The nexus between CEO incentives and analysts' earnings forecasts.

Abstract

In this paper, we examine the nexus between analysts' forecasts and CEO incentives over different forecasting horizons. We assemble a unique analyst-level sample for US firms covering the period between 1992 and 2015 from three different databases that provide information for CEO incentives and analysts' characteristics. Panel regression results reveal significant effect of CEO incentives and analysts' characteristics on the forecast accuracy of the latter. The reported results suggest that CEO incentives driven by high compensation, restricted stock holdings and stock ownership can correct analysts' optimism, whereas CEO bonus and sensitivity to changes in firm's value exacerbate analysts' optimism. We further examine how CEO incentives affect the impact of earnings management on analysts' forecasts. Results show that CEO incentives can augment the effect of earnings management on analysts' forecasts with CEO bonus being the most deteriorating factor. Our findings also indicate that experienced analysts are more optimistic in their forecasts, while higher forecast frequency can correct this optimism. We further show whether regulations affect forecasts.

JEL Classification: G21, G30, G34.

Keywords: Analysts' earnings forecasts; forecast horizons; analysts' experience; CEO incentives; regulation.

1. Introduction

During the last decades, the amount of other forms of CEO compensation, such as option grants, has increased significantly in relation to the traditional salary compensation (Guay et al. 2019; Benett et al. 2017; Hall and Murphy 2003; Jensen 2005b; Efendi et al. 2007). Firms have many reasons for granting to CEOs options, restricted stocks, cash bonus and increasing their stock ownership. The enhancement of CEO incentives to make decisions that would benefit shareholders is one of these motivations. Early literature suggests two competing theories on the effect of incentive compensation. The first hypothesis is the *incentive alignment* hypothesis suggesting that equity-based incentives can better align managers' and firm's interests (Jensen and Meckling 1976). Conversely, there is also evidence of *management-entrenchment* hypothesis according to which excessive equity-based compensation may increase mangers' short-termism with the latter servings their own interests (Shleifer & Vishny, 1989). Over the years, financial crisis, compensation arrangements have been in the global policy agenda aiming to better align individual's incentives with the long-term health of financial institutions (FSB 2019).[1] This focus has become more apparent after last financial crisis, as there is a board consensus that compensation arrangements played a role in the financial crisis (Bank of England, 2015).[2] The purpose of this study is to investigate the implications of CEO incentives driven by their compensation for analysts' forecast errors.

Financial analysts are sophisticated intermediaries between the firms and markets, who use all available information to form their earnings forecasts (Mauler 2019; Du and Budescou 2018; Bratten, Gleason, Larocque, and Mills 2017; Barvin et al. 2009; Allini et al. 2018; Zhou et al. 2016). Analysts' main objective is to release earnings forecasts that are input for stock recommendations (Friesen and Weller 2006). The latter is a significant determinant for investors' trading decisions. Recently, Kim et al. (2017) report evidence of information quality affecting analysts' forecasts. In addition, there is evidence indicating that limited information disclosure by firms can have a detrimental impact on analysts' forecast accuracy (Ali et al. 2019). Given that, CEOs are responsible for the strategic decision making of the firms (Zemba et al. 2006; Crossland and Chen 2013; Clinton et al. 2014; Stanley et al. 2015; Liu et al. 2014) and that, CEOs incentives can affect the quality and quantity of the information disclosure (Aboody and Kasznik 2000; Nanda et. al 2003; Hermalin and Weisbach 2012; Yeow et al.

[1] For further information see Financial Stability Board (FSB) Principles for Sound Compensation Practices (2009) and FSB report on implementing sound compensation practices (2019)

[2] https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2015/bonus-regulation-aligning-reward-with-risk-in-the-banking-sector.pdf?la=en&hash=B30E9A38C3626509539B7A3890FE3D3F15F03437

2013), we expect that analysts' forecasts can be affected by CEOs incentives. The existing literature provides limited evidence on how various forms of CEO incentives could affect analysts' forecasts.

Recently, Liu (2017) using a sample of Chinese listed firms for the period between 2008 and 2014 investigates the impact of equity-based compensation on analysts' forecasts. The author finds that analysts' accuracy is higher in firms with higher amounts of equity-based pay providing further evidence of *incentive alignment* effect. However, according to the author, this effect varies across different forms of equity incentives. Analyst's bias seems to reduce when firms use restricted stocks instead of stock options.

Kanagaretnam et al. (2012) argue that CEO option holdings can increase analysts' forecast errors. According to the authors, managers with higher stock option compensation might undertake higher risk, exert greater effort to improve firm performance and show opportunistic disclosure behaviour. These, in turn, can increase the complexity of analysts' forecasts leading to higher forecast errors. Conversely, the authors suggest the *incentive alignment* effect. According to this effect, higher option holdings could align managers' interests with those of the shareholders', improving firms' information disclosure that can result in lower analysts' forecast errors.

Another strand of literature links analysts' forecasts with firms' engagement in earnings management. Prior research documents both positive (Jeppson et al. 2018; Matsumoto 2002; Brown and Caylor 2005; Burgstahler and Eames 2006; Mande and Son 2012) and negative (Bilinski 2014, Bradshaw et al. 2001; Cohen and Lys 2003; Ahmed et al. 2005) impact of earnings management that come through different channels, i.e. through the use of discretionary accruals, on analysts' forecasts. Firm's engaging in earning manipulation could result in misleading and unreliable earning reports that analysts use. Analysts' forecast errors therefore is expected to be associated with firms' engagement in earnings management. There is also evidence that CEO incentives encourage executives to engage in earnings management. The evidence, to date, argues that executives with high option compensation would opportunistically manage earnings to affect stock price and achieve higher gains from their equity portfolios (Aboody and Kasznik 2000; Chauvin and Shenoy 2001; Greenspan 2002; Bergstresser and Philippon 2006; Burns and Kedia 2006; Efendi et al. 2007; McAnally et al. 2008). Motivated by prior findings of positive relationship between CEO incentives and the likelihood of earnings misreporting, we expect that CEO incentives can affect analysts'

earnings forecasts through earnings management as the latter can affect the quality of information disclosure to analysts.

Another issue that could affect analysts' earnings forecasts is analyst-specific characteristics. There is evidence that analysts' characteristics help explain why some analysts issue more accurate forecasts for some firms than others (Jeppson et al. 2019; Hong et al. 2000; Hong and Kubik 2003; Clement and Tse 2005; Clarke and Subramanian 2006; Allini et al. 2018; Zhou et al. 2016). Identifying those particular analysts' characteristics is a valuable exercise for all market participants that strive to increase the accuracy of forecasts. Herein, we argue that these approaches would lead to defragmentation of evidence and loss of information, as it is the interaction between CEO incentives and analysts' characteristics that is of prominence. It could be the case that, the impact of analysts' characteristics on forecast errors would vary with differences in CEO incentives across the firms.

Finally, it is also warranted to control for differences in the underlying relationships between analysts' forecast errors and plethora of characteristics, also controlling for different forecasting horizons. Most of the existing studies focus on analysts' forecasts for current earning. However, there is evidence that analysts' forecast ability varies with the forecast horizon and that forecast errors tend to be greater for long-term than for short-term forecasts (Richardson et al. 2004; Hovakimian and Saenyasiri 2010, 2014).[3] For this reason, we employ forecasts of current year, 1-year and 2-years ahead.

As a synopsis, this paper contributes to the growing literature of analysts' forecasts (Liu 2017; Kanagaretnam et al. 2012; Clinton et al. 2014; Stanley et al. 2015; Liu et al. 2014; Jeppson, Nathan H., et al. 2018; Matsumoto 2002; Brown and Caylor 2005; Burgstahler and Eames 2006; Mande and Son 2012; Bilinski, 2014, Bradshaw et al. 2001; Cohen and Lys 2003; Ahmed et al. 2005) in several ways. First, relaxing the limitations of the analysis of Kanagaretnam et al. (2012), this study employs forecast errors issued by individual analysts, rather than the consensus forecasts over 20 years. Second, while previous research (Kanagaretnam et al. 2012; Clinton et al. 2014; Stanley et al. 2015; Liu et al. 2014) focus on the impact of CEO stock options on analysts' forecasts, herein, we argue that CEO incentives might be driven by other forms of compensation such as total compensation, cash bonus, restricted stock holdings and

[3] Richardson et al. (2004) argue that initially analysts issue earnings forecasts that deviate more from the actual reported earnings and later as time converges to the forecast period end, they revise (walk-down) their forecasts closer to the actual earnings. The authors refer to this as the 'walk-down' phenomenon suggesting positive relationship between forecast horizon and analysts forecast errors. Additionally, Hovakimian and Saenyasiri (2014, 2010) find that analysts' forecast bias is higher for long-term forecast horizons.

stock ownership. Liu (2017) provides some evidence on the different impact of managerial compensation based on stock options and restricted stocks on analysts' forecasts. However, his study is focused on Chinese firms that operate in different institutional environment compared to US firms and thus, it would not provide an accurate conclusion for firms operating in the US. Furthermore, the author does not consider other forms of performance-based compensation such as total pay and cash bonus. We also account for the impact of analysts' characteristics. Employing a panel regression analysis, this study reveals the impact of such characteristics on forecasts over multiple forecasting horizons. Third, since prior research shows that CEO option grants increase the likelihood for financial misreporting, we consider the effect of earnings management on analysts' forecasts and investigate whether this effect varies with CEO incentives. We show that earnings management increases analysts' forecast errors, and that CEO incentives, such as compensation, CEO sensitivity to changes in firm's value, restricted stock holdings and ownership can mitigate this effect. Conversely, CEOs who enjoy high cash bonus can augment the above relationship. The results do not alter when we consider for endogeneity.

Next, we assume that analysts' forecast does not merge in vacuum but the interaction of their characteristics with CEO incentives could be of high importance (Allini et al. 2018; Clinton et al. 2014; Stanley et al. 2015; Liu et al. 2014). Therefore, we employ the interactions between analysts' and CEO incentives. Estimation results indeed provide evidence for channels of interaction between CEOs and analysts with analysts' experience being the leading indicator that corrects optimism for firms where CEOs enjoy high compensation, cash bonus, are sensitive to changes in firm's value and have greater stock ownership. Finally, we also examine the impact of the Global Statement Regulation (GS thereafter) and Dodd – Frank Act (DF thereafter) on the above relationships. We show that while these regulations can reduce analysts' optimism, they do not affect the relationship between forecasts errors and analysts' characteristics/CEO incentives in the same way. Variability exists both across firms with different CEO incentives and across analysts' characteristics.

The remainder of the paper is organised as follows: Section 2 presents the hypotheses to be tested; Section 3 discusses the data selection and offers some statistical description, while Section 4 presents the methodology and the estimated results. Section 5 reports results that control for endogeneity and provide robustness analysis. Finally Section 6 concludes and provides the policy implication of this study.

2. Hypotheses to be tested

2.1. The association between CEO incentives and analysts' forecast errors.

Liu (2017) and Kanagaretnam et al. (2012) show that stock option compensation results to higher analysts' forecast errors due to the higher level of forecasting complexity and the fact that the stock options can increase managers' short-term opportunity behaviours. This effect is known as the *management-entrenchment* effect. When firms use stock options as a part of CEO compensation, they aim to motivate executives to exert greater effort for better firm performance and this, in turn, might encourage managers to undertake riskier strategies. These managerial activities increase the difficulty for analysts' forecasting. In this case, analysts need greater access in management's information resulting to less accurate earnings forecasts. Arguably, the *interest alignment* effect can be present. It could be the case that high CEO incentives align the interests of managers with those of the shareholders', enhancing the information disclosure and thus, resulting in lower forecast errors.

There is also evidence that links analysts' forecasts with firms' engagement in earnings management. Both positive and negative association between earnings management and analysts' forecasts has been documented. Regarding the positive, literature (Jeppson et al. 2019; Matsumoto 2002; Brown and Caylor 2005; Burgstahler and Eames 2006; Mande and Son 2012; Zhou et al. 2016; Allini et al. 2018) argues that when firms engage in earning manipulation, they aim to meet analysts' expectations resulting in a convergence of analysts' forecasts and reporting earnings. This, in turn, result in decreasing forecast errors. Conversely, there is evidence that earning management could decrease forecast accuracy by hosting a more complex and misleading information environment for analysts (Bilinski, 2014, Bradshaw et al. 2001; Cohen and Lys 2003; Ahmed et al. 2005).

Furthermore, prior literature provides strong evidence of the impact of CEO incentives on earnings management through financial misreporting (Gong et al. 2019; Harakeh et al. 2019; Greenspan 2002; Cheng and Warfield 2005; Bergstresser and Philippon 2006; Efendi et al. 2007; Das et al. 2013). Executives may receive both fixed and performance-based compensation. While fixed amount is predetermined and usually is in cash, performance-based compensation is dependent on accounting measures and can have various forms (such as cash bonus, shares and share linked instruments). The fact that performance-based pay is linked to accounting targets essentially means that individuals will receive bonuses only if they meet these targets for the performance year. Recently, Grong et al. (2019) and Harakeh et al. (2019) show that executives with high performance-based compensation have greater incentives to misreport earnings to meet performance targets. Benett et al. (2017) provide evidence of

earnings management around firm's earrings targets while Das et al. (2013) find a positive and significant relationship between CEO bonus and earnings smoothing. Greenspan (2002), Bergstresser and Philippon (2006) and Efendi et al. (2007) argue that the likelihood of earnings misstatement is positively related with the CEO option portfolio. Cheng and Warfield (2005) show that CEOs with high stock and stock option portfolios engage in earnings management to avoid future earnings disappointments. However, the existing research does not document any significant association between other measures of CEO compensation, such as bonus and restricted stock holdings, and the likelihood of earnings misreporting.

Motivated by the evidence that CEO incentives could encourage earnings management (Gong et al. 2019; Harakeh et al. 2019; Sáenz González and García-Meca 2014; Das et al. 2013; Bergstresser and Philippon 2006; Cornett et al. 2008; Jiang et al. 2010; McAnally et al. 2008; Ebrahim 2007; Efendi et al. 2007; Rahman and Ali 2006; Xie et al. 2003), and that earnings management can affect analysts' forecasts, we examine whether the impact of earnings management on analysts' forecast varies with CEO incentives. We proxy CEO incentives employing CEO total compensation, cash bonus, the sensitivity of CEO compensation to one percentage point increase in the value of firm's equity (Bergstresser and Philippon 2004), CEO in-the-money option holdings, restricted stock holdings and stock ownership.

CEOs with high salary compensation and cash bonus driven by career concerns might have fewer incentives to mislead analysts and thus, enhance the accuracy of forecasts for the latter.[4]

Bergstresser and Philippon (2006) find that CEOs engage in earning manipulation when their compensation is tied to the value of their stock and option holdings. For this reason, we test whether the sensitivity of CEO stock and option compensation to one percentage point increase in the value of the equity of the company affects analysts' forecast errors. Evidence of such a relationship would be in line with the *management-entrenchment* hypothesis. Liu (2017) and Kanagaretnam, et al. (2012) state that managers with higher stock option compensation might undertake higher risk, exert greater effort to improve firm performance and show opportunistic disclosure behaviour increasing the complexity of analysts' forecasts and leading to higher forecast errors. Burns and Kedia (2006) argue that CEO option incentives render CEO wealth a convex function of stock price. Although there is a limited loss to CEO wealth from a stock

[4] It is more likely that CEOs will be fired by the board if the former miss analysts' earnings forecasts (Farrell and Whidbee 2003; Wiersema and Zhang 2011). Particularly, Wiersema and Zhang (2011) using a panel data on the S&P 500 firms during the period 2000 – 2005, show that analysts play an important role in boards evaluation of the CEOs' efficacy. The authors suggest that boards' decision about CEOs' dismissal is strongly associated with analysts' recommendations as the latter influence investors whom the board intends to please.

price decline, executives are rewarded when stock prices surges. For this reason, managers with high option compensation tend to inflate reported earnings to maintain high stock prices. Therefore, if forecasting complexity increases with high option incentives (Kanagaretnam, et al. 2012) and the latter can motivate earnings management (Burns and Kedia 2006; Efendi et al. 2007), then we can expect that option compensation can increase analysts' forecasts errors. Alternatively, it could be the case that greater option compensation enhances the alignment of managers' interests with those of the shareholders' providing evidence for the *interest alignment* effect. This, in turn, can increase management disclosure and lower forecast errors.

The difference between restricted stocks and other stocks is that the CEO has to meet some conditions before the actual grant of the stocks. These conditions can be either time-based or performance-based or combination of both (Bettis et al. 2010). Due to regulatory changes, the amount of restricted stock grants has increased dramatically in relation to the option compensation (Carter et al. 2007; Lord and Saito 2015).[5] The question is how the increasing use of restricted stocks as an executive compensation form affects analysts' forecasts.

Stock ownership - in the form of stock grants or restricted stocks - is considered stronger incentive alignment tool. This is because even when stock prices drop, stocks maintain their intrinsic value. Another reason that stock grants have a better *incentive alignment* effect is that stocks may offer managers ownership rights upon vesting. This is not the case with stock options that are considered riskier assets (Dodonova and Khoroshilov, 2006; Irving et al. 2011; Steven et al. 2014). Liu (2017) reports that analysts' bias for Chinese firms seems to reduce when firms use restricted stocks instead of stock options. Johnson and Natarajan (2005) using a sample of 149 firms over the period between 1984 and 1988 show that CEOs with greater stock holdings disclose more information to analysts than other CEOs. Furthermore, in contrast to option incentives, there is a symmetric relation between the wealth from restricted stock holdings/stock ownership and stock price (Burns and Kedia, 2006). These findings suggest that restricted stocks and stock ownership expose CEO to wealth losses when stock price drops and therefore, they may not increase CEO incentives for earnings manipulation. In line with this argument, Efendi et al. (2007) did not find significant relation between restricted stock holdings and earnings misreporting. For these reasons, we hypothesize that CEO restricted stock holdings and stock ownership could enhance the *interest alignment* effect, increase the

[5] Accounting Standards (FAS 148) requires firms to expense stock options by their fair value and not the intrinsic value.

information disclosure to analysts and decrease CEO incentives for earnings management. This, in turn, could mitigate analysts' forecast errors.

To examine whether the association between CEO incentives and analysts' forecast errors is not driven by other CEO characteristics, we further account for CEO power. There is evidence that CEOs can increase the unity of the boards and form clear strategic positions fastening the decision-making procedures (Cannella and Monroe 1997; Adut et al. 2011). Therefore, CEOs with greater power might have greater accountability and career concerns, as they feel more responsible for firm performance. Greater accountability could eliminate analysts' forecast errors due to the increased liability of the executives. In this case, CEOs with greater power can improve analysts' forecast accuracy. Arguably, there is evidence that firms with boards where CEOs are dominant disclose less information to market participants, whilst powerful CEOs can overpower all other members of the board eliminating board effectiveness (Eisenhardt and Bourgeois 1988; Haleblian and Finkelstein 1993). Thus, it could be the case that CEO power increases analysts' forecast errors.

Furthermore, CEOs who occupy dual roles in the board might have greater power. The duality in the role of the CEO and Director or Chairman could have positive impact on analysts' accuracy due to the greater accountability of the powerful executive. However, the CEO – Director/CEO – Chair duality could reduce the board independence and impair the monitoring of the CEO. This in turn, could allow the CEO to serve self-interests, such as short-term compensation, rather than in favour of the shareholders (Frankforter et al. 2000; Dunn 2004; Combs et al. 2007). CEO driven by self-interests could lean towards practices of financial misreporting and concealing bad news from market participants (Graham et al. 2005; Kothari et al. 2009; Ball 2009). Such practices could impend the information disclosure to analysts and thus, increase forecast errors (Lustgarten and Mande 1995).

Moreover, CEOs ranking as the best payed executives in a firm could be an indicator for higher power (Rijsenbilt and Commandeur 2013). Thus, CEOs with higher ranking are more likely to dominate over the other executives, follow self-serving practices and impede information disclosure leading to higher forecast errors for the analysts.

Therefore, to examine the above associations, we test the following hypothesis:

H1: CEO incentives can affect analysts' forecast errors.

2.2. *CEO incentives, earnings management and analysts' forecasts.*

Although, there is evidence that CEO incentives are associated with firms' engagement in earnings management and that earnings management can affect analysts' forecasts, up till now there is no evidence examining whether CEO incentives can augment/curb the impact of earnings management on analysts' forecasts. To cover this gap in the literature, this paper examines whether the impact of discretionary accruals on forecast errors varies with CEO incentives.[6] To this end, we include the interaction terms between discretionary accruals and indicators of CEO incentives. It could be the case that behind earnings management lays CEOs with specific incentives (Frankforter et al. 2000; Dunn 2004; Combs et al. 2007) who would undermine analysts' forecasts.

H2: CEO incentives can affect the relationship between earnings management and analysts' forecasts errors.

2.3. The impact of Global Analyst Research Statement and Dodd-Frank Act regulations on analysts' forecast errors.

As analysts and CEOs operate in regulated markets, we shall consider such conditions. For this reason, we focus on the impact of Global Analyst Research Statement regulation (GS) and the Dodd-Frank Wall Street and Consumer Protection Act (DF). GS is an enforcement provision between the Security Exchange Commission (SEC), National Association of Securities Dealers (NASD), New York Stock Exchange (NYSE) and twelve of the largest US investment institutions. The provision aims to address issues related to possible conflict of interests regarding analysts, who release forecasts and recommendations for investing or not in selected firms. GS was first introduced in 2002 and went into effect in 2003. The main motivation of GS regulation was to prevent the engagement of the investment institutions (the brokers) in practices to influence analysts' forecasts so as to gain higher compensation fees from their investment banking services.

An example of such a case can be the crash in technology stocks during 2000 and 2002. Analysts' optimistic research reports were considered to enhance the stock price surge in the late 90s when less than 1% of analysts provided 'sell' recommendations (Bogle 2002). Apparently, brokers' incentives to maintain their investment banking businesses with firms induced a conflict of interest between the brokers and analysts. If GS regulation eliminates the influence of brokers on analysts, then we expect that GS will enhance analysts' independence

[6] Discretionary or abnormal accruals are defined as the difference between the total accruals and normal accruals. Normal accruals are estimated employing Jones (1991) model.

and this, in turn, will lower their incentives for optimistic forecasts. Since GS enforcement focuses on analysts, in this research, we examine the effect of GS on analysts' forecast errors and whether the efficacy of the GS provisions varies with analysts' characteristics.

From another hand, the main aim of DF Act was to improve the regulation of the financial industry to prevent the US economy from experiencing a crisis like that of 2008. The DF Act is implemented by the SEC and includes provisions requiring detailed disclosure of executive compensation and corporate governance structure. According to the DF Act firms should disclose information about CEO pay versus firm performance ratio and a compensation recovery policy for the excess incentive-based executive compensation in case of financial misreporting. It could be the case that, prior DF analysts would issue biased forecasts to establish good relations with firms and gain access inside managerial information. If DF eliminates the need to gain inside information, then analysts' forecasts should be less biased. We extend our analysis by investigating the impact of DF Act on analysts' forecast errors and whether the efficacy of the DF provisions varies with CEO incentives.

Prior research shows that Global Analyst Research Statement and Dodd-Frank Act can affect analysts' forecasts (Kadan et al. 2006; Ertimur et al. 2007; Ke and Yu 2007; Chan et al. 2012; Dehaan et al. 2013; Hovakimian and Saenyasiri 2014). Kadan et al. (2006) argue that the implementation of such regulations has decreased analysts' optimism by 40% for stocks that have recently undergone an IPO. In line with this finding, Ertimur et al. (2007) and Ke and Yu (2007) report an improvement in analysts' recommendations after GS regulation. Moreover, Chan et al. (2012) and Dehaan et al. (2013) find that the adoption of DF provisions enhances the quality of firms' financial statements, decreases the number of financial report restatements and analysts' earnings forecast dispersion. Given that analysts use financial statements as their main source of information, greater quality and quantity of information disclosed through financial statements could decrease analysts forecast errors (Byard et al. 2006). In a cross-country analysis, Hovakimian and Saenyasiri (2014) examine the impact of GS on analysts' forecasts for 40 countries in developing and emerging regions over the period 1991 – 2010, revealing that prior to the GS analysts issued more optimistic forecasts, whereas this bias is greater for longer-term forecasts. Therefore, we test the following hypotheses:

H3: Global Analyst Research Statement regulation (GS) and Dodd-Frank Act (DF) can affect analysts' forecast errors.

3. Data selection and research design

3.1. Analysts' earnings forecasts

We construct a unique individual analyst-level sample of US firms covering the period between 1992 and 2015 assembled from three different databases. First, we derive analysts' earnings forecasts from I/B/E/S data source over three different horizons: current year, 1-year ahead and 2-years ahead. These earnings forecasts, say $FE_{i,j,t}$, are identified by analyst *i* for the firm *j* and referring to year *t*. For each of these forecasts, we obtain information about the broker and the analyst in question as they are individually identified by a code, whilst we also observe the forecast period and forecast revision dates. This information is crucial in defining forecast errors. We include forecast issued no later than the end of forecast period.[7] We also obtain information about the firm.

In some detail, information about firms' balance sheet items is drawn from COMPUSTAT. The challenge has been to match the two samples. We achieve a match using CUSIP identifier that allows merging I/B/E/S Detail file with COMPUSTAT.[8] A further challenge we faced is the use of CEO-specific data. Such data comes from ExecuComp, which provides detailed information regarding firms' executives. To extract data for the CEOs, we filter for executives that serve as CEOs in *j* firm of analysts *i* over the sample period *t*. In the third step, we match data from I/B/E/S, COMPUSTAT with ExecuComp. Given that our analysis accounts for different forecast horizons, we follow the same procedure to construct the dataset for each forecast horizon. Table 1 presents the distribution of analysts, brokers and firms for the different forecast horizons over the years 1992 – 2015. Note that the number of analysts issuing earnings forecasts and the number of firms followed by analysts decline as the forecast horizon increases (see Panels A, B and C in Table 1). This trend might be due to greater difficulty and complexity of earnings forecasts for longer horizons and reveals preferences by analysts to provide forecasts for shorter horizons, raising the significance of examining various horizons.

<<Table 1 about here>>

Table 2 reports the industry breakdown over different forecast horizons. Clearly, across forecast horizons (see Panels A, B and C in Table 2) there is a stable pattern of what appears as 'popular' industries to forecast. For example, firms in Information Technology industry show high percentage of earnings forecasts at 17.75%, 13.18% and 17.39% of for current, 1-

[7] In addition, as in the empirical section we are interesting on multiple analysts' forecasts on firm *j*, we exclude firms followed by only one analyst.

[8] Please note that the data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

year ahead and 2-years ahead forecast horizons respectively. Consumer Discretionary also show strong 'popularity' (at 17.19%, 15.42% and 19.98% of overall earnings forecasts for current, 1-year ahead and 2-years ahead forecast horizons respectively), as well as Financials (at 17.39%, 17.31% and 17.57% of overall earnings forecasts for current, 1-year ahead and 2-years ahead forecast horizons respectively).

<<Table 2 about here>>

3.2. Earnings forecast errors.

The starting block of our analysis is analysts' forecast errors. Consistent with previous literature (O'Brein 1990; Sinha et al. 1997; Clement and Tse 2005), we construct forecast errors taking as forecast the most recent forecast issued by analyst *i* for year *t*. The actual value is the actual earning as reported by firm *j* for year *t*. Thus, the forecast error is:

In our analysis, we employ the most recent analyst forecasts from each analyst for each firm. We opt for this measure because consensus earnings forecasts might not fully incorporate available information and could therefore be inefficient. We scale analysts forecast errors with firms' stock price to facilitate comparisons across firms. This is common in analysts forecast literature (see Jeppson et al. 201; Hovakimian and Saenyasiri 201; Butler and Lang 1991; Das and Sivaramakrishnan 1998; Richardson and Wysocki 2004).

$$FE_{i,j,t} = (ANALYST\_EST_{i,j,t} - ACTUAL_{j,t})/PRICE_{j,t-1}, \quad (1)$$

where $FE_{i,j,t}$ presents analyst's *i* earning forecast error for firm *j* and year *t*, $ANALYST\_EST_{i,j,t}$ is the most recent earning forecast issued by analyst *i* for firm *j* and year *t*, and $ACTUAL_{j,t}$ is the actual earning reported by firm *j* for year *t*. Finally, $PRICE_{j,t-1}$ is the stock price of firm *j* one year before the forecast period end *t*, which is a way to scale the forecast error in order to facilitate comparisons across firms (Duru and Reeb 2002; Bhat et al. 2006). Here, a positive/negative forecast error indicates that analysts are optimistic/pessimistic and therefore, positive/negative coefficients for CEO incentives variables would suggest that CEO incentives can increase analysts' optimism/pessimism.

Having derived the forecast error, we turn to analyst's characteristics, such as experience. We employ two measures: the first measure indicates analyst *i* firm-specific experience (FIRM_EXP thereafter) and is calculated as the number of years that analyst *i* follows firm *j*. The second measure reflects the general experience of analyst *i* and is measured as the total number of years that analyst *i* issues earnings forecasts (GEN_EXP thereafter). We also

account for the forecast revision (FOR_REV thereafter) of analyst *i* calculated as the number of days remained until the forecast period ends and since the last forecast revision issued by analyst *i* for firm *j* and year *t*. FOR_FREQ captures the number of earning forecasts of analyst *i* for firm *j* during year *t.* In addition, we employ a metric for the brokerage size of analyst *i* (BROKERAGE thereafter). BROKERAGE stands for the number of analysts hired by the brokerage company that has employed analyst *i.*

Table 3 indicates that the mean forecast error varies across different forecast horizons from 0.0002 in current year to 0.0054 and -0.0008 in 1-year ahead and 2-years-ahead respectively. Positive value in forecast errors implies that analysts are, on average, rather optimistic when it comes to forecasting earnings. This optimism is much greater for 1-year ahead forecast horizon, while interestingly for 2-years ahead analysts turn to be more pessimistic. It is remarkable that in current year there is a strong correction in the degree of optimism of analysts' forecasts. On the other hand, analysts' forecast frequency during the forecast period decreases in longer forecast horizon, indicating that analysts prefer releasing forecasts for short-term than for long-term. There is an increasing trend in the number of days remained until the forecast period ends and since the last forecast revision issued by analyst *i* for firm *j* and year *t* from 81 for current year to 360 and 711 days for 1-year and 2-years ahead respectively. This increasing number of days elapsed is in line with the lower forecast frequency for longer forecast horizons.

Table 3 shows that both firm and general experience are relatively similar for current and 1-year-ahead forecasts (about 3 years of firm experience and 12 years of general experience in current and 1-year-ahead), whereas analysts have less experience in 2-year-ahead earnings forecasting (about 4 years of firm experience and 7 years of general experience). In addition, the number of analysts that the broker company employs for current year forecasts is significantly higher than those of the longer-term horizons (about 69 analysts for the current year forecasts and 19 to 18 analysts for 1-year and 2-year-ahead forecasts).

<<Table 3 about here>>

3.3. Measuring CEO incentives.

Table 3 also reports some descriptive statistics for CEO incentives. We use CEO total compensation (TOTALPAY thereafter) as the natural logarithm of the sum of cash pay, stock option grants, restricted stock grants, long-term incentive plan pay-outs, and other annual compensation as reported in ExecuComp under the variable TDC1. Our next indicator for

CEO incentive is CEO cash bonus (BONUS thereafter) measured by the ratio of executive's bonus over total salary.[9]

We proxy CEO option incentives including CEO in-the-money option holdings (IN_THE_MONEY_OPTIONS thereafter).[10] We also consider for CEO incentives driven by restricted stock holdings employing the value of restricted stock holding grants over CEO salary (RESTRICTED_STOCKS thereafter). Additionally, we account for executive's stock ownership. Bhagat et al. (1999) argue that CEOs with greater stock holdings could exhibit greater incentives for efficient monitoring and information disclosure reducing analysts' forecast errors. Since current earnings are employed as a proxy to predict future earnings, it could be the case that CEOs might attempt to eliminate analysts' forecast errors to achieve high short-term stock price (Stein 1989). Our executive's stock ownership measure (STOCK_ONWERSHIP thereafter) is the ratio of the fair value of stocks owned by the executive excluding options divided by executive's salary.

Furthermore, following Bergstresser and Philippon (2006) we calculate CEO compensation sensitivity to changes in firm's equity value using the following equation:

$$\text{CEO\_SENSITIVITY}_{j,t} = ONEPCT_{jt}/(ONEPCT_{jt} + SALARY_{jt} + BONUS_{jt}), \quad (2)$$

where *SALARY* and *BONUS* are CEO salary and bonus respectively as reported in ExecuComp. *ONEPCT* is the dollar change in the value of CEO's stock and option portfolio due to one percentage point increase in the company stock price and is calculated as follows:

$$\text{ONEPCT}_{jt} = 0.01 * PRICE_{jt} \times (SHARES_{jt} + OPTIONS_{jt}), \quad (3)$$

where $PRICE_{jt}$ stands for firm's stock price, $SHARES_{jt}$ for the number of shares held by the CEO and $OPTIONS_{it}$ stands for the total number of options held by the CEO. The above indicator of CEO sensitivity captures the share of hypothetical CEO total compensation that would be the result of one percentage point increase in the value of equity of the firm.

Regarding CEO power measures, we employ an indicator variable that takes the value of one if the CEO occupies the position of the Director in the board and zero otherwise (CEO_DIR thereafter). Finally, ExecuComp provide information regarding the ranking of the CEO within

[9] Following McAnally et al. (2008) and Efendi et al. (2007), we deflate CEO incentives measures by CEO salary so as to capture the relative degree of the incentive.
[10] We also account for the impact of the total value of CEO options on analysts' forecasts, however the impact is either insignificant or the same with in-the-money options in few cases.

the firm. We employ CEO ranking within the company by the sum of Salary plus Bonus as an indicator for CEO power (CEO_RANK thereafter).

In addition, we include firm – specific characteristics. To this end, we employ the natural logarithm of the number of the distinct analysts following firm *j* during year *t* (NUM_ANAL thereafter) and serves as a proxy for analysts' incentives for forecasts that are more accurate and greater information disclosure. Greater number of analysts following a firm could increase information disclosure and as a result might decrease analysts' forecast errors (Drake and Myers 2011; Duru and Reeb 2002; Mauri et al. 2013). There is also evidence that greater number of analysts following a firm leads to decrease in forecast errors because analysts prefer following firms with better quality in earnings reports (Lang and Lundholm 1996; Gu and Wu 2003; Yu 2010). However, it could be the case that greater number of analysts covering a firm increases the competition between analysts for higher commission fees increasing forecast errors. Furthermore, we account for years with a loss, including a dummy that takes the value one for loss years and zero otherwise (LOSS thereafter). There is evidence that earnings forecasts for firms with losses are less accurate than those of profitable firms due to the problematic estimation of losses arising from managerial incentives (Brown 2001; Abarbanell and Lehavy 2003; Mande and Son 2012). We would expect LOSS to be positively associated with analysts' forecast errors. However, there is also evidence of insignificant effect of LOSS on analysts' accuracy (Duru and Reeb 2002). We also account for firm size (SIZE thereafter) measured by the natural logarithm of total assets and firm's leverage (LVRGE thereafter) as the ratio of long-term debt over total assets.

3.4. Measuring discretionary accruals

We define earnings management as the intentional misreporting of firms' performance and/or misapplication of accounting standards by insiders to deceive and mislead market participants (Leuz et al. 2003). Following Cohen and Zarowin (2010), we employ the modified version of Jones (1991) to measure the discretionary accruals for each year and each industry classified by its 2-digit SIC code. This measure takes into account industry-level changes that might affect accruals and enables for time-varying coefficients. We measure discretionary accruals based on the following model:

$$\frac{TAit}{Assets_{i,t-1}} = k_1 \frac{1}{Assets_{i,t-1}} + k_2 \frac{\Delta SALES_{it}}{Assets_{i,t-1}} + k_3 \frac{PPE_{it}}{Assets_{i,t-1}} + \varepsilon_{it}, \qquad (4)$$

where TA_{it} is the total accruals defined as $TA_{it} = EBXI_{it} - CFO_{it}$, where EBXI presents the earnings before the extraordinary items and discontinued operations and CFO stands for the

operational cash flows as are reported in the cash flow statement. Furthermore, we use total assets of the previous year ($Assets_{i,t-1}$) to deflate our variables while $\Delta SALES_{it}$ is the change in revenues. Finally, PPE_{it} represents the gross value of property, plant and equipment.

We use the estimated coefficients form equation (4) to calculate the normal accruals (NA_{it}) for each firm.

$$NA_{it} = \hat{k}_1 \frac{1}{Assets_{i,t-1}} + \hat{k}_2 \frac{\Delta SALES_{it}}{Assets_{i,t-1}} + \hat{k}_3 \frac{PPE_{it}}{Assets_{i,t-1}} \quad (5)$$

Next, we measure discretionary accruals for each firm as the difference between total accruals and the estimated normal accruals based on the following equation:

$$DA_{it} = \left(\frac{TA_{it}}{Assets_{i,t-1}}\right) - NA_{it} \quad (6)$$

Since, earnings manipulation involves both positive and negative value of discretionary accruals, in our analysis we employ the absolute value of discretionary accruals (Warfield et al. 1995; Gabrielsen et al. 2002; Wang 2006; Barth et al. 2008; Sáenz González and García-Meca 2014). The absolute value of discretionary accruals measures the extent to which managers engage in earnings manipulation practices to adjust reporting earnings. Descriptive statistics of the variables used for the estimation of discretionary accruals are reported in Table 3, while Table 4 report the correlation matrix. The mean value of discretionary accruals for our sample is -0.001 suggesting that on average firms manage downwards their accruals.

<<Table 4 about here>>

4. **Model specification**

In this study, we use the last earnings forecast issued by the individual analyst rather than the consensus earnings forecast. The starting point of our analysis is panel estimation of the relationship between analysts' forecast errors and CEO incentives (Kanagaretnam et al. 2012). Our regressions control for fixed effects and time effects, while we report robust standard errors.

$$Analyst\_FE_{ijt} = \alpha_0 + \alpha_1 TOTALPAY_{jt} + \alpha_2 BONUS_{jt} + \alpha_3 CEO\_SENSITIVITY_{jt} + \alpha_4 IN\_THE\_MONEY\_OPTIONS_{jt} + \alpha_5 RESTRICTED\_STOCKS_{jt} + \alpha_6 STOCK\_OWNERSHIP_{jt} + \alpha_7 DA_{jt} + \alpha_8 ANAL\_EXP_{ijt} + \alpha_9 FOR\_FREQ_{ijt} + \alpha_{10} FOR\_REV_{ijt} + \alpha_{11} BROKERAGE_{ijt} + \alpha_{12} CEO\_DIR_{jt} + \alpha_{13} CEO\_RANK_{jt} + \alpha_{14} NUM\_ANAL_{jt} + \alpha_{15} LOSS_{it} + \alpha_{16} SIZE_{it} + \alpha_{17} LVRGE_{it} + fixed\ effects + time\ dummies + \varepsilon_{it}, \quad (7)$$

where $Analyst\_FE_{ijt}$ stands for analyst's i forecast error for firm j in year t. $TOTALPAY_{jt}, BONUS_{jt}$, $CEO\_SENSITIVITY_{jt}$, $IN\_THE\_MONEY\_OPTIONS_{jt}$, $RESTRICTED\_STOCKS_{jt}$, $STOCK\_OWNERSHIP_{jt}$ are proxies of CEO incentives and stands for CEO total compensation, cash bonus, CEO sensitivity to firms equity value, in-the-money options, restricted stock holdings and stock ownership respectively. DA_{jt} captures firms' engagement in earnings management using discretionary accruals. $ANALYSTS\_EXP_{ijt}$ presents analysts' general or firm-specific experience, FOR_FREQ_{ijt} is analysts' forecast frequency, FOR_REV_{ijt} measures analysts' forecast revision period, and $BROKERAGE_{ijt}$ is the size of broker house that employs analyst i. In an extension, CEO_RANK_{jt} and CEO_DIR_{jt} proxy CEO power and are the ranking of the CEO among the executives in the firm during the year and the CEO – Director duality respectively.[11] NUM_ANAL_{jt}, $LOSS_{it}$, $SIZE_{it}$ and $LVRGE_{it}$ stands for the number of analysts following the firm during a year, the loss years, the size and the leverage ratio of the firm respectively.

4.1. The association between earnings forecast errors and CEOs' incentives

The starting point of our analysis is the association between CEO incentives and analysts' forecasts. The impact of CEO incentives on analysts' forecast errors is reported in Tables 5 – 7 for current, 1-year and 2-years ahead forecasts respectively. Starting with the current year forecasts in Table 5, in models (1) – (6) we examine the individual impact of CEO incentives on forecast errors, while Model (7) considers the simultaneous effect of CEO incentives on forecasts. The coefficients of TOTALPAY, RESTRICTED_STOCKS and STOCK_OWNERSHIP are negative and significant at 5% or better (see Models 1, 5 and 7). These results are in line with the *interest alignment* effect proposed by Liu (2017) and Kanagaretnam et al. (2012). Higher the total compensation, restricted stock holding and stock ownership, greater the alignment of managers' interests with those of the shareholders (Johnson and Natarajan 2005; Lilienfeld-Toal and Ruenzi 2014).

Furthermore, CEOs with high salary compensation driven by career concerns might have fewer incentives to mislead analysts and thus, enhance the accuracy of forecasts for the latter.[12]

[11] In this analysis, we have also accounted for CEO Chairperson duality as an indicator for CEO power, however the impact was insignificant.

[12] Previous literature finds that markets reward/penalize firms that consistently achieve/miss analysts' earnings forecasts in short-term (Bartov et al., 2002; Kasznik and McNichols 2002; Skinner and Sloan 2002).

Therefore, our results confirm Hypothesis H1 according to which CEO incentives can affect analysts' forecast errors for current year forecasts providing evidence for the *interest alignment* effect of higher compensation and stock holdings.

<<Table 5 about here>>

Conversely, the impact of BONUS, CEO sensitivity to one percentage change in the value of firm's equity (CEO_SENSITIVITY) and IN_THE_MONEY_OPTIONS is positive and significant at 1% level in Models (2) – (4) in Table 5. These results are consistent with Hypotheses H1 for current year forecasts suggesting that analysts' forecast errors are higher for firms where CEOs enjoy higher cash bonus, are more sensitive to the changes in firm's equity value and have substantial in-the-money option holdings. Our findings are in agreement with previous evidence that CEOs with higher sensitivity to share price and option incentives may induce executives to take greater risks by engaging in opportunistic behaviour such as earnings and disclosure management that would escalate forecasting complexity (Liu 2017; Bergstresser and Philippon 2006; Burns and Kedia 2006, Efendi et al. 2006; Kanagaretnam et al. 2012). Finally, in Model (7) which accounts for all CEO incentive variables simultaneously, estimated coefficients for TOTALPAY, CEO_SENSITIVITY, RESTRICTED_STOCK_HOLDING and STOCK_OWNERSHIP maintain their significant effect on analysts' forecast errors. Interestingly, in Model (7) the impact of CEO cash bonus and in-the-money options turn insignificant indicating that perhaps other incentives are of importance for analysts' forecasts rather than the option holdings and cash bonuses.

Next, we turn to the impact of CEO incentives for 1-year-ahead forecast horizon as presented in Table 6. TOTALPAY decreases analysts' forecast errors at 1% significance level, whereas analysts' forecast errors increase at 1% level for firms where CEOs enjoy higher bonus and are more sensitive to changes in the value of firm's equity (see Models 1-3). One can notice that while IN_THE_MONEY_OPTIONS variable carries positive sign for current year (see Model 4 in Table 5), for 1-year forecast horizon, the coefficient is insignificant (see Model 4 in Table 6). Interestingly, along with STOCK_OWNERSHIP, IN_THE_MONEY_OPTIONS would reduce analysts' forecast errors at 1% level in Model (7) which considers for all CEO incentive variables. This result, in combination with the insignificant impact of in-the money options in Model (7) in Table (5), implies that when we account for other CEO incentives, option incentives are of lower importance for analysts' forecasts. Notably, for longer-term forecast, analysts face lower difficulty in forecasting for firms where CEOs have substantially higher in-the-money option holdings. This result is in odds to Kanagaretnam et al. (2012) who find

that options increase analysts forecast errors. Herein, we argue that there are other incentives that affect analysts' forecasts and in line with the interest alignment effects of options, the latter could lead to higher information disclosure and thus, to lower forecast errors. Overall, for 1-year forecast horizon, estimation results confirm hypothesis H1, according to which CEO incentives can affect analysts' forecast errors.

Finally, Table 7 reports the regression results for 2-years ahead forecast horizon. Among all incentive variables, TOTALPAY and CEO_SENSITIVITY maintain their significant impact on forecast errors confirming hypothesis H1 for 2-years ahead forecasts (see Models 1, 2 and 7). In the literature (Bergstresser and Philippon 2006; Jiang, Petroni, and Yanyan Wang 2010; Sáenz González and García-Meca 2014) is reported that CEOs with greater sensitivity to changes in firm's value might have greater motivation to engage in earnings manipulation. Our results show that such actions would increase analysts' forecast complexity and thus, their forecast errors. Furthermore, the insignificant impact of restricted stock holdings and stock ownership implies that the *interest alignment* effect of stock holdings is less pronounced for longer-term forecasts.

Overall, our results complement Liu 2017 and Kanagaretnam et al. (2012) suggesting that CEO option incentives indeed affect analysts' forecasts. However, we extend their findings showing that CEOs do not affect analysts' forecasts only through their option holdings, but total compensation, cash bonus, restricted stock holdings and ownership are also significant determinants of forecast errors. Finally, we extent existing literature research suggesting that these effects vary for longer forecast horizon.

<<Table 7 about here>>

Concerning the impact of other firm-specific variables, the greater the number of analysts following a firm the higher the forecast error. Greater number of analysts following a firm might signal higher competition among the analysts who strive for better commission fees and management relations leading them to issue less accurate forecasts (Das et al. 1998; Gu and Wu 2003). We also control for firm size, leverage and firms in loss. The coefficient of SIZE has a positive impact on forecast error in all specifications at 1% level, insinuating that analysts issue earnings forecasts with greater errors for larger firms. The insignificant coefficient of LVRGE shows that analysts' forecast are not affected by firm's leverage ratio. Note that the coefficient of the LOSS is negative (positive) for current year (1-year ahead) forecasts,

indicating that for longer-term forecasts, forecast errors for firms with losses are greater than for firms without losses (Abarbanell and Lehavy 2003; Mande and Son 2012).

4.2. Earnings management, CEO incentives and analysts' forecast errors

The main motivation of our analysis is that CEO incentives can encourage executives to engage in financial misreporting (Greenspan 2002; Cheng and Warfield 2005; Bergstresser and Philippon 2006; Burns and Kedia 2006; Efendi et al. 2007), this in turn, can affect analysts' forecasts since they use firms' financial reports to extract information. In addition, existing literature argues that earnings management can affect analysts' forecasts (Bradshaw et al. 2001; Matsumoto 2002; Cohen and Lys 2003; Ahmed et al. 2005; Brown and Caylor 2005; Burgstahler and Eames 2006; Mande and Son 2012). For this reason, we account for earnings management employing firms' discretionary accruals. Most importantly, we include the interaction terms between discretionary accruals and indicators of CEO incentives to examine whether behind earnings management lays CEOs with specific incentives (Frankforter et al. 2000; Dunn 2004; Combs et al. 2007) who would further undermine analysts' forecasts.

Starting form current year forecasts, Table 8 presents estimation results for the model including the impact of discretionary accruals. DA asserts a positive and significant effect on forecast errors in most specifications. Turning to the interaction terms between discretionary accruals and CEO incentives, DA×TOTALPAY is insignificant suggesting that it is not total compensation that motivates CEOs to engage in earnings management and this in turn, does not affect analysts' forecasts. However, when it comes to the interaction between bonus and discretionary accruals, results reveal that CEOs with higher cash bonus augment the positive impact of DA on analysts' forecast errors at 1% level confirming hypothesis H2 according to which CEO incentives can affect the relationship between earnings management and forecast errors (see Model 2 and 8). This finding is in line with previous evidence suggesting that executives with high bonus compensation have greater incentives to misreport earnings to meet performance targets (Gong et al. 2019; Harakeh et al. 2019; Benett et al. 2017; Das et al. 2013; Greenspan 2002; Cheng and Warfield 2005; Bergstresser and Philippon 2006; Efendi et al. 2007) augmenting the positive relationship between analysts' forecast errors and discretionary accruals.

The interaction term DA×CEO_SENSITIVITY carries a negative coefficient at 1% level indicating that CEO sensitivity to changes in firm's value curbs the positive impact of DA on forecast errors. Similarly, the interaction term DA×IN_THE_MONEY_OPTIONS in Model

(7), DA×RESTRICTED_STOCKS in Model (5) and DA×STOCK_OWNERSHIP in Models (6) and (7) are of negative sign at 5% level or better providing evidence for the *interest alignment effect*. There is evidence that accruals provide useful information to market participants for forecasting earnings, cash flows and estimating equity value (Barth et al. 2016; Bushman et al. 2016; Hui et al. 2016). Accruals also serve as a tool for firms to smooth temporary timing fluctuations in cash flows (Hui et al. 2016). Given that analysts use firms' financial reports to form their earnings forecasts and that the latter are input for stock recommendations (Friesen and Weller 2006; Kim et al. 2017), CEOs with greater sensitivity to changes in firm's value might have fewer incentives to mislead analysts and higher incentives to engage in earning smoothing practices in order to meet analysts' forecasts (Das et al. 2013). This in turn leads to lower forecast errors for analysts. Given these results, H2 could be valid for current year forecasts.

Next, Table 9 presents estimation results for 1-year ahead forecast horizon. Once more, results provide strong evidence to accept hypothesis H2 according to which CEO incentives can affect the relationship between earnings management and forecast errors. The negative and significant at 1% level coefficients of DA×TOTALPAY in Models (2) and (8) show that for longer-term forecast horizon, higher CEO compensation can curb the impact of earnings management on analysts' forecasts. Similarly, higher CEO sensitivity to changes in firm's value and greater stock ownership mitigate the impact of DA on analysts' forecasts at 1% level in Model (8). Conversely, CEOs who enjoy greater cash bonus augment the above effect leading to higher forecast errors. Although the interaction term DA×IN_THE_MONEY_OPTIONS has positive sign in Model (5), this impact turns insignificant in Model (8). Interestingly, DA×RESTRICTED_STOCKS carries a positive sign in Model (8) suggesting that CEOs with greater restricted stock holdings augment the impact of earnings management on analysts for 1-year ahead forecasts. It could be the case that, CEOs engage in earnings management to meet the performance requirements put on their restricted stocks for the next year (Gong et al. 2019; Harakeh et al. 2019; Benett et al. 2017; Das et al. 2013; Greenspan 2002; Cheng and Warfield 2005) and this, in turn, can increase forecast errors for analysts.

Finally, for 2-years ahead forecasts one can notice that while the impact of DA on analysts' forecasts is almost insignificant in all specifications, the interaction terms between CEO incentives and DA are not (see Table 10). In line with findings for current year forecasts, the interaction terms DA×CEO_SENSITIVITY, DA×RESTRICTED_STOCKS and

DA×STOCK_OWNERSHIP are of negative sign indicating that for firms that CEOs have such incentives, the impact of earnings management on forecast errors is less pronounced. Contrary, the bonus compensation appears to enhance the positive effect of DA on forecast errors at 1% level in Model (8). Overall, the findings of this analysis document an interaction channel between CEO incentives and earnings management that can affect analysts' forecast errors.

4.3. The association between earnings forecast errors and analysts' characteristics

Unlike Liu (2017) and Kanagaretnam et al. (2012), we assume that analysts' forecast errors varies with analysts' forecast characteristics and that the interaction between these characteristics and CEO incentives can explain part of the variability in forecast errors. A plethora of previous research reports systematic differences in forecast accuracy (Scharfstein and Stein 1990; Trueman 1994; Mikhail et al. 1997; Clement 1999; Hong et al. 2000; Hong and Kubik 2003; Clement and Tse 2005; Clarke and Subramanian 2006). Earlier research provides mixed results, and is rather limited, in particular across forecast horizons. Some evidence suggests a link between analysts' accuracy and their career concerns and reputation (Scharfstein and Stein 1990; Trueman 1994; Hong and Kubik 2003). Scharfstein and Stein (1990) and Trueman (1994) first investigate the relation between analysts' forecasts and career concerns concluding that financial analysts try to enhance their reputation mimicking other analysts as a safe forecast strategy. According to the authors, analysts tend to issue forecasts similar to those released by other analysts previously even if they are not accurate. Furthermore, Hong and Kubik (2003) find that more accurate earnings forecasts increase the probability for favourable career outcomes for the analysts.

Other studies (Hong et al. 2000; Clement and Tse 2005; Clarke and Subramanian 2006) show that inexperienced analysts may be more likely to be fired for inaccurate earnings forecasts compared to more experienced analysts. The authors suggest that less experienced analysts put greater effort in forecasting and thus, are associated with lower forecast errors and greater earnings revision frequency. Clement and Tse (2005) employing a variety of analysts' characteristics such as analyst prior accuracy, experience and employer size, demonstrate that analysts with higher previous accuracy and experience are more likely to release bold forecasts. Furthermore, they show that the likelihood of an analysts' forecast revision to be bold increases with forecast horizon, forecast frequency and employer size. Clarke and Subramanian (2006) provide evidence that analysts with very good or very poor forecasting ability issue bold forecasts, while analysts experience enhances forecasting boldness in a non-linear way.

Furthermore, the authors document negative association between the probability of an analyst to be fired by the broker house and analyst forecasting ability.

In this analysis, we assume that analysts' forecast errors varies with analysts' forecast characteristics and thus, we account for systematic differences across the analysts. Table 11-13 present the panel fixed effects regressions where the impact of analysts' characteristics is the main focus. We account for two different measures of analyst experience, the firm-specific experience and the general experience. Furthermore, we hypothesize that analysts forecast frequency, revision period and the brokerage size are related to their forecast errors. Results are reported for current year, 1-year and 2-years ahead forecasts respectively.

For current year, firm-specific experience exerts positive impact on forecast errors at 1% level (see Table 11). A one percentage point increase in analysts' firm-specific experience would increase forecast errors by 0.045 percentage. - our findings could be compared with Clarke and Subramanian (2006) who argue that less experienced analysts are more likely to be fired for inaccurate earnings forecasts compared to more experienced analysts. According to the authors, less experienced analysts might put greater effort in forecasting and thus, are associated with lower forecast errors. Conversely, we find that forecast errors decrease with forecast frequency at 5% level in model (3), while the impact turns insignificant when we consider the full models (6) and (7). Finally, results suggest that forecast errors increase with forecast revisions at 1% level, whereas the impact of broker's size is insignificant. These results indicate that higher forecast frequency corrects analysts' optimism lowering forecast errors. Conversely, greater the number of days remained until the forecast period ends (FOR_REV), higher the forecast errors.

<<Table 11 about here>>

When it comes to the longer-term forecast horizon, Table 12 shows that both general and firm-specific analysts' experience assert a positive and 1% level significant impact on forecast errors for 1-year ahead forecast horizon. A one percentage increase in analysts' firm-specific (general) experience would increase forecast errors by 0.188 percentage (0.139 percentage) in 1-year-ahead forecasts (see Models 6 and 7). The effect of forecast frequency on analysts' forecast errors is negative and significant at 1% level. Note, tough, that there is some variability in the results across forecast horizons.[13] Specifically, while the impact of FOR_FREQ is

[13] We have to note that the variable 'forecast horizon' of some earnings forecasts issued by analysts *i* for firm *j* and year *t* is different for the current, 1-year ahead and 2-years ahead forecast horizons. The first one is a variable

insignificant for current year (see Models 6 and 7 in Table 11), a one percentage increase in the number of earnings forecasts would decrease forecast errors by 0.073 percentage in 1-year ahead (see models 6 and 7 in Table 12). Clearly, more frequent earnings forecasts are associated with lower forecast errors, in particular in one year ahead. Interestingly, one percentage increase in the number of days remained until the forecast period ends (FOR_REV) decreases analysts forecast errors at 0.023 percentage. It could be the case that, for longer-term forecast horizons, the greater revision period provides analysts with further opportunities of correcting their bias.

<<Table 12 about here>>

Finally, Table 13 presents results for 2-years ahead earnings forecasts. For longer-term forecasts analysts experience appears to mitigate their errors, albeit the relationship is insignificant is all models. Among all analysts' characteristics variables, only forecast revision exerts positive impact on analysts forecast errors at 5% level. Overall, these findings show that the impact of analysts' characteristics on the forecast errors varies across forecast horizons in terms of both magnitude and sign, being more pronounced for 1-year ahead.

<<Table 13 about here>>

4.4. The interaction between analysts' characteristics and CEO incentives

To the best of our knowledge, this is the first evidence for the impact of interactions between CEO incentives and analysts-specific characteristics on the forecast errors of the latter. In previous sections, we show that the individual impact of both CEO incentives and analysts' characteristics are of importance for earnings forecasts. It might be the case that there are inter-linkages between the two that could explain further some of the forecast errors. For example, the impact of CEO incentives on analysts' forecasts could vary with differences in analysts' characteristics. In this stage, we also account for CEO power including indicators of CEO-Director duality (CEO_DIR) and the ranking of the CEO among the executives in the firm (CEO_RANK). We employ these measures to account for any variability in analysts' forecast errors that might be driven by the opportunistic behaviour of the powerful CEOs and is not captured by the CEO incentive variables.

The estimated results for the interaction between CEO incentives and analysts' characteristics for current year, 1-year and 2-years ahead forecasts are presented in Table 14. In this analysis,

that measures the number of days that mediate until the forecast period end for the specific earnings forecast, while the second one presents the different forecast windows that we examine.

we focus on analyst firm-specific experience. Interestingly, CEO incentives, such as TOTALPAY, BONUS, CEO_SENSITIVITY and STOCK_OWNERSHIP, when interact with analysts' experience correct for optimism in earnings forecasts especially for current year (see the negative coefficients of the interaction variables in Table 14). These results indicate that analysts with greater firm experience issue less optimistic forecasts for firms where CEOs enjoy higher compensation, cash bonus, are more sensitive to changes in firm's value and have greater ownership. Conversely, the interaction term between analysts' experience and restricted stock holdings is positive and significant across all forecast horizons, insinuating that for firms where CEOs hold substantially higher restricted stocks would signal to analysts' to present higher optimism. This evidence shows the existence of a trade-off between the various CEO incentives and analysts' behaviour. From the one hand, restricted stock holdings curb analysts' forecast errors as presented by the negative coefficient of RESTRICTED_STOCKS in Table 14, but on the other hand, analysts with greater firm experience issue more optimistic forecasts when CEOs restricted stock holdings increases (see EXP×RESTRICTED_STOCKS in Table 14).

Overall, these results reveal that there might be channels of interaction between CEOs and analysts'. It is also of interest that such channels are stronger in 1-year ahead forecasts, compared to the current year forecasts where a correction in optimism is reported as some actual data regarding firm's earnings become available.

<<Table 14 about here>>

Next, we report panel regressions, focusing on the frequency of forecasts (FOR_FREQ). Results show that the higher the frequency of earnings forecasts by an analyst for a specific firm, the lower the forecast error, in particular for current year (see the individual impact of FOR_FREQ in Table 14). On the other side, the interactions FOR_FREQ×TOTALPAY, FOR_FREQ×BONUS and FOR_FREQ×STOCK_OWNERSHIP are positive and highly significant for current year forecasts.

These results imply that when CEOs enjoy higher compensation, bonus and hold greater stock ownership, an increase in the forecast frequency can augment analysts' forecast optimism. However, it is not the same story when there is strong CEO sensitivity, as the interaction term FOR_FREQ×CEO_SENSITIVITY reveals that analysts correct their optimism. Once again, we reveal that there is a channel on operation between CEOs and analysts when it matters most

for the formers, with the latter willing to revise frequently their forecasts in a window dressing fashion.

Finally, we also report the estimation results for the interactions between analysts' forecast revisions, measured as the number of days remained until the forecast period ends since the last forecast revision (FOR_REV) and CEO incentives. The individual impact of FOR_REV on forecast errors is positive and significant at 1% level for current and 2-year ahead forecasts. The interactions between FOR_REV - CEO total compensation, in-the-money options and restricted stock holdings reduce forecast errors for current year, thus correcting for the individual positive effect of FOR_REV. On the other hand, the interaction coefficient of FOR_REV×CEO_SENSITIVITY for current year forecasts is positive at 5% significance level. This result implies that CEO sensitivity to changes in firm's value would increase analysts' forecast errors at the expense of forecast accuracy when the number of days remained until the forecast period ends is greater. Finally, for 2-years-ahead forecasts, CEOs with higher ownership appear to mitigate the impact of forecast revision on analysts' forecast at 5% level.

One can notice that the inclusion of CEO power measures has not changed the impact of CEO incentives on analysts' forecasts, with CEO_DIR being positive and significant in all specifications at 5% level or better. This finding implies that it is of importance to separate the role of the CEO and other top executives in order to enhance board effectiveness. The CEO – Director duality could reduce the board independence and impair the monitoring of the CEO. This in turn, allows the CEO to serve his/her own interests (Frankforter et al. 2000; Dunn 2004; Combs et al. 2007). CEO driven by self-interests lean towards practices of financial misreporting and concealing bad news from market participants (Graham et al. 2005; Kothari et al. 2009; Ball 2009). Such practices could impend the information disclosure to analysts and thus, increase forecast errors (Lustgarten and Mande 1995).

Overall, we reveal evidence that interaction between CEOs and analysts should be examined as it assists our understanding of how analysts form their forecasts.

4.5. ***The impact of regulation changes: Global Analyst Research Statement and Dodd – Frank Act.***

Analysts and CEOs operate in regulated market conditions and since regulations can affect analysts' forecasts, we shall take into account such conditions. For this reason, we extend our analysis accounting for the impact of Global Analyst Research Statement (GS) and Dodd – Frank Act (DF) on the relation between analysts' forecasts and analysts' characteristics/CEO

incentives. This research is imperative as it sheds light on an issue of great importance for both regulators and market participants: To what extend regulations can curb or augment the impact of CEO incentives and analysts'specific characteristics on the forecast ability of the latter.

Table 15 presents panel regression results for current year, 1-year and 2-years ahead forecasts. GS and DF are indicator variables that take the value one following the implementation of GS and DF regulations respectively, and 0 otherwise. The individual impact of analysts' and CEO incentives variables present the relation between these variables and analysts' forecast errors pre-GS and pre-DF period. Whereas, the coefficients of the interaction terms between analysts' characteristics – GS and CEO incentives – DF present the impact of the regulations on the underlying relationships. Therefore, if the interaction coefficients are greater (less) than zero, then the relation between forecast errors and analysts' characteristics/CEO incentives has increased (decreased) following GS and DF regulations respectively.

One can observe that GS variable carries a negative sign for current year forecasts at 1% level suggesting that GS has indeed reduced analysts' forecast errors. Conversely, analysts' forecast errors are positively related to DF regulation for current year and negatively related for 1-year ahead at 1% level. Thus, DF augments analysts' errors for current year forecasts, while it mitigates forecast errors for 1-year ahead. Furthermore, while the individual impact of analysts' experience on forecast error is positive, the interaction term FIRM_EXP×GS is negative and significant at 1% and 5% level for current and 1-year ahead forecasts respectively. In opposition, the positive sign of FOR_FREQ×GS suggests that following the GS, greater forecast frequency augments analysts' errors for current year. The interaction between FOR_REV and GS carries a positive sign for 1-year ahead forecasts, indicating that after GS, longer forecast revision increases analysts' errors. Overall, our findings provide evidence to accept H3 hypothesis that GS regulation would affect the relationship between analysts' errors and their own characteristics, documenting significant correction in the over-prediction of analysts' earnings forecasts by experienced analysts.

<<Table 15 about here>>

Next, we turn to the impact of DF regulation on the relationship between CEO incentives and analysts' forecasts. One can observe that the correction in the analysts' forecasts driven by CEO total compensation and ownership is more pronounced for current year following the DF regulation (see the interaction terms DF×TOTALPAY and DF×STOCK_OWNERSHIP in Table 15). Interestingly, post DF, the results of this section document significant decrease in

analysts' forecast optimism for firms where the CEO is more sensitive to changes in firm's equity value (see the negative coefficients for DF×INCENTIVERATIO). Note, that the coefficients of the interaction terms between DF – BONUS and DF – RESTRICTED_STOCKS are positive and significant at 1% level for current year, implying that the DF regulation could augment forecast errors for analysts following firms where CEOs enjoy high cash bonus and hold greater amount of restricted stocks. Regarding 1-year ahead forecast, while DF has reduced analysts' optimism, there is a significant enhancement of forecast errors for firms where CEOs enjoy higher compensation, hold greater amount of restricted stocks and have greater ownership.

Overall, the findings of this section document significant reduction in analysts' forecast errors post DF for current year forecasts. Following the DF regulation, analysts issue less optimistic forecasts for 1-year-ahead horizon. Our findings are consistent with hypothesis H3 according to which Dodd-Frank Act can affect the relationship between analysts' forecast errors and CEO incentives. The results of this analysis complement earlier findings (Kadan et al. 2006; Ertimur et al. 2007; Ke and Yu 2007; Chan et al. 2012; Dehaan et al. 2013; Hovakimian and Saenyasiri 2014) showing that analysts' forecast errors has declined significantly after the implementation of the GS and DF regulations. Our study extends prior research suggesting that these regulations do not affect the relationship between forecasts errors and analysts' characteristics/CEO incentives in the same way. Variability exists both across firms with different CEO incentives and across analysts' characteristics. Therefore, we suggest that it would be prudent for future regulation changes to account for analysts' experience, forecast frequency and revision. Additionally, the efficacy of the regulations could be enhanced if policy makers put greater emphasis on CEO bonus, CEO sensitivity to changes in firm's value and CEO restricted stock holdings.

5. Testing for persistence: Dynamic Panel Data Analysis

As an additional sensitivity analysis, we also employ a dynamic panel data analysis to address the endogeneity of the analysts' forecasts and unobserved heterogeneity using the Arellano Bover (1995) dynamic analysis estimator.[14] In addition, this dynamic analysis also controls for

[14] Arellano and Bover (1995) provides a dynamic panel estimators that fits our specification as: the sample of this study has a small time dimension but very large cross sectional dimension across analysts; the model is also linear while past forecast errors could impact upon current ones. The estimator uses a generalized method of moments (GMM) where the first differences of instrument variables are uncorrelated with the fixed effects of the panel.

the 'learning by doing' hypothesis based on which analysts forecast accuracy could improve over time as they gain experience and learn from their past errors.

$$FE_{ijt} = \alpha_0 + \alpha_1 FE_{ijt-1} + \alpha_2 TOTALPAY_{jt} + \alpha_3 BONUS_{jt} + \alpha_4 CEO\_SENSITIVITY_{jt} + \alpha_5 IN\_THE\_MONEY\_OPTIONS_{jt} + \alpha_6 RESTRICTED\_STOCKS_{jt} + \alpha_7 STOCK\_OWNERSHIP_{jt} + \alpha_8 DA_{jt} + \alpha_9 ANAL\_EXP_{ijt} + \alpha_{10} FOR\_FREQ_{ijt} + \alpha_{11} FOR\_REV_{ijt} + \alpha_{12} BROKERAGE_{ijt} + \alpha_{13} CEO\_DIR_{jt} + \alpha_{14} CEO\_RANK_{jt} + \alpha_{15} NUM\_ANAL_{jt} + \alpha_{16} LOSS_{it} + \alpha_{17} SIZE_{it} + \alpha_{18} LVRGE_{it} + \varepsilon_{it}, \quad (8)$$

where one period lag of the dependent variable is noted as FE_{ijt-1}, with the rest of the variables remain as above.

Table 16 presents the dynamic analysis models of the impact of CEO incentives on analysts forecast errors.[15] Our main focus is on the estimated coefficient for the lagged forecast error, FE_{ijt-1}, which is significant and an in line with the expected magnitude (less than one). This finding suggests some persistency in analysts forecast errors with past year forecast errors being a significant determinant of their current year forecasts. In some detail, across all models in Table 16 analysts' forecast errors are positively correlated with their lagged values. This persistence suggest that analysts would not learn from previous forecast errors mistakes and correct their accuracy. On the contrary, our evidence shows that analysts need time to correct for their past forecast errors. There is not widely available evidence of persistence in forecast errors of analysts with Boudt et al. (2015) providing some empirical findings along similar lines.

In line with findings in our main analysis, CEO TOTALPAY and STOCK_OWNERSHIP exert a negative impact on analysts' forecast errors. Furthermore, in agreement with our previous findings (see Table 6), CEO_SENSITIVITY carry a positive coefficient indicating that CEOs with greater sensitivity to changes in firm's value can increase analysts forecast errors. IN_THE_MONEY_OPTIONS and RESTRICTED STOCKS carry positive signs, but are not

[15] In the estimation, we implement the two-step system GMM estimator with the Windmeijer (2005) correction to the reported standard errors. In the one-step system GMM robust standard errors are reported which are robust to heteroscedasticity. In the two-step GMM error terms are already robust and Windmeijer (2005) correction is implemented to standard errors. The two-step system GMM estimator uses the consistent variance covariance matrix from first step GMM to reconstruct the weight matrix. Without this correction, the standard errors tend to be downward biased. It also offers forward orthogonal deviations, as an alternative to differencing that preserves sample size in panel with gaps.

significant, whereas STOCK_OWNERSHIP would reduce analysts' forecast errors at 1% level in Model (7). This result, in combination with the insignificant impact of IN_THE_MONEY_OPTIONS and RESTRICTED STOCKS in Model (7) insinuates that when we control for other CEO incentives, option incentives and restricted stocks are of lower importance compared to stock ownership. In line with the static models of previous sections, we report results that show that CEO incentives would impact upon analysts' forecasts, in line with H1, but persistence in forecast errors is also of importance.

<<Table 16 about here>>

Further to the persistence of analysts' forecasts errors Table 17 provides evidence of the interactions between earnings management and CEO incentives. The lagged value for analysts' forecast errors maintains its positive and significant coefficient in all models, implying that there is persistence. The interaction terms DAXTOTALPAY, DA×SENSITIVITY and DA×STOCK_OWNERSHIP all carry negative coefficients, in line with the evidence of the previous sections that H2 is valid according to which CEO incentives can affect the relationship between earnings management and analysts' forecast errors.

<<Table 17 about here>>

Finally, we also consider for persistence in analysts' forecasts when exploring the impact of analysts' characteristics on their forecast errors, see Table 18. As above, the coefficient for the lagged analysts forecast error is positive and significant in all specifications indicating that analysts' past forecast errors play a significant role when forming current year forecasts. Next, in line with our findings reported in the main analysis section, both firm-specific and general experience assert positive effect on forecast errors. This result suggests that less experience analysts put greater effort in forecasting and thus are associated with lower forecast errors. Furthermore, dynamic panel analysis, confirms that analysts' forecast errors decrease with forecast frequency. In some detail, Table 18 shows that both general and firm-specific analysts' experience assert a positive and 1% level significant impact on forecast error. The effect of forecast frequency on analysts' forecast errors is negative and significant at 1%. So, we show that more frequent earnings forecasts are associated with lower forecast errors. Although one percentage increase in the number of days remained until the forecast period ends (FOR_REV) decreases analysts forecast errors, this impact is not statistical significance. It could be the case that, for longer-term forecast horizons, the greater revision period provides analysts with further opportunities. Lastly, the coefficient of BRAGE that controls for BROKERAGE that

is the size of the broker that employs analyst *i* (calculated as the number of analysts hired by the analyst's *i* broker company during year *t*) carries a positive sign across all models while is highly significant. This result shows large brokerages would deteriorate forecast accuracy. Such outcome has been theorised earlier by Jacob, et al. (1997), Clement and Tse (2005) and Clement (1999) who argue that the size of brokerage could assert a negative impact on accuracy as large brokerage houses would tend to focus on their turnover. However, there is no one size fit all case, as other studies provide empirical evidence that shows larger brokerage houses are associated with higher analysts forecasts accuracy (Clarke, Khorana, Patel,& Rau, 2007).

<<Table 18 about here>>

6. Conclusion

The results of this study show that CEO incentives such as total compensation restricted stock holdings and stock ownership can correct analysts' optimism reducing their forecast errors. Conversely, CEO cash bonus, sensitivity to changes in firm's equity value and in-the-money options can augment analysts' optimism. Accounting for different forecast horizons, we report stronger impact of the variables for current year forecasts. We further document significant interaction effects of CEO incentives and earnings management on analysts' forecasts

The interaction effects between analysts' characteristics and CEO incentives suggest a channel on operation between analysts and CEOs with analysts' experience being the leading characteristic that mitigates the impact of CEO incentives on the forecast errors. Finally, we show that following the GS regulation experienced analysts are less optimistic, while analysts' who issue more frequently forecasts exhibit greater errors for current year forecasts. Following the DF regulation, we document significant reduction in forecast optimism for firm where CEOs enjoy high compensation, are more sensitive to changes in firm's value and have greater ownership for current year forecasts.

The results of this study could be of high interest to several groups. In particular, the findings of this paper could be of interest to the managers in defining the compensation packages for the executives in such a way to decrease their incentives for enhancing analysts' forecast optimism. Additionally, this study could provide investors with valuable information when it comes to the reliability of analysts' earnings forecasts. Investors consider analysts' forecasts when they decide on their portfolio allocation. Thus, our findings could facilitate investors' ability to assess the accuracy of analysts' earnings forecasts.

This study provides also new evidence to broker houses that employ financial analysts. We show that experienced analysts issue more optimistic earnings forecasts and thus brokers should put a roof on the years that a specific analyst should follow a firm. In this way, the networking channel between analysts and firms might be mitigated. Furthermore, since forecast frequency corrects analysts' optimism, brokers should introduce minimum number of forecasts by each analyst for each firm during the forecast period. Moreover, given the evidence that the impact of CEO incentives on analysts' forecasts varies with analysts' characteristics, brokers could enhance the forecasts of analysts' that they employ in several ways. First, by assigning relatively more experienced analysts to firms where CEOs have higher incentives. Second, reducing the forecast frequency for analysts' following firms where CEOs enjoy higher compensation and cash bonus. Finally, brokers can reduce analysts' optimism by increasing the forecast frequency for firms where CEOs are more sensitive to changes in firm's value and hold substantially higher amount of restricted stocks.

Finally, policy makers could also benefit from the findings of this research. We show that both DF and GS regulations affect analysts' accuracy. However, we argue that the effects of GS and DF enforcements vary with analysts' characteristics and CEO incentives respectively and are less pronounced for longer-term forecasts. Thus, incorporating analysts' characteristics and CEO incentives in future changes in regulations could increase their efficacy.

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Table 1: Analysts, brokers and firms over years.

	Panel A: Current year forecast			Panel B: 1-year ahead forecast			Panel C: 2-years ahead forecast		
Year	Analysts	Brokers	Firms	Analysts	Brokers	Firms	Analysts	Brokers	Firms
1992	249	33	50	250	20	40	51	11	19
1993	874	97	212	849	83	157	150	35	62
1994	1023	103	332	1023	79	157	211	52	89
1995	1142	102	385	1143	91	239	275	52	117
1996	1270	120	419	1313	98	274	294	47	117
1997	1452	136	438	1364	104	310	314	57	132
1998	1608	151	463	1554	129	370	338	70	140
1999	1614	119	471	1583	125	391	402	65	157
2000	1628	155	464	1559	98	313	351	59	130
2001	1710	125	499	1688	101	352	413	59	150
2002	1922	124	546	1794	70	289	326	55	140
2003	1879	147	592	1918	74	393	480	62	213
2004	2023	179	647	1963	134	519	686	83	262
2005	2038	198	712	1983	174	629	910	115	348
2006	2092	185	774	1996	167	688	937	106	402
2007	1969	123	795	1985	161	713	1029	107	450
2008	1848	138	803	1838	147	730	1000	95	476
2009	2015	189	973	2063	153	882	1249	126	639
2010	2313	201	1096	2187	150	813	1269	141	726
2011	2295	181	1148	2185	135	851	1365	144	766
2012	2243	181	1170	2227	159	1051	1415	142	812
2013	2254	195	1165	2258	172	1081	1560	134	833
2014	2252	182	1139	2337	174	1070	1451	134	848
2015	947	118	135	996	99	126	483	60	105
Distinct Number	10700	745	2828	10641	742	2728	6457	520	2286
Observations	40660	3482	15428	40056	2897	12438	16959	2011	8133

Notes: This table presents the sample distributions of analysts, brokers and firms over the period 1992 - 2015 for current, 1-year and 2-year-ahead forecast horizons.

Table 2: Distribution of analysts' forecasts over industries.

		Panel A: Current year forecast		Panel B: 1-year ahead forecast		Panel C: 2-years ahead forecast	
SIC	Industry group	Obs.	%	Obs.	%	Obs.	%
10	Energy	18424	9.43%	6786	10.96%	17366	9.12%
15	Materials	11855	6.07%	3985	6.44%	11589	6.09%
20	Industrial	22775	11.65%	7640	12.34%	21718	11.41%
25	Consumer Discreti	33603	17.19%	9547	15.42%	32317	16.98%
30	Consumer Staples	8168	4.18%	2393	3.87%	8087	4.25%
35	Health Care	22955	11.75%	9272	14.98%	22688	11.92%
40	Financials	33981	17.39%	10712	17.31%	33447	17.57%
45	Information Techn	34695	17.75%	8158	13.18%	33099	17.39%
50	Telecommunicatio	3266	1.67%	1002	1.62%	3372	1.77%
55	Utilities	5704	2.92%	2400	3.88%	6693	3.52%
	Total	195426	100.00%	61895	100.00%	190376	100.00%

Notes: This table presents the sample distribution of analysts' forecasts over the different industries for the period between 1992 and 2015 for current, 1-year and 2-year-ahead forecast horizons. We classify industries based on the 2-digit SIC codes.

Table 3: Descriptive statistics

Panel A: Analysts' specific variables						
	Current year forecast		1-year ahead forecast		2-years ahead forecast	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
FE	0.0002	0.0096	0.0054	0.0292	-0.0001	0.0094
ANALYST_EST	2.05	2.51	2.11	2.32	2.69	2.59
FOR_FREQ	4.42	2.66	3.79	2.58	2.92	2.52
FOR_REV	81.09	69.77	360	102.56	711	99.25
FIRM_EXP	3.26	2.52	3.26	4.10	2.52	1.90
GEM_EXP	6.86	4.71	6.74	4.67	5.19	3.47
BROKERAGE	69.20	61.62	19.40	17.73	18.34	15.10

Panel B: CEO and other firm-specific variables					
Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
SALARY	733	446	IN_THE_MONEY OPTIONS	740.25	1756
BONUS	442	1412	LVRGE	0.18	0.18
TOTALPAY	6363.21	10120	NUM_ANAL	20.26	10.88
STOCK_OWNERSHIP	1822.98	13043	SIZE	8.22	1.85
CEO_SENSITIVITY	0.19	0.21	ACTUAL	1.95	2.54
RESTRICTED_STOCKS	564.51	1929	DA	-0.001	0.007

Notes: This table reports descriptive statistics for our sample. Panel A describes analyst specific variables while Panel B presents CEO and other firm-specific variables. Analyst-specific variables are obtained from I/B/E/S Detailed file for current, 1-year and 2-year-ahead forecast horizons. FE stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. ANALYST_EST stands for the last earning forecast issued by analyst *i* for firm *j* and year *t.* FOR_FREQ presents analyst forecast frequency and is calculated as the number of earnings forecasts by analyst *i* for firm *j* during year *t.* Next, FOR_REV stands for analyst forecast horizon and is calculated as the number of days remained until the forecast period end since the last forecast revision issued by analyst *i* for firm *j* and year *t*. FIRM_EXP is the analyst firm-specific experience and is measured as the number of years that analyst *i* following firm *j*. GEN_EXP presents the general experience of analyst and is calculated as the total number of years that an analyst *i* issue earnings forecasts. Finally, BROKERAGE presents the size of the broker that employs analyst *i* and is calculated as the number of analysts hired by the analyst's *i* broker company during year *t*. CEO characteristics are derived from Execucomp database. SALARY and BONUS stand for CEO salary and bonus respectively TOTALPAY stands for CEO total compensation as measured by the sum of cash pay, stock option grants, restricted stock grants long-term incentive plan pay-outs and other annual compensation as reported in ExecuComp under the variable TDC1. STOCK_OWNERSHIP reflects CEO stock ownership. The above CEO characteristics are expressed in thousand dollars. CEO_SENSITIVITY captures the share of the hypothetical CEO total compensation (CEO sensitivity) that would be resulted from one percentage point increase in the value of firm's equity. RESTRICTED_STOCKS stands for the value of restricted stock holdings and IN_THE_MONEY_OPTIONS present the value of CEO in-the-money options. ACTUAL is the actual earning reported by firm *j* for year *t*. LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. *t*. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. Finally, SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets.

Table 4: Correlation matrix for variables.

	FE	TOTALPAY	BONUS	CEO_SENSITIVITY	IN_THE_MONEY_OPTIONS	RESTRICTED_STOCKS	STOCK_OWNERSHIP	DA	CEO_RANK	CEO_DIR	FIRM_RXP	FOR_REV	FOR_FREQ	BROKERAGE	NUM_ANAL	LOSS	SIZE	LVRGE
FE	1.000																	
TOTALPAY	-0.083	1.000																
BONUS	-0.002	-0.011	1.000															
CEO_SENSITIVITY	0.013	-0.021	-0.001	1.000														
IN_THE_MONEY_OPTIONS	-0.006	0.017	0.674	0.072	1.000													
RESTRICTED_STOCKS	0.003	-0.020	0.000	0.052	0.000	1.000												
STOCK_OWNERSHIP	-0.004	-0.131	0.003	0.125	0.005	0.003	1.000											
DA	0.019	0.009	-0.001	-0.011	-0.002	0.001	-0.002	1.000										
CEO_RANK	0.012	-0.329	-0.009	-0.003	0.038	0.056	0.085	-0.003	1.000									
CEO_DIR	0.009	0.167	0.007	0.121	0.012	0.009	0.012	0.004	-0.429	1.000								
FIRM_RXP	-0.015	0.143	0.000	0.049	-0.001	0.006	-0.009	-0.005	-0.124	0.084	1.000							
FOR_REV	0.023	-0.029	0.005	0.006	0.005	0.001	0.002	0.000	-0.001	-0.012	0.009	1.000						
FOR_FREQ	-0.024	0.086	-0.006	0.020	-0.010	-0.004	0.003	-0.003	0.002	0.033	0.206	-0.384	1.000					
BROKERAGE	-0.022	0.077	-0.006	0.006	-0.008	0.002	0.002	-0.003	0.016	-0.030	0.047	-0.050	0.109	1.000				
NUM_ANAL	-0.044	0.408	0.034	0.121	0.053	0.012	0.045	-0.015	0.067	0.014	0.056	-0.039	0.130	0.056	1.000			
LOSS	0.041	-0.073	-0.007	-0.073	0.001	0.042	-0.011	0.031	-0.023	0.025	-0.051	0.004	0.008	-0.014	-0.053	1.000		
SIZE	-0.033	0.532	0.026	-0.028	0.040	-0.009	0.032	0.023	0.105	0.011	0.140	-0.070	0.127	0.109	0.573	-0.103	1.000	
LVRGE	0.054	0.069	-0.018	-0.089	-0.029	-0.014	-0.010	0.029	-0.004	0.025	0.011	-0.023	0.034	0.050	0.026	0.110	0.201	1.000

Note: The table presents the correlation matrix for the variables used in this analysis.

Table 5: The impact of CEO incentives on analysts' forecast errors for current year forecasts.

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
TOTALPAY	-0.082***						-0.088***
	(0.006)						(0.006)
BONUS		0.074***					0.047
		(0.024)					(0.037)
CEO_SENSITIVITY			0.002***				0.003***
			(0.000)				(0.000)
IN_THE_MONEY_OPTIONS				0.001***			-0.000
				(0.000)			(0.000)
RESTRICTED_STOCKS					-0.011**		-0.012**
					(0.004)		(0.005)
STOCK_OWNERSHIP						0.005*	-0.009***
						(0.003)	(0.003)
NUM_ANAL	0.052***	0.047***	0.039**	0.046***	0.047***	0.047***	0.043**
	(0.017)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
LOSS	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SIZE	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LVRGE	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.008***	-0.012***	-0.012***	-0.012***	-0.012***	-0.012***	-0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Time effects	YES	YES	YES	YES	YES	YES	YES
Fixed effects	YES	YES	YES	YES	YES	YES	YES
Observations	191,518	191,518	191,518	191,518	191,518	191,518	191,518
R-squared	0.525	0.524	0.524	0.524	0.524	0.524	0.526

Note: The table reports estimation results for the association between analyst forecast errors and CEO incentives for current forecasts. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. CEO incentives include the following variables: TOTALPAY that stands for CEO total compensation as measured by the natural logarithm of the sum of cash pay, stock option grants, restricted stock grants long-term incentive plan pay-outs and other annual compensation as reported in ExecuComp under the variable TDC1. BONUS presents CEO bonus and is calculated as the ratio of CEO bonus over CEO salary. CEO_SENSITIVITY captures the share of the hypothetical CEO total compensation that would be resulted from one percentage point increase in the value of firm's equity. IN_THE_MONEY_OPTIONS present the value of CEO in-the-money options, RESTRICTED_STOCKS stands for the value of restricted stock holdings and STOCK_OWNERSHIP reflects CEO stock ownership measured by the ratio of the value of CEO stock grants excluding options over CEO salary. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. LOSS is a dummy variable that takes the value one for loss year and zero otherwise. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets, while LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6: The impact of CEO incentives on analysts' forecast errors for 1-year ahead forecasts.

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
TOTALPAY	-0.048***						-0.051***
	(0.002)						(0.002)
BONUS		0.342***					0.275**
		(0.074)					(0.138)
CEO_SENSITIVITY			0.006***				0.009***
			(0.001)				(0.001)
IN_THE_MONEY_OPTIONS				0.000			-0.004***
				(0.000)			(0.001)
RESTRICTED_STOCKS					-0.005		-0.010
					(0.007)		(0.013)
STOCK_OWNERSHIP						-0.013	-0.094***
						(0.008)	(0.012)
NUM_ANAL	-0.043	-0.077	-0.097*	-0.076	-0.076	-0.077	-0.079
	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)
LOSS	0.001*	0.001**	0.001***	0.001**	0.001**	0.001**	0.001*
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
SIZE	0.011***	0.011***	0.011***	0.011***	0.011***	0.011***	0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LVRGE	0.001	0.002	0.002	0.002	0.001	0.002	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.045***	-0.072***	-0.071***	-0.072***	-0.072***	-0.072***	-0.042***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Time effects	YES	YES	YES	YES	YES	YES	YES
Fixed effects	YES	YES	YES	YES	YES	YES	YES
Observations	186,572	186,572	186,572	186,572	186,572	186,572	186,572
R-squared	0.563	0.558	0.558	0.558	0.558	0.558	0.563

Note: The table reports estimation results for the association between analyst forecast errors and CEO incentives for 1-year ahead forecasts. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. CEO incentives include the following variables: TOTALPAY that stands for CEO total compensation as measured by the natural logarithm of the sum of cash pay, stock option grants, restricted stock grants long-term incentive plan pay-outs and other annual compensation as reported in ExecuComp under the variable TDC1. BONUS presents CEO bonus and is calculated as the ratio of CEO bonus over CEO salary. CEO_SENSITIVITY captures the share of the hypothetical CEO total compensation that would be resulted from one percentage point increase in the value of firm's equity. IN_THE_MONEY_OPTIONS present the value of CEO in-the-money options, RESTRICTED_STOCKS stands for the value of restricted stock holdings and STOCK_OWNERSHIP reflects CEO stock ownership measured by the ratio of the value of CEO stock grants excluding options over CEO salary. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. LOSS is a dummy variable that takes the value one for loss year and zero otherwise. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets, while LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 7: The impact of CEO incentives on analysts' forecast errors for 2-years ahead forecasts.

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
TOTALPAY	-0.005***						-0.005***
	(0.001)						(0.001)
BONUS		-0.019					0.103
		(0.044)					(0.073)
CEO_SENSITIVITY			0.003***				0.003***
			(0.001)				(0.001)
IN_THE_MONEY_OPTIONS				-0.000			-0.002*
				(0.001)			(0.001)
RESTRICTED_STOCKS					-0.017		-0.019
					(0.011)		(0.012)
STOCK_OWNERSHIP						-0.001	-0.008
						(0.007)	(0.007)
NUM_ANAL	0.080	0.077	0.066	0.077	0.077	0.076	0.068
	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)	(0.052)	(0.051)
LOSS	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SIZE	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LVRGE	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.009***	-0.012***	-0.011***	-0.012***	-0.012***	-0.012***	-0.008***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Time effects	YES	YES	YES	YES	YES	YES	YES
Fixed effects	YES	YES	YES	YES	YES	YES	YES
Observations	60,659	60,659	60,659	60,659	60,659	60,659	60,659
R-squared	0.595	0.595	0.595	0.595	0.595	0.595	0.596

Note: The table reports estimation results for the association between analyst forecast errors and CEO incentives for 2-years ahead forecasts. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. CEO incentives include the following variables: TOTALPAY that stands for CEO total compensation as measured by the natural logarithm of the sum of cash pay, stock option grants, restricted stock grants long-term incentive plan pay-outs and other annual compensation as reported in ExecuComp under the variable TDC1. BONUS presents CEO bonus and is calculated as the ratio of CEO bonus over CEO salary. CEO_SENSITIVITY captures the share of the hypothetical CEO total compensation that would be resulted from one percentage point increase in the value of firm's equity. IN_THE_MONEY_OPTIONS present the value of CEO in-the-money options, RESTRICTED_STOCKS stands for the value of restricted stock holdings and STOCK_OWNERSHIP reflects CEO stock ownership measured by the ratio of the value of CEO stock grants excluding options over CEO salary. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. LOSS is a dummy variable that takes the value one for loss year and zero otherwise. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets, while LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 8: The impact of earnings management, CEO incentives and their interactions for current year forecast errors.

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
DA	0.015***	-0.012	0.016***	0.026***	0.016***	0.016***	0.016***	0.032
	(0.004)	(0.022)	(0.004)	(0.006)	(0.004)	(0.004)	(0.004)	(0.034)
DAXTOTALPAY		0.371						-0.077
		(0.307)						(0.404)
TOTALPAY		-0.075***						-0.081***
		(0.006)						(0.006)
DAXBONUS			4.470***					4.290***
			(0.813)					(0.838)
BONUS			6.121***					5.901***
			(1.105)					(1.139)
DA×CEO_SENSITIVITY				-4.456***				-4.429**
				(1.328)				(1.861)
CEO_SENSITIVITY				0.001***				0.002***
				(0.000)				(0.000)
DA× IN_THE_MONEY_ OPTIONS					-0.445			-2.910***
					(0.507)			(0.866)
IN_THE_MONEY_OPTIONS					-0.000			-0.005***
					(0.001)			(0.001)
DA×RESTRICTED_STOCKS						-24.596**		-0.996
						(10.913)		(12.089)
RESTRICTED_STOCKS						-0.026***		-0.013
						(0.009)		(0.010)
DA×I STOCK_OWEN							-0.343**	-0.371**
							(0.162)	(0.165)
STOCK_OWNERSHIP							0.003	-0.009***
							(0.003)	(0.003)
NUM_ANAL	0.063***	0.068***	0.063***	0.059***	0.063***	0.063***	0.063***	0.061***
	(0.018)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
LOSS	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SIZE	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LVRGE	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.014***	-0.010***	-0.014***	-0.013***	-0.014***	-0.014***	-0.014***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Time effects	YES	YES	YES	YES	YES	YES	YES	YES
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	161,374	161,374	161,374	161,374	161,374	161,374	161,374	161,374
R-squared	0.534	0.535	0.534	0.534	0.534	0.534	0.534	0.535

Note: The table reports estimation results for the impact of earnings management on the association between analyst forecast errors and CEO incentives for current year forecasts. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. DA stands for firms' engagement in earnings manipulation and presents the use of discretionary accruals. CEO incentives include the following variables: TOTALPAY that stands for CEO total compensation as measured by the natural logarithm of the sum of cash pay, stock option grants, restricted stock grants long-term incentive plan pay-outs and other annual compensation as reported in ExecuComp under the variable TDC1. BONUS presents CEO bonus and is calculated as the ratio of CEO bonus over CEO salary. CEO_SENSITIVITY captures the share of the hypothetical CEO total compensation that would be resulted from one percentage point increase in the value of firm's equity. IN_THE_MONEY_OPTIONS present the value of CEO in-the-money options, RESTRICTED_STOCKS stands for the value of restricted stock holdings and STOCK_OWNERSHIP reflects CEO stock ownership measured by the ratio of the value of CEO stock grants excluding options over CEO salary. DA×TOTALPAY, DA×BONUS, DA×CEO_SENSITIVITY, DA×OPTIONS_IN_THE_MONEY, DA×RESTRICTED_STOCKS and DA×STOCK_OWENSHIP are the interaction terms between DA and CEO incentives. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. LOSS is a dummy variable that takes the value one for loss year and zero otherwise. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets, while LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 9: The impact of earnings management, CEO incentives and their interactions for 1-year ahead forecast errors.

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
DA	-0.011	0.480***	-0.011	0.014	-0.011	-0.011	-0.011	0.873***
	(0.018)	(0.096)	(0.018)	(0.026)	(0.018)	(0.018)	(0.018)	(0.138)
DAXTOTALPAY		-0.648***						-1.055***
		(0.136)						(0.171)
TOTALPAY		-0.045***						-0.048***
		(0.002)						(0.002)
DAXBONUS			3.309***					2.975***
			(2.073)					(0.290)
BONUS			4.398***					3.994***
			(0.287)					(2.970)
DA×CEO_SENSITIVITY				-10.027				-34.919***
				(6.112)				(6.583)
CEO_SENSITIVITY				-0.000				0.003***
				(0.001)				(0.001)
DA× IN_THE_MONEY_ OPTIONS					9.644***			-3.839
					(1.404)			(4.739)
IN_THE_MONEY_OPTIONS					0.014***			-0.007
					(0.002)			(0.008)
DA×RESTRICTED_STOCKS						1.971		13.029***
						(2.002)		(4.431)
RESTRICTED_STOCKS						0.001		0.059**
						(0.014)		(0.026)
DA×STOCK_OWNERSHIP							-0.556	-0.818**
							(0.353)	(0.400)
STOCK_OWNERSHIP							-0.016**	-0.087***
							(0.008)	(0.011)
NUM_ANAL	-0.079	-0.047	-0.083	-0.077	-0.078	-0.079	-0.080	-0.068
	(0.058)	(0.058)	(0.058)	(0.059)	(0.059)	(0.058)	(0.059)	(0.058)
LOSS	0.002***	0.001**	0.002***	0.002***	0.002***	0.002***	0.002***	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SIZE	0.010***	0.011***	0.010***	0.010***	0.010***	0.010***	0.010***	0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LVRGE	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.069***	-0.043***	-0.069***	-0.069***	-0.069***	-0.069***	-0.069***	-0.041***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Time effects	YES	YES	YES	YES	YES	YES	YES	YES
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	156,991	156,991	156,991	156,991	156,991	156,991	156,991	156,991
R-squared	0.570	0.575	0.570	0.570	0.570	0.570	0.570	0.576

Note: The table reports estimation results for the impact of earnings management on the association between analyst forecast errors and CEO incentives for 1-year ahead forecasts. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. DA stands for firms' engagement in earnings manipulation and presents the use of discretionary accruals. CEO incentives include the following variables: TOTALPAY that stands for CEO total compensation as measured by the natural logarithm of the sum of cash pay, stock option grants, restricted stock grants long-term incentive plan pay-outs and other annual compensation as reported in ExecuComp under the variable TDC1. BONUS presents CEO bonus and is calculated as the ratio of CEO bonus over CEO salary. CEO_SENSITIVITY captures the share of the hypothetical CEO total compensation that would be resulted from one percentage point increase in the value of firm's equity. IN_THE_MONEY_OPTIONS present the value of CEO in-the-money options, RESTRICTED_STOCKS stands for the value of restricted stock holdings and STOCK_OWNERSHIP reflects CEO stock ownership measured by the ratio of the value of CEO stock grants excluding options over CEO salary. DA×TOTALPAY, DA×BONUS, DA×CEO_SENSITIVITY, DA×OPTIONS_IN_THE_MONEY, DA×RESTRICTED_STOCKS and DA×STOCK_OWENSHIP are the interaction terms between DA and CEO incentives. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. LOSS is a dummy variable that takes the value one for loss year and zero otherwise. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets, while LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 10: The impact of earnings management, CEO incentives and their interactions for 2-year ahead forecast errors.

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
DA	0.009	0.039	0.009	0.027*	0.009	0.009	0.009	0.082
	(0.012)	(0.100)	(0.012)	(0.015)	(0.012)	(0.012)	(0.012)	(0.101)
DAXTOTALPAY		-0.037						-0.071
		(0.133)						(0.127)
TOTALPAY		-0.005***						-0.005***
		(0.001)						(0.001)
DAXBONUS			-7.005					0.439***
			(9.436)					(0.118)
BONUS			-9.542					0.597***
			(12.828)					(0.160)
DA×CEO_SENSITIVITY				-9.100				-7.865*
				(5.919)				(4.757)
CEO_SENSITIVITY				0.001*				0.002**
				(0.001)				(0.001)
DA×IN_THE_MONEY_ OPTIONS					-1.219			-0.912
					(1.480)			(2.064)
IN_THE_MONEY_OPTIONS					-0.002			-0.003
					(0.002)			(0.004)
DA×RESTRICTED_STOCKS						-42.367*		-3.169
						(24.803)		(20.675)
RESTRICTED_STOCKS						-0.045*		-0.025
						(0.024)		(0.020)
DA×STOCK_OWENERSHIP							-8.779**	-75.439***
							(3.815)	(19.849)
STOCK_OWNERSHIP							-0.017	-0.102***
							(0.011)	(0.027)
NUM_ANAL								
	0.079	0.082	0.079	0.073	0.079	0.080	0.077	0.072
LOSS	(0.052)	(0.052)	(0.052)	(0.051)	(0.052)	(0.052)	(0.052)	(0.051)
	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
SIZE	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
LVRGE	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	-0.000	-0.000	-0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.012***	-0.009***	-0.012***	-0.012***	-0.012***	-0.012***	-0.012***	-0.009***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Time Effects	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	51,488	51,488	51,488	51,488	51,488	51,488	51,488	51,488
R-squared	0.609	0.610	0.609	0.610	0.609	0.610	0.610	0.611

Note: The table reports estimation results for the impact of earnings management on the association between analyst forecast errors and CEO incentives for 2-years ahead forecasts. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. DA stands for firms' engagement in earnings manipulation and presents the use of discretionary accruals. CEO incentives include the following variables: TOTALPAY that stands for CEO total compensation as measured by the natural logarithm of the sum of cash pay, stock option grants, restricted stock grants long-term incentive plan pay-outs and other annual compensation as reported in ExecuComp under the variable TDC1. BONUS presents CEO bonus and is calculated as the ratio of CEO bonus over CEO salary. CEO_SENSITIVITY captures the share of the hypothetical CEO total compensation that would be resulted from one percentage point increase in the value of firm's equity. IN_THE_MONEY_OPTIONS present the value of CEO in-the-money options, RESTRICTED_STOCKS stands for the value of restricted stock holdings and STOCK_OWNERSHIP reflects CEO stock ownership measured by the ratio of the value of CEO stock grants excluding options over CEO salary. DA×TOTALPAY, DA×BONUS, DA×CEO_SENSITIVITY, DA×OPTIONS_IN_THE_MONEY, DA×RESTRICTED_STOCKS and DA×STOCK_OWENSHIP are the interaction terms between DA and CEO incentives. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. LOSS is a dummy variable that takes the value one for loss year and zero otherwise. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets, while LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 11: The impact of analysts' characteristics on earnings forecast error for current year forecasts.

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
FIRM_EXP	0.045***					0.042***	
	(0.009)					(0.009)	
GEN_EXP		0.015					0.012
		(0.013)					(0.013)
FOR_FREQ			-0.014**			-0.009	-0.007
			(0.006)			(0.006)	(0.006)
FOR_REV				0.014***		0.010***	0.012***
				(0.003)		(0.003)	(0.003)
BROKERAGE					-0.003	-0.005	-0.003
					(0.008)	(0.008)	(0.008)
NUM_ANAL	0.047***	0.047***	0.047***	0.046***	0.047***	0.047***	0.046***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
LOSS	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SIZE	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LVRGE	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.010***	-0.012***	-0.012***	-0.012***	-0.012***	-0.010***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	191,518	191,518	191,518	191,518	191,518	191,518	191,518
R-squared	0.524	0.524	0.524	0.524	0.524	0.524	0.524

Note: The table reports estimation results for the association between analysts' forecast errors and analysts' characteristics for current year forecast. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. The explanatory variables are the natural logarithm of the following analysts' characteristics: GEN_EXP presents the general experience of analyst and is calculated as the total number of years that an analyst *i* issue earnings forecasts. FIRM_EXP is the analyst firm-specific experience and is measured as the number of years that analyst *i* following firm *j*. FOR_FREQ presents analyst forecast frequency and is the number of earnings forecasts by analyst *i* for firm *j* during year *t*. FOR_REV stands for analyst forecast horizon and is calculated as the number of days remained until the forecast period ends since the last forecast revision issued by analyst *i* for firm *j* and year *t*. Finally, BROKERAGE presents the size of the broker that employs analyst *i* and is calculated as the number of analysts hired by the analyst's *i* broker company during year *t*. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets. Finally, LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 12: The impact of analysts' characteristics on earnings forecast error for 1-year ahead forecasts.

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
FIRM_EXP	0.161***					0.188***	
	(0.028)					(0.028)	
GEN_EXP		0.116***					0.139***
		(0.037)					(0.037)
FOR_FREQ			-0.061***			-0.078***	-0.068***
			(0.015)			(0.015)	(0.015)
FOR_REV				-0.023***		-0.023***	-0.023***
				(0.009)		(0.009)	(0.009)
BROKERAGE					0.005	0.004	0.006
					(0.017)	(0.017)	(0.017)
NUM_ANAL	-0.069	-0.072	-0.069	-0.073	-0.076	-0.054	-0.059
	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)
LOSS	0.001**	0.001**	0.001**	0.001**	0.001**	0.001**	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SIZE	0.011***	0.011***	0.011***	0.011***	0.011***	0.011***	0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LVRGE	0.001	0.002	0.002	0.002	0.001	0.001	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.066***	-0.069***	-0.072***	-0.071***	-0.072***	-0.064***	-0.068***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
Time Effects	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Observations	186,572	186,572	186,572	186,572	186,572	186,572	186,572
R-squared	0.558	0.558	0.558	0.558	0.558	0.558	0.558

Note: The table reports estimation results for the association between analysts' forecast errors and analysts' characteristics for 1-year ahead forecasts. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. The explanatory variables are the natural logarithm of the following analysts' characteristics: GEN_EXP presents the general experience of analyst and is calculated as the total number of years that an analyst *i* issue earnings forecasts. FIRM_EXP is the analyst firm-specific experience and is measured as the number of years that analyst *i* following firm *j*. FOR_FREQ presents analyst forecast frequency and is the number of earnings forecasts by analyst *i* for firm *j* during year *t*. FOR_REV stands for analyst forecast horizon and is calculated as the number of days remained until the forecast period ends since the last forecast revision issued by analyst *i* for firm *j* and year *t*. Finally, BROKERAGE presents the size of the broker that employs analyst *i* and is calculated as the number of analysts hired by the analyst's *i* broker company during year *t*. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets. Finally, LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 13: The impact of analysts' characteristics on earnings forecast error for 2-years ahead forecasts.

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
FIRM_EXP	-0.006					-0.008	
	(0.021)					(0.021)	
GEN_EXP		-0.037					-0.040
		(0.029)					(0.029)
FOR_FREQ			0.003			0.003	0.004
			(0.011)			(0.011)	(0.011)
FOR_REV				0.015**		0.015**	0.015**
				(0.007)		(0.007)	(0.007)
BROKERAGE					0.010	0.009	0.010
					(0.012)	(0.012)	(0.012)
NUM_ANAL	0.076	0.074	0.076	0.073	0.078	0.073	0.071
	(0.051)	(0.051)	(0.051)	(0.052)	(0.051)	(0.052)	(0.052)
LOSS	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SIZE	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LVRGE	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.012***	-0.013***	-0.012***	-0.012***	-0.012***	-0.013***	-0.013***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Time Effects	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Observations	60,659	60,659	60,659	60,659	60,659	60,659	60,659
R-squared	0.595	0.595	0.595	0.595	0.595	0.595	0.595

Note: The table reports estimation results for the association between analysts' forecast errors and analysts' characteristics for 2-years ahead forecasts. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. The explanatory variables are the natural logarithm of the following analysts' characteristics: GEN_EXP presents the general experience of analyst and is calculated as the total number of years that an analyst *i* issue earnings forecasts. FIRM_EXP is the analyst firm-specific experience and is measured as the number of years that analyst *i* following firm *j*. FOR_FREQ presents analyst forecast frequency and is the number of earnings forecasts by analyst *i* for firm *j* during year *t*. FOR_REV stands for analyst forecast horizon and is calculated as the number of days remained until the forecast period ends since the last forecast revision issued by analyst *i* for firm *j* and year *t*. Finally, BROKERAGE presents the size of the broker that employs analyst *i* and is calculated as the number of analysts hired by the analyst's *i* broker company during year *t*. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets. Finally, LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 14: The interaction effects between CEO incentives and analysts' characteristics on analysts' forecast errors current, 1-year and 2-years ahead forecasts.

VARIABLES	Current year forecast	1-year ahead forecast	2-yrs ahead forecast
FIRM_EPX×TOTALPAY	-1.275***	-0.817***	-0.031
	(0.473)	(0.149)	(0.108)
FIRM_EPX×BONUS	-6.622*	-2.134	4.436
	(3.748)	(9.449)	(32.751)
FIRM_EPX ×CEO_SENSITIVITY	-3.408*	1.915	-4.221
	(2.069)	(6.483)	(4.929)
FIRM_EXP×OPT_IN_THE_MONEY	0.037	-0.107	0.011
	(0.033)	(0.084)	(0.307)
EXP×RESTRICTED_STOCKS	7.657***	19.559***	7.257**
	(1.732)	(6.015)	(2.910)
EXP×STOCK_OWNERSHIP	-0.615***	-1.054***	-0.341
	(0.100)	(0.166)	(0.212)
FOR_FREQ×TOTALPAY	1.978***	0.254*	0.138
	(0.630)	(0.151)	(0.103)
FOR_FREQ×BONUS	15.299***	-5.357	14.348
	(5.283)	(12.113)	(27.330)
FOR_FREQ×CEO_SENSITIVITY	-3.423	-18.533***	-0.309
	(2.898)	(6.995)	(4.562)
FOR_FREQ×OPT_IN_THE_MONEY	-0.033	0.064	-0.166
	(0.037)	(0.096)	(0.351)
FOR_FREQ×RESTRICTED_STOCKS	-2.052*	1.486	-2.954*
	(1.057)	(2.879)	(1.753)
FOR_FREQ×STOCK_OWNERSHIP	0.156***	-0.023	0.191
	(0.046)	(0.073)	(0.124)
FOR_REV×TOTALPAY	-1.860***	-0.025	-0.280***
	(0.303)	(0.085)	(0.076)
FOR_REV×BONUS	-1.232	-6.199	12.067
	(2.817)	(4.593)	(31.377)
FOR_REV×CEO_SENSITIVITY	3.165**	-2.852	3.739
	(1.339)	(3.865)	(3.075)
FOR_REV×OPT_IN_THE_MONEY	-0.033**	0.058	-0.211
	(0.015)	(0.039)	(0.314)
FOR_REV×RESTRICTED_STOCKS	-0.535*	1.744	0.991
	(0.322)	(1.132)	(1.160)
FOR_REV×STOCK_OWNERSHIP	0.010	0.063	-0.243**
	(0.027)	(0.056)	(0.102)
DA×TOTALPAY	-0.092	-1.055***	-0.074
	(0.407)	(0.171)	(0.128)
TOTALPAY	-0.025	-0.046***	0.005
	(0.017)	(0.004)	(0.003)
DA×BONUS	0.429***	2.978***	5.089***
	(0.084)	(0.249)	(0.028)
BONUS	0.569***	4.080***	6.821***
	(0.164)	(0.293)	(1.727)
DA×CEO_SENSITIVITY	-4.455**	-33.517***	-7.517
	(1.886)	(6.587)	(4.868)
CEO_SENSITIVITY	0.002**	0.008***	0.001
	(0.001)	(0.002)	(0.002)
DA×OPTIONS_IN_THE_MONEY	-2.781***	-5.303	-0.988
	(0.964)	(5.580)	(3.383)
IN_THE_MONEY_OPTIONS	-0.003*	-0.012	0.007
	(0.002)	(0.010)	(0.018)
DA×RESTRICTED_STOCKS	-8.355***	-4.614	-4.898
	(2.477)	(6.840)	(3.103)
RESTRICTED_STOCKS	-0.141***	-0.445**	-0.149**
	(0.043)	(0.181)	(0.075)
DA×STOCK_OWNERSHIP	-2.581***	-6.332***	-8.621***
	(0.448)	(1.050)	(2.125)
STOCK_OWNERSHIP	-0.008**	-0.096***	-0.101***
	(0.004)	(0.012)	(0.027)
DA	0.033	0.871***	0.084
	(0.035)	(0.139)	(0.102)
CEO_RANK	0.002	-0.144***	0.018

	(0.011)	(0.032)	(0.023)
CEO_DIR	0.000**	0.002***	0.001**
	(0.000)	(0.000)	(0.000)
FIRM_EXP	0.156***	0.867***	0.026
	(0.039)	(0.124)	(0.095)
FOR_REV	0.158***	0.014	0.254***
	(0.026)	(0.073)	(0.068)
FOR_FREQ	-0.187***	-0.283**	-0.106
	(0.053)	(0.129)	(0.094)
BROKERAGE	-0.003	-0.008	0.003
	(0.008)	(0.018)	(0.012)
NUM_ANAL	0.067***	-0.027	0.071
	(0.019)	(0.058)	(0.051)
LOSS	-0.001***	0.001**	-0.000
	(0.000)	(0.001)	(0.000)
SIZE	0.001***	0.011***	0.001***
	(0.000)	(0.000)	(0.000)
LVRGE	-0.000	0.000	-0.000
	(0.000)	(0.001)	(0.001)
Constant	-0.012***	-0.036***	-0.020***
	(0.002)	(0.005)	(0.004)
Time Effects	YES	YES	YES
Fixed effects	YES	YES	YES
Observations	161,374	156,991	51,488
R-squared	0.537	0.577	0.612

Note: The table reports estimation results for the interaction effects of CEO incentives and analysts' characteristics on analysts' forecast errors for current, 1-year and 2-years ahead forecasts. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. The explanatory variables are the natural logarithm of the following analysts' characteristics: GEN_EXP presents the general experience of analyst and is calculated as the total number of years that an analyst *i* issue earnings forecasts. FIRM_EXP is the analyst firm-specific experience and is measured as the number of years that analyst *i* following firm *j*. FOR_FREQ presents analyst forecast frequency and is the number of earnings forecasts by analyst *i* for firm *j* during year *t*. FOR_REV stands for analyst forecast horizon and is calculated as the number of days remained until the forecast period ends since the last forecast revision issued by analyst *i* for firm *j* and year *t*. Finally, BROKERAGE presents the size of the broker that employs analyst *i* and is calculated as the number of analysts hired by the analyst's *i* broker company during year *t*. CEO incentives include the following variables: TOTALPAY that stands for CEO total compensation as measured by the natural logarithm of the sum of cash pay, stock option grants, restricted stock grants long-term incentive plan pay-outs and other annual compensation as reported in ExecuComp under the variable TDC1. BONUS presents CEO bonus and is calculated as the ratio of CEO bonus over CEO salary. CEO_SENSITIVITY captures the share of the hypothetical CEO total compensation that would be resulted from one percentage point increase in the value of firm's equity. IN_THE_MONEY_OPTIONS present the value of CEO in-the-money options, RESTRICTED_STOCKS stands for the value of restricted stock holdings and STOCK_OWNERSHIP reflects CEO stock ownership measured by the ratio of the value of CEO stock grants excluding options over CEO salary. FIRM_EPX×TOTALPAY, FIRM_EPX×BONUS, FIRM_EPX×CEO_SENSITIVITY, FIRM_EXP×OPTIONS_IN_THE_MONEY, EXP×RESTRICTED_STOCKS, EXP×STOCK_OWNERSHIP are the interactions between analysts' experience and CEO incentives. FOR_FREQ×TOTALPAY, FOR_FREQ×BONUS, FOR_FREQ×CEO_SENSITIVITY, FOR_FREQ×OPTIONS_IN_THE_MONEY, FOR_FREQ×RESTRICTED_STOCKS, FOR_FREQ×STOCK_OWNERSHIP stands for the interactions between analysts' forecast frequency (FOR_FREQ) and CEO incentives. FOR_REV×TOTALPAY, FOR_REV×BONUS, FOR_REV×CEO_SENSITIVITY, FOR_REV×OPTIONS_IN_THE_MONEY, FOR_REV×RESTRICTED_STOCKS, FOR_REV×STOCK_OWNERSHIP present the interactions between analysts' forecast revision (FOR_REV) and CEO incentives. DA×TOTALPAY, DA×BONUS, DA×CEO_SENSITIVITY, DA×OPTIONS_IN_THE_MONEY, DA×RESTRICTED_STOCKS and DA×STOCK_OWENSHIP are the interaction terms between DA and CEO incentives. CEO_RANK stands for CEO ranking among the executives in the firm based on the salary and bonus compensations and CEO_DIR is an indicator variable that takes the value one if the CEO occupies the role of the director in the board, and zero otherwise. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets. Finally, LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 15: The impact of Global Analyst Research Statement (GS) and Dodd – Frank Act (DF) on analysts' forecast errors for current, 1-year and 2-yeards ahead forecasts.

VARIABLES	Current year	1-year ahead	2-years-ahead
GS	-0.003***	-0.004	0.000
	(0.001)	(0.002)	(0.003)
GS×FIRM_EXP	-0.055***	-0.104**	-0.039
	(0.017)	(0.052)	(0.077)
GS×FOR_FREQ	0.001***	-0.000	-0.001
	(0.000)	(0.000)	(0.001)
GS×FOR_REV	-0.006	0.059***	-0.035
	(0.008)	(0.021)	(0.027)
GS×BROKER	0.014	0.022	0.010
	(0.012)	(0.033)	(0.039)
FIRM_EXP	0.090***	0.313***	0.028
	(0.016)	(0.048)	(0.073)
FOR_REV	0.016**	-0.055***	0.054**
	(0.007)	(0.019)	(0.026)
FOR_FREQ	-0.073***	-0.083**	0.069
	(0.015)	(0.034)	(0.058)
BROKERAGE	-0.014	-0.022	-0.007
	(0.013)	(0.032)	(0.038)
DF	0.003***	-0.020***	0.003
	(0.001)	(0.003)	(0.002)
DF×TOTALPAY	-0.017**	0.006**	-0.000
	(0.009)	(0.003)	(0.002)
DF×BONUS	12.191***	-4.1089	4.573
	(3.981)	(12.339)	(7.607)
DF×CEO-SENSITIVITY	-0.080**	-0.028	-0.115
	(0.036)	(0.112)	(0.085)
DF×OPTIONS_IN_THE_MONEY	-0.002	-0.002	-0.000
	(0.002)	(0.008)	(0.005)
DF×RESTRICTED_STOCKS	0.099***	0.615***	0.038
	(0.029)	(0.082)	(0.070)
DF×STOCK_OWNERSHIP	-0.041***	0.055**	-0.020
	(0.008)	(0.024)	(0.016)
DF×DA	0.004	0.060	0.048
	(0.015)	(0.053)	(0.032)
TOTALPAY	-0.084***	-0.054***	-0.006***
	(0.006)	(0.002)	(0.002)
BONUS	0.011	-0.062	0.053
	(0.039)	(0.146)	(0.077)
CEO_SENSITIVITY	0.002***	0.005***	0.002***
	(0.000)	(0.001)	(0.001)
IN_THE_MONEY_OPTIONS	-0.000	-0.001	-0.001
	(0.000)	(0.001)	(0.001)
RESTRICTED_STOCKS	-0.103***	-0.595***	-0.054
	(0.030)	(0.083)	(0.070)
STOCK_OWNERSHIP	0.010**	-0.144***	0.005
	(0.005)	(0.017)	(0.013)
CEO_RANK	0.002	-0.130***	0.018
	(0.011)	(0.032)	(0.023)
CEO_DIR	0.000**	0.002***	0.001**
	(0.000)	(0.000)	(0.000)
DA	0.016***	-0.011	0.003

	(0.004)	(0.019)	(0.013)
NUM_ANAL	0.062***	-0.042	0.067
	(0.019)	(0.058)	(0.051)
LOSS	-0.001***	0.001**	-0.000
	(0.000)	(0.001)	(0.000)
SIZE	0.001***	0.011***	0.001***
	(0.000)	(0.000)	(0.000)
LVRGE	-0.000	-0.000	-0.000
	(0.000)	(0.001)	(0.001)
Constant	-0.006***	-0.026***	-0.011***
	(0.001)	(0.004)	(0.004)
Time Effects	YES	YES	YES
Fixed Effects	YES	YES	YES
Observations	161,374	156,991	51,488
R-squared	0.536	0.576	0.611

Note: The table reports estimation results for the effects of Global Analyst Research Statement (GS) and Dodd – Frank Act (DF) on analysts' forecast errors for current, 1-year and 2-years ahead forecasts. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. GS and DF are indicator variables that take the value one following the implementation of GS and DF regulations respectively, and 0 otherwise. The explanatory variables are the natural logarithm of the following analysts' characteristics: GEN_EXP presents the general experience of analyst and is calculated as the total number of years that an analyst *i* issue earnings forecasts. FIRM_EXP is the analyst firm-specific experience and is measured as the number of years that analyst *i* following firm *j*. FOR_FREQ presents analyst forecast frequency and is the number of earnings forecasts by analyst *i* for firm *j* during year *t*. FOR_REV stands for analyst forecast horizon and is calculated as the number of days remained until the forecast period ends since the last forecast revision issued by analyst *i* for firm *j* and year *t*. Finally, BROKERAGE presents the size of the broker that employs analyst *i* and is calculated as the number of analysts hired by the analyst's *i* broker company during year *t*. CEO incentives include the following variables: TOTALPAY that stands for CEO total compensation as measured by the natural logarithm of the sum of cash pay, stock option grants, restricted stock grants long-term incentive plan pay-outs and other annual compensation as reported in ExecuComp under the variable TDC1. BONUS presents CEO bonus and is calculated as the ratio of CEO bonus over CEO salary. CEO_SENSITIVITY captures the share of the hypothetical CEO total compensation that would be resulted from one percentage point increase in the value of firm's equity. IN_THE_MONEY_OPTIONS present the value of CEO in-the-money options, RESTRICTED_STOCKS stands for the value of restricted stock holdings and STOCK_OWNERSHIP reflects CEO stock ownership measured by the ratio of the value of CEO stock grants excluding options over CEO salary. GS×FIRM_EXP, GS×FOR_FREQ, GS×FOR_REV, GS×BROKER are the interactions between GS regulation and analysts' characteristics. DF×TOTALPAY, DF×BONUS, DF×CEO-SENSITIVITY, DF×OPTIONS_IN_THE_MONEY, DF×RESTRICTED_STOCKS, DF×STOCK_OWENERSHIP stands for the interactions between DF regulation and CEO incentives. GS×DA and DF×DA are the interaction terms between GS/DF regulations and DA. CEO_RANK stands for CEO ranking among the executives in the firm based on the salary and bonus compensations and CEO_DIR is an indicator variable that takes the value one if the CEO occupies the role of the director in the board, and zero otherwise. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets. Finally, LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 16: Dynamic Panel Data Analysis of the impact of CEO incentives on analysts' forecast errors, 1-year ahead forecasts.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FE_{t-1}	0.231***	0.237***	0.237***	0.237***	0.237***	0.237***	0.230***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
NUM_ANAL	0.006***	0.005***	0.005***	0.005***	0.005***	0.005***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
LOSS	-0.012***	-0.012***	-0.012***	-0.012***	-0.012***	-0.012***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SIZE	0.009***	0.008***	0.007***	0.008***	0.008***	0.008***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
LVRGE	-0.005**	-0.004**	-0.003	-0.004**	-0.004**	-0.004**	-0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
TOTALPAY	-0.046***						-0.051***
	(0.003)						(0.003)
BONUS		-0.134					-0.150
		(0.319)					(0.475)
CEO_SENS.			0.009***				0.014***
			(0.002)				(0.002)
IN_MNY_OPT				-0.003			-0.004
				(0.003)			(0.005)
RES_STOCKS					-0.007		-0.039
					(0.025)		(0.024)
STOCK_OWN						-0.041	-0.087***
						(0.029)	(0.029)
Constant	-0.048***	-0.075***	-0.074***	-0.075***	-0.075***	-0.076***	-0.045***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	97,311	97,311	97,311	97,311	97,311	97,311	97,311
Number of id	41,068	41,068	41,068	41,068	41,068	41,068	41,068
FE	YES	YES	YES	YES	YES	YES	YES

Note: The table reports estimation results for the association between analyst forecast errors and CEO incentives for 1-year ahead forecasts using dynamic panel analysis. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. FE(ijt-1) is one period lag of the dependent variable. CEO incentives include the following variables: TOTALPAY that stands for CEO total compensation as measured by the natural logarithm of the sum of cash pay, stock option grants, restricted stock grants long-term incentive plan pay-outs and other annual compensation as reported in ExecuComp under the variable TDC1. BONUS presents CEO bonus and is calculated as the ratio of CEO bonus over CEO salary. CEO_SENS is CEO_SENSITIVITY captures the share of the hypothetical CEO total compensation that would be resulted from one percentage point increase in the value of firm's equity. IN_MNY_OPT is IN_THE_MONEY_OPTIONS present the value of CEO in-the-money options, RES_STOCKS is RESTRICTED_STOCKS stands for the value of restricted stock holdings and STOCK_OWN is STOCK_OWNERSHIP reflects CEO stock ownership measured by the ratio of the value of CEO stock grants excluding options over CEO salary. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. LOSS is a dummy variable that takes the value one for loss year and zero otherwise. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets, while LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 17: Dynamic Panel Data Analysis of the interactions between earnings management and CEO incentives, 1-year ahead forecasts.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.FE	0.190***	0.187***	0.188***	0.191***	0.190***	0.190***	0.190***	0.186***
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
NUM_ANAL	0.004***	0.005***	0.004***	0.003***	0.004***	0.004***	0.004***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
LOSS	-0.009***	-0.009***	-0.008***	-0.009***	-0.009***	-0.009***	-0.009***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SIZE	-0.001***	0.001**	-0.003***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LVRGE	0.008***	0.007***	0.011***	0.009***	0.008***	0.009***	0.008***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
DA	0.037**	0.024	0.039*	0.070***	0.037**	0.037**	0.037**	0.967***
	(0.018)	(0.162)	(0.023)	(0.027)	(0.018)	(0.018)	(0.018)	(0.355)
DAXTOTALPAY		0.026						-1.153**
		(0.225)						(0.457)
TOTALPAY		-0.045***						-0.050***
		(0.003)						(0.003)
DAXBONUS			5.258					8.889
			(18.250)					(18.925)
BONUS			-0.415					0.575
			(0.422)					(0.885)
DA×CEO_SENS				-12.126				-38.37***
				(7.669)				(14.771)
CEO_SENS				0.003**				0.011***
				(0.001)				(0.002)
DA×M_OPT				-0.498				-18.721
					(8.361)			(15.130)
IN_MNY_OPT					-0.004			-0.040
					(0.012)			(0.026)
DA×RES_STOCKS						-14.496**		9.060
						(7.412)		(92.813)
RES_STOCKS						-0.050		0.022
						(0.046)		(0.058)
DA×STOCK_OWNE							-11.68***	-11.28***
							(1.678)	(1.974)
STOCK_OWN							-0.240***	-0.234***
							(0.024)	(0.025)
Constant	0.004	0.023***	0.014***	0.004*	0.004	0.004	0.001	0.033***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Observations	82,583	82,583	82,583	82,583	82,583	82,583	82,583	82,583
Number of id	35,373	35,373	35,373	35,373	35,373	35,373	35,373	35,373
FE	YES	YES	YES	YES	YES	YES	YES	YES

Note: The table reports estimation results for the impact of earnings management on the association between analyst forecast errors and CEO incentives for 1-year ahead forecasts using dynamic panel analysis. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. DA stands for firms' engagement in earnings manipulation and presents the use of discretionary accruals. FE(ijt-1) is one period lag of the dependent variable. CEO incentives include the following variables: TOTALPAY that stands for CEO total compensation as measured by the natural logarithm of the sum of cash pay, stock option grants, restricted stock grants long-term incentive plan pay-outs and other annual compensation as reported in ExecuComp under the variable TDC1. BONUS presents CEO bonus and is calculated as the ratio of CEO bonus over CEO salary. CEO_SENSITIVITY captures the share of the hypothetical CEO total compensation that would be resulted from one percentage point increase in the value of firm's equity. IN_THE_MONEY_OPTIONS present the value of CEO in-the-money options, RESTRICTED_STOCKS stands for the value of restricted stock holdings and STOCK_OWNERSHIP reflects CEO stock ownership measured by the ratio of the value of CEO stock grants excluding options over CEO salary. DA×TOTALPAY, DA×BONUS, DA×CEO_SENSITIVITY, DA×M_OPT is DA×OPTIONS_IN_THE_MONEY, DA×RESTRICTED_STOCKS and DA×STOCK_OWENSHIP are the interaction terms between DA and CEO incentives. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. LOSS is a dummy variable that takes the value one for loss year and

zero otherwise. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets, while LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 18: Dynamic Panel Analysis, the impact of analysts' characteristics on earnings forecast error.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.FE	0.204***	0.202***	0.202***	0.206***	0.204***	0.205***	0.204***	0.205***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
LOSS	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SIZE	-0.002***	-0.003***	-0.003***	-0.002***	-0.002***	-0.002***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NUM_ANL	0.004***	0.002***	0.002***	0.004***	0.004***	0.004***	0.002***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
LVRGE	0.007***	0.006***	0.007***	0.007***	0.007***	0.007***	0.006***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
FIRM_EXP		0.510***					0.462***	
		(0.034)					(0.035)	
GEN_EXP			0.604***					0.552***
			(0.046)					(0.047)
FOR_FRQ				-0.152***			-0.118***	-0.145***
				(0.024)			(0.024)	(0.024)
FOR_REV					-0.019		-0.016	-0.015
					(0.013)		(0.013)	(0.013)
BRAGE						0.138***	0.102***	0.095***
						(0.024)	(0.024)	(0.024)
Constant	0.006**	0.014***	0.011***	0.007***	0.007***	0.004	0.013***	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observ.	97,311	97,311	97,311	97,311	97,311	97,311	97,311	97,311
Num. of id	41,068	41,068	41,068	41,068	41,068	41,068	41,068	41,068
FE	YES	YES	YES	YES	YES	YES	YES	YES

Note: The table reports estimation results for the association between analysts' forecast errors and analysts' characteristics for 1-year ahead forecast using dynamic panel analysis. We control for time and fixed effects. The dependent variable is FE, which stands for analyst forecast error and is measured as the difference between the last forecast issued by analyst *i* for firm *j* and year *t* minus the actual reported earning form firm *j* and year *t*, scaled with the stock price of the previous year *t-1*. FE(ijt-1) is one period lag of the dependent variable. The explanatory variables are the natural logarithm of the following analysts' characteristics: GEN_EXP presents the general experience of analyst and is calculated as the total number of years that an analyst *i* issue earnings forecasts. FIRM_EXP is the analyst firm-specific experience and is measured as the number of years that analyst *i* following firm *j*. FOR_FREQ presents analyst forecast frequency and is the number of earnings forecasts by analyst *i* for firm *j* during year *t*. FOR_REV stands for analyst forecast horizon and is calculated as the number of days remained until the forecast period ends since the last forecast revision issued by analyst *i* for firm *j* and year *t*. Finally, BRAGE is BROKERAGE presents the size of the broker that employs analyst *i* and is calculated as the number of analysts hired by the analyst's *i* broker company during year *t*. NUM_ANAL presents the number of distinct analysts following firm *j* during year *t* and serves as a proxy for analyst coverage. SIZE stands for firm's size and is measured as the natural logarithm of firm's total assets. Finally, LVRGE presents firm leverage and is calculated as the ratio of firm long-term debt over total assets. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1