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Two Essays On Executive Compensation

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TWO ESSAYS ON EXECUTIVE COMPENSATION

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DEDICATION

I would like to dedicate this degree and the papers that make up my dissertation to my Lord and Savior Jesus Christ without whom I would have never even attempted to pursue a graduate degree and of who I will never be ashamed. I would also like to dedicate this to my parents whose consistent love and encouragement I leaned on throughout the duration of the program.

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ABSTRACT

This doctoral dissertation examines the effect of an exogenous event on Executive compensation and the relationship between executive compensation and earnings management undertaken by the firm.

My first essay presents evidence that natural disasters have an effect on CEO compensation. Our main findings are that option compensation is lower for CEOs in counties where a natural disaster occurred. Furthermore, in the year of the disaster, stock compensation is higher among CEOs in natural disaster counties when compared to those in non-disaster counties. When considering liquidity, option compensation levels are lower for firms with below average liquidity levels but stock compensation is higher for firms with above average liquidity levels. This suggests that the occurrence of natural disasters and liquidity positions of firms, which experienced natural disasters, have an effect on the type and level of compensation a CEO receives.

My second essay shows that Chief Financial Officers pay-for-performance sensitivity (Delta) is negatively associated with a firm's probability of engaging in real earnings management. Furthermore, it is also negatively associated with the levels of earnings inflating abnormal discretionary expenses, abnormal cash flows and abnormal production costs. This is even the case when the sample is restricted to those firms who are likely to have used real earnings management to reach earnings benchmarks. This suggests that the pay-for-performance of the Chief Financial Officer is not the primary factor driving firm real earnings management.

JEL classification: G30; Y40 *Keywords:* Company Finance; Corporate Finance;

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CHAPTER 1
INTRODUCTION – TWO ESSAYS ON EXECUTIVE COMPENSATION

1.1 Introduction

This dissertation contains two essays related to executive compensation. One (Essay 1) addresses how an exogenous event can affect the compensation levels of executives while the second explores the relationship between executive compensation and firm-level decision making. One of the central themes of finance is the separation of ownership and control within modern corporations. This causes a conflict of interest between the owners of a firm (shareholders) and the managers of the firm (the executives running the firm) (Jensen and Meckling (1976)). Executive compensation contracts are a mechanism by which the interests of both the managers and owners of a firm are aligned. Jensen and Murphy (1990a) suggested that the mechanism for doing this would be to offer a greater amount of equity-based incentive thereby allowing the compensation of an executive to be aligned with the increase in a firm's stock price. Yet it can be argued the preponderance of equity-based compensation as led to new and interesting questions. Firstly, the introduction of equity-based compensation has seen an explosion in executive compensation, with CEO compensation increasing 940% from 1978 to 2018, despite the S&P stock market only increasing 906.7% over the same time. Furthermore, the widespread use of equity-based compensation coincides with several recent catastrophic events, including the dot-com bubble in the late 1990s, the 2001–2002 corporate scandals, and the recent financial crisis. This unfortunate coincidence has led regulators, the media, and academics to question whether the large portfolios of stocks and options held by managers were the culprit in these financial disasters. Partly due to this, the finance literature explores the effects such compensation on executive decision-making

and behavior as well as exploration of non-monetary drivers of equity based compensation. My two essays specifically cover these topics.

My first essay investigates the effect of a non-monetary exogenous shock on the compensation structure and level of chief executive officers. The non-monetary exogenous shock is the occurrence of a natural disaster in the same county as the firms location .I find that Stock based compensation is dispersed at higher levels to CEOs in counties in which a natural disaster occurs, in the year of the disaster. In addition to this, option compensation is dispersed at lower levels to CEOs in counties where a natural disaster occurred. This also occurs in the year of the natural disaster.

My second essay examines the relationship between pay-for-performance sensitivity of chief financial officers the activities undertaken by the firm. Specifically, I look at the relationship between the change in the dollar value of the chief financial officer's wealth for a one-percentage point change in stock price and a firm's earnings management through manipulation of non-accounting activities. These non-accounting activities are called real earnings management as they manipulate actual firm processes that in turn could create or destroy future value. Firms may undertake real earnings management in order to meet certain earnings projections and in doing so protect the short-term value of stock. Overall, I found a negative relationship between chief financial officer pay-for-performance sensitivity and real earnings management of a firm. This even held when the sample was restricted to firms who were likely to engage in real earnings management to meet earnings targets.

CHAPTER 2

Essay 1- WEATHERING THE STORM: NATURAL DISASTERS AND EXECUTIVE COMPENSATION

2.1 Introduction

Since 1980, the U.S. has sustained 250 weather and climate disasters where damages/costs reached or exceeded $1 billion (CPI adjusted for 2019 prices). The total cost of these 250 events exceeds $1.7 trillion. Moreover, the number of these disasters seems to have increased over time.1 While there is extant research on the effects of these natural disasters on macro-economic variables such as migration rates, home prices, and poverty rates (Boustan, Kahn, Rhode, and Yanguas, 2018) and the effects on banks (Cotes and Strahan, 2017) there is substantially less evidence on the effects these events may have on firms and their Chief Executive Officers. This is somewhat surprising, given natural disasters and extreme weather events are issues that worry CEO's as they list them as 1st and 3rd most likely risk to occur and 3rd and 5th in terms of impact (The Global Risks Report 2019.World Economic Forum, 2019). Hence, in our paper we focus on the effects of natural disasters on executive pay.

Despite the abundance of literature that investigates executive pay, there is little evidence documenting the effects of micro-level events, such as natural disasters, on the structure of executive pay. One of the few exceptions in the vein of the literature is Dai, Ray, Stouraitis, and Tan (2019), who investigate the effects of terrorist effects on compensation structure. They use terrorist attacks as an event that allowed them to examine the causal effect of a nonmonetary factor on compensation. They could then investigate whether deterioration in the living environment (i.e., terrorist attacks) causally affect compensation. Clearly, in our paper we also investigate whether micro-events affect compensation, but use natural disasters as our event of choice. Using natural disasters, as our event not only allows us to test the aforementioned effects, it also allows us to

Investigate additional, related issues. Natural disasters also provide an exogenous shock in which two potential drivers of change to CEO compensation can be compared. Specifically, we are referring to perceived personal risk to the CEO, which may be affected by a natural disaster event and altered firm fundamentals resulting from the Natural disaster. Dessaint and Matray (2017) investigate manager responses to hurricanes in their areas and find that the sudden shock to the perceived liquidity risk leads them to increase corporate cash holdings. We posit that it is possible that CEO's will also change their compensation due to an increased personal risk that can take the form of either psychological risk due to loss of quality of life or liquidity risk in the firm. Alternatively, in the event of an exogenous shock, the firm's ability to compensation may be constricted by either lack of liquidity or diminished return.

Therefore, we test three major hypotheses in our paper relating executive compensation with natural disasters. The first hypothesis focuses on firm performance in the event of a natural disaster. Shaw and Zhang (2010) show that cash compensation is less sensitive to poor earnings performance than to better earnings performance. Since a natural disaster provides an exogenous shock that could influence firm performance, beyond that of the CEO, one can argue that cash compensation is more affected by natural disasters, when compared to other forms of compensation. Therefore, after a natural disaster firms may be more willing to provide equity compensation to encourage future performance.

Secondly, it is possible that natural disasters affect compensation structure, due to a sudden decrease in the perceived quality of life. Deng and Gao (2013) find that companies located in locations with a low quality of life (based on factors such as crime rates or cost of living) pay higher compensation to their CEOs compared to firms located in more livable locations. Noy (2008) shows that the amount of property damage incurred during the disaster is a negative

determinant of GDP growth performance for countries that experienced natural disaster. Since GDP per capita is an accepted matric of quality of life, one could argue that natural disasters provide an exogenous shock reducing the quality of life.

A third way in which natural disasters may effect executive compensation is through a liquidity channel. Lanfear, Lioui, and Siebert (2019) document strong abnormal returns due to U.S. landfall hurricanes over the period 1990 to 2017 on stock returns across stock portfolios sorted by market equity, book to market equity, momentum, return on equity and investment to assets. This, in turn, may affect the way that executive are being paid. In essence, firms may be forced to pay their executives in the form of equity, rather than in the form of cash.

Using a large number of natural disasters over the 1992-2017 period, we find that there does indeed appear to be an effect of natural disasters on the compensation structure of executives. Our main findings are that Stock based compensation is dispersed at higher levels to CEOs in counties in which a natural disaster occurs, in the year of the disaster. In addition to this, option compensation is dispersed at lower levels to CEOs in counties where a natural disaster occurred. Furthermore, the overall sample was split into 4 groups by the median levels of two variables (Each variable results in two groups, one below and one above the median level of the variable). The two variables were property damage, and cash levels. It was found that higher levels of stock compensation and lower levels of option compensation were awarded to CEOs in natural disaster counties for the below median property damage subsample. Higher stock LTIP compensation levels were found for the above median cash level subsample. Lastly, lower option compensation levels were found for the below median cash level subsample.

Our study contributes to at least two streams of literature. First, it contributes to the executive compensation literature. There is limited research on non-monetary factors that

influence executive compensation. Our findings enhance our understanding of how a specific and unpredictable non-monetary event can affect both the level and composition of CEO compensation under conditions of uncertainty. The second stream of literature investigates risk taking of CEOs and cash holdings. For example, Liu and Mauer (2011) find a positive relationship between CEO risk taking incentives (Vega) and cash holdings. However, the literature does not address the effect of liquidity uncertainty on CEO compensation. Although, Dai et al. (2019) document a preference for cash-based incentives by CEOs of firms affected by a terrorist attack, the main thrust of their hypothesis is that CEOs are compensated for a lower quality of life (see also Deng and Gao (2013) and Focke, Maug, and Niessen-Ruenzi (2017)). Natural disasters provide a different natural experiment allowing us to explore not only non-monetary determinants of CEO compensation, but also the role of firm liquidity plays in its determination.

The plan of the paper is as follows. In the next section, we review the related literature and develop our main hypotheses. Section three present our sample selection procedure, variable measurement, and research design whereas section 4 contains our results. Finally, section 5 concludes the paper.

2.2 Literature review and hypothesis development

Executive compensation is a multi-faceted, complicated subject. In particular, the high level of CEO compensation in the United States has spurred an explosion of literature exploring the determinants and antecedents of the level of CEO pay. As such, there are multiple streams of literature addressing issues from pay performance sensitivity (Jensen and Murphy, 1990; Aggarwal and Samwick (1999)), how CEO compensation is affected by sudden exogenous shocks, and how those shocks change CEOs perceived risk to their personal wealth. A number of papers investigate this latter stream of the literature. New regulations can be seen as an exogenous shock

that can help crystallize the underlying dynamics of CEO compensation. FAS 123R requires firms to report options-based compensation at fair value on their income statement, thus rendering options-based compensation more expensive from an accounting perspective. Skantz (2012) showed that option-intensity decreased after the passage of FAS 123R, while Hayes Lemmon and Qiu (2012) show that decreases in option use after passage of FAS 123R is not accompanied by change in firm financial and investment policies.

As noted earlier, another exogenous shock that has been investigated is terrorism. Dai et al. (2019) find that CEOs employed at firms located near terrorist attacks earn an average pay increase of 12% after the attacks, relative to comparable CEOs at firms far from attacks. This pay raise is CEO specific and does not apply to other executives. Furthermore, CEOs at terrorist attack proximate firms prefer cash-based compensation to equity-based holdings. They postulate that part of the reasoning behind this is a terrorist attack may decrease quality of life for the CEO. Deng and Gao (2013) find that companies located in locations with a low quality of life (based on factors such as crime rates or cost of living) pay higher compensation to their CEOs than firms located in more livable locations. On the other hand, Francis, Hasan, John, and Waisman (2016) find a positive relationship between the metropolitan size of a firm's headquarters and the total and equity portion of its CEO's pay. This is indicative of proximity to a highly skilled workforce and network spillover rather than explicit quality of life considerations.

However, terrorism is a complicated exogenous stock that does not provide resolution as it may have material effects on the firm's day-to-day business activities or provide opportunity for CEO rent seeking. Firms affected by terrorist attacks have lower returns than matched peers do the year after the attack, explaining preference for cash-based compensation. However, Dai et al.

(2019) find that while CEO pay increases there is no change in the financial or operational policies of the firm, suggesting potential impact on option values is not likely to explain why CEOs prefer increases in cash compensation to option compensation. While terrorism is a severe exogenous shock that can effect CEO compensation through loss of quality of life, natural disasters have been documented to affect perceived liquidity. The sudden change in perceived liquidity has been shown to effect the amount of cash a firm holds but no effect on CEO compensation has been investigated.

The literature concerning the effects of natural disasters on either the firms of executive compensation is sparse. Dessaint and Matray (2017) show that managers increase corporate cash holdings because of perceived liquidity risk. An extension of this would be to see how a CEO reacts to protect themselves against an increased perceived risk. Natural disasters are useful exogenous shock for this purpose as there are more occurrences of natural disasters than terrorist attacks. In addition to this, the ease with which specific natural disasters can be isolated while being unpredictable provides a clean exogenous shock (Tversky and Kahneman, 1973). Strobl (2011) shows that in response to a hurricane strike a county's annual economic growth rate will initially fall by 0.8, but then partially recover by 0.2 percentage points but is not economically important enough to be reflected in national growth rates. Lastly, Lanfear, Liou and Siebert (2018) document strong abnormal effects due to U.S. landfall hurricanes over the period 1990 to 2017 on stock returns and illiquidity.

Therefore, in our paper, we address a number of issues. First, we ask whether CEO compensation changes, when natural disasters hit. Second, we postulate, that unlike Dai et al (2019), firms are likely to change their compensation structure to incorporate more equity-based compensation.

Moreover, because of liquidity effects on the firm, this effect may be exacerbated if the firm, depending on the liquidity levels of the firm.

2.3 Methodology

2.3.1 Sample Selection

I obtained the data for this study from multiple sources. These include the Spatial Hazard Events and Losses Databases for the United States (SHELDUS). SHELDUS™ is a county- level hazard data set for the U.S. and covers natural hazards such thunderstorms, hurricanes, floods, wildfires, and tornados as well as perils such as flash floods, heavy rainfall, etc. and is located at the Arizona State University. From this database, we collect information on the date and county location of each natural disaster that occurred in the U.S between 1992 and 2017. To link this database with Execucomp, CRSP, and Compustat, we obtain a zip code list from simplemaps.com (https://simplemaps.com/data/us-zips).

The creation of the final analysis database follows the following process. Starting with 363,266 disaster-county observations, 343,105 observations from Compustat, 2,207,580 observations from CRSP, 296,923 observations from Execucomp and 41,666 county zip code observations were obtained. We merged the zip code and natural disaster databases in order to produce a new disaster-zip code database with 372,192 observations. The CEOs were isolated in Execucomp, leaving 30,508 CEO-year observations. The Execucomp CEO-year observations were joined to the Compustat database creating a new Executive-Compustat database with 311,129 observations. The Execucomp-Compustat database (311,129 observations) was joined to the CRSP database (30,508 observations) to create a new database containing all the information for both the

firm and CEO, with 2,209,832 data points. Data points with no observation were deleted resulting in 30,508 observations in the resulting CEO-firm database. The CEO-firm database was joined with the disaster-zip code database to create a database with disaster and CEO/firm information (111,422 observations) resulting in an analysis database of 30,504 observations. From this point, we deleted observations with no permno number (removing instances of natural disasters unattached to a county with a listed firm in it), producing an analysis database of 28,256. Lastly, we removed disaster instances with no property damage, CEOs over the age of 65, CEOs with tenure less than 2 and the observations with two natural disasters in a row from the sample to have a final analysis database as 16,268 observations.

In total, there were 835 disasters in the final analysis dataset. Disaster years ranged widely during the sample year as can be seen as the appendix A. The percentage of disaster, within the sample, ranged from, 1.08% in 1992 to 7.19% in 2016. In addition to this, table 1 shows the disaster years are concentrated in a few states, with over 50% of the disaster taken place in California, Alabama, New York, Georgia, Illinois and Connecticut alone.

Table 2. 1 Frequencies of disasters per year

Fiscal Year	Frequency	Percent	Cumulative Percent
1992	9	1.08	1.08
1993	26	3.11	4.19
1994	31	3.71	7.9
1995	27	3.23	11.13
1996	32	3.83	14.96
1997	22	2.63	17.59
1998	41	4.91	22.5
1999	18	2.16	24.66
2000	19	2.28	26.94
2001	28	3.35	30.29
2002	17	2.04	32.33
2003	29	3.47	35.8
2004	26	3.11	38.91
2005	29	3.47	42.38
2006	40	4.79	47.17
2007	30	3.59	50.76
2008	56	6.71	57.47
2009	60	7.19	64.66
2010	48	5.75	70.41
2011	36	4.31	74.72
2012	41	4.91	79.63
2013	46	5.51	85.14
2014	33	3.95	89.09
2015	33	3.95	93.04
2016	13	1.56	94.61
2017	45	5.39	100.00

Table 2. 2 State Distributions of Natural Disasters

State Name	Frequency	Percent	Cumulative Percent
California	108	12.93	12.93
Alabama	80	9.58	22.51
New York	76	9.10	31.62
Georgia	75	8.98	40.60
Illinois	51	6.11	46.71
Connecticut	48	5.75	52.46
Florida	47	5.63	58.08
Arkansas	45	5.39	63.47
Minnesota	35	4.19	67.66
North Carolina	25	2.99	70.66
Ohio	22	2.63	73.29
Virginia	22	2.63	75.93
Texas	21	2.51	78.44
New Jersey	19	2.28	80.72
Pennsylvania	19	2.28	82.99
Massachusetts	16	1.92	84.91
Wisconsin	16	1.92	86.83
Arizona	15	1.80	88.62
Colorado	15	1.80	90.42
North Dakota	8	0.96	91.38
Maryland	7	0.84	92.22
Missouri	6	0.72	92.93
Delaware	5	0.60	93.53
Idaho	5	0.60	94.13
Maine	4	0.48	94.61
Michigan	4	0.48	95.09
Oklahoma	4	0.48	95.57
Rhode Island	4	0.48	96.05
Washington	4	0.48	96.53
Hawaii	3	0.36	96.89
Kansas	3	0.36	97.25
Mississippi	3	0.36	97.60
New Mexico	3	0.36	97.96
South Carolina	3	0.36	98.32
Alaska	2	0.24	98.56
Oregon	2	0.24	98.80
Utah	2	0.24	99.04
Indiana	1	0.12	99.16
Iowa	1	0.12	99.28
Louisiana	1	0.12	99.40
Nebraska	1	0.12	99.52
Nevada	1	0.12	99.64
New Hampshire	1	0.12	99.76
West Virginia	1	0.12	100.00

2.3.2 Variable measurement

The main independent variable is termed disaster. A disaster firm year is created by a natural disaster taking place in the same county of the firm location in a particular year. Therefore, for any given year, disaster is a categorical variable that is equal to one when the disaster occurs in a county it equals one and zero otherwise. In other words, throughout the analysis the sample consists of a control group consists of counties and years where no natural disaster occurs and a disaster group where the natural disaster occurs. Therefore, the same firm can be in the disaster group in on year and not in a disaster group in another year. Another key independent variable is the post-categorical variable. This variable is designed to capture the effect of the FAS 123R law that passed in 2005. FAS 123R law was created so that the costs associated with equity payment for employee services are expensed on financial statement to reflect the cost of the economic transaction between a firm and its employee. Previously, this was not the case. Post is equal to one when the year was greater than or equal to 2005 and 0 otherwise. Lastly, an interaction term was created for the disaster and post variables, in order to capture the combined of the disaster and the post FAS 123R period.

The study incorporates two sets of variables, compensation variables and firm/executive characteristic variables. There are several compensation variables, which include total pay, salary, bonus, Options value, Stock grant value and Long-term Incentive payments (LTIP). Total pay was calculated by summing salary, bonuses, value of restricted stocks granted, and the value of options granted (following Black and Scholes, 1973), long-term incentive payouts, and other types of compensation. Salary is the value of the salary item in Execucomp while the Bonus term comes from the bonus item in Execucomp. Option value represents the value of options granted using the Black-Scholes methodology. Stock value is the value of restricted stock grants dispersed in the fiscal year. Long-term Incentive payments are compensation given to an executive based on

company performance over a period of more than a year. In addition to this, we summed the salary, bonus to create a term called cash based pay, and summed option value, stock grants and LTIP to create equity based pay. In the multivariate tests, the compensation variables are the log values of the Execucomp compensation variables.

The firm characteristic/executive variables are firm size, ROA, market to book ratio, leverage, Annual return, volatility, capital expenditure to assets ratio and CEO Tenure. Following the existing compensation literature (Dai et al. 2019)) we also introduce a series of firm-specific/executive characteristics in our model. Firm Size is measured by the natural logarithm of firm sales and is expected to be positively related to compensation. Volatility is the standard deviation of monthly stock returns over the past 60 months and is expected to be positively related to compensation. Annual return is the buy-and-hold return of a firm's stock over the past 12 months. ROA refers to net income before extraordinary items and discontinued operations divided by total assets. M/B Ratio is measured as the market value of equity divided by the book value of equity, in which the market value is obtained as the fiscal year closing price multiplied by the number of common shares outstanding. Capex/Assets is the ratio of Capital expenditures to total assets. Leverage is the sum of current liabilities and long-term debt divided by total assets. Finally, CEO tenure is simply the number of years that a CEO held their position is the same firm.

The last set of variables are the characteristics used to create sub-samples. The two variables on which the sample split was based were property damage (the dollar value of property damage sustained in the natural disaster) and cash levels (cash and short-term securities, CHE in Compustat)

2.3.3 Research design

The empirical analysis consists of two parts; the univariate analysis of difference and linear regression of component levels. The univariate analysis of difference simply tests the mean and median difference between all the variables in disaster counties and non-disaster counties. It is the first point at which a difference can be established between disaster counties and non-disaster counties in the year of a set disaster. The analysis assesses the effect a Natural disaster have on the level of CEO compensation. This is done through a linear regression model as presented below

$$CEO\ Pay\ Variable_{it+1} = \alpha + \beta_1 Disaster_{it} + \beta_2 Firm\ Size_{it} + \beta_3 ROA_{it} + \beta_4 Market\ to\ Book_{it} + \beta_5 Annual\ Return_{it} + \beta_6 Volatility_{it} + \beta_7 Leverage_{it} + \beta_8 Capex\ Assets\ Ratio\_it + \beta_9 Tenure_{it} + \delta_{it} + \beta\varepsilon_{it} \quad (1)$$

In both models, the term δt represents fixed effects.

In addition to analyzing these models in the year, the natural disaster occurred we also analyze these same models in the year after the occurrence of the natural disaster, in order to see whether the relationships between natural disaster occurrence and compensation change in the year after the disaster. Another possibility is that compensation changes initiated in the year of a natural disaster occurrence will also continue in the year after the disaster.

2.3.4 Descriptive statistics

Table 1 presents descriptive statistics of the number of natural disasters through the sample period from 1992-2017. The year in which the lowest number of natural disasters occur was 1992 (1.08% of the natural disasters occurred in this year) while the year with the highest number of natural disasters was 2009 (7.19% of the natural disasters occurred in this year). On average, any given year within the sample would have 3.85% of the natural disasters on average. Table 2 shows the

state distribution of natural disasters. The distribution of natural disasters are highly skewed towards six states with these states (California, Alabama, New York, Georgia, Illinois and Connecticut) accounting 52.46% of the natural disasters in the sample. Furthermore, approximately 92% of the natural disasters take place in 20 states

Approximately 3.15% of firm-year observations are affected natural disasters. The mean (median) CEO total pay is $5.08 ($3.19) million for total sample. The mean (median) cash-based pay is $1.14 ($0.86) million for the whole of sample. Similarly, the mean (median) level of equity- based pay is $3.08 ($0.96) million for treatment firms prior the whole sample.

Table 2. 3 Descriptive Statistics

This table presents summary statistics for the main variables as defined in appendix A.

Variable	N	Mean	Median	25th Percentile	75th Percentile
Compensation					
Total Pay ($M)	16,268	5.092	3.314	1.529	6.547
Cash-based pay ($M)	16,268	1.115	0.878	0.601	1.225
Salary ($M)	16,268	0.759	0.71	0.5	0.963
Bonus ($M)	16,268	0.356	0	0	0.374
Equity-based pay ($M)	16,268	1.06	0	0	0.368
Option Value ($M)	16,268	0.805	0	0	0.13
Stock Value ($M)	16,268	0.168	0	0	0
Long Term Incentive Payments	16,268	0.088	0	0	0
Firm Characteristics					
Firm size	22,446	7.81	7.68	6.55	8.96
ROA	22,442	0.04	0.04	0.01	0.08
MB Ratio	21,714	1.45	0.99	0.53	1.75
Annual Return	22,433	0.16	0.1	-0.11	0.33
Volatility	22,433	0.19	0.15	0.06	0.26
Leverage	22,326	0.24	0.21	0.07	0.35
Cash/Assets	22,450	0.14	0.07	0.02	0.19
Tenure	22,450	13.98	13	9	19

Volatility had a positive correlation coefficient, statistically significant at the 1% level, with Option value and a negative correlation coefficient with restricted stock grant value (Stock value) that was statistically significant at the 5% level. Lastly, capital expenditure to assets ratio was significantly correlated (each correlation coefficient was statistically significant at the 1% level) with all forms of cash based compensation presented. However, it was only positively correlated to option value (a coefficient of 0.08) at the 10% significance level and did not have a statistically significant relationship with Stock value.

Table 2. 4 Correlation of Variables

This table represents the spearman's correlation coefficients for the independent variables (excluding disaster) of the models (1) and (2). *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively

	Total Pay ($M)	Salary ($M)	Bonus ($M)	Option Value ($M)	Stock Value ($M)	LTIP	Firm size	ROA	MB Ratio	Annual Return	Volatility	Leverage	Capex Assets Ratio	Tenure
Total Pay ($M)	1													
Salary ($M)	0.13 ***	1												
Bonus ($M)	0.33***	0.20***	1											
Option Value ($M)	0.95***	0.1***	0.10***	1										
Stock Value ($M)	0.34***	0.23***	0.20***	0.08***	1									
Long Term Incentives	0.17***	0.12***	0.17***	0.06***	0.75***	1								
Firm size	0.14***	0.58***	0.23***	0.13***	0.20***	0.13***	1							
ROA	0.01	0.06***	0.04***	-0.01	0.01	0.01*	0.07***	1						
MB Ratio	0.06***	-0.12***	-0.02***	0.1***	-0.01	-0.03*	-0.23***	0.12***	1					
Annual Return	-0.01	-0.02***	0.00	-0.03**	-0.01	0.02*	-0.05***	-0.07***	-0.04***	1				
Volatility	0.03***	-0.04***	0.03***	0.05***	-0.03**	-0.07***	-0.09***	0.05***	0.17***	0.51***	1			

Leverage	0.00	0.18***	0.04***	-0.02**	0.04***	0.32***	0.26***	-0.11***	-0.22***	0.03***	-0.02***	1		
Capex Assets Ratio	-0.01	-0.07***	0.02***	0.01*	0.000	-0.06***	-0.09***	0.02***	0.09***	0.00	0.05***	-0.02**	1	
Tenure	0.02***	0.14***	0.02***	0.01	0.00	-0.02***	0.13***	0.08***	0.00	0.02***	0.03***	0.00	-0.01	1

Comparing the compensation of the firms affected by natural disaster to the control firms in panel A of table 5, the disaster firms have significantly less bonus based pay, equity-based pay, option value and stock grant value in the year of the disaster (Year 0). In a sense, this is hardly a surprise as equity based compensation is tied to firm performance, which was likely effected by the natural disaster that hit the firm.

Panel B show the same statistics as panel A accept with firm characteristic variables rather than compensation variables. The only differences between the disaster and control firms are that there are significant differences in the mean of ROA, median of the annual return, and leverage. Note that we test for differences using a t test differences for differences in the mean and a Z test for differences in medians between the two samples.

Table 2. 5 Summary Statistics

This table presents summary statistics for the Compensation variables. Column a represents the overall sample while columns b and c represent the summary statistics for the non-disaster county firms and disaster county firms respectively. Column (c) reports mean and median values for the firm-years of non-disaster county firms and firms in a county affected by natural disasters. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively

PANEL A	Overall		Disaster Firms		Non Disaster Firms		Difference	
COMPENSATION	Mean	Median	Mean	Median	Mean	Median	T	Z
Total Pay ($M)	5.092	3.314	5.197	3.643	5.088	3.306	2.640***	2.241***
Cash-based pay ($M)	1.116	0.878	1.089	0.876	1.112	0.878	0.380	0.125
Salary ($M)	0.759	0.710	0.789	0.751	0.758	0.705	1.860*	2.839***
Bonus ($M)	0.356	0.000	0.300	0.000	0.359	0.000	-4.138***	3.442**
Equity-based pay($M)	1.060	0.000	0.558	0.000	1.082	0.000	-7.210***	-6.176***
Option based pay ($M)	0.804	0.000	0.352	0.500	0.824	0.000	-7.760***	-6.423***
Stock grant value ($M)	0.168	0.000	0.125	0.000	0.170	0.000	-1.660*	-1.575
Long Term Incentive Payments	0.876	0.000	0.081	0.000	0.088	0.000	-1.300	-1.335
PANEL B	Overall		Disaster		Non Disaster Firms		Difference	
FIRM CHARACTERISTICS	Mean	Median	Mean	Median	Mean	Median	T	Z
Firm size	7.7600	7.6700	7.8100	7.6900	7.7600	7.6700	-0.2300	-0.4624
ROA	0.0400	0.0400	0.0400	0.0400	0.0400	0.0400	2.83***	1.6258
MB Ratio	1.4500	0.9800	1.4500	0.9900	1.4500	0.9800	0.3800	1.2321
Annual Return	0.1600	0.1000	0.1600	0.1000	0.1700	0.1100	0.7600	1.70*
Volatility	0.1900	0.1500	0.1900	0.1500	0.1900	0.1500	0.7800	1.2029
Leverage	0.2400	0.2200	0.2400	0.2100	0.2400	0.2100	-2.22**	-1.4064
Capex/Assets	0.0500	0.0300	0.1400	0.0700	0.0500	0.0300	0.2300	0.5048
Tenure	13.9000	13.0000	13.9900	13.0000	13.900	13.0000	-0.9800	-1.0569

2.4 Results and Discussion

2.4.1 Effect of natural disaster on the levels of CEO compensation

The basis of table 6 is the model (1). As previously stated, the next step was to find whether the levels of compensation were affected by the CEO's firm being in the same county as a natural disaster. The main independent variable is the categorical disaster variable. Panel A of table 6 shows that Equity based pay is negatively and significantly (with a coefficient -0.748 with a statistical level at the 5% level) associated with the disaster variable. This is driven by option

compensation being negatively and significantly associated with the disaster variable (a coefficient of -1.214 with a statistical level of 1%). Interestingly, stock compensation is positively associated with disaster occurrence at the 5% significance level, with a coefficient of 0.625. Potentially, the reason for this is that a natural disaster may cause firm performance to suffer or be less predictable. Therefore, it may be potentially cheaper to offer stock compensation rather than option compensation. With that said, the correlations in table 4 show no significant correlation between annual return and stock value. Furthermore, volatility is significantly and negatively correlated with Stock compensation. Overall, firms suffering a natural disaster occurrence in their county offer less option compensation but may see stock compensation as a lower cost means of compensating CEOs in the event of an event outside of their control.

The next step was to see whether in the analysis was to see whether the levels of compensation were affected by the extent of the property damage in the county (panel b) and the cash levels of the firm (panel c). Previous studies have suggested that property damage could be connected to quality of life (Noy, 2008). In addition to this, Dai et al (2019) postulated that terrorist attacks affected CEO quality of life for which they were compensated through cash based compensation. While there is no evidence of natural disaster occurrence causing significant increase or decrease in cash based compensation, splitting the sample by median property damage in the county, during the occurrence of a natural disaster, could give additional insight into what drives non-monetary considerations for CEO compensation. Since only equity compensation variables showed a statistically significant relationship with a natural disaster occurrence, these were the only compensation variables analyzed in panel B. Equity Compensation and Option compensation were negatively associated with the disaster variable (at 10% and 1% level of statistical significance respectfully) in the below median property damage subsample. However,

equity compensation was also negatively associated with the occurrence of natural disasters at the above median property damage subsample (coefficient of -0.805 at 10% significance level. This is approximately the same coefficient level as the below median property subsample, which was -0.759 at 10% level). Meanwhile, stock compensation was positively related to the disaster variable at the 5% level of statistical significance, with a coefficient of 0.952, in the below median property damage subsample.

The findings show little evidence for an association between potential effects to CEO property damage and CEO compensation in the event of a natural disaster. Another point of note is the main regression results in table 6 are driven mainly by the below median property damage subsample. This could be due to a firm suffering a decrease in firm performance but not sustaining direct infrastructure damage. Therefore, while the value of option compensation would decrease, increased stock compensation could be seen as a cheap alternative, especially in the post FAS123R environment were option compensation would be more expensive for accounting purposes.

Another potential diver of compensation could be the cash levels of the firm in the wake of a natural disaster. Could liquidity levels in the firm drive one type of compensation over another? Would an increase in cash levels lead to increased compensation in stock over option compensation? Panel C shows the results of the regressions for above and below median cash level subsample. The regressions for the Equity compensation, Stock compensation and Option compensation are repeated. Equity and option compensation had negative association with the disaster variable (Equity compensation had a coefficient of -1.288, statistically significant at 1% while option compensation had a coefficient of -1.494, statistically significant at 1% also) in the below median cash level subsample. However, the positive association between stock compensation and the disaster variable were statistically significant at 1% in the above median

cash level subsample (the coefficient being 1.445). These results show that liquidity is an important determinant of increased or decreased equity based compensation. Above median cash levels allow firms to increase stock compensation in the wake of a natural disaster but below median cash levels may force firms to decrease their option compensation.

Table 2. 6 Linear regressions of levels of CEO compensation

This table represents the coefficients of the linear regression model below. All the variables are defined in the appendix. The main independent variable is disaster, which is a categorical variable equal to one if a natural disaster took place in a county within the year and zero otherwise. Panel A represents the linear regression of the whole natural disaster sample the year in which the natural disaster took place (year 0) while panel B represent subsamples of the data. The subsample are organized according to the amount property damage, cash levels and annual return. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively. Numbers in the parenthesis are p-values

$$\ln(\text{CEO Pay Variable})_{it+1} = \alpha + \beta_1 \text{Disaster}_{it} + \beta_2 \text{Post}_{it} + + \beta_3 \text{Post*disaster}_{it} + \beta_4 \text{Firm size}_{it} + \beta 5 \text{ROA}_{it} + \beta_6 \text{M/B Ratio}_{it}$$

$$+ \beta_7 \text{Annual Return}_{it} + \beta_8 \text{Volatility}_{it} + \beta_9 \text{Leverage}_{it} + \beta_{10} \text{Capex/Assets}_{it} + \beta_{11} \text{Tenure}_{it} + \delta t + \varepsilon_{it}$$

Panel A: Linear Regression of Overall CEO compensation and compensation components

Variables	(Total Pay)	(Cash Based pay)	(Salary)	(Bonus)	(Equity Based Pay)	(Option)	(Stock value)	(LTIP)
disaster	-0.098	-0.031	-0.039	0.470	-0.748**	-1.214***	0.625**	0.365
	(0.370)	(0.810)	(0.761)	(0.289)	(0.017)	(0.001)	(0.048)	(0.188)
Post	1.074	-0.105	0.062	-10.286	-12.764***	-12.941***	0.822	0.315
	(0.332)	(0.937)	(0.963)	(0.024)	(<.0001)	(0.000)	(0.800)	(0.912)
*Post*disaster*	0.114	0.096	0.100	-0.235	0.750**	1.143***	-0.606*	-0.236
	(0.344)	(0.499)	(0.487)	(0.632)	(0.030)	(0.003)	(0.083)	(0.441)
Firm size	0.311***	0.134***	0.111***	0.130***	0.217***	0.198***	0.142***	0.164***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
ROA	0.057	1.004***	0.537*	4.414***	0.000	-0.680	1.597**	0.968
	(0.811)	(0.000)	(0.062)	(<.0001)	(1.000)	(0.375)	(0.023)	(0.115)
Market to Book	0.057***	-0.057***	-0.060***	-0.068**	-0.005	0.046*	-0.110***	-0.087***
	(<.0001)	(<.0001)	(<.0001)	(0.028)	(0.820)	(0.058)	(<.0001)	(<.0001)
Annual Return	0.062***	0.043**	0.008	0.443***	0.056	0.021	0.106**	0.109**
	(0.000)	(0.034)	(0.682)	(<.0001)	(0.254)	(0.703)	(0.034)	(0.012)
Volatility	-0.007	-0.021	-0.026	0.027	-0.039	0.019	-0.208**	-0.083
	(0.829)	(0.575)	(0.475)	(0.827)	(0.665)	(0.846)	(0.021)	(0.293)
Leverage	0.134***	0.079	0.157***	-0.762***	-0.084	-0.273*	0.240	-0.019
	(0.007)	(0.182)	(0.009)	(0.000)	(0.560)	(0.087)	(0.101)	(0.880)
Capex/assets	0.138	-0.520**	-0.730***	1.349*	1.315**	3.045***	-0.619	-1.664***
	(0.480)	(0.025)	(0.002)	(0.092)	(0.020)	(<.0001)	(0.279)	(0.001)
Tenure	0.000	-0.001	-0.001	-0.009	-0.010**	-0.004	-0.020***	-0.027***
	(0.791)	(0.431)	(0.529)	(0.154)	(0.023)	(0.462)	(<.0001)	(<.0001)
Industry FE's	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yea FE's	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,040	15,040	15,040	15,040	15,040	15,040	15,040	15,040
Adjusted R^2	0.234	0.073	0.063	0.445	0.729	0.633	0.226	0.174

Panel B: Linear Regression for Option Compensation by Property Damage, Cash levels and Annual Return						
	Equity Compensation		Stock Compensation		Option Compensation	
Year 0	>Median Property Damage	<Median Property Damage	>Median Property Damage	<Median Property Damage	>Median Property Damage	<Median Property Damage
disaster	-0.805*	-0.759*	0.130	0.952**	-0.465	-1.706***
	(0.091)	(0.070)	(0.791)	(0.022)	(0.375)	(0.000)
Post	-11.141***	-12.855***	-4.671***	0.841	-9.748***	-12.855***
	(<.0001)	(<.0001)	(<.0001)	(0.796)	(<.0001)	(<.0001)
Post Disaster	0.856*	0.725	-0.211	-0.835*	0.460	1.601***
	(0.097)	(0.126)	(0.692)	(0.076)	(0.418)	(0.002)
Firm size	0.190***	0.232***	0.123***	0.188***	0.154***	0.218***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
ROA	0.458	-0.115	1.307	1.873*	0.044	-1.078
	(0.610)	(0.916)	(0.158)	(0.081)	(0.965)	(0.368)
Market to Book	-0.049	0.034	-0.072**	-0.134**8	-0.022	0.092***
	(0.121)	(0.277)	(0.030)	(<.0001)	(0.538)	(0.008)
Annual Return	0.081	0.046	0.127	0.099*	0.026	0.019
	(0.389)	(0.436)	(0.189)	(0.090)	(0.799)	(0.771)
Volatility	-0.075	-0.017	-0.076	-0.240**	-0.022	0.039
	(0.677)	(0.871)	(0.682)	(0.022)	(0.913)	(0.736)
Leverage	-0.174	-0.020	-0.107	0.484**	-0.093	-0.457**
	(0.395)	(0.922)	(0.610)	(0.019)	(0.680)	(0.047)
Capex/Asset	2.500**8	0.207	-0.009	-0.825	3.466***	2.377***
	(0.003)	(0.790)	(0.992)	(0.284)	(0.000)	(0.006)
Tenure	-0.008	-0.014**	-0.018***	-0.020***	0.005	-0.012
	(0.224)	(0.034)	(0.008)	(0.002)	(0.497)	(0.100)
Industry FE's	Yes		Yes		Yes	
Observation	7817	8164	8100	8061	8192	7969
Adjusted R^2	0.090	0.086	0.069	0.072	0.094	0.631

Panel C: Linear Regression for Option Compensation by Property Damage, Cash levels and Annual Return						
	Equity Compensation		Stock Compensation		Option Compensation	
Year 0	>Median Cash levels	<Median Cash levels	>Median Cash levels	<Median Cash levels	>Median Cash levels	<Median Cash levels
disaster	0.341	-1.288***	1.445***	0.105	-0.717	-1.494***
	(0.524)	(0.001)	(0.002)	(0.810)	(0.202)	(0.001)
Post	-11.243***	-12.859***	-3.996***	0.595	-10.096***	-12.779***
	(<.0001)	(<.0001)	(<.0001)	(0.872)	(<.0001)	(0.001)
Post Disaster	-0.386	1.368***	-1.476***	-0.048	0.609	1.5198**
	(0.496)	(0.003)	(0.003)	(0.926)	(0.306)	(0.004)
Firm size	0.149***	0.307***	0.102***	0.186***	0.150***	0.265***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
ROA	-0.422	1.411	1.411**	1.315	-1.345*	1.404
	(0.580)	(0.377)	(0.036)	(0.463)	(0.093)	(0.448)
Market to Book	0.011	-0.016	-0.088***	-0.069	0.054**	0.024
	(0.647)	(0.772)	(<.0001)	(0.258)	(0.036)	(0.705)
Annual Return	0.202**	-0.038	0.180**	0.042	0.137	-0.052
	(0.011)	(0.550)	(0.011)	(0.554)	(0.103)	(0.484)
Volatility	-0.208	0.109	-0.316**	-0.096	-0.177	0.168
	(0.167)	(0.339)	(0.017)	(0.451)	(0.264)	(0.203)
Leverage	-0.035	-0.168	0.128	0.388	-0.072	-0.575**
	(0.850)	(0.485)	(0.434)	(0.150)	(0.708)	(0.039)
Capex/Asset	3.098***	0.419	-0.220	-0.438	4.636***	1.971**
	(0.000)	(0.593)	(0.769)	(0.618)	(<.0001)	(0.030)
Tenure	-0.009	-0.007	-0.019***	-0.018***	-0.003	0.000
	(0.123)	(0.343)	(0.001)	(0.019)	(0.652)	(0.974)
Industry FE's	yes		Yes		Yes	
Observation	7817	8164	8100	8061	8192	7969
Adjusted R^2	0.090	0.086	0.069	0.072	0.094	0.631

2.4.2 Robustness checks

The next step in the analysis is to see whether the effects of natural disasters on compensation had an effect beyond the fiscal year in which the natural disaster occurred. The same analysis was conducted for the same samples with the timeframe being the year after the natural disaster.

2.4.3 Robustness checks - Linear regression year after natural disaster

Table 7 shows the linear regression in the year after a natural disaster occurrence for Equity compensation, Option Compensation and Stock compensation only. This was due to their significant relationships with the disaster variable in the overall sample. Only stock compensation continued to have a significant relationship with the occurrence of a natural disaster the year after the natural disaster occurrence (the coefficient being 1.118, statistically significant at the 1% level). This shows that CEOs may have continued to receive stock compensation in the wake of a natural disaster, perhaps to allow CEOs to recover some of their lost option compensation.

Table 2. 7 Linear regressions of levels the year after the natural disasters

This table represents the coefficients of the linear regression model below. All the variables are defined in the appendix. The main independent variable is disaster, which is a categorical variable equal to one if a natural disaster took place in a county within the year and zero otherwise. The sample is split by the median cash levels (the Compustat variable is CHE, which represents cash and short term investments). Panel A represents total pay and cash based compensation variables while panel B represents the Equity based variables. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively. Numbers in the parenthesis are p-values

$$\ln(\text{CEO Pay Variable})_{it+1} = \alpha + \beta_1 \text{Disaster}_{it} + \beta_2 \text{Firm size}_{it} + \beta_3 \text{ROA}_{it} + \beta_4 \text{ M/B Ratio}_{it} + \beta_5 \text{ Annual Return}_{it} + \beta_6 \text{Volatility}_{it} + \beta_7 \text{Leverage}_{it} + \beta_8 \text{ Capex/Assets}_{it} + \beta_9 \text{Tenure}_{it} + \delta_t + \varepsilon_{it}$$

Regression for year after the disaster occurrence			
Variables	(Equity Based Pay)	(Option Compensation)	(Stock Compensation)
disaster	-0.634	-0.335	1.118***
	(0.122)	(0.422)	(0.001)
Post	-9.916***	-8.842***	-3.386***
	(<.0001)	(<.0001)	(<.0001)
*Post*disaster*	0.838*	0.378	-1.087***
	(0.064)	(0.410)	(0.003)
Firm size	0.258***	0.255***	0.166***
	(<.0001)	(<.0001)	(<.0001)
ROA	0.457	-0.389	2.089***
	(0.620)	(0.676)	(0.004)
Market to Book	-0.010	0.008	-0.113***
	(0.750)	(0.779)	(<.0001)
Annual Return	0.043	0.007	0.028
	(0.506)	(0.918)	(0.591)
Volatility	-0.365***	-0.264**	-0.082
	(0.002)	(0.025)	(0.376)
Leverage	-0.168	-0.390**	0.069
	(0.388)	(0.045)	(0.654)
Capex/assets	-0.610***	3.212***	-0.751
	(0.022)	(<.0001)	(0.238)
Tenure	-0.033***	-0.021***	-0.022***
	(<.0001)	(0.001)	(<.0001)
Industry FE's	Yes	Yes	Yes
Year FE's	Yes	Yes	Yes
Observations	14,845	14,845	14,845
Adjusted R^2	0.584	0.470	0.174

Another issue that needs to be addressed is the potential for natural disasters to have no effect on CEO compensation. To address this we ran a univariate test of mean and median differences between compensation variables of firms in disaster counties and firms in non-disaster counties, from the year before the natural disaster occurrence. In order to do this, we create compensation variables taken from the previous year or *lagged* compensation variables. Theoretically, this should result in no significant difference between compensation levels in disaster and non-disaster counties. The results for the univariate test of mean and median difference are in Panel A of table 8.

Panel A showed that the lagged Bonus compensation, Option compensation and LTIP compensation had highly significant different levels between disaster and non-disaster county firms. To address this further, I expanded the analysis to include regressions of lagged bonus compensation, option compensation and LTIP compensation. Potentially, the univariate analysis may be negatively biased due to the number of firms that may not pay certain non-mandatory compensation items. This could be especially true as the univariate differences coefficients were all highly negative. Therefore, regression analysis using the lagged compensation variables that showed significant differences in the univariate test of differences are presented in panel B of table 8.

Panel B shows no significant coefficients for lagged Bonus compensation, Option compensation and LTIP compensation disaster variables disaster. As such, it can be concluded that the occurrence of a natural disaster does have an effect on CEO compensation.

Table 2. 8 Univariate analysis and regressions of year before natural disaster

This table represents the coefficients of the linear regression model below. All the variables are defined in the appendix. The main independent variable is disaster, which is a categorical variable equal to one if a natural disaster took place in a county within the year and zero otherwise. The sample is split by the median cash levels (the Compustat variable is CHE, which represents cash and short term investments). Panel A represents total pay and cash based compensation variables while panel B represents the Equity based variables. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively. Numbers in the parenthesis

$$\ln(\text{CEO Pay Variable})_{it+1} = \alpha + \beta_1 \text{Disaster}_{it} + \beta_2 \text{Firm size}_{it} + \beta_3 \text{ROA}_{it} + \beta_4 \text{ M/B Ratio}_{it} + \beta_5 \text{Annual Return}_{it} + \beta_6 \text{Volatility}_{it} + \beta_7 \text{Leverage}_{it} + \beta_8 \text{ Capex/Assets}_{it} + \beta_9 \text{Tenure}_{it} + \delta_t + \varepsilon_{it}$$

PANEL A	Overall		Disaster Firms		Non Disaster Firms		Difference	
COMPENSATION	Mean	Median	Mean	Median	Mean	Median	T	Z
Total Pay ($M)	5.306	3.517	5.244	3.643	5.309	3.511	1.150	0.591
Cash-based pay ($M)	1.139	0.900	1.041	0.876	1.143	0.900	-0.680	-2.11**
Salary ($M)	0.774	0.736	0.793	0.751	0.773	0.735	-0.950	1.814*
Bonus ($M)	0.335	0.000	0.234	0.000	0.340	0.000	-6.610***	-6.010***
Equity-based pay($M)	1.080	0.000	0.700	0.000	1.097	0.000	-6.860***	-5.870***
Option Value ($M)	0.622	0.000	3.378	0.500	0.634	0.000	-6.790 ***	-5.704***
Stock grant value ($M)	0.121	0.000	0.083	0.000	0.122	0.000	-1.24	-1.075
Long Term Incentive Payments	0.060	0.000	0.049	0.000	0.061	0.000	-1.96*	-1.722*

Panel B: Regression for year before the disaster occurrence					
Variables	(Cash Based Pay)	(Bonus Compensation)	(Equity Based Pay)	(Option Compensation)	(LTIP Compensation)
disaster	-0.046	0.037	-0.583	-0.613	0.116
	(0.730)	(0.909)	(0.152)	(0.137)	(0.683)
Post	-0.023	2.053	0.926	0.617	0.595
	(0.986)	(0.681)	(0.827)	(0.884)	(0.840)
*Post*disaster*	0.0734	-0.365	0.657	0.600	0.031
	(0.61)	(0.498)	(0.145)	(0.188)	(0.922)
Firm size	0.129***	0.048*	0.147***	0.093***	0.175***
	(<.0001)	(0.073)	(<.0001)	(<.0001)	(<.0001)
ROA	0.907***	3.695***	-1.517*	-1.529*	0.502
	(0.002)	(0.001)	(0.085)	(0.091)	(0.414)
Market to Book	-0.047**8	-0.050*	0.052**	0.119***	-0.079***
	(<.0001)	(0.099)	(0.036)	(<.0001)	(<.0001)
Annual Return	0.047**	0.423***	0.043	0.005	0.124***
	(0.025)	(<.0001)	(0.507)	(0.944)	(0.006)
Volatility	-0.029	0.078	0.001	0.042	-0.081
	(0.441)	(0.578)	(0.991)	(0.720)	(0.323)
Leverage	0.112	-0.809***	-0.405**	-0.378**	-0.046
	(0.062)	(0.000)	(0.028)	(0.044)	(0.721)
Capex/assets	-0.188	3.836***	2.969***	5.419***	-1.045**
	(0.411)	(<.0001)	(<.0001)	(<.0001)	(0.033)
Tenure	-0.002	-0.025***	-0.036***	-0.019***	-0.035***
	(0.418)	(0.000)	(<.0001)	(0.001)	(<.0001)
Industry FE's	Yes	Yes	Yes	Yes	Yes
Year FE's	Yes	Yes	Yes	Yes	Yes
Observations	14,936	14,936	14,936	14,936	14,936
Adjusted R^2	0.234	0.531	0.056	0.474	0.083

2.5 Conclusion

There is little research investigating the effects of micro-level events on the structure of executive pay. In our paper, we study the effects of natural disasters on CEO pay. Not only are these effects economically large, occur frequently, and have substantial emotional effects, they occur mostly unexpected. Hence, they form a reasonable natural experiment to not only test whether there are effects on CEO pay, but also on whether liquidity concerns matter. Hence, we test three major hypotheses in our paper relating executive compensation with natural disasters. We find that there does indeed appear to be an effect of natural disasters on the compensation structure of executives.

Our main findings are that option compensation and equity compensation are dispersed at lower levels to CEOs in counties in which a natural disaster occurs, in the year of the disaster. Stock compensation was dispersed at higher levels to CEOs in counties in which a natural disaster occurs, in the year of the disaster. However, there appeared to be no statistically significant relationship between bonus compensation and the occurrence of a natural disaster in the firm's county.

When the sample was split by median levels of property damage, it was found that the main results were driven by the below median property damage subsample. In other words, CEOs in natural disaster counties were given higher levels of stock compensation and lower levels of option compensation for the below median property damage subsample only. This could lead to one of two implications, the first being that natural disasters do not have the same psychological effect on CEOs as terrorist attacks thereby not allowing them to have increased cash compensation. An alternative, explanation could also be that while property damage is an indicator of countywide damage it may also reflect material damage to the firm's ability to conduct its day-to-day

operations, thereby decreasing the firms desire to dispense relatively riskless cash compensation.

Considering liquidity, option compensation is paid at lower levels for firms in the below median cash levels subsample. Stock compensation is paid at higher levels in the above median cash levels subsample. Therefore, this indicates that liquidity levels after the natural disaster are an important factor in how compensation is dispensed. These results are dissimilar to Dai et al. (2019), who show a preference for cash-based compensation in the event of a terrorist attack. Overall, our study suggests that the occurrence of natural disasters and liquidity positions of firms, which experienced Natural disasters, have an effect on the type and level of compensation a CEO receives.

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Figure 2. 1 APPENDIX 2

Variable	Definition
Independent variable	
Disaster	Dummy variable that takes value 1 for affected firms after a natural disaster Firms not in an affected area are coded as 0.
Post	Dummy variable that takes value 1 for years after 2005 and zero otherwise
Compensation	
Total Pay	Item TDC1 in Execucomp that consists of salary, bonus, value of restricted stocks granted, value of options granted, long-term incentive payouts, and other types of compensation
Salary	Value of salary (item SALARY in Execucomp)
Bonus	Value of bonus (item BONUS in Execucomp)
Option Value	Value of options granted using Black-Scholes (item OPTION_AWARDS_BLK_VALUE in Execucomp)
Stock Value	
LTIP Value	Value of long-term incentive payouts (item LTIP in Execucomp)
Equity based pay	Sum of option value, stock value and LTIP value
Cash based pay	Sum of bonus and salary compensation
Firm Characteristics	
Firm Size	Natural logarithm of total assets from Compustat (item AT in Compustat)
Volatility	Standard deviation of the firm's monthly stock returns over the previous 5-year period
Annual Return	Buy-and-hold return on a firm's stock for the past 12 months
ROA	Net income before extraordinary items and discontinued operations divided by total assets (item IB/AT in Compustat)
Market to Book	Market value of equity divided by book value of equity, where the market value is obtained as the fiscal year closing price multiplied by common shares outstanding (item PRC×SHROUT/CEQ in Compustat)
Capex/Assets	Ratio of capital expenditure to total assets (item Capx/AT in Compustat)
Leverage	Sum of current liabilities and long-term debt divided by total assets (item (DLT+DLTT)/AT in Compustat)
CEO Characteristics	
Tenure	Number of years the CEO has held their post
Subsample	
Cash levels	Cash and short term securities (CHE Compustat)
Property Damage	Dollar value of property damage sustained in natural disaster

CHAPTER 3

Essay 2- CHIEF FINANCIAL OFFICERS; PAY-FOR-PERFORMANCE SENSITIVTY AND REAL EARNINGS MANAGEMENT

3.1 Introduction

The purpose of this study is to further our understanding of the relationship between compensations of chief executive and chief financial officers and real earnings management undertaken by their firms. Specifically, I investigated the how the pay-for-performance levels of both the chief financial officer of the firms affect:

- The choice to undertake real earnings management
- The relationship between pay-for-performance sensitivity and earnings increasing real earnings management
- The relationship between the pay-for-performance sensitivity and earnings increasing real earnings management within firms suspected of using earnings increasing REM to meet earnings benchmarks.

This study extends the literature in several ways. First, it establishes a connection between CEO and CFO pay-performance sensitivity (delta) and the decision for the firm to undertake real earnings management. While the literature has illustrated potential preference for accrual-based earnings management for the CEO and real earnings management for the CFO, the literature has never drawn a link between pay-for-performance sensitivity and the firm's decision to undergo real earnings management. I do this while taking into account relative power of the CEO and CFO. In addition to this, I also establish the relationship between CEO and CFO pay-for-performance sensitivity and the specific mode of real earnings management.

The extant literature has produced substantial evidence that executives engage in earnings management.[1] The reasons for this may arise from, contractual incentives, capital markets considerations or concerns over regulations. There are three forms of earnings management: non-GAAP compliant accounting, accruals management and real earnings management. Accruals-based earnings management involves within generally accepted accounting principles (GAAP) accounting choices that try to "obscure" or "mask" true economic performance (Dechow and Skinner, 2000). Roychowdhury (2006) defines real activities manipulations as ''management actions that deviate from normal business practices, undertaken with the primary objective of meeting certain earnings thresholds.

Prior research suggests that CEO and CFOs potentially have different preferences concerning accrual-based management (AEM) and real earnings management. Graham, Harvey and Rajgopal (2005) provide survey evidence showing that CFOs prefer REM in order to meet earnings targets. The results of the survey are logical implications when considering the differing roles of CEOs and CFOs. CEOs bear the responsibility of strategic direction for the firm, which in turn affects the current and future performance of the firm. Prior research supports this view. Under the assumption that REM can detract from future firm performance, CEOs can be seen to be neglecting duties to shareholders of the firm (Zhang, 2012). Similarly, the extant literature has also shown that presence of AEM could be seen as a neglect of the CFOs monitoring role (Feng, Ge, Luo and Shevlin (2011))

To summarize, the literature to date suggests that CEOs who have the ability to influence the earnings management process will rely on AEM, while CFOs who have the ability to influence the earnings management process will rely on REM. Furthermore, since the passage of SOX firms are more likely to move towards real earnings management in place of accruals-based

earnings management. However, by definition, Real earnings management will affect a firm's future performance, as the firm will negate future cash flows for the sake of current period income. Therefore, the pay-for-performance sensitivity of the CFO may be negatively associated with a firm's decision to undertake real earnings management. Furthermore, Gunny (2005) showed that that while real earnings management led to a decrease in subsequent operating performance, analysts and investors were only able to recognize some of the real earnings management that had taken place. This could mean that some methods of real earnings management are preferable to others or would have different relationships with a CFOs pay-for-performance. To my knowledge, there has been no documented relationship between CFO delta and the choice of a firm to undergo real earnings management or the method used. This is the gap in the literature this study will fill.

There is substantial evidence in the literature that firms use both accrual-based and real earnings management to meet earnings targets (Gunny 2010; Laksmana and Yang, 2014). However, there is also evidence that firms substitute one form of earnings management for another and that the exchange is dependent on the costs associated with either AEM or REM. (Zhang, 2012). While the extant literature has looked at firm level reasons or particular circumstances for the exchange between AEM and REM (Cohen and Zarowin, 2010; Zhang 2012) specific ties between choice of real earnings management (REM) and CFO compensation are not as detailed.

Some of the literature has addressed the relationship between equity compensation and discretionary accruals (Larcker Richardson and Tuna (2007); Cornett Marucs and Tehranian (2008)). Other literature has separated CEO and CFO pay for performance sensitivity, with differing conclusions depending on the type of misreporting (Jiang el al. (2008); Feng et al.,

(2011)). Another study has observed the connection pay-for-performance sensitivity and discretionary expense (Baker, Lopez, Reitenga and Ruch (2019)) but this only one form of real earnings management and does not address the connection between firm choice of REM and CFO compensation. Furthermore, my paper also looks at the relationship between CEO/CFO pay performance sensitivity and three separate measures of REM, while also accounting for pay-sensitivity to volatility for the CFO.

To implement my analysis, I first compute the three individual measures of REM; abnormal amounts of discretionary expenses, production cost and cash flows. These were generated using several REM models available in the literature. These abnormal amounts of REM are used to construct two cumulative REM variables following Francis, Hasan and Li (2016) for establishing the relationship between CEOs/CFOs pay-performance-sensitivity for and choice of REM method. By combining abnormal discretionary expenses and abnormal production cost into one REM measure (REM 1) and combining abnormal cash flows with abnormal discretionary expenses into another REM measure (REM 2), I create two measures of real earnings management that firms can choose to use. A logistic regression was used to determine the probability of a firm choosing one of these methods of REM and a linear regression was used to establish a relationship between CFO pay-for-performance and the level of abnormal REMs.

Using a sample from 1992 to 2018 I found CEO and CFO pay-performance-sensitivities was negatively related to a choice of the firm to use both REM 1 and REM 2. While the same is also true of CEO pay-performance-sensitivity, the strength of the negative relationship was substantially weaker. This would indicate that more-sensitive a CFOs firm is to stock performance the less likely a firm is to undertake any form of REM.

I was able to establish separate relationships between CFOs pay-for-performance and the three individual REM measures. There was a significant and positive relationship between CFO pay-for-performance, my discretionary expenses measure, and a negative relationship between the other individual REM measures. These relationships held even when restricting the sample to firms suspected of using REM to meeting an earnings benchmark, with the exception of discretionary expenses. The coefficient for discretionary expenses was negative but statistically insignificant. Taken together, these results suggest that CFO pay-for-performance sensitivity is a principal driver in a decision of a firm to not undertake REM.

3.2 Literature Review and hypothesis development

3.2.1 Chief Financial Officer duties, relationships and compensation

The central tension at the heart of compensation literature is the conflict of interest between a firms owners/investors and the managers hired to maximize the value of the firm. Mehran (1995) was one of the first to establish that the form of compensation, not just the amount, aligned firm and manager interests. Specifically, he found that firm performance is positively related to the share of equity held by managers and the share of manager compensation that is equity-based. Equity based compensation proliferated in the 1990s (Hall and Liebman 1998) leading to a new agency tension, the opportunity to manage earnings. Fuller and Jensen (2002) allege that increased intensity of stock options in the compensation package of the managers allows CEOs and CFOs to focus on boosting short-term stock prices at the expense of long-term value creation for the firm.

Bergstresser and Phillipon (2006) showed that the use of discretionary accruals to manipulate reported earnings is more pronounced at firms where the CEOs compensation was more sensitive to the increase in firm stock price.

While the literature is sparse concerning the CFO compensation and real earnings management relationship, it does tackle CFO and CEO compensation to other forms of earnings management. Various studies have tried to assess the driving forces behind executive earnings and expectations management. Baker, Collins and Reitenga (2003) find that high executive option compensation is associated with income decreasing discretionary accrual choices in periods leading up to option award dates. Jiang, Petroni and Wang (2010), however, follow this study by finding that CFO equity incentives should play a stronger role than those of the CEO in accruals management. They find that the magnitude of accruals and the likelihood of beating analyst forecasts are more sensitive to CFO equity incentives than to those of the CEO. Along these lines Kim, Li and Zhang (2011) found that the sensitivity of a CFO's option delta is positively related to the likelihood of a firm's stock price crash risk. CEO option sensitivity was much weaker.

Another stream of the compensation literature introduced the relative power of CEOs and CFOs as an explanation for earnings management. Feng, Ge, Luo and Shevlin (2010) CFOs of firms who commit material accounting information succumb to pressure from CEOs that are more powerful. The CEOs of accounting manipulation firms had higher equity incentives and more power than their matched counterparts who did not commit accounting manipulations. Baker, Lopez, Reitenga and Ruch (2019) examined the relative power of both CFO and CEOs on AEM and REM. In the pre-SOX period, they find that AEM (REM) is greater when the CEO (CFO) is powerful relative to the CFO (CEO). In the post-SOX period, however, we find

that the effect of relative CEO power on AEM subsides, whereas the effect of relative CFO power on REM persists.

In summary, while REM has increased in intensity post there has been no association established between CFO equity and real earnings management. However, the relationship between CFO compensation and earnings management was dependent on a variety of factors including job complexity (Balsam, Irani and Yin (2012)), equity incentives and relative power of CFO and CEO.

3.2.2 Real Earnings Management

Much of the literature is concerned with the effects of real earnings management on future firm performance, particularly given its prevalence. Graham et al. (2005) report that:

"[W]e find strong evidence that managers take real economic actions to maintain accounting appearances. In particular, 80% of survey participants report that they would decrease discretionary spending on R&D, advertising, and maintenance to meet an earnings target. More than half (55.3%) state that they would delay starting a new project to meet an earnings target, even if such a delay entailed a small sacrifice in value."

Geiger and Taylor (2003) document that SOX legislation allowed for the CFO and the CEO to be both held personally accountable for the quality of the financial information released by the company. Furthermore, the CFO responsibility is primarily concerned with the financial reporting quality of the firm. This is documented by Geiger and North (2006) where they documented CFOs being most responsible for financial reporting, using the setting of new CFOs

hires. Cohen, Dey and Lys (2008) document that accrual-based management increased until the passage of SOX in 2002. After this, the level of real earnings management activities declined prior to SOX and increased significantly after the passage of SOX, suggesting that firms switched from accrual-based to real earnings management methods after the passage of SOX.

To further drive this point home, (Collins, Masli, Reitenga and Sanchez (2009)); Feng et al. (2011)) find that CFOs bear substantial legal and career costs when involved in accounting manipulations. On the surface, it would seem logical that firm executives, particularly CFOs would prefer REM to AEM, since REM is more difficult to detect.

However, the literature has also established several disadvantages of engaging in REM. Firstly, REM can destroy long-term firm value. Cohen and Zarowin, (2010) show that SEO firms engage in REM to inflate earnings and the decline in post- SEO performance due to the real activities management is more severe than that due to accrual management. Badertscher (2011) notes that managers sustain the overvaluation of a stock by moving from accrual-based management, to real earnings management to non-GAAP earnings management. He also notes that "the downside of engaging in RTM is that it impacts cash flows. As a result, RTM is more costly than AM from a cash flow perspective because of its adverse impact on optimal business operations and its potential to destroy long-term firm value." The choice to engage in AEM, even in a sample that includes the implementation of SOX may reflect this. Bhojraj, Hribar, Picconi and McInnis (2009) show that firms which cut discretionary expenditures in order to just meet or exceed an analyst target, gain a short term stock price benefit relative to firms that miss forecasts with high quality earnings. This is then reversed over the next 3-year period. Additionally, firms reducing discretionary expenditures to beat forecasts have significantly greater equity issuances and insider selling in the following year Banker Huang and Natarajan (2011) show that firm

value is created through SG&A expenditure after the granting of long-term equity incentives. Since cutting SG&A expenditure would be consistent with REM, equity incentives could be positively associated with discretionary spending rather than negatively associated (this would be consistent with cutting discretionary spending to boost earnings). In addition, Vorst (2016) found that REM (in the form of abnormal reductions in R&D and SG&A) is associated with a 2 to 6 percent reduction in future industry-adjusted return on assets or cash flow from operations.

While the excepted wisdom is that firms undertake REM in order to meet benchmarks, are there any consequences aside from the value destruction? Are there other market participants who are able to identify REM and if so what is their opinion or reaction? Capital market reactions to REM are also covered in the literature.

Kim and Sohn (2011) show that a firms cost of capital is positively associated with the extent of real earnings management in the form altering production costs, discretionary expenditure and cash flows, through the artificial increase in sales (this would be due to the relaxation of credit terms for customers or steep discounts). Furthermore, increased REM was associated with a decreased future ROA and cash flows. Ge and Kim (2014) found that overproduction impaired credit ratings, while sale manipulation and overproduction are associated with higher bond yield spreads. Together these results indicate that credit markets perceive that firm risk has increased because of REM and require higher premiums. This is also particularly telling because unlike other stakeholders who find REM opaque, bondholders may not suffer from as much information asymmetry. Along these lines, Pappas, Walsh and XU (2019) examined loan contract terms with respect to the borrowing firm's REM. Increased REM is associated with higher interest spreads, shorter maturities and an increased likelihood of imposing collateral requirements.

Lastly, Jong Mertens, Vander Poel and Van Dijk (2019) investigated the perception of REM by analysts through a survey. Analysts saw a reduction in discretionary spending and delay of new project as value destroying while CFOs may view these forms of REM as acceptable for meeting benchmarks. CFOs may prefer this form of REM, as it may be difficult to detect. However, only one third of the analysts believed that firms should not sacrifice value in order to smooth earnings, with the rest suggesting at least some sacrifice in value to achieve earnings smoothing was acceptable. The reasoning behind this may be analysts view attaining earnings benchmarks by real earnings management as a positive signal of future firm performance.

Taken together, the literature suggests that the reasons behind REM are often connected with meeting earnings targets and deriving the immediate gains in stock value. There is evidence that long-term firm value is destroyed in the process and so potentially producing an inverse relationship between CFO pay-for-performance sensitivity and real earnings management. In addition to this, other factors might play a role in either the decision of the firm to engage in real earnings management. These factors include the relative power of the CFO and CEO (Baker at al. (2019)) and specific corporate events (Francis, Hasan and Li (2016)).

3.2.3 Hypothesis

While CFOs have a fiduciary responsibility to make decisions that increase the value of the firm there is a case where increasing the value of the firm in the short term may come at the expense of long-term value. Dechow and Sloan (1991) found that CEOs would spend less on R&D in the final years of their tenure, in line with altering discretionary spending within REM. However, reductions in the R&D spending are mitigated by CEO stock ownership, indicating that executives may be reluctant to engage in value damaging REM due to their equity

ownership. This would be particularly pronounced if their equity compensation were sensitive to the performance of the firm. This leads to the first hypothesis:

H1: CFO Pay-for-performance sensitivity is negatively associated with the likelihood of a firm engaging in any form of real earnings management.

In addition to Dechow and Sloan (1991), other authors have produced evidence of increase stock performance after increasing R&D, contingent on change in equity compensation. Chen (2004) notes that changes in R&D spending can be tied to changes in the value of CEO annual option grants. This was present when CEOs were approaching retirement or when firms were facing a small earnings decline or loss (where conditions would be most apt for REM).

This leads to:

Hypothesis 2A: The amount of REM in the form of Discretionary Expense will be positively associated with the pay-for-performance sensitivity.

Operating cash flows are an acknowledged valuation tool used for firms, being more useful for firms in more stable industries or economic environments (Dechow 1994; Liu, Nissim and Thomas (2007)). As such reducing operating cash flows for the sake of short-term equity gains would decrease the future value of the firm by definition. In addition to this, it is unclear how much control a CFO would have over cash flow REM. The principal way in which this form of REM would take place is through increasing units of product sold, through either lenient credit terms or steep price discounts. This would be more in line with the role of the CEO than the CFO. Therefore, the next hypothesis is:

Hypothesis 2B: Cash Flow REM is positively associated with CFO pay-for-performance sensitivity

Fan and Liu (2017) show that managers engage in the manipulation of COGS in order to achieve gross margin benchmarks. As has already been stablished in the literature REM is associated with a decrease in subsequent firm performance. Therefore:

Hypothesis 2C: Production cost REM is negatively associated with CFO pay-for-performance sensitivity

Firms are motivated to engage in REM in order to bear analyst expectation, smooth earning or meet earnings benchmarks (Graham et al. (2005); Jong et al. (2014)). Therefore, restricting the sample to those who have beaten an earnings benchmark and have chosen to engage in REM 1 and REM 2 as previously defined. I restrict the sample to firms who have engaged in REM 1 and REM 2 while also having 0<ROA<0.01 or 0<ROA change<0.01. This produces a third hypothesis broken down into three parts. In this sample, the central premise is that the CFO delta would be associated with earnings increasing REM. This would be reflected in the following hypotheses

Hypothesis 3A: The amount of REM in the form of Discretionary Expense will be negatively associated with the pay-for-performance sensitivity.

Hypothesis 3B: Cash Flow REM is negatively associated with CFO pay-for-performance sensitivity

Hypothesis 3C: Production cost REM is positively associated with CFO pay-for-performance sensitivity

3. 3 Methodology

In this section, I examine the impact of CFO pay-for-performance sensitivities in three settings: (1) In the logistic regression setting, to establish the relationship between CFO pay-for-performance sensitivity and firm choice of REM. (2) In the ordinary linear regression setting,

where the magnitude relationship between the three REM methods and the CFO pay-for-performance sensitivities can be established. The three REM methods are manipulation of sales resulting in lower cash flows, reporting lower cost of goods sold through increased production and decreasing discretionary expenses. (3) Repeating the same analysis with a sample restricted to firms more likely to have engaged in REM to meet earnings targets. Potentially the magnitude of the relationship between CFO pay-for-performance and the degree of each REM method changes. The rest of the methodology section will detail the main dependent and independent variables of the analysis.

3.3.1 Real Earnings Management

I rely on prior studies that developed the REM proxies I use. Following Roychowdhury (2006), as well Cohen and Zarowin (2010) I consider three metrices to study the level or forms of the level of REM: the abnormal levels of cash flow from operations (CFO), discretionary expenses and production costs. I focus on the following three REM methods and how they would relate to the:

1. Cash flow decrease – Acceleration of the timing of sales through increased price discounts or more lenient credit terms. Such discounts and lenient credit terms will temporarily increase sales volumes, but these are likely to disappear once the firm reverts to old prices. The additional sales will boost current period earnings, assuming the margins are positive. However, the discounts and lenient sales will result in lower cash flows within the period.
2. Increased Production costs – This would result in the lower costs of goods sold. When managers produce more units, they can spread the fixed overhead costs over a larger

number of units, thus lowering fixed costs per unit. As long as the reduction in fixed costs per unit is not offset by any increase in marginal cost per unit, total cost per unit declines. The decrease in the reported cost of goods sold means that the form can report increased operating margins. However, this will result in higher production costs given the level of sales and the cash flows generated for a given level of sales will be decreased.

3. Decreases in discretionary expenses including advertising, R&D and SG&A expenses. Reducing these expenses will increase current period earnings.

I use the methodology as implemented in Roychowdhury (2006). Normal levels of cash flow from operations (CFO) is expressed as a linear function of sales and change in sales. Model (1) is run following cross sectional regression for each industry and year:

$$\frac{CFO_{i,t-1}}{Assets_{i,t-1}} = K_1 \frac{1}{Assets_{i,t-1}} + K_2 \frac{Sales_{i,t-1}}{Assets_{i,t-1}} + K_3 \frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}} + \varepsilon_{i,t-1} \quad (1)$$

Abnormal CFO is actual CFO in period t minus the normal level of CFO calculated using the estimated coefficients from (1). Production costs are defined as the sum of COGS and change in inventory during the year. I model COGS as a linear function of sales in the same year.

$$\frac{COGS_{i,t}}{Assets_{i,t-1}} = K_1 \frac{1}{Assets_{i,t-1}} + K_2 \frac{Sales_{i,t}}{Assets_{i,t-1}} + \varepsilon_{i,t-1} \quad (2)$$

$$\frac{\Delta INV_{i,t}}{Assets_{i,t-1}} = K_1 \frac{1}{Assets_{i,t-1}} + K_2 \frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}} + K_3 \frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}} + \varepsilon_{i,t-1} \quad (3)$$

I used (3) and (4) to estimate the normal level of production costs using the following

$$\frac{Prod_{i,t}}{Assets_{i,t-1}} = K_1 \frac{1}{Assets_{i,t-1}} + K_2 \frac{Sales_{i,t-1}}{Assets_{i,t-1}} K_3 \frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}} + K_4 \frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}} + \varepsilon_{i,t-1} \quad (4)$$

The term Prod represents production cost in year t, defined as the sum of COGs and the change in inventories.

Following Cohen and Zarowin, (2010) discretionary expenses were modeled as a function of lagged sales.

$$\frac{DISX_{i,t}}{Assets_{i,t-1}} = K_1 \frac{1}{Assets_{i,t-1}} + K_2 \frac{Sales_{i,t-1}}{Assets_{i,t-1}} + \varepsilon_{i,t-1} \quad (5)$$

The term DISX is defined as the sum of advertising expenses, R&D expenses and SG&A. The abnormal CFO, abnormal production costs and abnormal discretionary expenses are computed as the difference between the actual values and predicted normal levels from models (1), (4) and (5).

In addition to this, I created two cumulative REM measures that would more accurately reflect a firm's decision to engage in REM and form the dependent variable in the logistics regression. Following Taylor and Xu (2010) and Francis et al. (2016) I create two indicator variables for REM, REM_1 and REM_2. REM_1 is calculated by sorting abnormal levels of discretionary expenses and abnormal production costs into quintiles. Since firms with high abnormal production costs (low abnormal discretionary expenses) are assumed to be manipulating production costs (discretionary expenditures) to inflate earnings, firms with high abnormal production costs (low discretionary expenses) are assigned into the highest abnormal production cost (the highest abnormal discretionary expenses) quintile. The quintile assignments are then summed to form a single index ranging from 0 to 10. Firms were considered engaging in REM with a score of six, which was above the median and are coded as 1 while firms with a five or below are coded as zero. A similar procedure was done for the calculation of REM_2, with abnormal cash flow replacing abnormal production costs. The difference being that abnormal cash flows were sorted into quintiles with the lowest abnormal cash flows being assigned to quintile 5. The same summation procedure was applied and firms considered engaging in this form of REM were awarded a score of six. REM_2 is coded as one if the cumulative score is above a six and zero otherwise. I do not have a measure that combines abnormal cash flows and abnormal production costs. This practice follows Cohen and Zarowin (2010). They explain that

overproduction automatically leads to abnormally low CFO and therefore, adding these two measures may double count REM.

3.3.2 Pay for performance

I use Delta as an established proxy for executive pay-for-performance. Following Coles, Naveen and Naveen (2006) Delta is defined as the change in the dollar value of the executive's wealth for a one-percentage point change in stock price. Vega is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. In addition to this, I also include CFO and CEO Vega. Vega is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. The reason being that while Delta captures some exposure to volatility, exposure to volatility and stock price may exert different motivations on the executive to engage in earnings management behavior.

3.3.3 Empirical Models

There are two empirical models, each with the same set of variables, one being a logistic model and the other being an OLS model. The models are as follows:

$$Pr(REM) = k_1 CFO\ Delta + k_2 Delta + k_3 CFO\ Vega + k_4 Vega + k_5 CEO\ Power + k_6 CFO\ Power + k_7 Firm\ Size + k_8 Market\ to\ Book + k_9 StdCashFlow + k_{10} StdSalesGrowth + k_{11} Old\ Firm + k_{12} Leverage + k_{13} StdAnRet + k_{14} Z\ score + K_{15} OpCycle + K_{16} Noa\_Ind \quad (6)$$

$$Abn\ REM = k_1 CFO\ Delta + k_2 Delta + k_3 CFO\ Vega + k_4 Vega + k_5 CEO\ Power + k_6 CFO\ Power + k_7 Firm\ Size + k_8 Market\ to\ Book + k_9 StdCashFlow + k_{10} StdSalesGrowth + k_{11} Old\ Firm + k_{12} Leverage + k_{13} StdAnRet + k_{14} Z\ score + K_{15} OpCycle + K_{16} Noa\_Ind \quad (7)$$

Model (6) represents the probability of a firm undergoing REM 1 and REM 2 as defined earlier. The term Abn REM in model (7) represents one of the three methods of REM defined earlier; abnormal discretionary expenditure, abnormal cash flows and abnormal production costs. Increasing earnings would mean that a decrease in discretionary expenditure and cash flows. According to hypotheses 2 this would mean a *positive* relationship between CFO Delta and both abnormal discretionary expenditures and abnormal cash flows. On the other hand, an increase in the production costs would also mean manipulation of COGs and increased earnings. Therefore, hypothesis 2 predicts that an increased CFO pay-for-performance sensitivity would have a negative relationship with earnings increasing REM. This would mean that Delta would have a negative relationship with production costs.

I also scaled the Delta and Vega variables through the log transformation, following Chava and Purnanandam (2010). The exact transformation was log (1+Delta/Vega). Furthermore, I also included CFO and CEO power measures in line with Baker et al. (2019). The reasoning behind this is Baker at al. found that CFO power was a positive predictor for an increased REM. The pay-for-performance sensitivity of the CFO may work against the power executive power dynamics with respect to REM. A full list of variable definitions can be found in the appendix.

3.3.4 Sample selection

My sample data on executives from the ExecuComp database over the period 1992–2010 and merge it with firm financial data from Compustat and analyst forecast data from IBES. Following prior research (Chava and Purnanandam (2010); Gunny (2010)) I exclude firms form the financial industry (SIC 6000–7000) and utility industry (SIC 4400–5000). This is because they operate in highly regulated industries, which have a different set of accounting rules. I selected observations in which there was a CFO using the CFOANN variable in Execucomp. I limited the sample to CFOANN with the term 'fin' 'Fin' 'CFO' 'accounting' and 'acctg'. I then eliminated firms with missing CFO control variables. Furthermore, the number of lagged variables required tor the model limits the sample. A summary of the sample composition and selection criteria are presented in Table 1.

Table 3. 1 Sample Selection

Sample selection criteria			
	Firms	Firm-years	Number of Executives
ExecuComp Database 1992-2018	3,772	52,479	12,355
Less			
Firms that did not meet search criteria for CFOs	327	15,981	7,968
Financial firms	627	3,191	6,649
Utility firms			
Final Sample	2,452	28,697	5,939

3.3.5 Descriptive Statistics

Table 2 shows the descriptive statistics of the variables used in this study. One of the most noticeable features of the data is that the CFO delta is several orders of magnitude lower than that of the CEO ($85.89 mean change in CFO wealth for 1% change in stock price compared to $596.70 for the CEO). This is hardly surprising considering that the CEO is the highest paid executive within a firm and stocks and options are the chief way to align their interests with that

of the stockholders. Furthermore, the role of the CFO inherently requires a balance between fiduciary responsibility and value maximizing decision making. In addition to this, CFO Vega and Vega also have similar magnitudes of difference. Once again, the CEO Vega is higher than CFO Vega ($121.82 change in CEO wealth for 1% of volatility versus $31.52 change in CFO wealth for 1% of volatility). Therefore, it would appear that the CEO is incentivized to risk than the CFO. The literature shows that REM can destroy subsequent REM and while there are benefits to meeting earnings targets, the use of REM may paradoxically increase long-term risk of the firm. The compensation of the CFO may not incentivize REM. The Delta and Vega figures in table 2 are similar to Cole and Naveen (2008).

Abnormal REM measures are very small with mean values of zero for abnormal production costs and cash flows. Abnormal discretionary expenses only have a mean value of 0.007 percent of total assets. This appears to be in line with Graham et al. (2005) where ‘‘the opinion of 15 of 20 interviewed executives is that companies would/should take actions such as these to deliver earnings, as long as the actions are within GAAP and the real sacrifices are not too large.’’ ‘‘Actions such as these’’ refers to postponing or eliminating expenses or in the context of my study decreasing discretionary expenditure (creating negative discretionary expenditures). However, relatively speaking, the standard deviations of each of the abnormal REM were large compared to the mean and median values. This indicates a wide range of variation within the sample.

Table 3. 2 Descriptive Statistics

Variable	N	Mean	Lower Quartile	Median	Upper Quartile	Standard Deviation
Earnings Management						
Discretionary Expense	26378	0.0071	-0.1118	-0.0139	0.0859	0.3276
Discretionary Production Cost	25587	0.0000	-0.0883	0.0071	0.0959	0.2040
Discretionary Cash Flow	26028	0.0000	-0.0423	-0.0003	0.0428	0.0869
Executive Compensation						
CFO Equity Comp (000's)	10769	708.4592	68.3570	282.2950	768.4080	1244.8525
CEO Equity Comp (000's)	10790	2783.4660	92.3890	748.7615	2293.2950	13270.7424
CFO Cash Comp (000's)	27765	501.2974	300.0000	418.6620	593.5130	336.1050
CEO Cash Comp	27765	1076.0666	575.0000	850.0000	1201.9230	897.8493
CFO CPS	27638	15.0534	10.9281	14.2461	17.8090	7.5753
CPS	27660	37.8020	30.1922	37.9365	45.1623	13.0589
CFO Delta	26883	85.8934	11.8591	33.0375	83.7583	277.3283
Delta	27060	596.7022	67.3262	185.8636	528.0359	1328.9300
CFO Vega	26791	31.5215	2.3871	11.0023	31.1575	98.7648
Vega	26966	121.8172	8.5099	39.9138	125.8088	280.6635
Firm Characteristics						
Size	28574	7.2624	6.1259	7.1599	8.2911	1.6293
Market to Book	28172	3.9493	1.4524	2.3261	3.8562	78.4216
StdCashFlow	28697	0.0945	0.0807	0.0807	0.0807	0.0544
StdSalesGrowth	28697	0.1347	0.0480	0.1084	0.2070	0.1052
Old Firm	28585	0.6968	0.0000	1.0000	1.0000	0.4596
Lev	28697	0.4380	0.3508	0.5123	0.6526	1.2131
StdAnRet.	28697	0.3404	0.1919	0.2885	0.4209	0.2276
Z Score	28697	1.5547	0.9374	1.5337	2.1695	1.2381
OpCycle	12847	4.7999	4.5060	4.8385	5.1380	0.6008
Noa Ind	24213	0.0000	-0.2229	0.0440	0.3276	5262.9300

3.4 Empirical Results

3.4.1 Empirical tests: Hypothesis 1

Hypothesis 1 stated that there would be a negative relationship between the propensity of a firm to engage in REM and the CFO delta. This hypothesis was tested for both forms of REM as defined earlier. REM 1 was the cumulative REM resulting from a combination of abnormal discretionary expenses and abnormal production costs while REM resulted from a combination of abnormal discretionary expenditure and abnormal cash flows. The logistic regression of model

(6) was run for both REM measures for the total sample and in the pre and post SOX time periods. The additional analysis for SOX was carried out as SOX increased the penalties for discretionary accruals. Therefore, the sample was also split into pre and post Sox samples. Table 3 presents the results. In the total sample, coefficients for both methods of REM were negative (-0.2601 for REM 1 and -0.35 for REM 2) and were both significant at the 1% significance levels. This shows that CFO delta is highly related to the decision not to engage in either form of REM. CEO Delta was only significant for REM 2 and was negative at the 1% level of significance. The results show that executives see REM as value destroying and a threat to their personal wealth. CFO Vega was non-significant for both forms of REM. This may not be a surprise when considering earnings management may be used to smooth volatility in earnings. Along these lines, CEO Vega is negatively associated with REM 1 at the 1% significance level. Interestingly CFO power has high positive coefficients with REM 1 and 2 indicating that firms with powerful CFOs are more likely to engage in REM. These findings agree with those of Baker et al. (2019).

Curiously, the results were not as pronounced in the pre SOX sample. CFO delta was only significantly negatively associated with REM 1, with a coefficient of -0.2909 (significant at 1%). CEO delta had a significant negative association with REM 2 only in the pre sample and even then only at the 10% level of significance. However, the post sample sees CFO coefficients similar to that of the overall sample, negative and highly significant. This seems counterintuitive as the passage of SOX increased the punishment associated with excessive discretionary accruals. Furthermore, CFO power had a very high negative coefficient in with either form of REM in the post SOX sample. This seems to run counter to other studies were CFO power would appear to increase the likelihood of engaging in REM but could also be indication that CFOs

view REM as value destroying and at least in the long run more damaging for their wealth. As in the total sample, CEO Delta also had a negative and highly statistically significant relation to REM 2 but was much smaller in magnitude than that of CFO Delta. Together, these results confirm that CFO delta is negatively related to the firm's probability of engaging in REM. This is in line with hypothesis 1.

Table 3. 3 CFO pay-for-performance and choice of real earnings management

$$Pr(REM) = k_1 CFO\ Delta + k_2 Delta + k_3 CFO\ Vega + k_4 Vega + k_5 CEO\ Power + k_6 CFO\ Power + k_7 Firm\ Size + k_8 Market\ to\ Book + k_9 StdCashFlow + k_{10} StdSalesGrowth + k_{11} Old\ Firm + k_{12} Leverage + k_{13} StdAnRet + k_{14} Z\ score + K_{15} OpCycle + K_{16} Noa\_Ind$$

Logit Regression on CFO pay-for-performance sensitivity and real earnings management

		Total Sample		Pre SOX Sample		Post SOX Sample	
	Predicted Sign	REM 1	REM 2	REM 1	REM 2	REM 1	REM 2
CFO Delta	-	-0.2601***	-0.3501***	-0.2909***	-0.1424	-0.2649***	-0.3981***
		(<.0001)	(<.0001)	(0.0099)	(0.2036)	(<.0001)	(<.0001)
CEO Delta	-	-0.00874	-0.1213***	0.0651	-0.1599*	-0.0104	-0.1126***
		(0.7568)	(<.0001)	(0.4022)	(0.0516)	(0.7367)	(0.0003)
CFO Vega	?	0.00632	0.0158	-0.007	0.00282	0.00991	0.0247
		(0.6519)	(0.5084)	(0.9424)	(0.9802)	(0.6049)	(0.4341)
CEO Vega	?	-0.1205*	-0.00801	0.0148	0.1129	-0.1583***	-0.0411
		(<.0001)	(0.7332)	(0.7826)	(0.2448)	(<.0001)	(0.1569)
CEO power	-	0.2934	0.444*	-9.4296	-0.7116	0.3764	0.4646*
		(0.2657)	(0.0937)	(0.9116)	(0.6451)	(0.1639)	(0.0892)
CFO power	+	0.4733***	0.5121***	0.4302	0.4088	-5.5791***	-5.5791***
		(<.0001)	(<.0001)	(0.1301)	(0.1507)	(0.0002)	(<.0001)
Size	?	0.2522	0.306***	0.083	0.1536**	2.2135***	2.2135***
		(<.0001)	(<.0001)	(0.2638)	(0.0362)	(<.0001)	(<.0001)
Market to Book	?	-0.00028	-0.00168*	0.000724	-0.00633	-0.00033	-0.00094
		(0.7234)	(0.0872)	(0.6226)	(0.2913)	(0.7473)	(0.4128)
StdCashFlow	+	-4.3358***	-3.9422***	-1.7234	-2.3426	-5.5791***	-5.4253
		(<.0001)	(<.0001)	(0.3706)	(0.2316)	(<.0001)	(<.0001)
StdSalesGrowth	+	1.9649***	2.3072	0.8879	2.2511***	2.2135***	2.2613
		(<.0001)	(<.0001)	(0.2729)	(0.0049)	(<.0001)	(<.0001)
Old	?	0.0557	0.00238	-0.0491	-0.2581	0.0525	0.0376
		(0.4258)	(0.9727)	(0.7644)	(0.1124)	(0.5061)	(0.6341)
Leverage	+	0.0505	0.2944**	0.5613	0.8273**	-0.0247	0.2833**
		(0.6865)	(0.0176)	(0.1477)	(0.036)	(0.8545)	(0.0352)
StdAnRet	+	-0.0437	0.1489	-0.0277	0.1132	-0.1007	0.1867
		(0.7569)	(0.2844)	(0.9421)	(0.7682)	(0.5174)	(0.222)
Z score	-	-0.0161	-0.0471	-0.0335	0.0334	-0.0235	-0.0672*
		(0.6094)	(0.1329)	(0.6784)	(0.6734)	(0.5037)	(0.0564)
Opcycle	?	-0.6103***	-0.3443***	-0.2439*	-0.034	-0.7041***	-0.4383
		(<.0001)	(<.0001)	(0.087)	(0.8089)	(<.0001)	(<.0001)
Noa Ind	-	-0.00003	-0.0001	-0.00027	0.0100	0.0000	-0.0001
		(0.541)	(0.2107)	(0.7652)	(0.2231)	(0.6573)	(0.1274)

N	8894	8894	1252	1252	7642	7642
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
SIC FE	Yes	Yes	Yes	Yes	Yes	Yes
Likelihood Ratio χ2	1389.6707	1675.2866	338.8957	349.4613	1158.2849	1494.8507
Pseudo R-sq.	0.1447	0.1717	0.2371	0.2436	0.1406	0.1777

3.4.2 Empirical Results: Hypothesis 2

Hypothesis 2 is split into three parts with each being concerned with a specific REM method, abnormal discretionary expenses, abnormal cash flows and abnormal production. The central premise of the hypotheses is that real earnings management is ultimately value destroying, even if used to momentarily increase earnings. Executives are aware of this and unwilling to engage in REM. Furthermore, this will result in a decrease in levels of earnings increasing REM. Practically this means that CFO Delta will have a positive relationship with the amount of abnormal discretionary expenditure and abnormal cash flows. It will also have a negative relationship with abnormal production costs. Hypotheses 2A-2C were proven through the findings shown in table 3. CFO Delta had positive coefficients with abnormal discretionary expenditures and abnormal cash flows. (0.0194 and 0.0123 respectively). While small these coefficients were highly statistically significant and point to the fact that CFO Delta is still negatively associated with earnings increasing REM behavior. Confirmation of this is found by the statistically significant relationship that CFO Delta has to abnormal production. This is because increased production costs would decrease the average cost of goods sold thereby increasing earnings. Once again, CFO Delta moves in the opposite direction to REM. Interestingly, CFO power appears to be in line with REM. It has a significantly negative coefficient for abnormal discretionary expenses that is statistically significant at the 1% level (-0.0397). It also has a negatively significant coefficient for abnormal cash flows also significant at the 1% level of significance. Finally, CFO power has a positive association with the level of

Abnormal production costs. Put together these indicate that CFO Delta and CFO power provide opposite motivation for REM. Hypotheses 2A, 2B and 2C were proven correct.

Table 3. 4 CFO pay-for-performance and levels of real earnings management

$$Abn\ REM = k_1 CFO\ Delta + k_2 Delta + k_3 CFO\ Vega + k_4 Vega + k_5 CEO\ Power + k_6 CFO\ Power + k_7 Firm\ Size + k_8 Market\ to\ Book + k_9 StdCashFlow + k_{10} StdSalesGrowth + k_{11} Old\ Firm + k_{12} Leverage + k_{13} StdAnRet + k_{14} Z\ score + K_{15} OpCycle + K_{16} Noa\_Ind$$

OLS Regression on CFO pay-for-performance sensitivity and real earnings management

	Abnormal Discretionary Expenditure	Abnormal Cash Flow	Abnormal Production costs
CFO Delta	0.0194***	0.0123***	-0.0227***
	(<.0001)	(<.0001)	(<.0001)
CEO Delta	0.0092***	0.0032***	-0.00179
	(0.0032)	(0.0001)	(0.3698)
CFO Vega	0.0006	-0.0004	0.0003
	(0.6023)	(0.2014)	(0.6913)
CEO Vega	0.0133***	0.0002	-0.0119***
	(<.0001)	(0.7608)	(<.0001)
CEO Power	-0.0286	0.0009	0.0282
	(0.3326)	(0.9127)	(0.1331)
CFO Power	-0.0397***	-0.0156***	0.0238***
	(0.0029)	(<.0001)	(0.0056)
Size	-0.0263***	-0.0010	0.0194***
	(<.0001)	(0.2247)	(<.0001)
Market to Book	0.0000	-0.0000	-0.0000
	(0.569)	(0.6089)	(0.4697)
StdCashFlow	0.3895***	0.0577***	-0.1553***
	(<.0001)	(0.0037)	(0.001)
StdSalesGrowth	-0.1176***	-0.0871***	0.1967***
	-0.001	(<.0001)	(<.0001)
Old	-0.0354***	0.0025	0.0217***
	(<.0001)	(0.2246)	(<.0001)
Leverage	0.0483***	-0.0457***	0.0064
	(0.0005)	(<.0001)	(0.4721)
StdAnRet	0.0415***	-0.0151***	0.0109
	(0.0079)	(0.0003)	(0.2776)
Z Score	0.0088**	0.0201***	-0.0309***
	(0.0108)	(<.0001)	(<.0001)
Opcycle	0.0388***	0.0067***	-0.0648***
	(<.0001)	(<.0001)	(<.0001)
Noa Ind	0.0002***	0.0001***	-0.0000
	(<.0001)	(0.0067)	(0.8071)
N	8179	8075	7952
Adj-R^2	0.1826	0.1755	0.1179

Definitions of the variables can be found in the appendix. Abnormal REM can refer to abnormal Discretionary Expenditure, Cash Flow or Production Costs

3.4.3 Empirical Results: Hypothesis 3

The final hypothesis is connected to whether firms who are very likely to have engaged in REM to just meet earnings benchmarks have the same relationship between CFO Delta and REM. The analysis is the same as hypothesis 2 except that the sample is restricted to firms with ROA and change in ROA, from the previous year to this year, being between zero and 0.01 while also being above the REM score of six for both measures REM 1 and 2. This isolated firm years where firms engaged in both forms of REM and just beat an earnings benchmark in the same year. Table 4 show the results. While the numbers are very small the conditions set for this sample also create the highest chance of isolating firms using REM to reach benchmarks, a practice which seems to be acceptable in the investment community and is bourne out in the literature (Graham et al. (2005)).

The results were surprising and were in the opposite direction to the hypotheses stated. Discretionary expenditure had a small positive coefficient with CFO delta that proved to be statistically insignificant. However, the statistical strength and direction between CFO Delta abnormal Cash Flow and abnormal production costs remain the same. This shows that it is highly unlikely that CFO pay-for-performance sensitivity is not a contribution factor towards the magnitude of abnormal production costs and cash flows a firm would generate through REM. It must be noted, however, that the coefficients were small in size (an example being the coefficient of -0.0097 for CFO Delta and abnormal production costs). Therefore, while the coefficients were in the opposite direction to those stated in the hypothesis and were statistically significant, they were also small in magnitude.

Table 3. 5 CFO pay-for-performance and levels of real earnings management in the "suspect" sample

$$Abn\ REM = k_1 CFO\ Delta + k_2 Delta + k_3 CFO\ Vega + k_4 Vega + k_5 CEO\ Power + k_6 CFO\ Power + k_7 Firm\ Size + k_8 Market\ to\ Book + k_9 StdCashFlow + k_{10} StdSalesGrowth + k_{11} Old\ Firm + k_{12} Leverage + k_{13} StdAnRet + k_{14} Z\ score + K_{15} OpCycle + K_{16} Noa\_Ind$$

OLS Regression on CFO pay-for-performance sensitivity and real earnings management in the "suspect" sample

	Abnormal Discretionary Expenditure	Abnormal Cash Flow	Abnormal Production Cost
CFO Delta	0.0089	0.01097***	-0.0097***
	(0.4481)	(<.0001)	(0.0028)
CEO Delta	-0.0000	0.0000	-0.0019
	(0.8116)	(0.0541)	(0.4743)
CFO Vega	0.0031	-0.00133	-0.0003
	(0.405)	(0.1058)	(0.9185)
CEO Vega	-0.0000	0.0000	-0.0055**
	(0.4545)	(0.3562)	(0.0318)
CEO Power	0.0415	-0.00844	-0.0368
	(0.5799)	(0.6087)	(0.087)
CFO Power	-0.0943**	-0.00552	0.0236**
	(0.0164)	(0.5213)	(0.0197)
Size	0.0031	-0.00314	0.0099***
	(0.7825)	(0.2094)	(0.0001)
Market to Book	-0.0001	0.0001	0.0001
	(0.8642)	(0.1815)	(0.4709)
StdCashFlow	-0.0711	-0.16915	-0.3853***
	(0.8968)	(0.16)	(0.0002)
StdSalesGrowth	0.0212	-0.1186***	0.0704**
	(0.8649)	(<.0001)	(0.0111)
Old	0.0341	0.0108	-0.0162**
	(0.2209)	(0.0794)	(0.0155)
Leverage	0.0082	-0.0720***	-0.0162
	(0.894)	(<.0001)	(0.7063)
StdAnRet	0.0306	-0.0272*	0.0053
	(0.6161)	(0.0501)	(0.7694)
Z Score	-0.0257*	-0.0062*	0.0257***
	(0.0659)	(0.0461)	(<.0001)
Opcycle	0.0083	-0.00179	-0.0232**
	(0.6865)	(0.6934)	(<.0001)
Noa Ind	-0.0001***	0.0000	-0.0000
	(<.0001)	(0.7629)	(0.1614)
N	755	738	694
Adj R^2	0.3982	0.1062	0.1307

Definitions of the variables can be found in the appendix. Abnormal REM can refer to abnormal Discretionary Expenditure, Cash Flow or Production costs

3.5 **Discussion and conclusion**

I show that CFO pay-for-performance sensitivity is negatively associated with the likelihood **of** engaging in REM. I believe this is in line with the literature, which shows evidence for REM as value destroying activity. Furthermore, in the general firm population, CFO pay-for-performance sensitivity is positively associated with abnormal discretionary expenditure. REM is typically associated with a reduction in discretionary expenditure in order to increase earnings in a particular period. REM is also associated with decreased cash flows, usually from the relaxation of credit terms or discount of product prices. However, the results showed that there was a negative relation between abnormal cash flows and CFO pay-for-performance sensitivity. Once again, it seems that pay for performance increases the magnitude of the cash flows a firm generates. This may not be as counterintuitive as the other findings when considering the mechanisms by which cash flow would decrease, would be decisions largely taken by the CEO. Finally, in opposition to earnings increasing REM, firms CFO delta had a negative relationship with abnormal production costs. These relationships continued to hold even when the sample was restricted to those firms that were likely to have engaged in REM to meet earnings targets. Together, these results suggest that CFO pay-for-performance sensitivity is not associated with an increase in the magnitude of REM. Interestingly; CFO power was consistently positively associated with the probability of a firm engaging in REM and the magnitude of individual REM methods. This is in line with previous literature (Baker et al. (2019)) and suggests that pay-for-performance in itself in not a driver for CFOs to engage in REM.

Figure 3. 1 APPENDIX 3

Variables	
Dependent Variables	
REM 1	Cumulative scores abnormal discretionary expenses and abnormal cash flows are sorted into quintiles, with each quintile receiving a score of 1-5. The highest scores are the awarded to the lowest abnormal discretionary expenses and cash flows. This is done as low discretionary expenses and cash flows are evidence of REM. The scores for each variable are summed and scores of 6 are coded as 1 and those, which are not, are 0.
REM 2	Cumulative scores abnormal discretionary expenses and abnormal Production costs are sorted into quintiles. The highest scores are the awarded to the lowest abnormal discretionary expenses and highest production costs. This is done as low discretionary expenses and high production costs are evidence of REM. The scores for each variable are summed and scores of 6 are coded as 1 and those which are not are 0.
Abnormal Discretionary Expenditure	The difference between discretionary expenses of a firm and those predicted by models established in the literature. Discretionary expenses are defined as the summation of R&D, advertising and selling, general and administrative expenditure
Abnormal Cash Flow	Abnormal Operating Cash Flows. The difference between cash flows of a firm and those predicted by models established in the literature. Cash Flows are the difference between operating cash flow and extraordinary items and discontinued operations
Abnormal Production costs	The difference between production costs of a firm and those predicted by models established in the literature. Production costs are inventory change plus cost of goods sold.
Independent Variables	
Delta	The change in the dollar value of the executive's wealth for a one percentage point change in stock price.
Vega	The change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns
CFO Power	Coded as 1 if the CFO was also a member of the board and 0 otherwise
CEO Power	Coded as 1 if the CEO was also the chairman and 0 otherwise
Size	log of total assets
Market to Book	Ratio of market capitalization of the firm and its book value
StdCashFlow	Standard deviation of the cash flows for 5 years
StdSalesGrowth	Standard deviation of the Sales growth for 5 years
Old	Coded as 1 when the firm has been on Compustat for 20 years or more and 0 otherwise
Leverage	total liabilities to total assets ratio
StdAnRet	Standard deviation of the Annual Return for 5 years
Z score	The Altman Z-score is the output of a credit-strength test that gauges a publicly traded manufacturing company's likelihood of bankruptcy. Larger scores mean decreased chance of bankruptcy (more financially healthy)
OpCycle	The log of the past 5 year average of [365/(cog/inventory)+ 365/(sales/accounts receivable)]
Noa Ind	Industry adjusted (shareholders equity - cash and marketable securities + total debt)/$Sale_{t-1}$

CHAPTER 4

4.1 CONCLUSION AND SUMMARY

Broadly speaking, my two essays of the dissertation discuss executive compensation for what are typically the two most senior executives in a corporation, namely the chief executive officer and the chief financial officer. Executive compensation is the subject of much discussion in terms of the broader economy as well as research in the finance and accounting literature. Therefore, both essays contribute to this literature due to the exploration of relationships between non-monetary drivers of executive compensation and the effect of executive compensation on firm level decision-making. Furthermore, my dissertation also presents these relationships with respect to specific types of executive compensation. This will have implications for future financial and accounting research.

In my first essay, I find that CEOs of firms affected by natural disasters have significantly greater value of restricted stock grants but significantly decreased value of options among CEOs in natural disaster counties when compared to those in non-disaster counties. When considering liquidity, option compensation levels are lower for firms with below average liquidity levels but stock compensation is higher for firms with above average liquidity levels. This suggests that the occurrence of natural disasters and liquidity positions of firms, which experienced natural disasters, have an effect on the type and level of compensation a CEO receives. This contributes to the literature by showing a potential and increasingly relevant contribution to the levels and type of CEO compensation.

While much of the financial and accounting literature focuses on the action of the CEO increasing portions of research show that the chief financial officer (CFO) affects decisions made by the firm. Along these lines, I investigated the relationship between Chief Financial Officers

pay-for-performance sensitivity (Delta) and real earnings management. The second essay shows that Delta is negatively associated with a firm's probability of engaging in real earnings management. Furthermore, it is also negatively associated with the levels of earnings inflating abnormal discretionary expenses, abnormal cash flows and abnormal production costs. These results even held when isolating "suspect" firms who used real earnings management and just met earnings targets. The findings may seem counterintuitive but also confirm the significance of CFO power as a key driver towards firm earnings management, in agreement with precious literature by Baker et al (2019). This indicates that the CFO equity compensation is not a key driver towards a firm participating in real earnings management.

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