DOES CEO PAY MATTER?

An analysis of U.S. tech firms

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Yu Xuan Deng

40173189

Abstract

A wide range of literature on CEO pay and firm performance exists, however, there is no agreement on whether performance-based compensation will lead to a higher-performing firm. Context-specific data and information are all factors that affect the results, such as the structure of CEO pay, CEO power, company culture, industry, and time period. (Abowd, 1990; Benmelech et al., 2010; Frydman & Jenter, 2010). This paper provides context specific data and examines whether CEO performance compensation influences performance of firms listed on the S&P 500 index between 2008 and 2018. This paper finds a negative and statistically significant relationship at the 90% level between future firm performance and CEO performance compensation percentage change. However, there is a positive and statistically significant relationship at the 95% level between present firm performance and CEO performance compensation percentage change.

1) Introduction

There is a consensus amongst the general population that performance compensation is an effective method of increasing productivity in the workplace because it incentivizes hard work among employees. Despite the wide range of existing literature on CEO pay and firm performance, there is no general agreement on whether performance-based compensation will lead to a higher-performing firm. A relatively weak, or even negative, correlation exists between CEO compensation and company performance (Bebchuk, Cremers, and Peyer, 2008).

The most promising research on CEO compensation and firm performance examines evidence from the London Stock Exchange. Balafas & Florackis (2013) find that "CEO incentive pay is negatively associated with subsequent short-term returns. Interestingly, firms that pay their CEOs at the bottom of the incentive-pay distribution earn positive abnormal returns and significantly outperform those at the top of the incentive-pay distribution." In summary, Balafas & Florackis finds excessive CEO compensation, as compared to peers, leads to lower returns. Balafas & Florackis' paper's finding is also consistent with Cooper et al.'s research on the U.S. market (2016). Despite the negative relationship, CEO compensation of Standard and Poor's (S&P) 500 companies have been rising since the late 1990s (Bereskin & Cicero, 2012). The counter-intuitive result is rather intriguing given the disincentive for shareholders to raise the CEO's compensation in the face of little added value and the high monetary costs associated. Most of a CEO's compensation package is performance-based, so shareholders must evaluate whether the common belief holds merit and whether lucrative compensation packages for CEOs are worth the investment.

There are currently three major theories behind this phenomenon. The first theory is that market forces beyond shareholders' control directly affect the compensation of CEOs (Kaplan, 2008). The other proposed explanation is the managerial power theory where compensation is higher for CEOs with more power over the pay setting process (Essen et al., 2015). The third view is that CEO compensation may be based on measures that are only observable to the two parties, and the unexplained variation in compensation that are unrelated to economic variables are explained by the future firm returns (Hayes & Shaefer, 2000).

While all three theories are valid and have shown statistically significant results, this paper favors the market theory behind CEO performance pay increases and that excessive pay indicates higher future firm returns. With inflation effects and market trends generally upward trending, it is intuitive CEO compensation will generally rise as well. While CEOs with more power over their pay will undoubtedly pay themselves more, this paper evaluates market trends and general performance pay to performance relationships which includes CEOs with more power and with less power. Specifically, this paper's goal is to evaluate whether performance compensation is used to reward good performance or to incentivize more effort in the future for CEO's with and without power over their pay setting process. There are two main research questions. Does CEO performance compensation have a positive and significant relationship with firm returns? Is performance compensation used to reward good behavior or used to incentivize future performance?

According to the research of Abowd, 1990; Benmelech et al., 2010 and Frydman & Jenter, 2010, context-specific data and information are all factors that affect the results, such as the structure of CEO pay, CEO power, company culture, industry, and period. Since very few studies currently evaluate the relationship between CEO performance compensation and firm simple returns in the US and most importantly, the direction of the effect, this paper fills the gap in the current literature study by analyzing context-specific data and examines whether CEO performance compensation influences the performance of US firms across different industries between 2008 and 2018 and which direction is the effect. Furthermore, this paper also evaluates whether performance compensation is used to reward positive firm returns in the current period. It would be interesting to see whether tech CEOs' performance compensation affects firm returns because it is in the CEO's best interest to take advantage of the speculation in stock prices, so this paper hypothesizes there would be a positive relationship between CEO performance compensation and firm returns. This paper's second hypothesis is that performance compensation is used more to incentivize effort in the future rather than reward for past performance.

Using data from the Wharton Research Data Services (WRDS), Center for Research In Security Prices (CRSP), and Compustat Execucomp database, this paper uses panel data, runs a linear regression, and finds that there is a statistically significant negative correlation between CEO performance compensation percentage change and firm returns for public firms in the U.S. Similar to the results from the London Stock Exchange and the results of Cooper et al. (2016). Specifically, running the multivariate regression of simple returns in percentage at t+1, stock options in millions, stock option percentage change (regressor of interest), salary in thousands, salary percentage change at time t, and market value in millions, with year, sector, and state fixed effects, the coefficient of interest is -0.0127 with a p-value of 0.0937. The result is statistically at the 90% confidence level. However, running the same regression with returns in percentage at time t instead of t+1 the resulting coefficient is 0.0553 with a p-value of 0.000. This result is statistically at the 95% confidence level which suggests that CEO performance compensation is used to reward good past firm performance since year end reviews are normally conducted after firm performance data are released. On the other hand, my results suggest CEO performance compensation is not as effective at supporting firm growth.

Despite the results are statistically significant, this paper does not prove a causal relationship, nor does it attempt to make a causal claim. Due to the limitations in data, and the lack of a well-designed experiment to collect data, it is difficult to make a claim that a change in CEO performance compensation will cause the firm to perform poorly in the future. Furthermore, since this paper uses S&P 500 firms in 2023, there is selection bias in the sample since the dataset only includes successful firms since 2008 and new firms after 2008. Thus, the dataset does not include delisted and bankrupt firms. As a result, the results are likely overestimations of the true values. This paper highlights a statistically significant correlation that should be studied further. Additionally, this paper's findings on the effects of CEO performance compensation on present firm returns are also correlations rather than causal relationships. Further research is needed to evaluate whether performance compensation is used more to reward good present performance rather than to incentivize future effort exertion. It is likely there is a mix between reward for the past and incentive for the future, but the exact mechanics is yet to be determined and the ratio yet to be found. It would be interesting to see which types of firms in which sectors are more likely to reward for past or future behavior of CEOs. To further explore the relationship between CEO incentive, pay and returns, this paper also provides a secondary analysis using returns as the dependent variable and incentive pay as the independent. The secondary analysis results agree and support the primary results as well.

The following data section will provide a comprehensive description of the database used and a description of the data set. Summary statistics will be provided, and a detailed discussion on regressors, controls and the regressor of interest will also be included. Furthermore, data cleaning techniques, selection, and limitations in the data will be discussed. In the empirical methods section, this paper will highlight the empirical methods used, manipulations done to help with comprehension, reasoning behind the chosen variables, limitations with the method, and potential improvements on the regression. This paper will discuss the findings in more detail in the results section. Finally, the conclusion will summarize and conclude this paper.

2) Data

The paper uses panel data from three separate sources. First, a list of U.S. public firms on the S&P 500 and their respective sector is obtained from google sheets S&P 500 listings in 2023. The list contains ticker, company name, and sector information. Next, company data including gvkey, date, year, ticker, company name, calendar year closing price, market value, and state are obtained from the WRDS CRSP/Compustat Merged database under Fundamentals Annual from the period 1950 to 2018; the maximum available data timeframe excluding pandemic effects. The gvkey is an company identifier used to merge the datasets, the date is the formatted dd/mm/yyyy to identify the time of each closing price, year is extrapolated from date, company name is the full name of each company represented, calendar year closing price is the closing price of each listed company on December 31 of each year, and state is the registered location of the company. Finally, company CEO executive information like, the CEO code, base salary, stock option value, gvkey, year, date became CEO, date left as CEO, title, executive last name, executive first name, gender, and company ticker data are retrieved from Compustat Execucomp Annual Compensation from the period 1992 to 2018; the maximum available data timeframe excluding pandemic effects. The CEO code is a unique identifier that matches historical and present CEO's with their respective firms, base salary is in thousands, stock option and awards in millions are values using the grant date fair value of the reward, and year is the index.

After the data are downloaded, they are imported into python and merged together keeping all CEO salary information and dropping the unmatched records. State IDs are given in alphabetical order, then the data frame was filtered so only observations related to the incumbent CEO of the observation date were kept the rest was dropped. Company returns data are calculated as simple future returns, where 2018 returns are calculated as (2018 price close – 2017 price close)/(2017 price close) for each observation. Change in CEO salary and stock options are also calculated in the same manner. Next, salary, stock options, returns, salary percentage change, and stock percentage change are scaled to hundred thousand, million, percentage point, percentage point, and percentage point respectively. Finally, observations with more than 1000% change in base salary or stock option change are dropped.

There are some limitations to the dataset. This paper uses S&P 500 firms in 2023, since there is little historical data on S&P 500 firms in 2008. Ideally, the firms used in the analysis are also time series data so all companies including delisted and bankrupt companies are included too. As a result of this limitation there is selection bias in the sample since the dataset only includes successful firms since 2008 and new firms after 2008. Thus, the dataset does not include delisted and bankrupt firms. As a result, the final values are likely overestimations of the true values since only good performing firms are included.

After data cleaning, in the sample, as seen in Figure I and II in the Appendix, there is information on 409 companies from 38 different states in 11 different sectors with their respective CEOS over 10-year span from 2008 to 2018. The missing 91 companies from the 500 companies are likely due to using historical data as the list of 500 companies is constantly changing.

Table I in the Appendix shows the following information. The mean base salary is $1.1 million, with a standard deviation of $463,00. The highest and lowest salaries are $5.6 million and $0, respectively. The mean return is 10.49%, with a standard deviation of 51.47%. The minimum and maximum returns are -99.92% and 1809.55%, respectively. The main regressor of interest is STOCK_%_CHANGE (stock option percentage change), the second regressor of interest is STOCK in millions, and the dependent variable will be RETURNS in percent. SALARY (base salary in hundred thousand), SALARY_%_CHANGE (base salary percentage change), and MARKET VALUE (market cap in millions) are included as controls for the regression. Year, State, and Sector fixed effects are also controlled for in the regression. This study will have a statement about correlation and will attempt to reach a causal statement through using time series data to determine the sequence of events. Analyzing the relationship between change in stock options and firm returns in different periods will show the direction of the effect.

3) Empirical Methods

The empirical method this paper uses is a combination of the empirical methods used in Cooper et al. 2016, Bebchuk et al. 2008, and Armstrong et al. 2021. OLS regressions with critical p-values set at 0.1, 0.05, and 0.01 are used in this paper. This paper uses salary and stock options as the main regressors of interest as seen in Cooper et al. Additionally, similar to Bebchuk et al and Armstrong et al. Year fixed effects were included to account for annual market swings and other macro-level economic affects. State and sector fixed effects are added in this paper to control legislative differences across the different states and industry differences across the different sectors. Firm size is also controlled in this paper using MARKET_VALUE in millions as a control variable. The unique feature for this paper is the analysis of the percentage change in stock option awards and salary and the effects of this on returns of different periods. In the following equations, STOCK was scaled from dividing STOCK_OPTIONS by 1000 so the units will be in millions, SALARY were scaled from dividing SALARY by 100 so the units would be in hundred thousand. The other percentages such as RETURNS, STOCK_%_CHANGE, and SALARY_%_CHANGE were multiplied by 100 to get percentage points instead of decimals. The scaling was done to increase the interpretability of the coefficients. Otherwise, the coefficients are too small to understand intuitively. Equation (1) below is the main OLS regression this paper will run to find the relationship between performance pay and firm returns.

(1) $$RETURNS_{i,t+1} = \alpha + \beta STOCK\_\%\_CHANGE_{i,t} + \gamma STOCK_{i,t} + \delta SALARY_{i,t} + \theta SALARY\_\%\_CHANGE_{i,t} + \mu MARKET\_VALUE_{i,t} + \sum_{2008}^{2018} \varphi YEAR_i + \sum_{1}^{38} \omega STATEID_i + \sum_{1}^{11} \sigma SECTOR\_CODE_i + \varepsilon_{i,t}$$

In theory, if shareholders attempt to incentivize CEOs to work hard in the next period and there is a positive correlation between performance pay and firm returns, the expected result of γ should be positive as stock option increases in the current year will lead to increases in firm return the next year. Running a slightly different regression as seen in equation (2), if shareholders attempt to reward CEOs hard work for the current period and there is a positive correlation between performance pay and firm returns, the expected result of γ should be positive since shareholders will increase CEO stock options based on positive firm returns this year.

(2) $$RETURNS_{i,t} = \alpha + \beta STOCK\_\%\_CHANGE_{i,t} + \gamma STOCK_{i,t} + \delta SALARY_{i,t} + \theta SALARY\_\%\_CHANGE_{i,t} + \mu MARKET\_VALUE_{i,t} + \sum_{2008}^{2018} \varphi YEAR_i + \sum_{1}^{38} \omega STATEID_i + \sum_{1}^{11} \sigma SECTOR\_CODE_i + \varepsilon_{i,t}$$

Comparing the results of both regressions will answer the research question initially asked. Whether performance compensation of CEOs will increase firm returns, and whether it is used to reward past efforts. In contrast to previous literature that uses CAPM models to calculate firm returns, this paper uses simple returns calculated from the firm's end of year closing prices. Based on the assumption that CEO's generally do not invest capital into their respective public companies, they would not be considered as investors, so their net worth is based on firm's simple price difference returns rather than based on risk adjusted excessive market returns.

For each regression equation (1), and (2), this paper also includes 3 additional models to evaluate the omitted variable bias of STOCK_%_CHANGE. For simplicity, fixed effects in equations (1) and (2) are not written out in the following models but are included in the regression.

$$i)\ RETURNS = \alpha + \beta STOCK\_\%\_CHANGE_{i,t} + \varepsilon_{i,t}$$

$$ii)\ RETURNS = \alpha + \beta STOCK\_\%CHANGE_{i,t} + \gamma STOCK_{i,t} + \varepsilon_{i,t}$$

$$iii)\ RETURNS = \alpha + \beta STOCK\_\%\_CHANGE_{i,t} + \gamma STOCK_{i,t} + \delta SALARY_{i,t} + \varepsilon_{i,t}$$

$$iv)\ RETURNS = \alpha + \beta STOCK\_\%\_CHANGE_{i,t} + \gamma STOCK_{i,t} + \delta SALARY_{i,t} + \theta SALARY\_\%\_CHANGE_{i,t}$$

$$v)\ RETURNS = \alpha + \beta STOCK\_\%\_CHANGE_{i,t} + \gamma STOCK_{i,t} + \delta SALARY_{i,t} + \theta SALARY\_\%\_CHANGE_{i,t} + \mu MARKET\_VALUE_{i,t}$$

If the omitted variable bias is positive, it would likely mean the regression reported in this paper is underestimating the true effects of performance compensation on firm returns while if the omitted variable bias is negative, it would likely mean the regression reported is overestimating the true effects of performance compensation on firm returns. Subtracting subsequent γ values will give the OVB values.

To explore the effects of RETURNS on STOCK_%_CHANGE, secondary regressions are run to determine if the results would be different than the primary regressions. The only modification to equations (1), (2), i), ii), iii), iv), and v) was writing RETURNS on the right-hand side and writing STOCK_%_CHANGE on the left-hand side. Otherwise, the regressions are identical. The hope and aim are for the primary and secondary regression results to be similar and of the same direction.

There are some limitations to the empirical method used here. Additional control variables and fixed effects could be included to further the accuracy of the results. Ideally, firm level fixed effects could be included as seen in Bebchuk et al. (2008), and controlling for firm size by number of employees and sales would be desirable. Adding interaction terms between STOCK_%_CHANGE and every sector would be interesting to see since it would show which sectors are performance compensation more effective at raising firm returns. Future research could then ask why performance compensation is more effective at raising firm returns in some sectors than others.

4) Results

Running regression (1), attempts to answer the first research question: Does CEO performance compensation have a positive and significant relationship with firm returns? From the Appendix, Table II, Model I onwards, the coefficient on STOCK_%_CHANGE is negative. All the coefficients on STOCK_%_CHANGE are significant at the 90% level, hence the null hypothesis is rejected. This result confirms the findings of Cooper et al. (2016), Bebchuk et al. (2008), Benmelch et al. (2010), and Balafas & Florackis (2013). This counterintuitive result is rather interesting because it suggests CEO performance compensation is fundamentally different than regular employee performance compensation. There is extensive literature that proves performance compensation for employees leads to higher employee productivity. However, it is evident this does not apply to CEOs of publicly traded firms in the US. It is likely CEOs with higher stock compensation exert costly effort to raise stock prices of their firms but ultimately at the sacrifice of firm performance. Another explanation is that CEOs who are paid higher stock options take on more risky behavior (Armstrong et al., 2021) which also aligns with the previous explanation. It is interesting to note that the level of performance compensation does not have a significant relationship with firm returns, however the level of base salary does. Base salary is also negatively correlated with firm returns in the future.

Regression (2) attempts to answer the second research question: Is performance compensation used to reward good behavior or used to incentivize future performance? As seen in Appendix, Table III, Model I onwards, the coefficient on STOCK_%_CHANGE is positive and becoming more neutral. All the coefficients on STOCK_%_CHANGE are significant at the 99% level, hence the null hypothesis is rejected. From the regression it suggests stock options are used to reward CEOs for good firm performance in the current period. Since most public firms have a shareholder meeting at the end of each fiscal year to discuss firm performances and have reviews, it is most likely the returns of the firm in the current period affects the stock compensation of the CEO.

Running secondary modified regressions, as seen in Appendix, Table II A, the coefficients on RETURNS are all negative and significant at the 90% level. With market value control, the negative relationship becomes stronger and is significant at the 95% level. This result confirms the main regression in Table II and indicates there is indeed a negative relationship. Model V in Table II A may indicate the effects of RETURNS on STOCK_%_CHANGE is stronger than the effects of STOCK_%_CHANGE on RETURNS. In all models, the results are statistically significant at the 99% level.

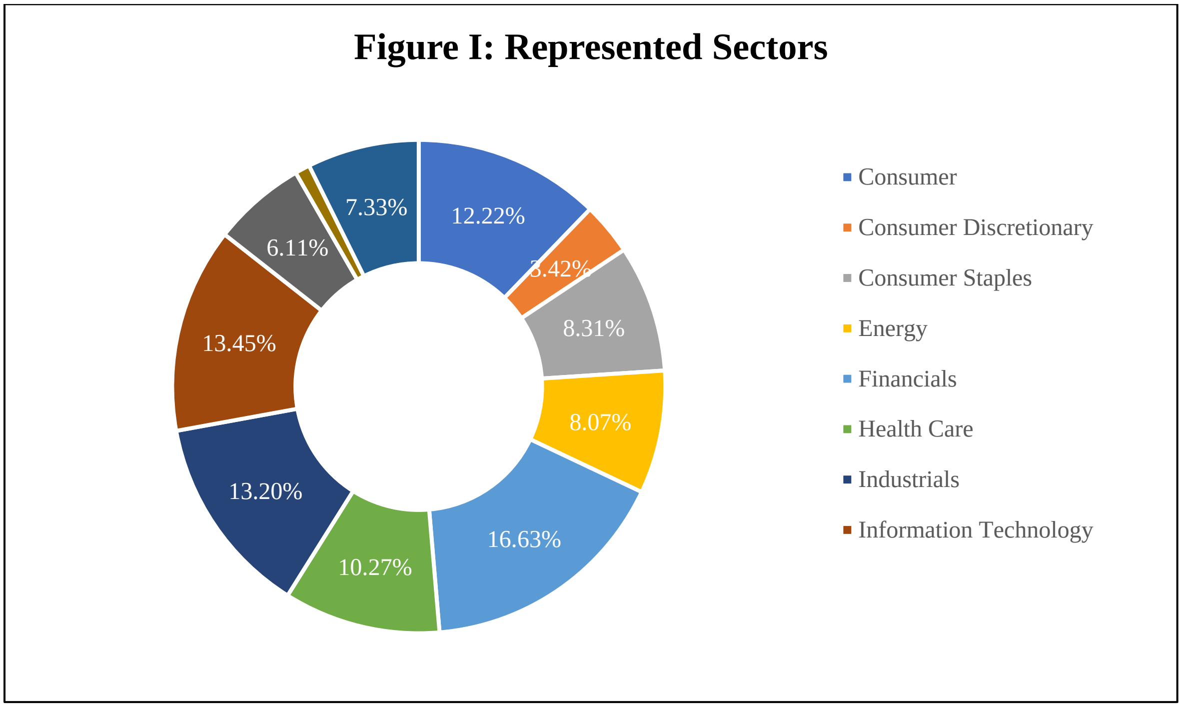
The modified secondary regressions in Appendix, Table III A show similar results to Table III. Namely, all the coefficients are positive and statistically significant at the 99% level. What is more interesting is the coefficients of RETURNS on STOCK_%_CHANGE is bigger than the coefficients of STOCK_%_CHANGE on RETURNS which suggests RETURNS has a bigger effect on STOCK_%_CHANGE. Which is a better indication for this paper's hypothesis is that in the current period, performance compensation is used to reward good performance.

The results from Table II and Table II A agree and make intuitive sense and confirm the hypothesis at the beginning that higher firm stock returns in the current period will lead to getting paid more stock compensation in the current period. However, in contrast to the hypothesis that higher performance compensation in the current period will lead to higher firm returns in the next period, the relationship is in fact negative. The results from Table III and Table III A show a negative and statistically significant result. Despite the results, it is unclear how non-observable and intrinsic firm values will be affected in the future through raising CEO performance compensation. Furthermore, due to selection bias in the data set from including only successful companies, the results may be overinflated. It is also unclear whether the long-term consequences of maximizing stock returns are positive or negative. In agreement with most of the previous literature, these results indicate that firm returns are negatively correlated with CEO performance pay. This paper attempts to make a causal statement through time delayed effects of performance pay and firm returns. However, it is difficult to make claims with certainty about both the proximal and distal causes of why there is a negative relationship between CEO performance pay and firm returns in contrast to employees' productivity which is positively correlated with performance pay. Nonetheless, this paper's second research question and result follows intuition. Despite the unintuitive result from the first research question, this paper could provide insight into whether CEO performance pay is adequate but also raises the question of whether CEOs should be paid less since it is clear there is minimal benefits to raising performance pay for CEOs of the S&P 500. The results does support the market theory behind CEO pay since if there is no clear ROI for the shareholders to invest in the CEO, then the rise in CEO pay is likely the result of macro market forces. Similar to the ratcheting effect of the minimum wage (Kaur, 2019), CEOs in general as compared to villagers have even more negotiation power over their wage thus their market wage is expected to raise higher than the prevailing rises in market wages.

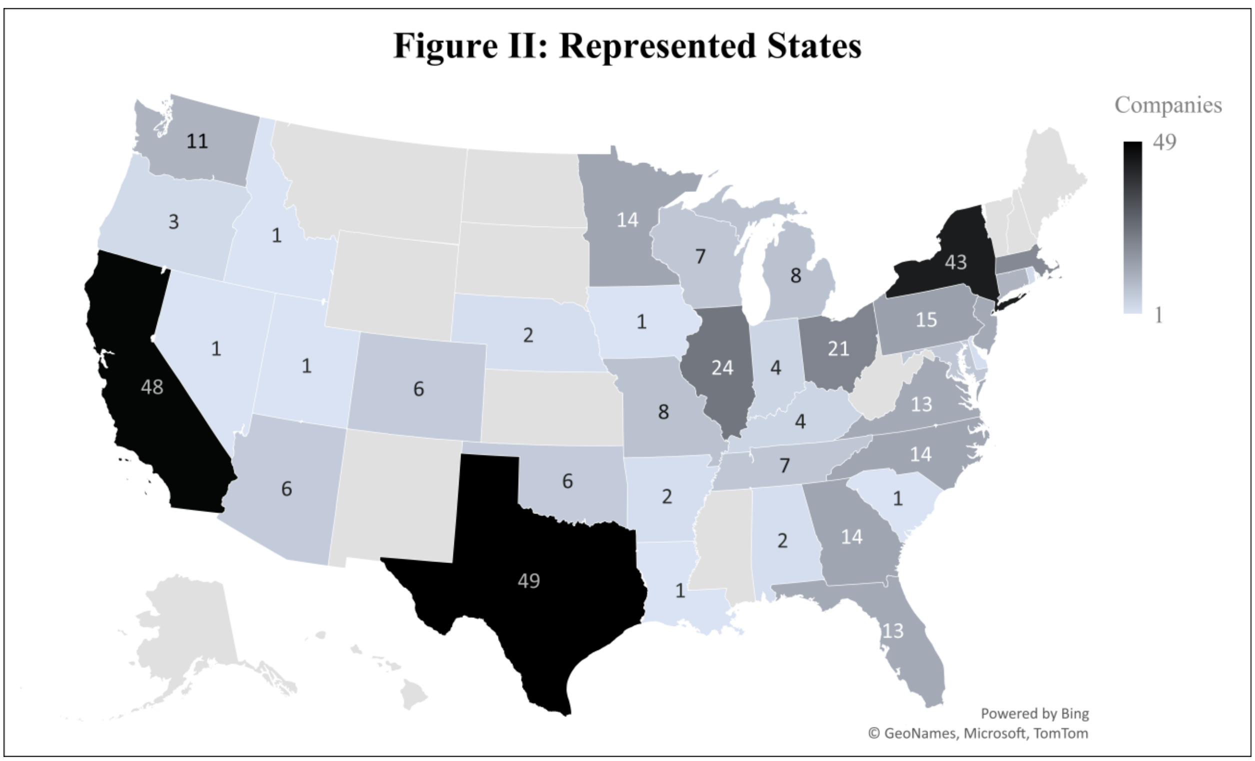
5) Conclusion

This paper provides context-specific information and analyzes whether there is a correlation between CEO performance compensation and firm returns of public U.S. firms in the S&P 500 index. Using panel data from 2008 to 2018, this paper finds a negative relationship between CEO performance pay percentage change and future firm returns and finds there is no significant relationship between stock option level pay and firm returns. This result aligns with current literature, and most notably it confirms the findings of Cooper et al. (2016), Bebchuk et al. (2008), Benmelch et al. (2010), and Balafas & Florackis (2013). This paper contributes to the current literature by highlighting there is a statistically significant relationship between CEO performance pay percent change and current firm returns. The result aligns with the theory that stock options are used to reward CEOs for good firm performance in the current period. Since most public firms have a shareholder meeting at the end of each fiscal year. Whether both results have a causal interpretation and whether simple firm return is an appropriate proxy for a firm's long-run performance is unclear. Furthermore, unobservable firm values that affect long-term performance are not accounted for in this paper; hence it is unclear whether negative returns are necessarily bad for the firm. Further research in this area could control for firm level fixed effects, and also use the CAPM model in addition with simple firm returns to evaluate the effects of CEO performance compensation. Additionally, including interaction terms of stock option percentage change with each sector in the S&P 500 could show which sectors are most affected by stock option compensation. Due to the limitations of the dataset used in this paper and the selection bias of using firms in 2023 rather than 2008, it would be more accurate to design an experiment and randomly select 5 to 10 firms in the S&P 500 within each sector and track the performance of the firms over the course of 10 to 20 years. Using the randomized control trial method to evaluate the effects of CEO performance pay and future firm returns is the best method to accurately determine whether performance pay for CEOs is worth the investment. Despite the limitations of this paper, it nonetheless highlights the general effects of performance pay on CEO's decisions and hopes to assist future researchers in designing causal experiments to conduct.

6) Appendix



Notes: There are 11 sectors total with 409 companies of the S&P 500 represented.



Notes: There are 38 states total with 409 companies of the S&P 500 represented with the number of companies in each state numbered. Darker means more companies in the state.

Table I: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	N
RETURNS (Percent)	10.49	51.47	-99.92	1809.55	3836
STOCK_%_CHANGE	13.34	60.40	-123.47	792.85	4025
STOCK (Millions)	11.96	8.40	-3.04	112.46	4025
SALARY (Hundred Thousands)	11.27	4.63	0.00	56.00	4025
SALARY_%_CHANGE	4.14	27.12	-100.00	820.00	4025
MARKET_VALUE (Millions)	149.9946	3119.973	242.6754	1073391	4025
YEAR			2007	2018	4025
STATEID			1	38	4025
SECTOR_CODE			1	11	4025

Source: WRDS CRSP 1950-2018, Compustat Execucomp 1992-2018, S&P 500 Index Google Sheets 2023.

Notes: Stock options and awards are valued using the grant date fair value of the award. Salary is measured as fiscal year end base salary. Year end is measured as calendar year end. Returns are calculated as simple returns then multiplied by 100 to get percentage points. The datapoints range from 2008 to 2018 to avoid pandemic effects and due to dataset limitations. There are a total of 38 states of which the S&P 500 companies are located in. There are a total of 11 sectors of which the companies are in. Market value is calculated as number of shares outstanding multipiled by the year end closing price per share also known as market cap.

Table II: OLS Main Regression Results

Independent Variable	Returns$_{t+1}$				
	Model I	Model II	Model III	Model IV	Model V
STOCK_%_CHANGE	-0.0127*	-0.0527*	-0.0256*	-0.0316*	-0.0137**
	(0.0937)	(0.0765)	(0.0884)	(0.0859)	(0.0486)
STOCK (Millions)		-0.125	-0.0375	-0.0419	-0.0485
		(0.273)	(0.740)	(0.720)	(0.700)
SALARY (Hundred Thousands)			-0.353**	-0.338*	-0.307*
			(0.044)	(0.051)	(0.097)
SALARY_%_CHANGE				-0.00703	0.00616
				(0.835)	(0.852)
MARKET_VALUE (Millions)					-0.000000889
					(0.941)
Constant	-40.84***	-39.63***	-36.51***	-36.62***	-35.87***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.122	0.122	0.123	0.122	0.133
Sample Size	3836	3834	3834	3834	3620
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes

p-values in parentheses

* p<0.1 ** p<0.05 *** p<0.01

Source: WRDS CRSP 1950-2018, Compustat Execucomp 1992-2018, S&P 500 Index Google Sheets 2023.

Note: Returns are at time t+1 while other dependent variables are at time t. The regression uses robust standard errors and adjusted R squared. The units for % change variables like STOCK and SALARY are percentage points.

Table III: OLS Regression Results

Independent Variable	$Returns_t$				
	Model I	Model II	Model III	Model IV	Model V
STOCK_%_CHANGE	0.0553***	0.0546***	0.0530***	0.0507***	0.0518***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STOCK (Millions)		0.0171	0.0714	0.0882	0.0669
		(0.800)	(0.355)	(0.254)	(0.413)
SALARY (Hundred Thousands)			-0.221	-0.281	-0.433**
			(0.145)	(0.053)	(0.007)
SALARY_%_CHANGE				0.0272	0.0329
				(0.386)	(0.323)
MARKET_VALUE (Millions)					0.0000215**
					(0.027)
Constant	1.738	1.577	3.565	4.002	5.611
	(0.828)	(0.845)	(0.665)	(0.625)	(0.498)
R^2	0.253	0.253	0.253	0.253	0.253
Sample Size	4025	4023	4023	4023	3797
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes

p-values in parentheses

* p<0.1 ** p<0.05 *** p<0.01

Source: WRDS CRSP 1950-2018, Compustat Execucomp 1992-2018, S&P 500 Index Google Sheets 2023.

Note: Returns are at time t in the same period as other dependent variables. The regression uses robust standard errors and adjusted R squared. The units for % change variables like STOCK and SALARY are percentage points.

Table II A: Secondary OLS Regression Effects of Returns on Stock Options

Independent Variable	STOCK_%_CHANGE				
	Model I	Model II	Model III	Model IV	Model V
RETURNS (Period t+1)	-0.02*	-0.0782*	-0.0376*	-0.0446*	-0.195**
	(0.0935)	(0.0745)	(0.0879)	(0.0852)	(0.0372)
STOCK (Millions)		1.859***	2.313***	2.486***	2.522***
		(0.000)	(0.000)	(0.000)	(0.000)
SALARY (Hundred Thousands)			-1.950***	-2.756***	-2.438***
			(0.000)	(0.000)	(0.000)
SALARY_%_CHANGE				0.409***	0.384***
				(0.000)	(0.000)
MARKET_VALUE (Millions)					-0.0000698***
					(0.000)
Constant	18.81	-0.201	16.84	22.25**	22.20**
	(0.101)	(0.986)	(0.142)	(0.040)	(0.042)
R^2	0.122	0.122	0.123	0.122	0.133
Sample Size	3836	3834	3834	3834	3620
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes

p-values in parentheses
* p<0.1 ** p<0.05 *** p<0.01

Source: WRDS CRSP 1950-2018, Compustat Execucomp 1992-2018, S&P 500 Index Google Sheets 2023.
Note: Returns are at time t+1 while other dependent variables are at time t. The independent variable is also at time t. The regression uses robust standard errors and adjusted R squared. The units for % change variables like STOCK and SALARY are percentage points.

Table III A : Secondary OLS Regression Effects of Returns on Stock Options

Independent Variable	STOCK_%_CHANGE				
	Model I	Model II	Model III	Model IV	Model V
RETURNS (Period t)	0.164***	0.152***	0.146***	0.134***	0.128***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STOCK (Millions)		1.856***	2.275***	2.449***	2.470***
		(0.000)	(0.000)	(0.000)	(0.000)
SALARY (Hundred Thousands)			-1.804***	-2.650***	-2.331***
			(0.000)	(0.000)	(0.000)
SALARY_%_CHANGE				0.408***	0.383***
				(0.000)	(0.000)
MARKET_VALUE (Millions)					-0.0000637***
					(0.001)
Constant	17.56*	-2.039	14.24	20.32**	19.96*
	(0.098)	(0.846)	(0.182)	(0.045)	(0.053)
R^2	0.017	0.076	0.088	0.120	0.126
Sample Size	4025	4023	4023	4023	3797
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes

p-values in parentheses
* p<0.1 ** p<0.05 *** p<0.01

Source: WRDS CRSP 1950-2018, Compustat Execucomp 1992-2018, S&P 500 Index Google Sheets 2023.

Note: Returns are at time t in the same period as other dependent variables and the independent variable. The regression uses robust standard errors and adjusted R squared. The units for % change variables like STOCK and SALARY are percentage points.

Table IV: Companies In Each Sector

Sector	ID	Count
Consumer	1	50
Consumer Discretionary	2	14
Consumer Staples	3	34
Energy	4	33
Financials	5	68
Health Care	6	42
Industrials	7	54
Information Technology	8	55
Materials	9	25
Telecommunications Services	10	4
Utilities	11	30
Total		409

Notes: Sectors are separated and labeled by the S&P 500 index. 91 companies are removed from the 500 index due to the dataset only going from 2008 to 2018 while the company data is from 2023

Table V: Companies In Each State

State	ID	Count
AL	1	2
AR	2	2
AZ	3	6
CA	4	48
CO	5	6
CT	6	11
DC	7	3
DE	8	2
FL	9	13
GA	10	14
IA	11	1
ID	12	1
IL	13	24
IN	14	4
KY	15	4
LA	16	1
MA	17	20
MD	18	7
MI	19	8
MN	20	14
MO	21	8
NC	22	14
NE	23	2
NJ	24	13
NV	25	1
NY	26	43
OH	27	21
OK	28	6
OR	29	3
PA	30	15
RI	31	3
SC	32	1
TN	33	7
TX	34	49
UT	35	1
VA	36	13
WA	37	11
WI	38	7
Total		409

Notes: Not all states are represented since not every state has a company on the S&P 500 index. 91 companies are removed from the 500 index due to the dataset only going from 2008 to 2018 while the company data is from 2023.

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