DOES CEO PAY MATTER?

An analysis of U.S. tech firms

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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 between future firm performance and CEO performance compensation percentage change. However, there is a positive and statistically significant relationship 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, and salary percentage change at time t, with year, sector, and state fixed effects, the coefficient of interest is -0.025 with a p-value of 0.039. The result is statistically at the 95% confidence level. However, running the same regression with returns in percentage at time t instead of t+1 the resulting coefficient is 0.0378 with a p-value of 0.000. This result is also statistically at the 95%

confidence level which indicates that CEO performance compensation is used to reward good past firm performance while it is not 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. 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.

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

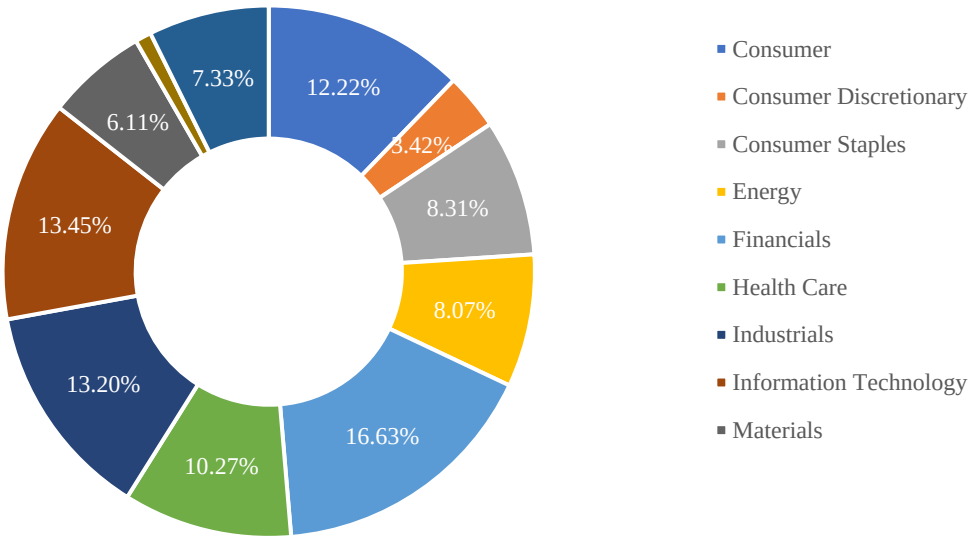
The paper uses panel data from three separate sources. First, a list of U.S. public firms on the S&P 500 and their respective sector is obtained from google sheets S&P 500 listings in 2023. The list contains ticker, company name, and sector information. Next, company data including gvkey, date, year, ticker, company name, calendar year closing price, 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.

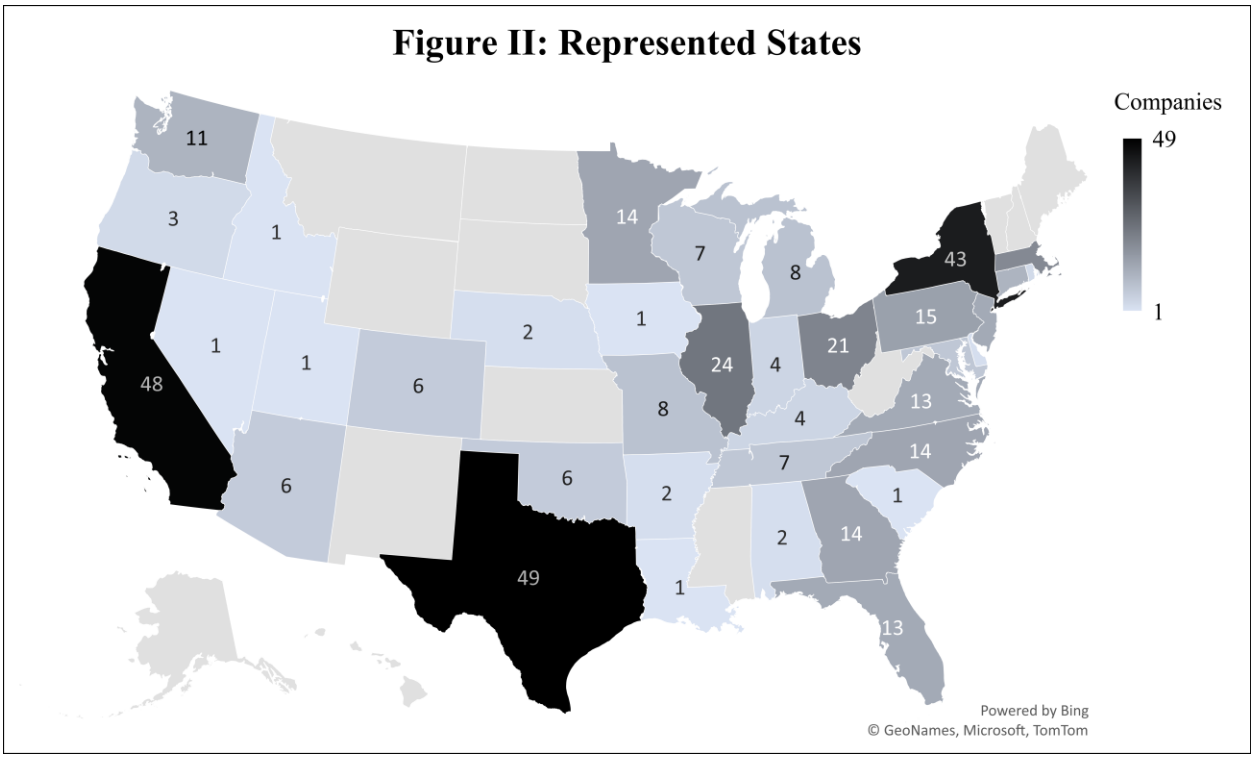
After data cleaning, in the sample, as seen in figure I and II, there is information on 409 companies from 38 different states in 11 different sectors with their respective CEOS over 10-year span from 2008 to 2018. The missing 91 companies from the 500 companies are likely due to using historical data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

Figure I: Represented Sectors



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

Figure II: Represented States



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 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 9.21%, with a standard deviation of 40.39%. The minimum and maximum returns are -99.92% and 532.94%, respectively. The main regressor of interest is STO_CH_PER (stock option percentage change), the second regressor of interest is STOCKOPT_MIL, and the dependent variable will be returns. SALARY_THOU (base salary in hundred thousands), SAL_CH_PER (base salary percentage change) 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.

Table I: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	N
RETURNS (Percent)	9.21	40.39	-99.92	532.94	4020
STOCKOPT_MIL (Millions)	11.96	8.40	-3.04	112.46	4020
STO_CH_PER (Percent Change)	13.87	63.02	-123.47	857.67	4020
SALARY_THOU (Thousands)	11.27	4.63	0.00	56.00	4020
SAL_CH_PER (Percent Change)	4.14	27.12	-100.00	820.00	4020
YEAR			2007	2018	4020
STATEID			1	38	4020
SECTOR_CODE			1	11	4020

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. Returns are calculated as simple returns then multiplied by 100 to get percentage points. The merged datapoints range from 2008 to 2018 to avoid pandemic effects. 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.

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. 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_OPT_MIL was scaled from dividing STOCKOPT by 1000 so the units will be in millions, SALARY_THOU were scaled from dividing SALARY by 100 so the units would be in hundred thousand. The other percentages such as RETURNS, STO_CH_PER, and SAL_CH_PER 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) $$RETURNS_{i,t+1} = \alpha + \beta STOCKOPT\_MIL_{i,t} + \gamma STO\_CH\_PER_{i,t} + \delta SALARY\_THOU_{i,t} + \theta SAL\_CH\_PER_{i,t} + \sum_{2008}^{2018} \varphi YEAR_i + \sum_{1}^{38} \omega STATEID_i + \sum_{1}^{11} \sigma SECTOR\_CODE_i + \varepsilon_{i,t}$$

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) $$RETURNS_{i,t} = \alpha + \beta STOCKOPT\_MIL_{i,t} + \gamma STO\_CH\_PER_{i,t} + \delta SALARY\_THOU_{i,t} + \theta SAL\_CH\_PER_{i,t} + \sum_{2008}^{2018} \varphi YEAR_i + \sum_{1}^{38} \omega STATEID_i + \sum_{1}^{11} \sigma SECTOR\_CODE_i + \varepsilon_{i,t}$$

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 STO_CH_PER. For simplicity, fixed effects in equations (1) and (2) are not written out in the following models but are included in the regression.

$$i)\ RETURNS = \alpha + \beta STOCKOPT\_MIL_{i,t} + \varepsilon_{i,t}$$
$$ii)\ RETURNS = \alpha + \beta STOCKOPT\_MIL_{i,t} + \gamma STO\_CH\_PER_{i,t} + \varepsilon_{i,t}$$
$$iii)\ RETURNS = \alpha + \beta STOCKOPT\_MIL_{i,t} + \gamma STO\_CH\_PER_{i,t} + \delta SALARY\_THOU_{i,t} + \varepsilon_{i,t}$$

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.

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 STO_CH_PER 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?

Table II: OLS Main Regression Results

Independent Variable	$Returns_{t+1}$			
	Model I	Model II	Model III	Model IV
STOCKOPT_MIL	-0.144	-0.110	-0.00214	-0.000123
	(0.126)	(0.235)	(0.983)	(0.999)
STO_CH_PER		-0.0185*	-0.0213**	-0.0215**
		(0.076)	(0.045)	(0.039)
SALARY_THOU			-0.439**	-0.446**
			(0.015)	(0.019)
SAL_CH_PER				0.00328
				(0.940)
Constant	-37.80***	-37.90***	-34.19***	-34.14***
	(0.000)	(0.000)	(0.001)	(0.001)
R^2	0.126	0.126	0.127	0.127
Sample Size	3829	3829	3829	3829
Year Fixed Effects	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes

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

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.

From Table II, Model II onwards, the coefficient on STO_CH_PER is negative and becoming more negative. All the coefficients on STO_CH_PER are significant at the 95% level, hence the null hypothesis is rejected. The omitted variable bias is negative indicating that the regression is likely underestimating the true effects of percentage change in stock compensation and firm returns. If more confounders are accounted for, the negative relationship will likely deepen. 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 lead 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?

Table III: OLS Regression Results

Independent Variable	$Returns_t$			
	Model I	Model II	Model III	Model IV
STOCKOPT_MIL	0.0728	-0.00452	0.0473	0.0721
	(0.268)	(0.946)	(0.534)	(0.354)
STO_CH_PER		0.0431***	0.0419***	0.0378***
		(0.000)	(0.000)	(0.000)
SALARY_THOU			-0.210	-0.293*
			(0.166)	(0.053)
SAL_CH_PER				0.0356
				(0.350)
Constant	4.359	4.585	6.404	7.070
	(0.593)	(0.570)	(0.436)	(0.390)
R^2	0.254	0.258	0.259	0.259
Sample Size	4020	4020	4020	4020
Year Fixed Effects	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes

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

Note: Returns are at time t in the same period as other dependent variables. The regression uses robust standard errors and adjusted R squared.

As seen in Table III, Model II onwards, the coefficient on STO_CH_PER is positive and becoming more neutral. All the coefficients on STO_CH_PER are significant at the 99% level, hence the null hypothesis is rejected. The omitted variable bias is negative indicating that the regression is likely underestimating the true effects of percentage change in stock compensation and firm returns in the same period. If more confounders are accounted for, the positive relationship will likely lower. From the regression it is clear 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 rather STO_CH_PER affecting RETURNS.

The results 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 show a negative and statistically significant result. Despite the results, is unclear how non-observable and intrinsic firm values will be affected in the future through raising CEO performance compensation. It is also unclear whether the long-term consequences of maximizing stock returns are positive or negative. In agreement with the majority of 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, 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

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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