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Stock-based compensation and performance – does compensation that leans more toward executives create better ROE performance?

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Abstract. While executives are often seen as the centre of corporate governance, making important decisions, impacting firm operations, they are often compensated generously by stock-based compensation. The cost of compensating them is significant and material. At the same time, whether such high compensation is worthwhile is questionable, especially when the compensation is unequally high compared to that of ordinary employees. This study examines the impact of stock-based compensation disparity between executives and average employees on firm performance. Utilizing data from publicly traded North American firms between 2015 and 2019 from Compustat's Fundamental Annual and Execucomp, this paper applies statistical methodologies to analyze the causality between compensation structure and Return on Equity (ROE). This paper provides insights into the effectiveness of compensation strategies by developing a model that projects firm performance based on the CEO-to-employee stock-based compensation ratio. The findings indicate a statistically significant relationship between compensation disparity and firm performance, with a positive correlation suggesting that higher CEO compensation relative to employees may contribute to improved ROE. Along with the model, this study highlights the importance of understanding compensation structures in optimizing firm outcomes.

1 Introduction

Executives are the core of corporate governance. They design strategies, make decisions, and are expected to lead firms to success. Executive characteristics are associated with firm performance in various aspects [1], like ESG performance, financial performance [2], etc. The significance of executives is widely recognized; as a result, a pay disparity exists between executives and average employees. For instance, the average disparity was 290.3 times in the United States in 2023 [3]. Therefore, the cost of having executives is significant and material, considering the compensation must be competitive enough to attract good-quality human resources. The reasonableness of the disparity comes into doubt when the question of whether more unequally paid firms perform better arises. Pay, on the one hand, can be double-edged. Better pay can lead to better performance, and vice versa. However,

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stock-based compensation is usually awarded before corresponding firm performance is examined, and causality is more observable.

This paper uses statistical methodology to draw a comprehensive conclusion regarding the correlation between the disparity in stock-based compensation between executives and average employees and firm performance. Comprehensiveness is achieved by focusing on observations from North America and including all publicly traded firms within the given geography. At the same time, a model will be created that can potentially be used to project a firm's Return on Equity by simply using the CEO to employee stock-based compensation ratio. The paper intends to give shareholders and industries insights into reconsidering the approach to achieving firm success by compensating executives and restructuring the overall perception of the correlation between firm performance and executive governance.

The paper will examine the theoretical backgrounds, provide theories and assumptions concerning the topic, and then make assumptions and hypotheses to set the tone for the following analysis. The hypothesis will concern whether firm performance is affected by the wedge between stock-based compensation for ordinary employees and executives. The regression model will be introduced, and a descriptive and predictive analysis of the model will be discussed. Finally, the paper will conclude with compensation disparity and ROE performance and further discuss the implications of the results.

2 Theoretical backgrounds

Compensation is remuneration for employees' performance and contributions to the firm [4]. Its significance is material in two ways. One is performance-based compensation, of which stock-based compensation is a classic example, which motivates employees to improve efficiency and dedicate more productive work to the firm, enabling it to perform better regarding the stock price. At the same time, lucrative stock-based compensation attracts better-skilled human resources into the company [5]. On the other hand, stock-based compensation represents substantial spending for firms. It presents users of financial reports with threats to quality financial reporting, as it provides incentives for unfaithful representation of a firm's financial substance. The materiality lies in the fact that shareholders expect management to be present and effective in balancing the benefits and risks associated with such compensation. In other words, the corresponding increase in firm performance should justify the reasonableness of the compensation amount intended to be remunerated [5].

Among stock-based compensation, compensation to executives, who are a firm's top management, is usually the most material.

The issue's significance comes from three theories: agency theory, stewardship theory [6] and resource dependence theory [5]. Agency theory distinguishes between ownership and leadership in firms, where shareholders hold ownership, but shareholders do not necessarily lead the firm. In contrast, executives are employed by shareholders and lead the firms, expected to act in the interest of the shareholders [7]. Costs and risks come into play when the actions of executives lead to firm performance, in essence, flowing to the shareholders rather than the executives. In contrast, stock-based compensation represents one solution to such costs, as it links executives' work and the compensation they receive.

Stewardship theory assumes that executives will act in the principal's best interest. This theory is based on a choice between individual and organizational interests, in which executives are believed to be stewards who will act for the collective's interest [8]. A stock-based compensation scheme towards executives, however, challenges this theory because it adds personal interest to executives' actions, which is clearly against the principles of stewardship theory, and assumes that executives will be more motivated if their personal interests are involved.

Resource dependency theory posits that firms rely on external resources to operate [9]. In this case, leadership is required, and relationships must be maintained to acquire the necessary resources consistently. The significance of executives is again explained, since executives are an internal resource that firms rely upon to reduce reliance on external resources [5].

The effectiveness of such compensation has been long questioned (Wang et al, 2021). However, several studies have shown a positive correlation between firm performance and executive compensation [10, 11]. Similarly, general stock-based compensation to all employees is material not only in terms of effectiveness but also in terms of efficiency. Executive compensation is also material regarding efficiency, and its quantity should be considered. In terms of amount, executive compensation is usually ten or dozen times that of an ordinary employee [12], indicating a “pay disparity.” The pay disparity, if unexplained, has been proven detrimental to firms’ performance [13]. This study focuses on stock-based compensation due to its strong association with firm performance, specifically, the effect of the wedge between the stock-based compensation of executives and the average employee on firm performance.

3 Hypothesis and Model

For the paper, an alpha level of 5% is chosen. Firm performance will be measured primarily regarding shareholders' concerns, and *Return on Equity (ROE)* will be used as the primary metric. Return on Equity is net income divided by shareholders’ equity. It is selected for its commonness in measuring profitability, considering shareholders’ contribution [6].

For the dependent variable, *ROE*, data from S&P Global Market Intelligence Data for publicly traded North American companies will be used. Return on Equity is calculated using the following equation:

$$Return\ on\ Equity\ (ROE_{it}) = \frac{Net\ Income\ (Loss)}{Averaged\ Shareholders'Equity} \tag{1}$$

Net income (loss) is the net earnings after all expenses have been deducted from revenues. The data is extracted from the income statements of the corresponding firms. *Averaged shareholders’ equity* is usually calculated by averaging the year-beginning and year-end balances in the shareholders ' equity account. It measures the portion of a firm’s assets owned by shareholders. This paper will use the shareholders’ equity per year-end balance sheets for simplicity and efficiency, balancing costs and outcomes.

For the wedge, the *stock-based compensation* toward ordinary employees will be measured by total stock-based compensation divided by the number of employees(*employee size*) [13].

$$Averaged\ stock\text{-}based\ compensation\ for\ employees = \frac{Stock\text{-}based\ Compensation}{Employee\ size} \tag{2}$$

In contrast, stock-based compensation for executives will be calculated by adding *stock awards* and *option awards*, the two most common types of stock-based compensation.

A firm typically has more than one executive, and the compensation for individual executives is usually tailored; averaging compensation across multiple executives is thus unreasonable. For this paper, executives with the titles of CEO or Chief Executive Officer will be assumed to be those with these titles due to their significance among all executives, and their stock compensation will be used to represent executives’ stock-based compensation.

$$Stock\text{-}based\ compensation\ for\ CEO = Stock\ awards + Option\ awards \tag{3}$$

The wedge will be presented by dividing executives by ordinary (averaged) employees [13], to eliminate any effect of the difference in magnitude of compensation amongst firms, thus controlling these variables.

$$CEO\ to\ employee\ ratio(R_{it}) = \frac{Stock\text{-}based\ compensation\ for\ CEO}{Averaged\ stock\text{-}based\ compensation\ for\ employees} \quad (4)$$

Then, a linear-log regression will be performed to determine the correlation between the independent and dependent variables, with the following equation:

$$ROE_{it}=\beta_0+\beta_1 log(R_{it})+\beta_2 dte_{it}+\beta_3 ltd_{it}+\theta_t+\lambda_i+\varepsilon_{it} \quad (5)$$

The sample's time frame is fiscal year 2015 to 2019. The time frame was chosen because, starting in 2020, COVID-19 influences will jeopardize the study of correlation. For controlled variables, ROE is affected by various factors. First, macroeconomic conditions are expected to change throughout the 5-year sample period. To control this variable, the point in time measured in years will be controlled; this variable will be shown as θ_t.

Another external factor is the sector in which the firm is located. Every observation will be categorized into the corresponding industry using the Standard Industry Code, which categorizes all industries into 10 sectors in total: agriculture, forestry, fishing and mining, construction, manufacturing, transportation & public utilities, wholesale trade, retail trade, finance, insurance, real estate, and services. Nine corresponding Boolean variables will be developed to control the sector in which the firm operates [5], shown as λ_i in the model for the equation.

Two variables will be controlled for internal factors: the debt-to-equity ratio (dte_{it}) and the long-term debt ratio (ltd_{it}), which significantly affect ROE performance [14]. Other factors, such as firm size and current ratio, are insignificant and, therefore, do not need to be controlled [15].

The sample data will be cleaned by removing all observations with empty numbers, then outliers will be removed by replacing all anomalies with extreme values with the 1st and 99th percentiles

of the data. In addition, the zeros are reserved for the *CEO-to-employee ratio*, considering it is reasonable for some CEOs not to receive any stock-based compensation.

Following, a qualitative analysis will be performed to interpret the quantitative results.

4 Empirical Results

After the cleaning of data, the sample is left with 15,684 observations. As Figure 1 shows, for ROE, the mean is 0.0865 and the median is 0.0943. The distribution as shown, is symmetrical, with most of the observations centering around 0.

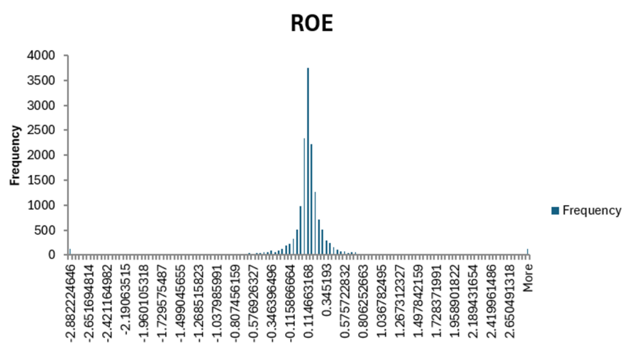

Figure 1. Histogram of ROE of publicly traded firms in the US from 2015 to 2019.

As Figure 2 shows, the disparity exists for CEO-to-employee ratios and is pervasive and large in value. The mean is 1,855, signifying that on average, the compensation for a CEO can be 1,855 times larger than that of an average employee. The distribution is right-skewed, and the median is significantly smaller than the mean.

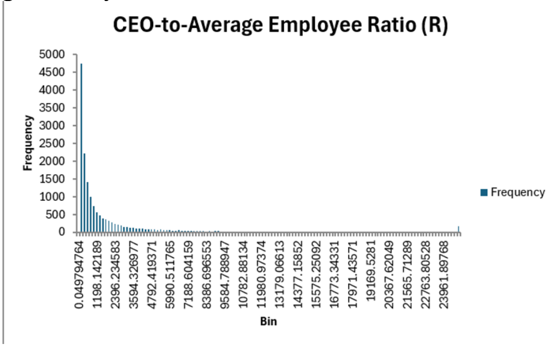

Figure 2. Histogram of CEO to Employee stock-based compensation ratio from 2015 to 2019.

After a linear-log regression was run, the following results were found:

Table 1. R-squared of the linear-log regression model.

R-Squared	Adjusted R-Squared.	Standard Error Regression	Standard deviation	# Fitted	# Missing	Critical t	Confidence level
0.017	0.016	0.499	0.503	15684	0	1.960	95.0%

According to Table 1, the model, with an adjusted R-squared value as small as 0.016, indicates that only a small portion of the variation in ROE can be explained by the compensation disparity between CEOs and employees.

Then, in Table 2, regarding the significance of the model, with a p-value as small as 7.786×10^{-30}, which is significantly smaller than the alpha level of 0.05, there is sufficient evidence to reject the null hypothesis and accept Hypothesis 1 that firm performance is affected by the wedge between stock-based compensation for ordinary employees and executives. It is safe to conclude that the independent variable is statistically significant.

Table 2. Coefficient Table of the model.

Variable	Coefficient	Standard Error	t-statistic	P-value	Lower 95%	Upper 95%	VIF	Standard Coefficient
logR	0.0627	0.00551	11.369	7.786 E-30	0.0519	0.0735	1.227	0.100
Constant	-0.0631	0.0935	-0.675	0.500	-0.246	0.120	0	0

According to the model, a positive correlation exists between the CEO's Employee Stock-based Compensation and Return on Equity. This means the ROE increases as the CEO's and average employee's compensation gap increases. In other words, the more unequal the compensation of the CEO and employee, the better the firm's performance in terms of ROE. The coefficient of 0.0627 states that with a 1% increase in R, there will be a 0.0627 increase in the ROE. This proves that paying the CEO more stock-based compensation can improve firm performance.

While some research results provide a negative correlation between firm performance and unexplained pay disparity and a positive correlation between firm performance and explained pay disparity [13], this paper, including both explained and unexplained ones to construct a model, suggests a positive correlation. Under past research as context, the compensation disparity in the given time frame and given market is dominantly explained, meaning the disparity is reasonable.

5 Conclusion

A positive correlation can be found between the two variables by performing a linear-log regression on the CEO to Employee Stock-based Compensation and ROE for North American publicly traded firms from 2015 to 2019. Although a small adjusted R-squared value has been obtained, the small p-value allows us to conclude the statistical significance of the difference in stock-based compensation between executives and average employees.

Though the independent variable is proven to be statistically significant, the R-squared suggests that the ratio cannot explain much of the variation of ROE. In other words, attempting to improve firm performance by simply paying the CEO more stock-based compensation is insufficient. The small R-squared is probably due to a lack of control over various controlled variables. While this paper has attempted to mitigate the effects of factors such as scale and macroeconomic conditions, the various factors that affect firm performance still exist. However, there are two obstacles in terms of controlling these variables. Firstly, the correlations between firm performance and various factors are debatable, and the control activities can be endless and non-exhaustible. A common practice by several researchers concerning similar topics has been narrowing the industry or focusing on specific cases. However, the pervasiveness of the conclusions of those studies comes into question. This paper can give a general and pervasive conclusion in this case.

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