then up when approaching to the extreme cutoff in every panel. However, only negative coefficients are significantly downward in excessive overconfident CEOs measured as Net Stock Purchases excluding stock dividends after pledge indicating the excessively overconfident CEOs have adverse influence on the stock performance: The coefficient of top 40% to top 30% is -0.0167 and -0.0218

significant at 10%, which suggests that stock return in excessively overconfident CEO firms migrates from 68% less to 89% less than in moderate overconfident CEO firms.

For excessively diffident CEOs, the effect is also non-monotonic to the extreme cutoff. Same as of excessive overconfident CEOs, only negative coefficients are significant in excessive diffident CEO measured as Net Stock Purchases excluding stock dividends after pledge indicating that excessively diffident CEOs have adverse influence on stock performance: The coefficient of bottom 30% is -0.0276 significant at 1%, which suggests that stock return in excessively diffident CEO firms is 112% less than in moderate overconfident CEO firms.

From Table 11, I found out that excessive overconfident CEOs and excessive diffident CEOs have adverse impact on stock performance but not that significant as profitability Q, ROA, and ROE. The pattern is not that clear and insignificant, may because the CEOs characteristic overconfidence and diffidence is not easily sensed by investors or the personal characteristic of CEOs is not the main driver to influence the stock performance. As we know, the stock return has been discovered that that is affected primarily by concurrent systematic risk, company size, book-to-market effect, and momentum. From the regression results, I found that dividend yield and book-to-market have significant influence power on firm stock performance. Dividend yield is positive significantly at 1% and persistent in all regressions indicating that how many dividends paid would influence the investors' demand on the stock and future price increase. Book-to-Market are also positive significant at 5% after controlling firm and CEO characteristics showing that return of value stock is higher than of growth stock correspond to our knowledge that the price of value-oriented stock would reverse after long term depression.

VI. Conclusion

In recent decade, there is an increasing interest in researching on the characteristic of CEO to the activity of firm in academy. Although many scholars studied the effect on investment decision and financing decision, there are few papers to study the effect on firm value, the most important affairs investors and managers care about directly and empirically. Thus the paper is to study the relation between the CEOs' overconfidence and firm performance.

The empirical results certified the hypothesis that excessively overconfident and excessive diffident CEOs reduce the performance of firms. From the result, the excessively overconfident and excessively diffident CEOs decrease the firm profitability measured by industry-adjusted Q, ROA, and ROE significantly. The adverse effects on firm profitability become large economically and significantly to the extreme cutoffs and excessively overconfident CEOs adversely affect profitability more than excessive diffident CEOs. On examining the stock performance, the excessively overconfident and diffident CEOs have also adverse impact when compared to moderate overconfident CEOs on significant results. However, the influence on stock performance is minor than on profitability and the pattern is non-monotonic and insignificant when approaching to the extreme cutoff.

Overall, these results are consistent with prediction made by Goel and Thakor (2008) and Hackbarth (2008) that excessively overconfident CEOs and excessively diffident CEO may decrease the firm value due to overinvestment and underinvestment problem and moderate overconfident CEO may increase the firm value.

The paper extends empirical research on the relationship between CEO overconfidence and firm value. Furthermore, the new classification of CEO

confidence level proposed by Goel and Thakor (2008) is applied firstly to study the relationship between CEO confidence level and firm performance in Taiwanese companies. In addition to providing the evidence on the newly theoretical predictions, using pattern to testify the influence of CEOs' confidence on firm performance by classifying CEO to excessively overconfident and excessively diffident by set several cut points on the distribution of their net stock purchases activities helps to understand the effect in all round manner. Finally, the research is quite comprehensive as considered the contingent factors such as CEO's pledge activities and/or stock dividends that will influence our confidence level measure in Taiwan. Without carefully considering those activities prevailing in Taiwan business market, the results may be bias and imprecise as conduct.

However, there is still some ambiguity needed to be solved. On the dimension of corporate finance, the future research could examine why the effect of excessive diffident CEOs on firm value is non-monotonic to the extreme cutoff, which is the reason why the more extreme diffident CEOs are not harm the company that much and even increase the firm value. On the dimension on asset management, the further research could be conducted on the reason why there is less significant influence on stock performance from excessively overconfident and diffident CEOs, especially after proving that they reduced the company profitability if the market is efficient. Could investors sense CEOs' characteristics on confidence level and do they understand their influence on firm profitability would be interesting to study.

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Appendix A

This appendix defines the variables used in the study. All data are from Taiwan Economic Journal (TEJ) database.

Variables	Description
Dependent variables	
Industry-adjusted Tobin's Q (Q)	The ratio of market value of assets to book value of assets and then minus the industry mean Q. The market value of assets is calculated as the sum of the book value of assets in current fiscal year and the market value of common stocks that stock prices in current calendar year less the book value of common stocks and deferred taxes.
Industry-adjusted Return on Assets (ROA)	The ratio of earnings before interests, taxes, depreciation and amortization to book value of asset in the beginning of the year and then minus industry mean ROA.
Industry-adjusted Return on Equities (ROE)	The ratio of earnings before interests, taxes, depreciation and amortization to book value of equities in the beginning of the year and then less industry mean ROE.
Total Return	Annual compound gross stock return.
Variables relating to CEO overconfidence, lagged values	
Excessively overconfident CEO	Net stock purchases measure of CEO overconfidence every year. The cutoffs are set by top 40%, 30%, 20%, and 10% of the distribution of Net stock purchases (EO_raw). When CEOs are classified in the dimension, set them as 1 for dummy variable, and zero otherwise. EO_pledge: Those cutoffs of Net stock purchase after pledge. EO_div: Those cutoffs of Net stock purchases excluding stock dividends. EO_pledge& div: Those cutoffs of Net stock purchases excluding stock dividends after pledge.
Excessively diffident CEO	Net stock purchases measure of CEO diffidence every year. The cutoffs are set by bottom 40%, 30%, 20%, and 10% of the distribution of Net stock purchases (ED_raw). When CEOs are classified in the dimension, set them as 1 for dummy variable, and zero otherwise. ED_pledge: Those cutoffs of Net stock purchase after pledge. ED_div: Those cutoffs of Net stock purchases excluding stock dividends. ED_pledge& div: Those cutoffs of Net stock purchases excluding stock dividends after pledge.
Moderate overconfident CEO	Rest of CEOs is not classified as excessively overconfident and excessively diffident CEOs.
CEO ownership	The shares CEOs own divided by shares outstanding in a year.
Other independent or control variables, lagged values except beta	
Sales	Natural logarithm sales every year.
R&D	Research and development expenditures scaled by book assets.
Firm age	Natural logarithm the number of years passed from the years companies set to the current year.
Beta	The systematic risk beta is the estimator regressed by annual individual stock excess return and market excess return per firm. Excess return is the gross return over risk free-rate, one year time deposit saving rate averaged from five major Taiwanese financial institutions.
Book-to-Market	The ratio of book value of common stock in the end of year plus deferred taxes over market value of common stock in the end of that year.
Market Value	Natural logarithm stock price in the end of the year multiplying shares outstanding.
Return	Compound gross return in the year.
Dividend yield	The ratio of dividends in the fiscal year to market capitalization in the end of year.
Institutional ownership	The shares of the stocks held by the institutions scaled by shares outstandings.
Hidden variables for performance-attribution regressions	
Excess return	The monthly return in excess of the risk-free rate, one month time deposit saving rate, from equal-weighted investment portfolios.
RMRF	The market premium calculated by gross market return over risk-free rate, one month time deposit saving rate, per month.
SMB	The market capitalization premium per month.
HML	The book-to-market ratio premium per month.
Momentum	The annual stock return premium before past two months per month.

Table 1: Sample frequency of excessively overconfident CEO and excessively diffident CEO

The tables described the summary for the frequency of excessively overconfident CEO and excessively diffident CEO observation for a sample of 10,258 firm-years from 1991 to 2009. Panel A contains the results where the units and the percentage of excessively overconfident CEOs measured as top 20% of distribution of Net Stock Purchase and excessively diffident CEOs measured as bottom 20% of distribution of Net Stock Purchase is a CEO-firm-year and Panel B contains the results where the percentage of excessively overconfident and excessive diffident CEOs is a CEO-industry.

Panel A. Frequency in firm years

Fiscal year	Total	Excessively overconfident CEO (EO_raw)		Excessively overconfident after pledge CEO (EO_pledge)		Excessively overconfident excluding dividends CEOs (EO_div)		Excessively overconfident excluding dividends after pledge CEOs (EO_pledge& div)		Excessively diffident CEOs (ED_raw)		Excessively diffident after pledge CEOs (ED_pledge)		Excessively diffident excluding stock dividends CEOs (ED_div)		Excessively diffident excluding stock dividends after pledge CEOs (ED_pledge& div)	
		No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
1991	107	22	21%	22	21%	22	21%	22	21%	22	21%	22	21%	22	21%	22	21%
1992	131	33	25%	33	25%	31	24%	32	24%	53	40%	53	40%	32	24%	32	24%
1993	142	37	26%	37	26%	37	26%	38	27%	62	44%	62	44%	37	26%	37	26%
1994	155	41	26%	41	26%	47	30%	48	31%	63	41%	63	41%	42	27%	42	27%
1995	183	51	28%	51	28%	62	34%	62	34%	70	38%	70	38%	46	25%	46	25%
1996	241	60	25%	60	25%	67	28%	70	29%	101	42%	101	42%	66	27%	64	27%
1997	282	74	26%	74	26%	59	21%	87	31%	100	35%	100	35%	106	38%	77	27%
1998	358	92	26%	81	23%	91	25%	102	28%	129	36%	137	38%	131	37%	95	27%
1999	425	105	25%	115	27%	105	25%	132	31%	173	41%	178	42%	154	36%	107	25%
2000	498	123	25%	134	27%	134	27%	159	32%	229	46%	193	39%	195	39%	129	26%
2001	585	129	22%	158	27%	159	27%	181	31%	311	53%	219	37%	221	38%	164	28%
2002	699	157	22%	195	28%	194	28%	213	30%	405	58%	250	36%	274	39%	215	31%
2003	766	181	24%	211	28%	230	30%	229	30%	454	59%	286	37%	291	38%	242	32%
2004	839	188	22%	219	26%	273	33%	259	31%	508	61%	322	38%	292	35%	259	31%
2005	891	212	24%	211	24%	292	33%	281	32%	541	61%	509	57%	296	33%	278	31%
2006	948	218	23%	218	23%	320	34%	314	33%	605	64%	592	62%	313	33%	294	31%
2007	968	244	25%	254	26%	336	35%	325	34%	602	62%	520	54%	328	34%	314	32%
2008	981	254	26%	249	25%	340	35%	326	33%	603	61%	601	61%	329	34%	318	32%
2009	1059	308	29%	305	29%	357	34%	364	34%	566	53%	561	53%	369	35%	340	32%
Average			25%		26%		29%		30%		48%		43%		33%		28%

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Panel B. Frequency in 26 industry group classified by Taiwan Stock Exchange (TSE)

Industry group	Total	Excessively overconfident CEO (EO_raw)	Excessively overconfident after pledge CEO (EO_pledge)	Excessively overconfident excluding dividends CEOs (EO_div)	Excessively overconfident excluding dividends after pledgeCEOs (EO_pledge& div)	Excessively diffident CEOs (ED_raw)	Excessively diffident after pledge CEOs (ED_pledge)	Excessively diffident excluding stock dividends CEOs (ED_div)	Excessively diffident excluding stock dividends after pledge CEOs (ED_pledge& div)
Cement	1%	1%	1%	1%	1%	1%	1%	1%	1%
Food	3%	2%	3%	3%	4%	4%	4%	3%	3%
Plastics	3%	2%	2%	2%	2%	4%	4%	3%	2%
Textile	7%	3%	5%	7%	8%	9%	9%	7%	7%
Machinary	5%	3%	4%	4%	4%	5%	5%	5%	4%
Electronic appliance and Wire	2%	2%	2%	2%	2%	2%	2%	1%	2%
Ceramics	0%	1%	1%	0%	1%	0%	0%	1%	1%
Paper manufacturing	1%	1%	1%	1%	1%	1%	1%	1%	1%
Steel	4%	3%	3%	3%	4%	5%	5%	4%	4%
Rubber	1%	2%	1%	1%	1%	1%	1%	1%	1%
Automobile	1%	0%	0%	0%	0%	1%	1%	0%	0%
Construction	6%	3%	3%	3%	4%	7%	7%	6%	5%
Transportation	3%	1%	1%	1%	2%	4%	3%	1%	1%
Tourism	1%	0%	1%	0%	1%	2%	1%	1%	1%
Shops	2%	1%	1%	1%	1%	2%	2%	2%	2%
Chemicals	4%	2%	2%	2%	3%	5%	5%	4%	4%
Biotechnology	3%	2%	3%	3%	3%	3%	3%	3%	3%
Semiconductor	8%	13%	12%	12%	10%	6%	7%	8%	10%
PC	7%	11%	11%	9%	9%	6%	7%	9%	9%
Optoelectronics	5%	8%	8%	7%	7%	4%	4%	6%	6%
Telecommunication	4%	6%	6%	6%	5%	4%	4%	5%	5%
Electronic component	11%	14%	14%	13%	13%	9%	9%	11%	11%
Electronic distribution	3%	5%	5%	4%	3%	2%	2%	3%	3%
Information services	3%	2%	2%	3%	2%	2%	2%	3%	2%
Other electronics	4%	6%	5%	5%	5%	5%	5%	6%	6%
Others	6%	5%	5%	5%	5%	6%	6%	6%	6%

Table 2: Summary Statistics of CEO characteristics and firm valuation

The Table presents the summary statistics of sample firm and CEO characteristic of panel data on firm valuation. Panel A contains statistics of full sample, panel B of excessively overconfident CEO firms and excessively diffident CEO firms without considering other factors sample, panel C of excessively overconfident and excessively diffident after pledge CEO-firm sample, and Panel D of excessively overconfident and excessively diffident excluding stock dividends after pledge. Considering the different characteristic existing in different level of excessive overconfidence and excessive diffidence, rows 1 of each item show the statistics of top and bottom 40% of the distribution of Net Stock Purchase classified as excessive overconfidence and excessive diffidence observations and rows 2 show that of top and bottom 10% classified as excessive overconfidence and excessive diffidence observations. Q is calculated as the ratio of market value of assets to book value of assets and then minus the industry median Q. The market value of assets is the sum of the book value of assets in current fiscal year and the market value of common stocks that stock prices in current calendar year less the book value of common stocks and deferred taxes. ROA is the ratio of earnings before interests, taxes, depreciation and amortization to book value of asset in the beginning of the year and then minus industry median ROA. ROE is the ratio of earnings before interests, taxes, depreciation and amortization to book value of equities in the beginning of the year and then less industry median ROE. Sales is the sale revenues in the fiscal year. Firm age is the number of years passed from the years companies set to the current year. Rest of variables is described in Appendix A.

Panel A. Summary Statistics of full sample

	$N=10{,}258$				
Variable	Mean	Median	SD	Min.	Max.
Dependent variables					
Q	0.14	-0.04	0.85	-4.65	6.97
ROA	0.00	-0.02	0.09	-0.57	0.64
ROE	-0.02	-0.04	0.16	-1.97	1.85
Independent variables					
Sales($m)	9,124	2,364	40,523	1	1,473,026
Firm age	24	23	12	1	63
R&D	0.02	0.01	0.03	0.00	0.46
CEO share ownership	0.04	0.02	0.05	0.00	0.46

Panel B. Summary statistics of Net Stock Purchases to classify observations into excessive overconfidence and excessive diffidence

Variable		Excessively overconfident CEO sample N of 40%= 4,387 N of 10% = 1,703					Excessively diffident CEO sample N of 40%= 5,301 N of 10% = 2,824				
		Mean	Median	SD	Min.	Max.	Mean	Median	SD	Min.	Max.
Dependent variables											
Q	40%	0.29	0.08	0.92	-2.85	6.94	0.01	-0.14	0.77	-4.65	6.97
	10%	0.23	0.03	0.94	-3.14	6.94	0.10	-0.06	0.79	-3.11	6.92
ROA	40%	0.01	-0.01	0.09	-0.57	0.64	-0.02	-0.03	0.08	-0.48	0.60
	10%	0.00	-0.02	0.09	-0.41	0.64	-0.01	-0.02	0.09	-0.42	0.60
ROE	40%	-0.01	-0.02	0.15	-1.23	0.93	-0.04	-0.05	0.16	-1.97	1.85
	10%	-0.02	-0.04	0.16	-1.61	1.85	-0.03	-0.04	0.16	-1.97	1.26
Independent variables											
Sales($m)	40%	11,849	2,701	54,113	4	1,473,026	7,015	2,154	24,915	1	875,573
	10%	19,580	3,933	79,946	4	1,473,026	6,481	2,100	26,674	1	523,118
Firm age	40%	21	20	11	1	62	26	25	12	1	63
	10%	24	22	11	2	59	25	24	11	2	63
R&D	40%	0.02	0.01	0.03	0.00	0.46	0.01	0.00	0.03	0.00	0.37
	10%	0.02	0.01	0.03	0.00	0.22	0.02	0.01	0.03	0.00	0.34
CEO share ownership	40%	0.05	0.03	0.06	0.00	0.46	0.03	0.01	0.05	0.00	0.43
	10%	0.08	0.06	0.07	0.00	0.46	0.04	0.02	0.05	0.00	0.43

Panel C. Summary statistics of Net Stock Purchases after pledge to classify observations into excessive overconfidence and excessive diffidence

Variable		Excessively overconfident CEO sample N of 40%= 4,398 N of 10% = 1,637					Excessively diffident CEO sample N of 40%= 5,312 N of 10% = 2,593				
		Mean	Median	SD	Min.	Max.	Mean	Median	SD	Min.	Max.
Dependent variables											
Q	40%	0.28	0.07	0.92	-2.85	6.94	0.02	-0.13	0.77	-4.65	6.97
	10%	0.22	0.01	0.95	-3.14	6.94	0.10	-0.06	0.78	-3.11	6.42
ROA	40%	0.01	-0.01	0.09	-0.57	0.64	-0.02	-0.02	0.08	-0.48	0.60
	10%	0.00	-0.02	0.09	-0.29	0.64	-0.01	-0.02	0.08	-0.36	0.60
ROE	40%	-0.01	-0.03	0.15	-1.23	1.26	-0.04	-0.05	0.16	-1.97	1.85
	10%	-0.02	-0.04	0.16	-1.09	1.85	-0.03	-0.04	0.16	-1.97	1.04
Independent variables											
Sales($m)	40%	11,762	2,685	54,001	4	1,473,026	6,858	2,154	24,464	1	875,573
	10%	19,778	3,655	81,924	4	1,473,026	7,242	2,378	28,010	1	523,118
Firm age	40%	22	20	11	1	62	26	25	12	1	63
	10%	24	23	11	3	59	25	24	11	2	63
R&D	40%	0.02	0.01	0.03	0.00	0.46	0.02	0.00	0.03	0.00	0.37
	10%	0.02	0.01	0.03	0.00	0.19	0.02	0.01	0.03	0.00	0.34
CEO share ownership	40%	0.05	0.03	0.06	0.00	0.46	0.03	0.01	0.05	0.00	0.43
	10%	0.07	0.06	0.07	0.00	0.46	0.04	0.03	0.05	0.00	0.43

Panel D. Summary statistics of Net Stock Purchases excluding stock dividends after pledge to classify observations into excessive overconfidence and excessive diffidence

Variable		Excessively overconfident CEO sample					Excessively diffident CEO sample				
		N of 40%= 4,061 *N* of 10% = 1,962					*N* of 40%= 5,820 *N* of 10% = 1,923				
		Mean	Median	SD	Min.	Max.	Mean	Median	SD	Min.	Max.
Dependent variables											
Q	40%	0.13	-0.05	0.81	-3.17	6.94	0.16	-0.03	0.88	-4.65	6.97
	10%	0.08	-0.08	0.79	-3.14	6.94	0.20	0.02	0.90	-3.11	6.29
ROA	40%	-0.01	-0.02	0.08	-0.57	0.51	0.00	-0.02	0.09	-0.48	0.64
	10%	-0.01	-0.02	0.08	-0.31	0.51	0.00	-0.01	0.10	-0.36	0.64
ROE	40%	-0.03	-0.04	0.14	-1.23	1.26	-0.02	-0.04	0.17	-1.97	1.85
	10%	-0.03	-0.05	0.15	-1.09	1.85	-0.02	-0.03	0.18	-1.97	1.04
Independent variables											
Sales($m)	40%	9,671	2,491	41,578	3	1,473,026	8,802	2,265	40,889	1	1,420,573
	10%	11,615	2,886	52,312	4	1,473,026	12,962	2,599	61,838	1	1,420,573
Firm age	40%	23	22	11	1	62	24	23	12	1	63
	10%	24	24	11	1	59	24	23	11	1	63
R&D	40%	0.02	0.01	0.03	0.00	0.46	0.02	0.01	0.03	0.00	0.37
	10%	0.02	0.01	0.03	0.00	0.22	0.02	0.01	0.03	0.00	0.34
CEO share ownership	40%	0.04	0.02	0.05	0.00	0.43	0.04	0.02	0.05	0.00	0.46
	10%	0.06	0.04	0.06	0.00	0.43	0.06	0.04	0.06	0.00	0.46

Table 3: Summary Statistics of CEO characteristics and stock performance

The Table presents the summary statistics of sample firm and CEO characteristic of panel data on stock performance and related control variables. Panel A, B, C, and D, and Rows 1 and Rows 2 are defined as same as of Table 2. Total Return is stock gross compound yearly return. Market value is stock price in the end of the prior year multiplying shares outstanding. Firm age is the number of years passed from the year companies was found to the previous fiscal year. Rest of variables is the same in Appendix A.

Panel A. Summary Statistics of full sample

Variable	Mean	Median	SD	Min.	Max.
			N=9,389		
Dependent variables					
Total Return	-0.02	-0.03	0.58	-2.93	2.65
Independent variables					
Beta	1.10	1.05	0.62	-3.46	3.95
Book-to-market	0.77	0.52	0.85	0.02	9.90
Market value ($m)	14,296	3,142	60,888	50	1,743,504
Returnt-1	-0.03	-0.04	0.61	-2.52	2.74
Dividend yield	0.03	0.01	0.04	0.00	0.37
Institutional ownership	0.07	0.02	0.12	0.00	0.76
Firm age	26	25	12	2	64
CEO share ownership	0.03	0.01	0.05	0.00	0.46

Panel B. Summary statistics of Net Stock Purchases to classify observations into excessive overconfidence and excessive diffidence

Variable		Excessively overconfident CEO sample *N* of 40%= 4,020 *N* of 10% = 1,657					Excessively diffident CEO sample *N* of 40%= 4,951 *N* of 10% = 2,663				
		Mean	Median	SD	Min.	Max.	Mean	Median	SD	Min.	Max.
Dependent variables											
Total Return	40%	-0.07	-0.07	0.60	-2.93	2.54	0.01	0.00	0.57	-2.26	2.65
	10%	-0.05	-0.07	0.61	-2.93	2.54	-0.02	-0.04	0.59	-2.90	2.65
Independent variables											
Beta	40%	1.21	1.20	0.62	-3.46	3.95	1.03	0.95	0.61	-3.46	3.95
	10%	1.24	1.23	0.54	-0.11	3.63	1.07	1.03	0.60	-0.39	3.95
Book-to-market	40%	0.53	0.39	0.48	0.02	6.76	0.97	0.68	1.02	0.02	9.90
	10%	0.63	0.40	0.69	0.02	8.00	0.83	0.55	0.91	0.02	9.80
Market value ($m)	40%	19,337	4,045	80,108	89	1,743,504	10,105	2,475	39,059	50	655,629
	10%	31,625	5,576	116,223	106	1,743,504	8,651	2,739	28,732	73	474,960
Returnt-1	40%	-0.09	-0.09	0.61	-2.28	2.74	0.03	0.01	0.61	-2.52	2.73
	10%	-0.07	-0.09	0.64	-1.98	2.25	0.00	-0.02	0.61	-2.26	2.73
Dividend yield	40%	0.03	0.02	0.04	0.00	0.37	0.03	0.00	0.04	0.00	0.37
	10%	0.03	0.02	0.04	0.00	0.37	0.03	0.01	0.04	0.00	0.33
Institutional ownership	40%	0.08	0.03	0.12	0.00	0.76	0.07	0.01	0.11	0.00	0.74
	10%	0.10	0.04	0.13	0.00	0.76	0.06	0.01	0.11	0.00	0.75
Firm age	40%	23	22	11	3	63	28	27	12	2	64
	10%	25	24	11	4	60	26	26	11	3	64
CEO share ownership	40%	0.05	0.03	0.06	0.00	0.46	0.03	0.01	0.04	0.00	0.40
	10%	0.08	0.06	0.07	0.00	0.46	0.04	0.02	0.04	0.00	0.40

Panel C. Summary statistics of Net Stock Purchases after pledge to classify observations into excessive overconfidence and excessive diffidence

Variable		Excessively overconfident CEO sample *N* of 40%= 4,011 *N* of 10% = 1,593					Excessively diffident CEO sample *N* of 40%= 4,965, *N* of 10% = 2,478				
		Mean	Median	SD	Min.	Max.	Mean	Median	SD	Min.	Max.
Dependent variables											
Total Return	40%	-0.07	-0.07	0.60	-2.93	2.54	0.01	0.00	0.58	-2.26	2.65
	10%	-0.04	-0.06	0.61	-2.93	2.58	-0.02	-0.03	0.59	-2.26	2.65
Independent variables											
Beta	40%	1.20	1.20	0.61	-3.46	3.95	1.04	0.96	0.61	-3.46	3.95
	10%	1.23	1.22	0.55	-0.18	3.63	1.06	1.03	0.58	-0.39	3.63
Book-to-market	40%	0.56	0.40	0.55	0.02	9.90	0.95	0.66	1.00	0.02	9.80
	10%	0.67	0.42	0.74	0.02	8.00	0.81	0.54	0.88	0.02	8.40
Market value ($m)	40%	19,162	3,942	80,213	89	1,743,504	9,768	2,509	37,247	50	655,629
	10%	31,494	5,166	118,279	106	1,743,504	9,694	2,913	29,684	73	474,960
Returnt-1	40%	-0.08	-0.08	0.61	-2.28	2.74	0.02	0.00	0.61	-2.52	2.73
	10%	-0.05	-0.07	0.65	-1.98	2.25	-0.02	-0.04	0.60	-2.26	2.65
Dividend yield	40%	0.03	0.02	0.04	0.00	0.37	0.03	0.00	0.04	0.00	0.37
	10%	0.03	0.02	0.04	0.00	0.37	0.03	0.01	0.04	0.00	0.33
Institutional ownership	40%	0.08	0.03	0.12	0.00	0.76	0.07	0.01	0.12	0.00	0.74
	10%	0.10	0.03	0.14	0.00	0.76	0.07	0.01	0.11	0.00	0.75
Firm age	40%	23	22	11	3	63	27	26	12	2	64
	10%	25	24	11	4	60	26	26	11	3	64
CEO share ownership	40%	0.05	0.03	0.06	0.00	0.46	0.03	0.01	0.04	0.00	0.40
	10%	0.07	0.06	0.07	0.00	0.46	0.04	0.02	0.05	0.00	0.40

Panel D. Summary statistics of Net Stock Purchases excluding stock dividends after pledge to classify observations into excessive overconfidence and excessive diffidence

| | | Excessively overconfident CEO sample | | | | | Excessively diffident CEO sample | | | | |
| | | N of 40%= 3,761   N of 10% = 1,915 | | | | | N of 40%= 5,302   N of 10% = 1,821 | | | | |
Variable		Mean	Median	SD	Min.	Max.	Mean	Median	SD	Min.	Max.
Dependent variables											
Total Return	40%	-0.05	-0.07	0.59	-2.93	2.54	0.00	-0.01	0.58	-2.26	2.65
	10%	-0.02	-0.04	0.61	-2.93	2.65	-0.02	-0.03	0.61	-2.26	2.28
Independent variables											
Beta	40%	1.13	1.07	0.62	-3.46	3.95	1.10	1.04	0.61	-3.46	3.95
	10%	1.17	1.13	0.61	-1.86	3.63	1.13	1.11	0.56	-0.33	3.95
Book-to-market	40%	0.67	0.49	0.64	0.02	9.90	0.83	0.53	0.96	0.02	9.80
	10%	0.77	0.53	0.78	0.02	8.00	0.75	0.47	0.88	0.02	8.40
Market value ($m)	40%	14,813	3,434	52,514	87	1,174,224	13,974	2,893	66,756	50	1,743,504
	10%	15,795	3,583	53,499	106	1,174,224	20,554	3,494	96,528	73	1,743,504
Returnt-1	40%	-0.13	-0.14	0.60	-2.28	2.74	0.04	0.03	0.61	-2.52	2.65
	10%	-0.07	-0.08	0.64	-2.28	2.25	0.02	0.00	0.63	-2.26	2.65
Dividend yield	40%	0.03	0.01	0.04	0.00	0.37	0.03	0.01	0.04	0.00	0.37
	10%	0.03	0.01	0.04	0.00	0.37	0.03	0.02	0.04	0.00	0.31
Institutional ownership	40%	0.07	0.02	0.11	0.00	0.69	0.08	0.02	0.12	0.00	0.76
	10%	0.07	0.02	0.12	0.00	0.69	0.09	0.03	0.13	0.00	0.76
Firm age	40%	25	24	11	3	63	26	25	12	2	64
	10%	26	25	11	3	60	25	24	11	2	64
CEO share ownership	40%	0.04	0.02	0.05	0.00	0.43	0.03	0.01	0.05	0.00	0.46
	10%	0.06	0.04	0.06	0.00	0.43	0.06	0.04	0.06	0.00	0.46

Table 4: Correlations of different measure of excessive overconfident and excessive diffident CEOs

The table describes the correlation of different measure method of confidence. EO_raw and ED_raw are the excessively overconfident CEOs and excessively diffident CEOs measured by net stock purchase, EO_pledge and ED_pledge are those measured by net stock purchases after pledge, EO_div and ED_div are those measured by net stock purchases excluding stock dividends, and EO_pledge& div and ED_pledge& div are those measured by net stock purchases excluding stock dividends after pledge. The excessive overconfidence and excessive diffidence are set as top 20% and bottom 20% of distribution of Net Stock Purchase here as a example.

	EO_raw	EO_pledge	EO_div	EO_pledge&div	ED_raw	ED_pledge	ED_div	ED_pledge&div
EO_raw	1							
EO_pledge	0.83	1						
EO_div	0.51	0.49	1					
EO_pledge&div	0.43	0.56	0.79	1				
ED_raw	-0.63	-0.51	-0.35	-0.28	1			
ED_pledge	-0.44	-0.56	-0.27	-0.33	0.74	1		
ED_div	-0.12	-0.09	-0.48	-0.34	0.24	0.30	1	
ED_pledge&div	-0.02	-0.12	-0.31	-0.44	0.19	0.38	0.76	1

Table 5: Correlations of confidence level with firm valuation measure

The table describes the correlation of confidence level measure and other independent variable with firm valuation. The excessive overconfidence and excessive diffidence are set as top 20% and bottom 20% of distribution of Net Stock Purchases here as a example. Panel A contains the results with excessively overconfident CEOs and excessively diffident CEOs measured by Net Stock Purchases, panel B contains with those measured by Net Stock Purchases after pledge, panel C are with those measured by Net Stock Purchases excluding stock dividends, and panel D are with those measured by Net Stock Purchases excluding stock dividends after pledge.

Panel A. confidence level measured by Net Stock Purchase

	Q	ROA	ROE	Excessive Overconfidence	Excessive diffidence	Sales	Firm age	R&D	CEO ownership
Q	1								
ROA	0.54	1							
ROE	0.43	0.89	1						
Excessive Overconfidence	0.12	0.07	0.04	1					
Excessive diffidence	-0.17	-0.13	-0.10	-0.63	1				
Sales	0.09	0.14	0.18	0.18	-0.13	1			
Firm age	-0.16	-0.16	-0.12	-0.12	0.19	0.10	1		
R&D	0.17	0.02	-0.03	0.09	-0.10	-0.12	-0.36	1	
CEO ownership	0.06	0.06	0.03	0.32	-0.14	-0.19	-0.09	0.08	1

Panel B. confidence level measured by Net Stock Purchase after pledge

	Q	ROA	ROE	Excessive Overconfidence	Excessive diffidence	Sales	Firm age	R&D	CEO ownership
Q	1								
ROA	0.54	1							
ROE	0.43	0.89	1						
Excessive Overconfidence	0.09	0.05	0.03	1					
Excessive diffidence	-0.09	-0.10	-0.09	-0.56	1				
Sales	0.09	0.14	0.18	0.16	-0.11	1			
Firm age	-0.16	-0.16	-0.12	-0.10	0.13	0.10	1		
R&D	0.17	0.02	-0.03	0.07	-0.05	-0.12	-0.36	1	
CEO ownership	0.06	0.06	0.03	0.32	-0.08	-0.19	-0.09	0.08	1

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Panel C. confidence level measured by Net Stock Purchase excluding stock dividends

	Q	ROA	ROE	Excessive Overconfidence	Excessive diffidence	Sales	Firm age	R&D	CEO ownership
Q	1								
ROA	0.54	1							
ROE	0.43	0.89	1						
Excessive Overconfidence	-0.03	-0.05	-0.06	1					
Excessive diffidence	0.07	0.08	0.07	-0.48	1				
Sales	0.09	0.14	0.18	0.05	-0.01	1			
Firm age	-0.16	-0.16	-0.12	-0.08	-0.05	0.10	1		
R&D	0.17	0.02	-0.03	0.11	0.03	-0.12	-0.36	1	
CEO ownership	0.06	0.06	0.03	0.23	0.16	-0.19	-0.09	0.08	1

Panel D. confidence level measured by Net Stock Purchase excluding stock dividends after pledge

	Q	ROA	ROE	Excessive Overconfidence	Excessive diffidence	Sales	Firm age	R&D	CEO ownership
Q	1								
ROA	0.54	1							
ROE	0.43	0.89	1						
Excessive Overconfidence	-0.04	-0.05	-0.05	1					
Excessive diffidence	0.08	0.06	0.04	-0.44	1				
Sales	0.09	0.14	0.18	0.04	0.02	1			
Firm age	-0.16	-0.16	-0.12	-0.02	-0.05	0.10	1		
R&D	0.17	0.02	-0.03	0.06	0.05	-0.12	-0.36	1	
CEO ownership	0.06	0.06	0.03	0.20	0.19	-0.19	-0.09	0.08	1

Table 6: Correlation of confidence level with firm stock performance measure

The table describes the correlation of confidence level measure and other independent variable with firm stock performance. The excessive overconfidence and excessive diffidence are set as top 20% and bottom 20% of distribution of Net Stock Purchases here as a example. Panel A, B, C, and D are defined as same as in Table 5.

Panel A. confidence level measured by Net Stock Purchase

	Total Return	Excessive overconfidence	Excessive diffidence	Beta	Book-to-market	Market Value	Return$_{t-1}$	Dividend yield	Institutional ownership	Firm age	CEO ownership
Total Return	1										
Excessive overconfidence	-0.06	1									
Excessive diffidence	0.09	-0.67	1								
Beta	-0.02	0.15	-0.10	1							
Book-to-market	0.29	-0.18	0.25	0.00	1						
Market Value	-0.21	0.23	-0.23	-0.03	-0.50	1					
Return$_{t-1}$	-0.22	-0.05	0.08	0.00	-0.26	0.15	1.00				
Dividend yield	0.35	0.04	-0.02	-0.02	-0.13	0.06	-0.02	1.00			
Institutional ownership	0.00	0.11	-0.04	0.04	-0.18	0.41	0.09	0.17	1.00		
Firm age	0.05	-0.15	0.16	-0.32	0.15	0.05	0.04	0.00	-0.06	1.00	
CEO ownership	-0.02	0.35	-0.16	0.05	-0.04	-0.18	-0.01	-0.02	-0.08	-0.09	1.00

Panel B. confidence level measured by Net Stock Purchase after pledge

	Total Return	Excessive overconfidence	Excessive diffidence	Beta	Book-to-market	Market Value	Return$_{t-1}$	Dividend yield	Institutional ownership	Firm age	CEO ownership
Total Return	1										
Excessive overconfidence	-0.05	1									
Excessive diffidence	0.07	-0.59	1								
Beta	-0.02	0.13	-0.04	1							
Book-to-market	0.29	-0.13	0.13	0.00	1						
Market Value	-0.21	0.20	-0.16	-0.03	-0.50	1					
Return$_{t-1}$	-0.22	-0.03	0.04	0.00	-0.26	0.15	1				
Dividend yield	0.35	0.01	0.01	-0.02	-0.13	0.06	-0.02	1			
Institutional ownership	0.00	0.09	-0.04	0.04	-0.18	0.41	0.09	0.17	1		
Firm age	0.05	-0.13	0.11	-0.32	0.15	0.05	0.04	0.00	-0.06	1.00	
CEO ownership	-0.02	0.34	-0.09	0.05	-0.04	-0.18	-0.01	-0.02	-0.08	-0.09	1.00

Panel C. confidence level measured by Net Stock Purchase excluding stock dividends

	Total Return	Excessive overconfidence	Excessive diffidence	Beta	Book-to-market	Market Value	Return$_{t-1}$	Dividend yield	Institutional ownership	Firm age	CEO ownership
Total Return	1										
Excessive overconfidence	0.00	1									
Excessive diffidence	-0.03	-0.48	1								
Beta	-0.02	0.12	0.05	1							
Book-to-market	0.29	-0.05	-0.03	0.00	1						
Market Value	-0.21	0.03	0.00	-0.03	-0.50	1					
Return$_{t-1}$	-0.22	-0.09	0.08	0.00	-0.26	0.15	1				
Dividend yield	0.35	0.03	0.00	-0.02	-0.13	0.06	-0.02	1.00			
Institutional ownership	0.00	0.01	0.03	0.04	-0.18	0.41	0.09	0.17	1.00		
Firm age	0.05	-0.10	-0.04	-0.32	0.15	0.05	0.04	0.00	-0.06	1.00	
CEO ownership	-0.02	0.25	0.13	0.05	-0.04	-0.18	-0.01	-0.02	-0.08	-0.09	1.00

Panel D. confidence level measured by Net Stock Purchase excluding stock dividends after pledge

	Total Return	Excessive overconfidence	Excessive diffidence	Beta	Book-to-market	Market Value	Return$_{t-1}$	Dividend yield	Institutional ownership	Firm age	CEO ownership
Total Return	1										
Excessive overconfidence	-0.01	1									
Excessive diffidence	-0.01	-0.46	1								
Beta	-0.02	0.09	0.06	1							
Book-to-market	0.29	-0.01	-0.05	0.00	1						
Market Value	-0.21	0.01	0.05	-0.03	-0.50	1.00					
Return$_{t-1}$	-0.22	-0.07	0.06	0.00	-0.26	0.15	1.00				
Dividend yield	0.35	0.01	0.02	-0.02	-0.13	0.06	-0.02	1.00			
Institutional ownership	0.00	-0.02	0.06	0.04	-0.18	0.41	0.09	0.17	1.00		
Firm age	0.05	-0.05	-0.06	-0.32	0.15	0.05	0.04	0.00	-0.06	1.00	
CEO ownership	-0.02	0.22	0.17	0.05	-0.04	-0.18	-0.01	-0.02	-0.08	-0.09	1.00

Table 7: Excessively overconfident CEOs and excessive diffident CEOs vs. firm valuation by Q

The following tables describe the results of regression with dependent variables industry-adjusted Tobin's Q. Q is the ratio of the market value of assets to the book value of assets and then deduct industry's median Q. The market value of assets is calculated as the sum of the book value of assets in current fiscal year and the market value of common stocks that stock prices in current calendar year less the book value of common stocks and deferred taxes. The variables Excessive overconfidence and excessive diffidence are dummy variables that are one if the CEO of the firm was classified as excessive overconfidence (diffidence) and zero otherwise. Excessively overconfident (diffident) CEOs are classified into by the top (bottom) 40%, 30%, 20%, and 10% end of the distribution of the Net Stock Purchase in panel A, that of the distribution of Net Stock Purchases after pledge in panel B, that of the distribution of Net Stock Purchases excluding stock dividends in panel C, and that of the distribution of Net Stock Purchases excluding stock dividends after pledge in panel D. All independent variables are lagged one year and defined in Appendix A. The first four columns are regression results by controlling firm characteristics and column 5 to 8 are results by controlling firm and CEO's characteristics, and year and industry fixed effects. Standard errors are reported in parentheses, and significance at the 1%, 5%, and 10% level is indicated by ***, *, and *, respectively.

Panel A. confidence level measured by Net Stock Purchase

	Dependent variable = Q Confidence measure based on Net stock purchases							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	0.0160	-0.0537 **	-0.0077	0.0466	0.0462	-0.0344	-0.0273	-0.0367
	(0.037)	(0.027)	(0.024)	(0.023)	(0.034)	(0.026)	(0.024)	(0.024)
Excessive diffidence	-0.1771 ***	-0.2538 ***	-0.2152 ***	-0.0350	-0.1135 ***	-0.1849 ***	-0.1550 ***	-0.0396 **
	(0.036)	(0.025)	(0.021)	(0.019)	(0.034)	(0.024)	(0.020)	(0.018)
Ln (sales)	0.0623 ***	0.0615 ***	0.0607 ***	0.0695 ***	0.0951 ***	0.0962 ***	0.0978 ***	0.1063 ***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln (firm age)	-0.1529 ***	-0.1466 ***	-0.1501 ***	-0.1839 ***	-0.2324 ***	-0.2293 ***	-0.2324 ***	-0.2431 ***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)
RD / Asset	3.5565 ***	3.6111 ***	3.6304 ***	3.7745 ***	4.5461 ***	4.5536 ***	4.5756 ***	4.6487 ***
	(0.279)	(0.279)	(0.278)	(0.280)	(0.291)	(0.291)	(0.291)	(0.292)
CEO ownership					1.2281 ***	1.3221 ***	1.3678 ***	1.6282 ***
					(0.159)	(0.163)	(0.166)	(0.172)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years				10258				
No. of firm				1217				
R-square	0.0658	0.0692	0.0684	0.0542	0.2118	0.231	0.2292	0.2237

Panel B. confidence level measured by Net Stock Purchase after pledge

	Dependent variable = Q Confidence measure based on Net stock purchases after pledge							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	0.0252	-0.0521 *	0.0554 **	0.0461 **	0.0581 *	-0.0256	-0.0126	-0.0466 **
	(0.037)	(0.027)	(0.023)	(0.023)	(0.035)	(0.026)	(0.023)	(0.024)
Excessive diffidence	-0.1558 ***	-0.2478 ***	-0.0773 ***	-0.0221	-0.0963 ***	-0.1772 ***	-0.1125 ***	-0.0831 ***
	(0.037)	(0.025)	(0.020)	(0.019)	(0.034)	(0.024)	(0.019)	(0.018)
Ln (sales)	0.0632 ***	0.0626 ***	0.0655 ***	0.0698 ***	0.0957 ***	0.0968 ***	0.1002 ***	0.1069 ***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln (firm age)	-0.1588 ***	-0.1522 ***	-0.1707 ***	-0.1830 ***	-0.2353 ***	-0.2326 ***	-0.2385 ***	-0.2396 ***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)
RD / Asset	3.5954 ***	3.6584 ***	3.7421 ***	3.7943 ***	4.5639 ***	4.5835 ***	4.6239 ***	4.6446 ***
	(0.279)	(0.279)	(0.280)	(0.280)	(0.291)	(0.291)	(0.291)	(0.292)
CEO ownership					1.2607 ***	1.3375 ***	1.4664 ***	1.6936 ***
					(0.158)	(0.162)	(0.167)	(0.171)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years				10258				
No. of firm				1217				
R-square	0.0644	0.0687	0.058	0.0544	0.2302	0.231	0.2269	0.2249

Panel C. confidence level measured by Net Stock Purchase excluding stock dividends

	Dependent variable = Q Confidence measure based on Net stock purchases excluding stock dividends							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	0.1213 **	-0.0234	-0.0652 ***	-0.1122 ***	0.0728	-0.0527 **	-0.1009 ***	-0.1894 ***
	(0.048)	(0.025)	(0.020)	(0.021)	(0.045)	(0.024)	(0.020)	(0.022)
Excessive diffidence	0.1858 ***	0.0891 ***	0.0847 ***	0.0538 ***	0.1514 ***	0.0796 ***	0.0742 ***	0.0248
	(0.047)	(0.024)	(0.020)	(0.020)	(0.044)	(0.023)	(0.019)	(0.020)
Ln (sales)	0.0736 ***	0.0744 ***	0.0737 ***	0.0745 ***	0.1061 ***	0.1073 ***	0.1074 ***	0.1117 ***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln (firm age)	-0.1868 ***	-0.1868 ***	-0.1842 ***	-0.1853 ***	-0.2464 ***	-0.2467 ***	-0.2443 ***	-0.2412 ***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)
RD / Asset	3.8072 ***	3.8697 ***	3.8801 ***	3.8590 ***	4.7015 ***	4.7282 ***	4.7352 ***	4.6689 ***
	(0.280)	(0.281)	(0.281)	(0.280)	(0.292)	(0.291)	(0.291)	(0.291)
CEO ownership					1.4863 ***	1.5440 ***	1.6287 ***	1.9689 ***
					(0.156)	(0.159)	(0.167)	(0.175)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years				10258				
No. of firm				1217				
R-square	0.0563	0.0578	0.059	0.0581	0.2258	0.2283	0.2301	0.2311

Panel D. confidence level measured by Net Stock Purchase excluding stock dividends after pledge

	Dependent variable = Q							
	Confidence measure based on							
	Net stock purchases excluding stock dividends after pledge							
	40%	30%	20%	10%				
Excessive overconfidence	0.0163	-0.0158	-0.0654 ***	-0.0844 ***	-0.0238	-0.0621 ***	-0.1048 ***	-0.1632 ***
	(0.044)	(0.023)	(0.020)	(0.021)	(0.042)	(0.022)	(0.019)	(0.021)
Excessive diffidence	0.0836 *	0.1363 ***	0.0826 ***	0.0328	0.0431	0.0618 ***	0.0442 **	-0.0364 *
	(0.044)	(0.023)	(0.020)	(0.021)	(0.041)	(0.022)	(0.020)	(0.021)
Ln (sales)	0.0736 ***	0.0735 ***	0.0723 ***	0.0734 ***	0.1059 ***	0.1060 ***	0.1065 ***	0.1115 ***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln (firm age)	-0.1868 ***	-0.1816 ***	-0.1814 ***	-0.1834 ***	-0.2458 ***	-0.2428 ***	-0.2401 ***	-0.2365 ***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)
RD / Asset	3.8070 ***	3.7531 ***	3.8282 ***	3.8020 ***	4.6954 ***	4.7066 ***	4.7117 ***	4.6044 ***
	(0.280)	(0.280)	(0.281)	(0.280)	(0.292)	(0.291)	(0.291)	(0.291)
CEO ownership					1.4911 ***	1.4733 ***	1.6267 ***	1.9501 ***
					(0.156)	(0.160)	(0.167)	(0.172)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years				10258				
No. of firm				1217				
R-square	0.0554	0.0611	0.0585	0.0559	0.2247	0.2275	0.2283	0.2279

Table 8: Excessively overconfident CEOs and excessive diffident CEOs vs. firm valuation by ROA

The following tables describe the results of regression with dependent variables industry-adjusted ROA. ROA is the ratio of earnings before interests, taxes, depreciation and amortization to book value of asset in the beginning of the year and then minus industry median ROA. The variables Excessive overconfidence and excessive diffidence are defined as same as table 7 and all independent variables are lagged one year and defined in appendix A. The confidence level measure methods are the same in panel A to D as above that in Table 7. The first four columns are regression results by controlling firm characteristics and column 5 to 8 are results by controlling firm and CEO's characteristics, and year and industry fixed effects. Standard errors are reported in parentheses, and significance at the 1%, 5%, and 10% level is indicated by ***, *, and *, respectively.

Panel A. confidence level measured by Net Stock Purchase

	Dependent variable = ROA Confidence measure based on Net stock purchases							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	-0.0056	-0.0100 ***	-0.0109 ***	-0.0058 **	-0.0053	-0.0129 ***	-0.0166 ***	-0.0157 ***
	(0.004)	(0.003)	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)
Excessive diffidence	-0.0206 ***	-0.0236 ***	-0.0214 ***	-0.0028	-0.0210 ***	-0.0261 ***	-0.0244 ***	-0.0067 ***
	(0.004)	(0.003)	(0.002)	(0.002)	(0.004)	(0.003)	(0.002)	(0.002)
Ln (sales)	0.0095 ***	0.0096 ***	0.0098 ***	0.0105 ***	0.0132 ***	0.0134 ***	0.0139 ***	0.0150 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln (firm age)	-0.0274 ***	-0.0270 ***	-0.0274 ***	-0.0299 ***	-0.0385 ***	-0.0381 ***	-0.0383 ***	-0.0393 ***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
RD / Asset	-0.1049 ***	-0.0979 ***	-0.0945 ***	-0.0855 ***	0.0226	0.0233	0.0231	0.0297
	(0.029)	(0.029)	(0.029)	(0.029)	(0.033)	(0.033)	(0.033)	(0.033)
CEO ownership					0.1444 ***	0.1623 ***	0.1820 ***	0.2153 ***
					(0.018)	(0.018)	(0.019)	(0.019)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years				10258				
No. of firm				1217				
R-square	0.0601	0.0617	0.0615	0.0532	0.1127	0.1146	0.1153	0.1084

Panel B. confidence level measured by Net Stock Purchase after pledge

	Dependent variable = ROA Confidence measure based on Net stock purchases after pledge							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	-0.0047	-0.0107 ***	-0.0072 ***	-0.0060 **	-0.0035	-0.0134 ***	-0.0130 ***	-0.0160 ***
	(0.004)	(0.003)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)
Excessive diffidence	-0.0202 ***	-0.0249 ***	-0.0149 ***	-0.0077 ***	-0.0194 ***	-0.0267 ***	-0.0166 ***	-0.0127 ***
	(0.004)	(0.003)	(0.002)	(0.002)	(0.004)	(0.003)	(0.002)	(0.002)
Ln (sales)	0.0095 ***	0.0096 ***	0.0100 ***	0.0104 ***	0.0132 ***	0.0135 ***	0.0142 ***	0.0149 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln (firm age)	-0.0277 ***	-0.0273 ***	-0.0286 ***	-0.0295 ***	-0.0389 ***	-0.0384 ***	-0.0391 ***	-0.0388 ***
	(0.020)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
RD / Asset	-0.1036 ***	-0.0945 **	-0.0842 ***	-0.0865 ***	0.0243	0.0270	0.0299	0.0267
	(0.029)	(0.029)	(0.029)	(0.029)	(0.033)	(0.033)	(0.033)	(0.033)
CEO ownership					0.1463 ***	0.1650 ***	0.1939 ***	0.2192 ***
					(0.018)	(0.018)	(0.019)	(0.019)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years				10258				
No. of firm				1217				
R-square	0.0605	0.0627	0.0575	0.0541	0.1127	0.1152	0.1106	0.1101

Panel C. confidence level measured by Net Stock Purchase excluding stock dividends

	Dependent variable = ROA Confidence measure based on Net stock purchases excluding stock dividends							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	0.0051	-0.0020	-0.0086 ***	-0.0124 ***	0.0102 **	-0.0022	-0.0125 ***	-0.0207 ***
	(0.005)	(0.003)	(0.002)	(0.002)	(0.005)	(0.003)	(0.002)	(0.002)
Excessive diffidence	0.0149 ***	0.0117 **	0.0102 ***	0.0056 ***	0.0199 ***	0.0128 ***	0.0066 ***	-0.0003
	(0.005)	(0.003)	(0.002)	(0.002)	(0.005)	(0.003)	(0.002)	(0.002)
Ln (sales)	0.0105 ***	0.0105 ***	0.0105 ***	0.0105 ***	0.0142 ***	0.0143 ***	0.0144 ***	0.0149 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln (firm age)	-0.0305 ***	-0.0302 ***	-0.0300 ***	-0.0301 ***	-0.0402 ***	-0.0401 ***	-0.0400 ***	-0.0395 ***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
RD / Asset	-0.0834 ***	-0.0802 ***	-0.0771 ***	-0.0812 ***	0.0393	0.0405	0.0430	0.0351
	(0.029)	(0.029)	(0.029)	(0.029)	(0.033)	(0.033)	(0.033)	(0.033)
CEO ownership					0.1626 ***	0.1637 ***	0.1843 ***	0.2221 ***
					(0.018)	(0.018)	(0.019)	(0.020)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years				10258				
No. of firm				1217				
R-square	0.0559	0.058	0.0599	0.0572	0.1087	0.1115	0.1125	0.1125

Panel D. confidence level measured by Net Stock Purchase excluding stock dividends after pledge

	Dependent variable = ROA							
	Confidence measure based on							
	Net stock purchases excluding stock dividends after pledge							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	-0.0062	-0.0060 **	-0.0094 ***	-0.0109 ***	-0.0008	-0.0065 ***	-0.0138 ***	-0.0185 ***
	(0.005)	(0.002)	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.002)
Excessive diffidence	0.0016	0.0076 ***	0.0042 **	0.0023	0.0065	0.0075 ***	-0.0006	-0.0056 **
	(0.005)	(0.002)	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.020)
Ln (sales)	0.0104 ***	0.0104 ***	0.0104 ***	0.0105 ***	0.0142 ***	0.0142 ***	0.0144 ***	0.0149 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln (firm age)	-0.0302 ***	-0.0299 ***	-0.0298 ***	-0.0298 ***	-0.0401 ***	-0.0398 ***	-0.0394 ***	-0.0390 ***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
RD / Asset	-0.0841 ***	-0.0861 ***	-0.0798 ***	-0.0866 ***	0.0381	0.0393	0.0408	0.0280
	(0.029)	(0.029)	(0.029)	(0.029)	(0.033)	(0.033)	(0.033)	(0.033)
CEO ownership					0.1631 ***	0.1607 ***	0.1933 ***	0.2189 ***
					(0.018)	(0.018)	(0.019)	(0.019)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years				10258				
No. of firm				1217				
R-square	0.0544	0.0574	0.0565	0.0552	0.1067	0.11	0.1097	0.1104

Table 9: Excessively overconfident CEOs and excessive diffident CEOs vs. firm valuation by ROE

The following tables describe the results of regression with dependent variables industry-adjusted ROE. ROE is the ratio of earnings before interests, taxes, depreciation and amortization to book value of shareholders' equities in the beginning of the year and then minus industry median ROE. The variables Excessive overconfidence and excessive diffidence are defined as same as table 7 and all independent variables are lagged one year and defined in appendix A. The confidence level measure methods are the same in panel A to D as above that in Table 7. The first four columns are regression results by controlling firm characteristics and column 5 to 8 are results by controlling firm and CEO's characteristics, and year and industry fixed effects. Standard errors are reported in parentheses, and significance at the 1%, 5%, and 10% level is indicated by ***, *, and *, respectively.

Panel A. confidence level measured by Net Stock Purchase

	Dependent variable = ROE Confidence measure based on Net stock purchases							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	-0.0229 ***	-0.0249 ***	-0.0261 ***	-0.0189 ***	-0.0148 **	-0.0255 ***	-0.0330 ***	-0.0315 ***
	(0.005)	(0.005)	(0.005)	(0.004)	(0.007)	(0.005)	(0.005)	(0.005)
Excessive diffidence	-0.0352 ***	-0.0320 ***	-0.0311 ***	-0.0047	-0.0354 ***	-0.0404 ***	-0.0372 ***	-0.0100 ***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.007)	(0.005)	(0.004)	(0.004)
Ln (sales)	0.0211 ***	0.0220 ***	0.0216 ***	0.0225 ***	0.0271 ***	0.0277 ***	0.0286 ***	0.0302 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln (firm age)	-0.0437 ***	-0.0431 ***	-0.0443 ***	-0.0470 ***	-0.0648 ***	-0.0641 ***	-0.0644 ***	-0.0656 ***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
RD / Asset	-0.3445 ***	-0.3139 ***	-0.3406 ***	-0.3319 ***	-0.1788 ***	7+0.1774 ***	-0.1786 ***	-0.1718 ***
	(0.053)	(0.054)	(0.053)	(0.053)	(0.059)	(0.059)	(0.059)	(0.059)
CEO ownership					0.2002 ***	0.2336 ***	0.2720 ***	0.3225 ***
					(0.032)	(0.033)	(0.033)	(0.035)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years				10258				
No. of firm				1217				
R-square	0.0595	0.0607	0.0613	0.0574	0.1164	0.118	0.1192	0.1155

Panel B. confidence level measured by Net Stock Purchase after pledge

	Dependent variable = ROE Confidence measure based on Net stock purchases after pledge							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	-0.0142 **	-0.0228 ***	-0.0208 ***	-0.0163 ***	-0.0085	-0.0244 ***	-0.0264 ***	-0.0287 ***
	(0.007)	(0.005)	(0.004)	(0.004)	(0.007)	(0.005)	(0.005)	(0.005)
Excessive diffidence	-0.0326 ***	-0.0374 ***	-0.0258 ***	-0.0133 ***	-0.0303 ***	-0.0410 ***	-0.0271 ***	-0.0201 ***
	(0.007)	(0.005)	(0.004)	(0.004)	(0.007)	(0.005)	(0.004)	(0.004)
Ln (sales)	0.0208 ***	0.0210 ***	0.0217 ***	0.0222 ***	0.0270 ***	0.0276 ***	0.0289 ***	0.0298 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln (firm age)	-0.0443 ***	-0.0438 ***	-0.0453 ***	-0.0463 ***	-0.0653 ***	-0.0645 ***	-0.0654 ***	-0.0648 ***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
RD / Asset	-0.3576 ***	-0.3421 ***	-0.3280 ***	-0.3379 ***	-0.1770 ***	-0.1726 ***	-0.1700 ***	-0.1773 ***
	(0.053)	(0.053)	(0.053)	(0.053)	(0.059)	(0.059)	(0.059)	(0.059)
CEO ownership					0.1989 ***	0.2325 ***	0.2854 ***	0.3179 ***
					(0.032)	(0.033)	(0.034)	(0.034)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years	10258							
No. of firm	1217							
R-square	0.0597	0.0616	0.0602	0.0576	0.1164	0.1184	0.1165	0.1161

Panel C. confidence level measured by Net Stock Purchase excluding stock dividends

	Dependent variable = ROE Confidence measure based on Net stock purchases excluding stock dividends							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	0.0000	-0.0072	-0.0183 ***	-0.0249 ***	0.0138	-0.0045	-0.0213 ***	-0.0346 ***
	(0.009)	(0.005)	(0.004)	(0.004)	(0.009)	(0.005)	(0.004)	(0.004)
Excessive diffidence	0.0189 **	0.0180 ***	0.0133 ***	0.0047	0.0321 ***	0.0221 ***	0.0104 ***	-0.0019
	(0.009)	(0.005)	(0.004)	(0.004)	(0.009)	(0.005)	(0.004)	(0.004)
Ln (sales)	0.0221 ***	0.0222 ***	0.0221 ***	0.0223 ***	0.0285 ***	0.0286 ***	0.0288 ***	0.0296 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln (firm age)	-0.0481 ***	-0.0477 ***	-0.0474 ***	-0.0473 ***	-0.0672 ***	-0.0671 ***	-0.0667 ***	-0.0660 ***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
RD / Asset	-0.3304 ***	-0.3237 ***	-0.3166 ***	-0.3253 ***	-0.1543 ***	-0.1523 ***	-0.1481 **	-0.1622 ***
	(0.053)	(0.053)	(0.053)	(0.053)	(0.059)	(0.059)	(0.059)	(0.059)
CEO ownership					0.2195 ***	0.2208 ***	0.2562 ***	0.3205 ***
					(0.031)	(0.032)	(0.034)	(0.035)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years				10258				
No. of firm				1217				
R-square	0.059	0.0611	0.062	0.0601	0.1153	0.1178	0.118	0.1178

Panel D. confidence level measured by Net Stock Purchase excluding stock dividends after pledge

	Dependent variable = ROE Confidence measure based on Net stock purchases excluding stock dividends after pledge							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	-0.0192 **	-0.0162 ***	-0.0200 ***	-0.0212 ***	-0.0052	-0.0138 ***	-0.0244 ***	-0.0312 ***
	(0.008)	(0.004)	(0.004)	(0.004)	(0.008)	(0.004)	(0.004)	(0.004)
Excessive diffidence	-0.0041	0.0069	0.0026	-0.0016	0.0092	0.0103 **	-0.0027	-0.0114 ***
	(0.008)	(0.004)	(0.004)	(0.004)	(0.008)	(0.004)	(0.004)	(0.004)
Ln (sales)	0.0220 ***	0.0221 ***	0.0220 ***	0.0221 ***	0.0285 ***	0.0285 ***	0.0289 ***	0.0296 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln (firm age)	-0.0476 ***	-0.0472 ***	-0.0469 ***	-0.0466 ***	-0.0670 ***	-0.0664 ***	-0.0658 ***	-0.0651 ***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
RD / Asset	-0.3315 ***	-0.3307 ***	-0.3210 ***	-0.3358 ***	-0.1562 ***	-0.1538 ***	-0.1520 ***	-0.1740 ***
	(0.053)	(0.053)	(0.053)	(0.053)	(0.059)	(0.059)	(0.059)	(0.059)
CEO ownership					0.2198 ***	0.2201 ***	0.2751 ***	0.3174 ***
					(0.031)	(0.032)	(0.034)	(0.035)
Year fixed effect					x	x	x	x
Industry fixed effect					x	x	x	x
No. of firm years				10258				
No. of firm				1217				
R-square	0.0578	0.06	0.0595	0.0583	0.1135	0.1162	0.1159	0.1163

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Table 10: Performance-Attribution regression for excessively overconfident CEO portfolio and excessive diffident CEO portfolio

The table shows the abnormal return estimates from a regression based on four factor model for excessively overconfident CEO portfolio, moderate overconfident CEO portfolio, and excessive diffident CEO portfolio. The method to classify CEO confident level is the same as in table 7 and then assigned firm having one specific confident level CEO by lagged one year to the portfolio of that confident level CEO. The portfolio is reset each year and equal-weighted. The dependent variable is the monthly excess return over risk-free rate, one month time deposit saving rate, from an equal-weighted investment in three portfolios. The independent variables including market premium (RMRF), market capitalization premium (SMB), book-to-market ratio premium (HML), and past annual stock return premium (Momentum), are omitted below just show the monthly alpha. The first four columns are regression results of CEO confidence level measured by Net stock purchases, columns 5 to 8 are that measured by Net stock purchases after pledge, columns 9 to 12 are that measured by Net stock purchases excluding stock, and columns 13 to 16 are that measured by Net stock purchases excluding stock after pledge. Standard errors are reported in parentheses, and significance at the 1%, 5%, and 10% level is indicated by ***, *, and *, respectively.
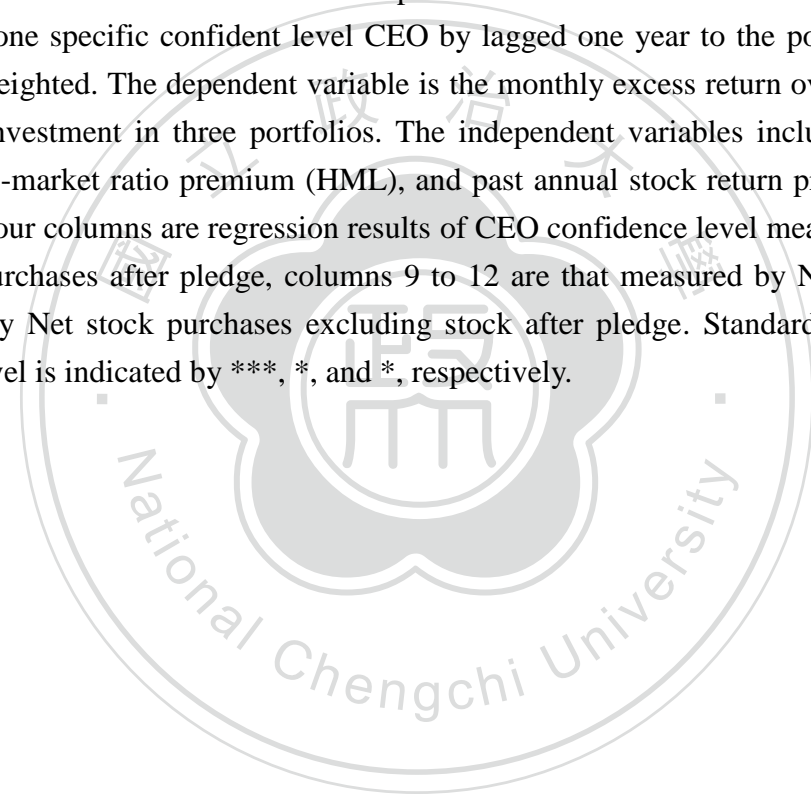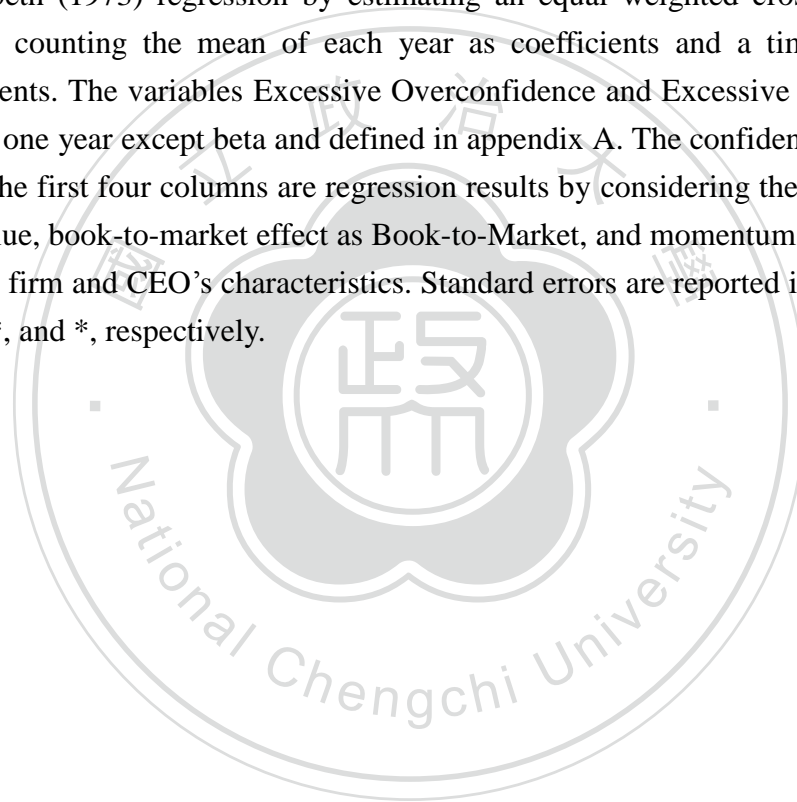
	Dependent variable = Monthly Return Confidence measure based on Net stock purchases				Dependent variable = Monthly Return Confidence measure based on Net stock purchases after pledge			
	40%	30%	20%	10%	40%	30%	20%	10%
Excessively overconfident CEO portfolio								
Monthly alpha	-0.0067 ***	-0.0074 ***	-0.0076 ***	-0.0059 ***	-0.0063 ***	-0.0072 ***	-0.0063 ***	-0.0046 ***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Moderate overconfident CEO portfolio								
Monthly alpha	-0.0060 ***	-0.0057 ***	-0.0062 ***	-0.0044 ***	-0.0070 ***	-0.0052 ***	-0.0044 ***	-0.0047 ***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Excessively diffident CEO portfolio								
Monthly alpha	-0.0016	-0.0015	-0.0019	-0.0024 *	-0.0017	-0.0017	-0.0028 **	-0.0021
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
No. of firm years			125069				125069	
No. of firm			1217				1217	
R-square of Excessively overconfident CEO portfolio	0.9383	0.9325	0.9249	0.9278	0.9389	0.9339	0.9315	0.9284
R-square of Moderate overconfident CEO portfolio	0.8740	0.9210	0.9325	0.9533	0.8754	0.9238	0.9450	0.9538
R-square of Excessively diffident CEO portfolio	0.9587	0.9608	0.9615	0.9573	0.9618	0.9645	0.9622	0.9516

	Dependent variable = Monthly Return Confidence measure based on Net stock purchases excluding stock dividends				Dependent variable = Monthly Return Confidence measure based on Net stock purchases excluding stock dividends after pledge			
	40%	30%	20%	10%	40%	30%	20%	10%
Excessively overconfident CEO portfolio								
Monthly alpha	-0.0055 ***	-0.0050 ***	-0.0045 ***	-0.0039 ***	-0.0051 ***	-0.0040 ***	-0.0037 ***	-0.0031 **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Moderate overconfident CEO portfolio								
Monthly alpha	-0.0021	-0.0007	-0.0025 **	-0.0037 ***	-0.0007	-0.0013	-0.0030 **	-0.0040 ***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)
Excessively diffident CEO portfolio								
Monthly alpha	-0.0031 **	-0.0045 ***	-0.0052 ***	-0.0050 ***	-0.0035 **	-0.0052 ***	-0.0053 ***	-0.0048 **
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
No. of firm years			125069				125069	
No. of firm			1217				1217	
R-square of Excessively overconfident CEO portfolio	0.9581	0.9555	0.9557	0.9518	0.9583	0.9612	0.9631	0.9561
R-square of Moderate overconfident CEO portfolio	0.8911	0.9354	0.9539	0.9619	0.8446	0.9419	0.9506	0.9696
R-square of Excessively diffident CEO portfolio	0.9475	0.9418	0.9262	0.9056	0.9436	0.9347	0.9283	0.9085

Table 11: Excessively overconfident CEOs and excessive diffident CEOs vs. firm stock performance

The following tables describe the results of regression with Total stock return. Total stock return is the gross compound return per year. The regression is conducted by Fama-Macbeth (1973) regression by estimating an equal weighted cross-sectional regression of total return on explanatory control variables and then counting the mean of each year as coefficients and a time-series standard deviation adjusted by Newey-West method of 18 year coefficients. The variables Excessive Overconfidence and Excessive Diffidence are defined as same as table 7 and all independent variables are lagged one year except beta and defined in appendix A. The confidence level measure methods are the same in panel A to D as above that in Table 7. The first four columns are regression results by considering the traditional main factors including market risk as Beta, company size as Market value, book-to-market effect as Book-to-Market, and momentum as Return$_{t-1}$ besides confidence variables and columns 5 to 8 are results by adding firm and CEO's characteristics. Standard errors are reported in parentheses, and significance at the 1%, 5%, and 10% level is indicated by ***, *, and *, respectively.

Panel A. confidence level measured by Net Stock Purchase

	Dependent variable = Total return Confidence measure based on Net stock purchases							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	-0.0078	-0.0118	-0.0043	-0.0042	-0.0087	-0.0167	-0.0004	0.0010
	(0.013)	(0.012)	(0.018)	(0.015)	(0.009)	(0.011)	(0.016)	(0.013)
Excessive diffidence	0.0173	0.0179	0.0223	0.0012	0.0161	0.0139	0.0250 *	0.0002
	(0.013)	(0.016)	(0.013)	(0.010)	(0.014)	(0.017)	(0.014)	(0.010)
Beta	-0.0039	-0.0068	-0.0071	-0.0084	0.0202	0.0168	0.0169	0.0162
	(0.039)	(0.039)	(0.038)	(0.039)	(0.035)	(0.034)	(0.033)	(0.034)
Book-to-Market	0.1492	0.1451	0.1512	0.1487	0.1858 **	0.1828 **	0.1871 **	0.1805 **
	(0.091)	(0.088)	(0.091)	(0.087)	(0.085)	(0.082)	(0.084)	(0.078)
Ln (MV)	0.0006	0.0015	0.0017	-0.0002	-0.0086	-0.0071	-0.0078	-0.0100
	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Return$_{t-1}$	-0.0357 **	-0.0368 **	-0.0356 **	-0.0330 *	-0.0334 **	-0.0348 **	-0.0335 **	-0.0296 *
	(0.016)	(0.016)	(0.017)	(0.017)	(0.014)	(0.014)	(0.015)	(0.015)
Dividend yield					0.0353 ***	0.0348 ***	0.0356 ***	0.0356 ***
					(0.003)	(0.003)	(0.003)	(0.003)
Institutional ownership					0.0223	0.0217	0.0206	0.0179
					(0.025)	(0.025)	(0.026)	(0.027)
Ln (firm age)					0.0100	0.0091	0.0102	0.0110
					(0.016)	(0.016)	(0.016)	(0.016)
CEO ownership					0.0752	0.1094	0.0771	0.0218
					(0.087)	(0.097)	(0.093)	(0.076)
No. of firm years				9390				
No. of Fama-Macbeth obs				18				

Panel B. confidence level measured by Net Stock Purchase after pledge

	Dependent variable = Total return Confidence measure based on Net stock purchases after pledge							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	-0.0069	-0.0126	-0.0070	0.0130	-0.0024	-0.0107	-0.0013	0.0238
	(0.012)	(0.010)	(0.019)	(0.013)	(0.007)	(0.009)	(0.016)	(0.014)
Excessive diffidence	0.0112	0.0110	-0.0002	0.0091	0.0179	0.0134	-0.0003	0.0101
	(0.009)	(0.014)	(0.014)	(0.014)	(0.011)	(0.016)	(0.012)	(0.015)
Beta	-0.0061	-0.0076	-0.0092	-0.0087	0.0184	0.0162	0.0150	0.0163
	(0.039)	(0.039)	(0.038)	(0.039)	(0.035)	(0.034)	(0.034)	(0.034)
Book-to-Market	0.1527	0.1492	0.1569 *	0.1492	0.1872 **	0.1856 **	0.1912 **	0.1793 **
	(0.090)	(0.088)	(0.089)	(0.087)	(0.085)	(0.083)	(0.083)	(0.078)
Ln (MV)	0.0009	0.0012	0.0009	-0.0015	-0.0082	-0.0077	-0.0092	-0.0123 *
	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Return$_{t-1}$	-0.0339 **	-0.0346 **	-0.0315 *	-0.0314 *	-0.0316 **	-0.0326 **	-0.0284 *	-0.0281 *
	(0.016)	(0.016)	(0.017)	(0.017)	(0.014)	(0.015)	(0.015)	(0.015)
Dividend yield					0.0350 ***	0.0350 ***	0.0353 ***	0.0354 ***
					(0.003)	(0.003)	(0.002)	(0.003)
Institutional ownership					0.0191	0.0202	0.0190	0.0166
					(0.026)	(0.026)	(0.027)	(0.027)
Ln (firm age)					0.0106	0.0097	0.0125	0.0111
					(0.016)	(0.016)	(0.016)	(0.016)
CEO ownership					0.0659	0.0900	0.0400	-0.0622
					(0.078)	(0.090)	(0.073)	(0.091)
No. of firm years				9390				
No. of Fama-Macbeth obs				18				

Panel C. confidence level measured by Net Stock Purchase excluding stock dividends

	Dependent variable = Total return Confidence measure based on Net stock purchases excluding stock dividends							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	-0.0029	-0.0204	-0.0085	0.0046	0.0027	-0.0190	-0.0010	0.0151
	(0.019)	(0.015)	(0.011)	(0.009)	(0.023)	(0.012)	(0.010)	(0.012)
Excessive diffidence	0.0133	-0.0153	-0.0181 **	-0.0118	0.0204	-0.0123	-0.0113	-0.0057
	(0.025)	(0.012)	(0.008)	(0.007)	(0.028)	(0.011)	(0.009)	(0.010)
Beta	-0.0083	-0.0065	-0.0064	-0.0075	0.0168	0.0187	0.0176	0.0181
	(0.039)	(0.039)	(0.039)	(0.039)	(0.034)	(0.034)	(0.035)	(0.035)
Book-to-Market	0.1534	0.1464	0.1484	0.1515	0.1884 **	0.1813 **	0.1813 **	0.1874 **
	(0.091)	(0.090)	(0.090)	(0.091)	(0.084)	(0.082)	(0.082)	(0.082)
Ln (MV)	0.0001	0.0002	0.0001	-0.0001	-0.0097	-0.0090	-0.0092	-0.0106
	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)	(0.008)	(0.008)	(0.007)
Return$_{t-1}$	-0.0356 **	-0.0331 *	-0.0281	-0.0268	-0.0333 **	-0.0308 **	-0.0255	-0.0235
	(0.017)	(0.017)	(0.017)	(0.017)	(0.015)	(0.015)	(0.015)	(0.015)
Dividend yield					0.0363 ***	0.0356 ***	0.0355 ***	0.0361 ***
					(0.003)	(0.003)	(0.003)	(0.002)
Institutional ownership					0.0212	0.0181	0.0198	0.0186
					(0.026)	(0.028)	(0.028)	(0.027)
Ln (firm age)					0.0102	0.0109	0.0109	0.0120
					(0.017)	(0.016)	(0.016)	(0.017)
CEO ownership					0.0065	0.0406	0.0233	-0.0313
					(0.077)	(0.078)	(0.083)	(0.122)
No. of firm years				9390				
No. of Fama-Macbeth obs				18				

Panel D. confidence level measured by Net Stock Purchase excluding stock dividends after pledge

	Dependent variable = Total return							
	Confidence measure based on							
	Net stock purchases excluding stock dividends after pledge							
	40%	30%	20%	10%	40%	30%	20%	10%
Excessive overconfidence	-0.0162 **	-0.0199	-0.0014	0.0132	-0.0167 *	-0.0218 *	0.0029	0.0198
	(0.006)	(0.013)	(0.011)	(0.010)	(0.008)	(0.012)	(0.010)	(0.013)
Excessive diffidence	-0.0096	-0.0283 ***	-0.0163 **	-0.0082	-0.0064	-0.0276 ***	-0.0120	-0.0043
	(0.008)	(0.008)	(0.007)	(0.014)	(0.009)	(0.009)	(0.009)	(0.020)
Beta	-0.0085	-0.0065	-0.0069	-0.0086	0.0164	0.0178	0.0173	0.0173
	(0.039)	(0.039)	(0.039)	(0.039)	(0.034)	(0.034)	(0.035)	(0.035)
Book-to-Market	0.1551	0.1478	0.1483	0.1492	0.1918 **	0.1842 **	0.1823 **	0.1851 **
	(0.091)	(0.089)	(0.090)	(0.092)	(0.082)	(0.081)	(0.081)	(0.083)
Ln (MV)	-0.0005	-0.0005	0.0001	-0.0003	-0.0097	-0.0092	-0.0093	-0.0108
	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)	(0.008)	(0.008)	(0.008)
Return$_{t-1}$	-0.0317 *	-0.0299 *	-0.0278	-0.0273	-0.0293 *	-0.0275 *	-0.0254	-0.0258
	(0.017)	(0.017)	(0.017)	(0.017)	(0.015)	(0.015)	(0.015)	(0.015)
Dividend yield					0.0362 ***	0.0352 ***	0.0354 ***	0.0359 ***
					(0.002)	(0.002)	(0.003)	(0.002)
Institutional ownership					0.0185	0.0184	0.0211	0.0208
					(0.027)	(0.028)	(0.027)	(0.027)
Ln (firm age)					0.0093	0.0097	0.0107	0.0121
					(0.017)	(0.017)	(0.016)	(0.016)
CEO ownership					0.0275	0.0588	0.0265	-0.0245
					(0.086)	(0.085)	(0.100)	(0.150)
No. of firm years				9390				
No. of Fama-Macbeth obs				18				