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Can Firm Characteristics diminish CEO Optimism effect: the U.S. Securities Market Evidence

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Abstract

This study aims to investigate the impact of CEO optimism on analyst's forecast bias with data gathered from the years 1993 to 2015 in the US and to identify whether or not certain firm characteristics can ease analyst's forecast bias affected by CEO optimism. These being: cash dividend changes, external financing, credit rating, and CEO gender and to verify firm characteristics have the ability to improve an analyst's prediction or not as well as have the ability to reduce the impact of CEO optimism on analyst forecast bias. The empirical findings have shown that optimistic CEOs are more likely to release higher earnings forecasts and increase analyst forecast bias. Analysts can reduce the forecast bias caused by optimistic CEOs by learning more about cash dividend changes, debt financing, credit ratings, and CEO gender. This effect is also more significant in relation to the analysts' negative forecast bias.

JEL classification numbers: G31, G32, G34, G38
Keywords: Analyst Forecast, CEO Optimism, Analysts Forecast Bias Sensitivity.

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1. Introduction

The analyst plays an important role and possesses the expertise for delivering accurate security market information to investors. Clapham and Schwenk (1991) found that the majority of CEOs have the personal characteristic of being optimistic. The reasons for the prevalent optimism in CEOs has been empirically documented by Wong and Zang (2014), who found a process of rational self-selection, i.e., the majority of firms prefers to hire optimistic CEOs in order to inspire their employees and attract more investor attention. Self-attribution bias was also empirically recognized in a study by Bettman and Weitz (1983), where it is shown that self-attribution behavior exists in most CEOs, and CEOs have optimistic outlooks in terms of the outcome of their career and promotion. Such optimism tends to attribute positive results to self-attribution, and negative results to force majeure.

Bradly, Gokkaya, Liu, and Xie (2017) have found that analysts act in an external supervisory role and are widely trusted by investors. A study by Barron, Byard, and Yu (2008) found that analysts will attempt to avoid future forecast failure by obtaining more firm information to reduce forecast bias when analyst forecast bias has been broadened. Thus, in this study, we assume analyst forecast accuracy can be reinforced by adopting four types of firm characteristics:

1. Cash dividend changes.
2. External financing.
3. Credit rating.
4. CEO gender, which to analyze the positive or negative forecast bias of analysts.

In line with these characteristics, we have employed these firm's characteristics as corporate information being transmitted to analysts in an attempt to discover any cause and effect relationships that exist between CEO optimism and analyst forecast bias.

Our study's contribution is revealing an empirical framework that enables us to synthesize CEO optimism effects with analyst forecast bias. We have empirically shown that the firm characteristics of cash dividend changes, external financing, credit rating, and CEO gender all have the ability to reinforce the accuracy of analyst forecasting, and these characteristics will strengthen analyst forecast reliability by providing accurate information for investors in making investment strategies.

The remainder of this study is organized as follows. In Section 2, a review of the relevant literature that includes the relationship between CEO optimism and analyst forecast bias is undertaken. In Section 3, we describe the data source by giving a brief summary of statistical foundations. In Section 4, an empirical result analysis is presented. Finally, in the concluding section, we summarize our findings and analysis.

2. Literature Review

2.1 The relationship between analyst forecast bias and CEO optimism

Campbell et al. (2011) obtained a higher managerial payroll database to calculate stock options value and used it as a degree of CEO optimism, then proceeded to

undertake a comparison of CEO investment efficiency in order to find out the relationship between these two variables. Momhamed and Shehata (2016) have also found that firms that have optimistic CEOs will have increased sensitivity towards a firm's R&D cash flow investment, which shows that optimistic CEOs are more interested in investing than general CEOs (Lin et al. 2005; Lin and Chen 2012).
The asymmetry of information between a firm and its investors are affected by the effects of CEO optimism. In line with the portfolio theory, Wong and Zang (2014) found that when a CEO's personal shares holding is larger than his/her diversification ratio, an optimism factor can be identified. Their empirical result has shown these two variables are significantly positively correlated. According to previous scholars' findings, in this study, we assume that when CEOs optimism exists in a firm, CEO tends to release higher earnings forecast. In turn, optimistic information will influence analyst forecast and, as a result, earnings forecasts increase, and analyst forecast broadens. On the basis of this idea, we have constructed Hypothesis 1 below:

Hypothesis 1: Analyst forecast bias positively correlates with CEO optimism because optimistic CEOs are more likely to deliver higher earnings forecasts.

2.2 The relationship between cash dividend changes and analyst forecast bias

A firm's cash dividend policy has two major themes: investment return to shareholders and future investment development. Optimistic CEOs tend towards investment to a degree larger than those general CEOs (Lin et al., .2005, Lin and Chen, 2012). For analysts, when a firm invests in projects that generate stable profits and releases corporate information to external investors, the uncertainty over corporate information volatility and earnings forecasts decreases and, consequently, analyst forecast bias is reduced. Thus, we have formulated Hypothesis 2a:

Hypothesis 2a: Analyst forecast bias is less affected by CEO optimism when a firm has higher cash dividend changes.

2.3 The relationship between external financing and analyst forecast bias

Optimistic CEOs believe that investment can generate more profit. This behavior may cause potential investment distortion and produce an over-investment effect. Hong, Tsai, and Ko (2013) have found that optimistic CEOs are more cash flow-sensitive than CEOs who are not optimistic. Linet al. (2005), Chen and Lin (2012) have also found that the percentage of optimistic CEOs participating in investment is greater than the average CEO.
However, optimistic CEOs over-investment resulting in external financing may impact shareholders and creditors. As a result, problems with managers, shareholders, and creditors may increase. Guariglia and Yang (2016) study the investment efficiency of listed companies in China and found increases in agency

cost and over-investment. According to previous literature, optimistic CEOs tend to over-invest by increasing external financing, resulting in an asymmetry of information between managers and investors, thus increasing the need for financial disclosure.

In this study, we propose that optimistic CEOs show over-investment behavior and thus may use the external financing to raise funds. For an analyst, over-investment increases the sensitivity of earnings volatility and the effectiveness of supervision; consequently, an analyst will become conservative with firm's earnings forecast due to its over-investment behavior. Therefore, we formulate Hypothesis 2b as below:

Hypothesis 2b: Optimistic CEOs are negatively correlated with analyst forecast bias; thus, increases in external financing can inhibit analyst forecast bias affected by CEO optimism.

2.4 The relationship between credit rating and analyst forecast bias

Unlike the financial report which only focuses on numerical interpretations, credit appraisals include the quality of firm management, liquidity, business performance, and business development prospects, revealing the potential development of the firm in the future. Guantay and Hackbarth (2010) research takes credit ratings from S&P and Moody's in the US to calculate the credit difference between company bonds and government bonds to explore the relationship between credit rating and analyst forecast. They have found that if the spread of credit rating is high, firm credit risk becomes high and brings uncertainty to its stakeholders.

Therefore, this study believes that credit rating can affect the level of information disclosure. When the credit rating is high, information disclosure improves. Under the full information delivery of managers and analysts, the impact on CEO optimism on firm earnings forecast can be weakened, resulting in a conservative analyst earnings forecast. Thus, an analyst might downgrade the earnings forecast. Therefore, Hypothesis 2c is constructed as follows:

Hypothesis 2c: Analyst forecast bias and credit rating are negatively correlated; thus, better credit ratings can inhibit the analyst forecast bias effect of CEO optimism.

2.5 The relationship between female CEOs and analyst forecast bias

Recently, with the increase of women participating in the workforce, females have been occupying higher managerial roles at a firm in greater numbers than before. (Fullerton, et al. 1999).Many higher managerial positions have been occupied by females, and research has shown that female CEOs are more efficient at corporate governance than male CEOs (Eagly and Carli, 2003; Ahern and Dittmar, 2012). What are the differences when a female CEO has influence at a firm? Ling (2013) indicates that during investment decisions, females tend to be more cautious, conservative, and risk-adverse.

This study assumes that in corporate governance, the conservative attitude of female CEOs will affect external information delivery. When compared to male CEOs,

females CEOs are more conservative in their forecast. When the voluntary earning forecast is conservative, analyst earnings forecast will tend to be conservative. Therefore, we have constructed Hypothesis 3 as follows:

Hypothesis 3: Female CEOs and CEO optimism are negatively correlated; thus, female CEOs have the ability to inhibit analyst forecast bias affected by CEO optimism.

3. Methodology

3.1 Data resources

Data obtained or this study is originally from ExecuComp's CEO options database. We take this data as a CEO optimism proxy variable. Analyst forecast bias (Forecast error, ERROR) is obtained from US listed companies in the I/B/E/S database of real and forecast firm's earning per share (EPS). Control variables and other CEO characteristics are employed in this study, which were originally obtained from the Compustat database's yearly financial reports. We have also standardized the sample firms according to the Standard Industrial Classification (SIC) in classifying our observations of industry distribution of U.S. listed companies from 1993 to 2105.

3.2 Variable definitions

3.2.1 Dependent variable-analyst forecast bias

This study uses Dhaliwal and Radhakrishnan (2012) to measures the variable of analyst forecast bias definition. We have employed an earnings per share forecast value to calculate the average of all analyst forecast bias and have obtained ERROR by adjusting the stock price deflation. In addition, Wong and Zang (2014) show that each individual analyst has personal expertise, and their industry preference is different. Thus, in this study, we take the median of analyst forecast to value the prior 8 months of actual earnings announcements as the accounting year forecast. The analyst forecast variable is defined in Equation (1)

$$\mathrm{FERROR}_{\mathrm{i,t}} = \left|\frac{\mathrm{EPS}_{\mathrm{i,t}} - \mathrm{FEPS}_{\mathrm{i,t}}}{\mathrm{PRICE}_{\mathrm{i,t-1}}}\right| \quad (1)$$

Where represents the type of company, represents the accounting year, FEPS is the company of actual earnings announcement at t a year of the median prior 8 months of all analyst forecast earnings. EPS is the i company earnings per share at the year. PRICE is the stock closing price for the $t-1$ year.

3.2.2 Dependent variable—analyst forecast bias

Wong and Zang (2014) calculate the average exercise price of CEO un-exercise stock options value and shares to measure CEO optimism. If the price of CEO un-exercise stock options values and shares is 1.67 times (deep-in-the-money) higher than the average exercise price, and an option is not exercise, we can say it is CEO

optimism. Jenner, Lisic, Nanda, and Silveri (2016) take previous literature as a reference to measure CEO optimism by using 1.67 times higher than the average exercise price to run a regression. Thus, in this study, we adopt the same variable measurement of CEO optimism and analyst forecast bias as in past literature to run the regression. The formula for CEO optimism measurement of this study is below:

$$\mathrm{C_{i,t}} = \frac{\mathrm{OUUEV_{i,t}}}{\mathrm{OUUN_{i,t}}} \tag{2}$$

$$\mathrm{Estimated\_SP_{i,t}} = \mathrm{PRICE_{i,t}} - \mathrm{C_{i,t}} \tag{3}$$

Where OUUEV is the estimated CEO un-exercise stock options value, and OUUN is the volume of CEO un-exercise stock options, Estimated_SP is the exercise price of CEO stock options; PRICE is the closing price of stock. If stock prices are larger than 1.67 times of exercise prices, the option is deep-in-the-money, and the CEO has the characteristics of CEO optimism, then D_OM=1, otherwise D_OM=0.

3.2.3 Variable interactions

We aim to examine the influence of analyst forecast bias by CEO optimism and to test whether or not firm characteristics will have an effect on analyst forecast bias. So, we assume firm characteristics include cash dividend changes, ($DI\_DIF_{i,t}$) is the accumulated sum of cash dividend changes at $t-1$ cash dividend, firm's external financing ($DLTT_{i,t}$) is the long-term debt value of the $i-th$ company at t year. The company convertible bonds ($DCVT_{i,t}$) is the company convertible bond value of the $i-th$ company of the t year. Particular stock ($PSTK_{i,t}$) is the particular stock value of the $i-th$ company of the t year. Common stock ($CSTK_{i,t}$) is the common stock value of the $i-th$ company of the t year. Firm credits rating ( ) is the level of credit rating at the $i-th$ company of the t year, 18 is an AAA level of bond, 1 is the level of D bonds. Female CEO ($FEMALE_{i,t}$), FEMALE=1represents female CEO, otherwise 0.

3.2.4 Control variables

This study adopts control variables to investigate analyst forecast bias affected by CEO optimism following Wong and Zang's (2014) study. The control variables including firm size ($SIZE_{i,t-1}$), which is the log of the market value of the i company, the number of analyst followers ($COV_{i,t}$), which is the log of the number of analyst followers at i company. Earnings volatility ($EVOL_{i,t}$), which is the

standard deviation of ROA from the $t-1$ year to $t-4$ year at $i-th$ company; return volatility ($RETVOL_{i,t}$), which is the standard deviation of holdings at $i-th$ company stock return 12 months prior to the actual earnings announcement of $i-th$ company at i company. Firm's growth performance variables including Return of Asset ($ROA_{i,t}$) which is the earnings divided by the total assets of $i-th$ company at t year; PE ratio($EP_{i,t}$) is the stock price divided by the earnings per share of $i-th$ company at $t-1$ year; book to market ratio ($BM_{i,t}$) is the book value divided by the market value of $i-th$ company at year; sales growth rate($SGR_{i,t}$) is the total sales of $i-th$ company at year minus the total sale at $t-1$ year, then divided by the total sales at $t-1$ year; the ratio of fixed asset changes($\Delta PPE_{i,t}$)is the asset changes of $i-th$ company at year, plant, and equipment divided by the total asset at $t-1$ year. Return of stock holdings($RET12_{i,t}$) is $i-th$ company stock return 12 months prior to the actual earnings announcement at company of $i-th$ company; accruals (ACC)is the profit minus operating cash flow of $i-th$ company at $t-1$ year, and then divided by the total asset at t a year.[4]

3.3 Construction of baseline model

3.3.1 The relationship between CEO optimism and analyst bias

In order to test Hypothesis 1 which says that analyst forecast bias is positively correlated with CEO optimism because optimistic CEOs are most likely to deliver higher earnings forecast, we have formulated our regression model as Equation (4):

$$\begin{aligned} FERROR_{i,t}^{+,-} = {} & \alpha_0 + \beta_0 D\_OM_{i,t} + \alpha_1 EP_{i,t} + \alpha_2 EP_{i,t} \times D\_EP + \alpha_3 SIZE_{i,t-1} + \alpha_4 BM_{i,t} \\ & + \alpha_5 COV_{i,t} + \alpha_6 SGR_{i,t} + \alpha_7 ACC_{i,t-1} + \alpha_8 \Delta PPE_{i,t} + \alpha_9 ROA_{i,t} + \alpha_{10} EVOL_{i,t} \\ & + \alpha_{11} RETVOL_{i,t} + \alpha_{12} RET12_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{4}$$

If t coefficient of β_0>0, then CEO optimism and analyst forecast bias are positively correlated. Within Equation (4), FERROR represents analyst forecast bias, D_OM is the dummy variable of CEO optimism, 1 is CEO has optimistic characteristics, otherwise 0. SIZE represents firm size, COV is the number of investors following an analyst, EVOL is the level of earnings volatility, ROA is the return of total asset, EP is the PE ratio, D_EP is the dummy variable, 1 represents firm generates profit at the end of accounting year, otherwise 0, BM is the ratio of book to market, SGR is the growth rate of sales, △PPE is the changes in fixed asset/total asset, RET12

[4] COV is 3.178, the average of EVOL

is the return of stock.

3.3.2 The relationship between cash dividend changes and analyst forecast bias

In order to test Hypothesis 2a, we assume analyst forecast bias is less affected by CEO optimism when a firm has higher cash dividend changes, so, we expect a negative relationship between cash dividend changes and analyst forecast bias if the coefficient of β_1<0. We have constructed Equation (5) as below:

$$\begin{aligned} FERROR_{i,t}^{+,-} = {} & \alpha_0 + \beta_0 D\_OM_{i,t} + \beta_1 D\_OM_{i,t} \times DI\_DIF_{i,t} + \alpha_1 DI\_DIF_{i,t} + \alpha_2 EP_{i,t} \\ & + \alpha_3 EP_{i,t} \times D\_EP + \alpha_4 SIZE_{i,t-1} + \alpha_5 BM_{i,t} + \alpha_6 COV_{i,t} + \alpha_7 SGR_{i,t} \\ & + \alpha_8 ACC_{i,t-1} + \alpha_9 \Delta PPE_{i,t} + \alpha_{10} ROA_{i,t} + \alpha_{11} EVOL_{i,t} + \alpha_{12} RETVOL_{i,t} \\ & + \alpha_{13} RET12_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{5}$$

Where DI_DIF is the cash dividend changes at a firm; other control variables used in Equation (5) are the same as those in Equation (4). We have distinguished positive and negative analyst forecast bias separately by comparing the difference between these two forecast biases using the whole samples of CEO optimism, cash dividend changes, external financing, credit rating, and female CEOs in this study.

3.3.3 The relationship between cash dividend changes and analyst forecast bias

To test Hypothesis 2b which states that optimistic CEOs are negatively correlated with analyst forecast bias, thus, external financing can inhibit analyst forecast bias affected by CEO optimism, and analyst forecast bias might decrease; therefore, if the coefficient of β_1< 0, analyst forecast bias and CEO optimism are negatively correlated. We have formulated Equation (6) as below:

$$\begin{aligned} FERROR_{i,t}^{+,-} &= \alpha_0 + \beta_0 D\_OM_{i,t} + \beta_1 D\_OM_{i,t} \times FS_{i,t} + \alpha_1 FS_{i,t} + \alpha_2 EP_{i,t} \\ &+ \alpha_3 EP_{i,t} \times D\_EP + \alpha_4 SIZE_{i,t-1} + \alpha_5 BM_{i,t} + \alpha_6 COV_{i,t} + \alpha_7 SGR_{i,t} \\ &+ \alpha_8 ACC_{i,t-1} + \alpha_9 \Delta PPE_{i,t} + \alpha_{10} ROA_{i,t} + \alpha_{11} EVOL_{i,t} + \alpha_{12} RETVOL_{i,t} \\ &+ \alpha_{13} RET12_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (6)$$

Where FS is the external financing that includes long-term debt, convertible bonds, particular shares, and common shares. Other control variables used in Equation (6) are the same as those used in Equation (4). We also distinguish between the positive and negative analyst forecast bias separately in this study to analyze the difference between these two forecast biases.

3.3.4 The relationship between cash dividend changes and analyst forecast bias

To verify Hypothesis 2c that analyst forecast bias and credit rating is negatively correlated and, thus, better credit rating can inhibit the analyst forecast bias effect of CEO optimism, we have assumed the coefficient of β_1<0 in Equation (7); therefore when a firm's credit rating improves, the firm's disclosure becomes more transparent with its forecast information, analyst forecast bias is reduced, and we assume that CEO optimism and analyst forecast bias are negatively correlated. So, we have constructed the regression model in Equation (7) below:

$$\begin{aligned} FERROR_{i,t}^{+,-} &= \alpha_0 + \beta_0 D\_OM_{i,t} + \beta_1 D\_OM_{i,t} \times CREDIT_{i,t} + \alpha_1 CREDIT_{i,t} + \alpha_2 EP_{i,t} \\ &+ \alpha_3 EP_{i,t} \times D\_EP + \alpha_4 SIZE_{i,t-1} + \alpha_5 BM_{i,t} + \alpha_6 COV_{i,t} + \alpha_7 SGR_{i,t} \\ &+ \alpha_8 ACC_{i,t-1} + \alpha_9 \Delta PPE_{i,t} + \alpha_{10} ROA_{i,t} + \alpha_{11} EVOL_{i,t} + \alpha_{12} RETVOL_{i,t} \\ &+ \alpha_{13} RET12_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (7)$$

Where CREDIT is the credit rating, other control variables used in Equation (6)are the same as Equation (4), and we have analyzed the positive and negative analyst forecast bias in the whole sample.

3.3.5 The relationship between female CEOs and analyst forecast bias

In order to test Hypothesis 3, female CEOs and CEO optimism are negatively correlated, thus, female CEOs have the ability to inhibit analyst forecast bias by CEO optimism. So, we expect female CEOs and analyst forecast bias to be negatively correlated and anticipate the coefficient of β_1<0 in Equation (8).We have formulated the regression model of Equation (8) as below:

$$\begin{aligned} FERROR_{i,t}^{+,-} = {} & \alpha_0 + \beta_0 D\_OM_{i,t} + \beta_1 D\_OM_{i,t} \times FEMALE_{i,t} + \alpha_1 FEMALE_{i,t} + \alpha_2 EP_{i,t} \\ & + \alpha_3 EP_{i,t} \times D\_EP + \alpha_4 SIZE_{i,t-1} + \alpha_5 BM_{i,t} + \alpha_6 COV_{i,t} + \alpha_7 SGR_{i,t} \\ & + \alpha_8 ACC_{i,t-1} + \alpha_9 \Delta PPE_{i,t} + \alpha_{10} ROA_{i,t} + \alpha_{11} EVOL_{i,t} + \alpha_{12} RETVOL_{i,t} \\ & + \alpha_{13} RET12_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (8)$$

Where FEMALE is the dummy variable of female CEOs, and if the CEO is female, the dummy variable of FEMALE=1, otherwise 0. Other control variables used in Equation (7) are the same as Equation (4). We have also distinguished positive and negative analyst forecast bias by comparing the difference between these two forecast biases using the whole samples of CEO optimism, cash dividend changes, external financing, credit rating, and female CEOs in this study.

4. Empirical results

4.1 Description of samples

Table 1 presents the descriptive statistics of variables by listings the average of sample size, standard deviation, and Maximum. The FERROR average is 0.43; the median is 0.433. In this study, we take D_OM as the proxy to measure CEO stocks option, the maximum is 1, otherwise 0. There is a difference between firm performance and the growth capacity of our study sample. In the standard deviation of company performance (EP) 0.070is the smallest, while in the standard deviation of SGR 0.184 is the biggest. The average firm size is 7.530, the average of COV is 3.178, the average of EVOL is 0.048, and the average of RETVOL is 0.203.

Table 1: Descriptive Statistics of Variables

Variable	Mean	Standard Deviation	Minimum	25%	50%	75%	Maximum
FERROR	0.431	0.861	0.000	0.048	0.153	0.433	9.714
D_OM	0.161	0.368	0.000	0.000	0.000	0.000	1.000
EP	0.038	0.070	-0.656	0.027	0.048	0.067	0.195
SIZE	7.530	1.461	4.306	6.422	7.395	8.521	11.487
BM	0.485	0.301	0.046	0.271	0.421	0.626	2.034
COV	3.187	0.885	0.693	2.639	3.219	3.829	5.106
SGR	0.109	0.184	-0.429	0.011	0.083	0.181	1.149
ACC	-0.055	0.063	-0.333	-0.086	-0.050	-0.019	0.177
△PPE	0.046	0.073	-0.170	0.005	0.027	0.066	0.487
ROA	0.053	0.071	-1.036	0.025	0.054	0.088	0.250
EVOL	0.048	0.064	0.002	0.014	0.028	0.055	0.664
RETVOL	0.203	0.120	0.052	0.117	0.170	0.252	0.841
RET12	0.161	0.284	-0.645	-0.017	0.146	0.319	1.329

Note: Newey and West (1987) t-statistics are reported in parentheses and *, ** and *** indicate significance at 10%, 5%, and 1%, respectively. Note: FERROR is analyst forecast error, D_OM is CEO optimism, EP represents PE ratio, SIZE represents a firm's size, BM represents book to market ratio, COV represents the number of analyst followers, SGR represents the growth rate of a firm, ACC represents the accruals,△PPE represents the change of fixed assets, ROA represents the return on the total asset, EVOL represents the volatility of earnings, RETVOL represents the level of earnings volatility and RET12 represents the rate of return of stock.

4.2 Description of samples

Table 2 represents the regression results of CEO optimism impact on analyst forecast bias, the coefficient of the whole sample D_OM is 0.211; analyst forecast bias and CEO optimism are positively correlated at 5% level of significance, which indicates analyst forecast bias has positively correlated with CEO optimism because optimistic CEOs are more likely to deliver higher earnings forecast. We also add industry and year to test the effect of industry and year and have found the result is still significant.

Table 2: CEO Optimism Impact on Analyst Forecast Bias

	Whole Samples		Analyst Positive Bias		Analyst Negative Bias	
Intercept	-0.111	(-0.29)	-0.681	(-1.38)	0.747	(1.13)
D_OM	0.211**	(2.11)	0.112	(1.13)	0.479**	(2.23)
EP	1.133	(1.21)	0.494	(1.34)	2.233	(0.94)
EP×D_EP	-5.075***	(-4.36)	-5.050***	(-7.23)	-4.792*	(-1.83)
SIZE	-0.0422	(-0.86)	-0.0262	(-0.48)	-0.0781	(-0.88)
BM	1.194***	(5.22)	0.891***	(2.69)	1.303***	(4.17)
COV	-0.161*	(-1.67)	-0.0340	(-0.44)	-0.372*	(-1.92)
SGR	-0.0784**	(-2.05)	-0.0604	(-1.51)	-0.0964	(-1.00)
ACC	0.0226	(0.04)	0.549	(1.32)	0.781	(0.59)
△PPE	-0.731**	(-2.25)	-0.174	(-1.04)	-1.492*	(-1.89)
ROA	-2.374***	(-3.87)	1.190**	(2.28)	-5.326***	(-4.03)
EVOL	-0.00349**	(-2.50)	-0.00201*	(-1.69)	-0.00656	(-1.53)
RETVOL	1.890***	(2.94)	1.632***	(2.65)	2.770*	(1.87)
RET12	0.301	(1.18)	0.243	(1.01)	0.592	(1.09)
Industry	YES		YES		YES	
Year	YES		YES		YES	
Adjusted R^2	0.1791		0.3889		0.1174	

Note: Newey and West (1987) t-statistics are reported in parentheses and *, ** and *** indicate significance at 10%, 5%, and 1%, respectively. Note: FERROR is analyst forecast error, D_OM is CEO optimism, EP represents PE ratio, SIZE represents a firm's size, BM represents book to market ratio, COV represents the number of analyst followers, SGR represents the growth rate of a firm, ACC represents the accruals, △PPE represents the change of fixed assets, ROA represents the return on the total asset, EVOL represents the volatility of earnings, RETVOL represents the level of earnings volatility and RET12 represents the rate of return of stock.

The relationship between control variables and analyst forecast bias: first, the correlation between analyst forecast bias with SIZE and COV are negatively related, and positively correlated with RETVOL. These implicate firms with small size, fewer analyst followers and high return volatility, with these characteristics broadening analyst forecast bias; second, the proxy of performance and growth, the correlation of analyst forecast bias with SGR, △PPE, BM, and ROA are negatively correlated, these points to firms with the characteristic of good performance and growth will lower analyst forecast bias. Finally, ACC and RET12 are positively correlated with analyst forecast bias and are not significant.

The empirical results from Table 2 have verified Hypothesis 1 that analyst forecast bias is positively correlated with CEO optimism because optimistic CEOs are more likely to deliver higher earnings forecast. In addition, we have to test positive and

negative analyst forecast bias separately in this study; Positive Bias represents positive analyst forecast bias, and Negative Bias represents negative forecast bias. The regression result is shown in the Positive Bias column, D_OM (0.112), is not significant while the Negative Bias column, D_OM (0.479), is positive and significantly correlated with negative analyst forecast bias, which indicates CEO optimism has a significant impact on negative analyst forecast bias. When we add industry and year to the regression, the result is still consistent; therefore, we can say that the impact of CEO optimism on negative analyst forecast bias is greater than that on positive analyst forecast bias.

The coefficient of analyst forecast bias is 0.142 and is positively correlated with the whole sample column in Table 3, which represents the fact that CEO optimism does affect analyst forecast bias. The coefficient of D_OM×DI_DIF is -0.000183 and is negatively correlated with analyst forecast bias at 5% level of significance. Thus, Hypothesis 2a can be confirmed that analyst forecast bias is less affected by CEO optimism when a firm has higher cash dividends and that when the volatility of future earnings has decreased, analysts can predict a firm's future profit more accurately and can reduce analyst forecast bias.

By analyzing positive and negative analyst forecast bias, in the Negative Bias column of Table 3, the coefficient of D_OM×DI_DIF is -0.00195 and is significantly negative with regards to analyst forecast bias, which indicates negative analyst forecast bias is lowered by CEO optimism with cash dividend changes; in Table 3 of the Positive Bias column, the coefficient of D_OM×DI_DIF is -0.0000617 and positive analyst forecast is not significant, which indicates positive analyst forecast bias is not affected by increased cash dividends. Furthermore, negative analyst forecast bias is significantly affected by CEO optimism and increased cash dividend affects negative analyst forecast bias more than positive analyst forecast bias in this study. In conclusion, we can say CEO optimism has the ability to affect analyst forecast bias; however, when a firm increases cash dividends, analyst forecast bias caused by CEO optimism is reduced; the effect of CEO optimism is most significantly found in the negative analyst forecast bias.

Table 4 represents the regression results of CEO optimism and external financing on analyst forecast bias. We looked to test four types of firm external financing strategies: debt financing, convertible bonds, preferred stock and common stock in the regression, and have found that only debt financing is negatively correlated with analyst forecast bias in the sample, the coefficient of D_OM×DLTT is -0.00585 and is negatively related to analyst forecast bias, which implies CEO optimism has enlarged analyst forecast bias and caused optimistic CEOs to increase debt financing and, as a consequence, analyst forecast bias decreases.

Table 4 has also confirmed Hypothesis 2b that says optimistic CEOs are negatively correlated with analyst forecast bias. When an optimistic CEO increases the percentage of external financing, an analyst will tend to be more conservative and to be more cautious in the monitoring of a firm's earnings forecast, therefore, analyst forecast bias will show a decrease with a corresponding increase of external financing at a firm.

Table 3: CEO Optimism and Impact of Cash Dividend Changes on Analyst Forecast Bias

	Whole samples		Positive Bias		Negative Bias	
Intercept	0.696***	(6.51)	0.545***	(7.09)	0.663	(0.86)
D_OM	0.142***	(4.93)	0.0871***	(3.85)	0.478**	(2.21)
D_OM×DI_DIF	-0.000183**	(-2.15)	-0.0000617	(-0.25)	-0.00195*	(-1.93)
DI_DIF	0.000275***	(4.13)	0.000287**	(2.46)	0.00137***	(3.47)
C.V	YES		YES		YES	
Industry	YES		YES		YES	
Year	YES		YES		YES	
Adjusted R^2	0.2392		0.2972		0.1316	

Note: Newey and West (1987) t-statistics are reported in parentheses and *, ** and *** indicate significance at 10%, 5%, and 1%, respectively. Note: FERROR is analyst forecast error, D_OM is CEO optimism, EP represents PE ratio, SIZE represents a firm's size, BM represents book to market ratio, COV represents the number of analyst followers, SGR represents the growth rate of a firm, ACC represents the accruals, △PPE represents the change of fixed assets, ROA represents the return on the total asset, EVOL represents the volatility of earnings, RETVOL represents the level of earnings volatility and RET12 represents the rate of return of stock.

Table 4: CEO Optimism and Impact of External Financing on Analyst Forecast Bias

	Whole Sample		Positive Bias		Negative Bias	
Intercept	0.343	-0.91	-0.103	(-0.19)	1.088	(1.59)
D_OM	0.240**	(2.24)	0.125	(1.19)	0.564**	(2.37)
D_OM×DLTT	-0.00585**	(-2.27)	0.000632	(0.34)	-0.0200**	(-2.27)
DLTT	0.00387***	(4.65)	0.00105**	(2.05)	0.00824***	(4.92)
C.V	YES		YES		YES	
Industry	YES		YES		YES	
Year	YES		YES		YES	
Adjusted R^2	0.1793		0.3924		0.1171	

Note: Newey and West (1987) t-statistics are reported in parentheses and *, ** and *** indicate significance at 10%, 5%, and 1%, respectively. Note: FERROR is analyst forecast error, D_OM is CEO optimism, EP represents PE ratio, SIZE represents a firm's size, BM represents book to market ratio, COV represents the number of analyst followers, SGR represents the growth rate of a firm, ACC represents the accruals, △PPE represents the change of fixed assets, ROA represents the return on the total asset, EVOL represents the volatility of earnings, RETVOL represents the level of earnings volatility and RET12 represents the rate of return of stock.

Analyzing analyst positive and negative forecast bias, in the Positive Bias column, the coefficient of D_OM×DLTT is 0.000632 and is insignificant with analyst

positive forecast bias, however, in Negative Bias column, the coefficient of D_OM×DLTT is -0.0200 and is significantly correlated with analyst forecast bias. The results imply negative analyst forecast bias is correlated with the increase of CEO optimism. But, the increase in external financing will broaden the firm's debt ratio to earnings uncertainty and attract more attention from investors in monitoring a firm's performance, thus negative analyst forecast bias will be reduced.

In conclusion, CEO optimism has the ability to broaden negative analyst forecast bias, however, when a firm increases external financing, investors will also increase their oversight because of the high debt capital structure caused by the increase of firm debt.

The coefficient of the whole sample column D_OM is 3.064 in Table 5, and positive analyst forecast bias is significant at 5% level. The result indicates that CEO optimism increases analyst forecast bias; the coefficient of D_OM×CREDIT is -0.493, and is negatively correlated with analyst forecast bias at 5% level of significance. Thus, Hypothesis 2c, which says analyst forecast bias and credit rating are negatively correlated, i.e., better credit rating can inhibit analyst forecast bias caused by CEO optimism, has been verified in this study.

Table 5: CEO Optimism and Impact of Credit Rating on Analyst Forecast Bias

	Whole Sample		**Positive Bias**		**Negative Bias**	
Intercept	-0.291	(-0.35)	-0.382	(-0.87)	0.0480	(0.03)
D_OM	3.064**	(2.40)	1.835*	(1.71)	5.412*	(1.73)
D_OM×CREDIT	-0.493**	(-2.37)	-0.285*	(-1.68)	-0.878*	(-1.72)
CREDIT	0.00616	(0.05)	-0.166***	(-2.70)	2.313	(0.84)
C.V	YES		YES		YES	
Industry	YES		YES		YES	
Year	YES		YES		YES	
Adjusted R^2	0.1344		0.2015		0.1592	

Note: Newey and West (1987) t-statistics are reported in parentheses and *, ** and *** indicate significance at 10%, 5%, and 1%, respectively. Note: FERROR is analyst forecast error, D_OM is CEO optimism, EP represents PE ratio, SIZE represents a firm's size, BM represents book to market ratio, COV represents the number of analyst followers, SGR represents the growth rate of a firm, ACC represents the accruals, △PPE represents the change of fixed assets, ROA represents the return on the total asset, EVOL represents the volatility of earnings, RETVOL represents the level of earnings volatility and RET12 represents the rate of return of stock.

When a firm's credit rating improves, the CEO has the ability to increase external financing through the low cost of debt, and analysts will reduce a firm's earnings forecast. Analyzing the positive and negative analyst forecast bias, in Table 5 of the Positive Bias column, the coefficient of D_OM×CREDIT is -0.285 and is negatively and significantly correlated with analyst forecast bias; in the column of Negative Bias, the coefficient of D_OM×CREDIT is 5.412 and is significantly and negatively correlated with analyst forecast bias, which represents the idea that

analyst forecast bias is affected by CEO optimism. When a firm's credit rating improves, both positive and negative analyst forecast drops, but in terms of lowering the effects of CEO optimism, negative analyst forecast bias is greater than positive analyst forecast bias in our study. This implies that increased cash dividends affects negative analyst forecast bias greater than positive analyst forecast bias.

Table 6 represents the result of CEO optimism and gender impact on analyst forecast bias, the coefficient of the whole sample D_OM is 0.22 and analyst forecast bias is positively related at 5% level of significance. However, the coefficient of D_OM×FEMALE is -0.428 and is negatively correlated with analyst forecast bias at 10% level of significance. Therefore, Hypothesis 3concludes that female CEOs and CEO optimism are negatively correlated, meaning female CEOs have the ability to inhibit analyst forecast bias caused by CEO optimism.

However, if the CEO is female, firm investment portfolios tend to select a low investment risk because female CEOs are more risk-adverse, so, the predictability of firm future earnings is greatly improved. Therefore, an analyst will have a more conservative earnings forecast, and analyst forecast bias will be reduced. We have also analyzed positive and negative analyst forecast bias separately. In the Positive Bias column of Table 6, the coefficient of D_OM×FEMALE is -0.316 and is not significant with positive analyst forecast bias, which represents the idea that the behavior of female CEO's with regards to cash positions does not affect positive analyst forecast bias.

However, in the Negative Bias column of Table 6, the coefficient of D_OM×FEMALE is 0.499 and is significant with negative analyst forecast bias, which represents the idea that female CEOs have the tendency to hold on to more cash at the firm and that this behavior will reduce negative analyst forecast bias. Our empirical study has shown that analyst forecast is broadened by CEO optimism, and that female CEOs show risk aversion characteristics and tend to be more conservative indecision making, leading to female CEOs investing in low-risk projects.

Table 6: CEO Optimism and Impact of Gender on Analyst Forecast Bias

	Whole Sample		**Analyst Positive Bias**		**Analyst Negative Bias**	
Intercept	-0.109	(-0.29)	-0.677	(-1.37)	0.748	(1.14)
D_OM	0.220**	(2.18)	0.119	(1.20)	0.499**	(2.27)
D_OM×FEMALE	-0.428*	(-1.84)	-0.316	(-1.58)	-1.064*	(-1.83)
FEMALE	0.0379	(0.22)	-0.0707	(-0.52)	0.257	(0.70)
C.V	YES		YES		YES	
Industry	YES		YES		YES	
Year	YES		YES		YES	
Adjusted-R^2	0.1792		0.389		0.1174	

Note: Newey and West (1987) t-statistics are reported in parentheses and *, ** and *** indicate significance at 10%, 5%, and 1%, respectively. Note: FERROR is analyst forecast error, D_OM is CEO optimism, EP represents PE ratio, SIZE represents a firm's size, BM represents book to market ratio, COV represents the number of analyst followers, SGR represents the growth rate of a firm, ACC represents the accruals, △PPE represents the change of fixed assets, ROA represents the return on the total asset, EVOL represents the volatility of earnings, RETVOL represents the level of earnings volatility and RET12 represents the rate of return of stock.

5. Conclusion

The empirical results have shown that CEO optimism is positively correlated with analyst forecast bias, which indicates that optimistic CEOs have the ability to influence analyst assessment on analyst earnings forecasts, which may result in an increase in analyst forecast bias. Our study has adopted four types of firm characteristics to analyze analysts' positive and negative forecast bias in this study; all these characteristics have a significant negative impact on analyst forecast bias, which indicates firm characteristics lower the effectiveness of CEO optimism on analyst forecast bias. In line with Steve and Williams (2001) study, which revealed the presence of asymmetry sensitivity between analysts' positive and negative forecast bias, our empirical results find the presence of an asymmetrical effect between analyst positive and negative forecast bias that can reduce the forecast bias caused by optimistic CEOs when receiving corporate information from cash dividend changes, debt financing, credit ratings, and CEO gender. And these firm characteristics are all negatively correlated with analyst forecast bias.

Through the above findings, this study explores the idea that CEO optimism has a large influence on analyst forecast. The analyst acts as an agency between manager and investor by transferring firm information. The assessment report provided by analysts has the power to influence investors, while the accuracy of firm earnings forecasts from analysts will also affect the investment behavior of investors. Nevertheless, if earning forecast accuracy decreases, it will cause an asymmetry of information between investors and firms, and can also result in huge losses caused by the blind investment of investors. Our empirical results show that certain firm

characteristics have the ability to decrease the analyst forecast bias caused by CEO optimism, with earnings forecast accuracy not only assisting investors in analyzing firm information, but also promoting the transparency of financial market information.

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