Effect of executive compensation on firm performance

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Abstract

The paper finds evidence that the equity-based CEO pay is positively related to firm performance and risk-taking. Both stock price and operating performance as well as firm's riskiness increase in the pay-performance sensitivities (PPS) provided by CEO stock options and stock holdings. PPS can explain stock returns better as an additional factor to the Fama-French 3-factor model. When CEOs are compensated with higher PPS, firms experience higher return on asset (ROA). The higher PPS also leads to the higher risk-taking. While CEO incentive compensation has been perceived mixed on its effectiveness, this study provides support to the equity-based CEO compensation in reducing agency conflicts between CEOs and shareholders.

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1. Introduction

Agency conflicts between shareholders and managers are prevalent in modern corporations and are one of the most heavily studied topics in the finance literature. While chief executive officers (CEOs) are assumed to work for the best interest of shareholders, they can readily pursue own interests at the expense of shareholders' interest. As Jensen and Meckling (1976) argue, CEOs with a little ownership can consume more perquisites and reduce their firm values. To incentivize CEOs with a little or no ownership, firms start granting equity-based compensation, which presumably aligns shareholders interest with CEOs.

The practice of equity-based compensation has doubled since 1990s and is still growing. The main purpose of incorporating equity in the compensation package is to motivate managers to engage in activities that will maximize shareholders' wealth. Murphy (1999) explains that when executives are given the opportunity to become part-owners of the firm, they note the opportunity to increase their wealth with the increase in stock returns. Thus, executives will engage in behaviors that will increase the performance of the firm, leading to an increase in stock price performance. As a result, executives can cash in large compensation. Researchers have studied the relationship between the incentive compensation and the firm performance by several measures. Among them, the pay-performance sensitivity and the pay-volatility sensitivity are the two most important measures of CEO incentive in the literature (Murphy 2012).

However, the practice in CEO compensation during the past few decades raises doubt to its efficacy. While the equity-based compensation significantly increases the CEO pay over time, it is still in debate whether the incentive compensation indeed improves the firm performance and/or risk taking. The debate in the literature provides the motivation for this

paper to scrutinize the relationship between incentive compensation and firm performance using different aspects. Studies in CEO compensation report mixed results on the effectiveness of CEO compensation on the firm performance. The goal of this article is to examine whether incentive compensation increases firm performance, measured by stock returns, operating performance, and risk taking. The paper differs from the existing literature by being the first study in incentive compensation to use the Fama-French three factor model (Fama and French, 1993) and by providing evidence that managers with higher PPS increase firm performance. Furthermore, this study uses various aspects of firm performance measures to address the relationship, whereas other studies use only one to two measures. Therefore, it contributes to the literature of executive compensation by examining whether equity-based compensation motivates executives to exert effort that increases shareholders' wealth.

The pay-performance sensitivity has received extensive attention in incentive compensation to CEOs. Primarily, researchers became interested in examining whether shareholders are receiving what they are paying for (Cooper, Gulen and Rau, 2014). Jensen and Murphy (1990) argue that the issue rises due to information asymmetry between the shareholders and the executives. The asymmetric information occurs because shareholders do not have complete information about the executives' activities and the firm's investment opportunities. Since shareholders are interested in maximizing their wealth, they are concerned about whether executives exert effort to increase shareholders' wealth. On the other hand, executives are interested in their private gains and the cost of pursuing different actions. Dow and Raposo (2005) point out that executive incentive compensation is an essential key to align the interest of managers and shareholders.

To examine the relationship above, we obtain the sample of CEO compensation available in the ExecuComp database. We estimate the pay-performance sensitivity and pay-volatility sensitivity for each CEO in the sample firms, following the method by Deniel, Li and Naveen

(2012) and Core and Guay (2002). Even though we follow their method of estimating CEO incentive compensation, this paper has a different goal from them. Core and Guay (2002) only present and validate the one-year approximation method for estimating the CEO incentive. Daniel, Li and Naveen (2013) are more into finding CEO pay for luck. Their dependent variable was firm-related wealth. Therefore, they study the relationship between firm related wealth and CEO luck. Both papers did not see the relationship between incentive compensation and firm performance. This paper computes annual stock return performance, operating performance and risk taking of all the firms and examines the relationship between incentive compensation and firm performance using these different measures.

The results of this paper show positive relations between incentive compensation and firm performance and suggest that incentive compensation to executives is important in motivating executives on behalf of shareholders and contributes to enhancing firm performance. Thus, the results contrast the findings of negative relationship in recent studies. Furthermore, incentive compensation can help mitigate agency conflicts since the interest of executives are aligned with that of shareholders by motivating executives to work for the best interest of shareholders. Therefore, it also supports the agency theory literature by Jensen and Meckling (1976). The results of this study reduce concerns on many recent studies, which find that incentive compensation does not help improve firm performance and imply that shareholders do not receive what they pay for (Cooper, Gulen and Rau, 2014, Brick, Palmon and Wald, 2006, Bebchuk and Fried, 2005).

This paper contributes to the literature of executive compensation in three ways. First, the study directly examines whether managerial incentives provided by equity-based compensation improve stock price performance and/or operating performance. While most studies in the literature focus on executive compensation as a whole or as individual components for firm performance, we investigate the direct relation between pay-

performance sensitivities (PPS) and firm performance and between pay-volatility sensitivities (PVS) and risk taking. Second, although information on managers' PPS is publicly available and must have been reflected into stock prices in efficient capital markets, we find that managers with higher PPS increase firm performance both in stock returns and in earnings from operation. Third, while managers in the modern corporations have little share-ownership in their firms, the agency conflicts between shareholders and managers can be significantly reduced by granting equity-based compensation to managers. Hence, the current trend toward a high level of executive compensation provided mostly by equity-based incentives might be a natural practice among modern corporations.

This paper is divided into several sections. Section 2 provides a detail overview of the literature. Section 3 develops the hypotheses of this paper. In section 4, I explain the process of data collection and show pattern in the data sample. Section 5 presents methodologies used to estimate pay-performance sensitivity, pay-volatility sensitivity and control variables and to examine the relationship between executive compensation and firm performance. In section 6, I discuss the results that are obtained from testing the hypotheses and robustness. Lastly, Section 7 presents conclusion.

2. Literature Review

2.1 Importance of Executive Compensation and Stock Incentive

Executive compensation first received attention when researcher identified the existence of agency problems between shareholders and managers. In principle, shareholders should design an optimal contract including incentive compensation, which motivates managers to improve firm performance. Incentive compensation can be structured by shareholders because it is hard to construct a perfect contract between managers and shareholders. If shareholders have all the information about the executive decisions and

activities, they can create a perfect contract which maximizes shareholders' value. However, it is not possible to design a perfect contract in practice. Therefore, shareholders need to design contracts that will provide incentives for executives to take decisions and implement actions that will enhance shareholder wealth. One way of doing this is to design executive compensation which is aligned with maximizing shareholder wealth. Therefore, equity-based compensation became extremely popular in 1960s, when the rise of equity-based compensation was about 41 times that in a typical U.S. factory worker (Langsam, Kreuze and Newell, 1997).

However, the managerial power approach tend to differ from this concept. According to Bedchuk and Fried (2003), CEO compensation is not only an instrument for addressing agency problem but also a part of it as some features of pay arrangements reflect managerial rent-seeking behavior. CEOs have substantial influence over their own pay by providing a different set of incentive to directors (Weisbach, 2007). CEOs can shift director's focus to consider CEO's interests rather than the interest of shareholders. According to Weisbach (2007), directors have incentive to keep their jobs and CEOs can provide benefits to directors in many different ways. Furthermore, CEOs can use their influence to help directors attain additional directorships. Overall, directors have incentives to act on behalf of the CEOs. However, while the relationship between the directors' compensation and firm performance might be important, I focus my study on CEO compensation.

As CEO activities affect the future performance of the firm, any component that can influence the firm's strategies are considered to be an important factor. Executive compensation holds great power to influence CEO activities (Jensen and Murphy, 1990 and Dow and Raposo, 2005). If executive compensation is designed in such a way that variations in compensation are associated with that in firm performance, the CEO's decision making process will be more affected as this decision will be tied to the personal benefits of the CEO.

To elaborate the connection, Jensen and Meckling (1976) explain "why managers will engage in activities that make the firm value less than it would be if they were the sole owners of the firm". Managers seem to be more cautious if they have considerable amount of wealth tied to the firm. The attached wealth discourages them to misuse firm resources and encourages them to engage in behaviors that will improve the firm value. When a manager's wealth is not tied to the firm, agency conflicts arise. Therefore, executive incentive compensation may potentially play a vital role in reducing agency conflicts and increasing shareholders' wealth.

Akindayomi and Warsame (2009) argue that shareholders and executives have different goals and risk preferences. CEOs want to maintain and increase their incomes and reputation. On the other hand, to get higher returns, managers must take higher risk. According to Amihud and Lev (1981), CEOs are more worried about the losses associated with risk-taking, which prevents them from taking risk. Low (2009) documents that this risk aversion behavior of managers can reduce the firm`s much needed risk, consequently adversely impacting shareholder wealth.

Murphy (1999) shows several features of executive compensation. Among them equity-based compensation plays a vital role in influencing CEO decision, since stock returns fluctuate with firm performance and firm performance varies with CEO's decisions. Therefore, equity-based compensation in the executive compensation package provides the incentive to the managers to make decisions that will enhance the firm performance, which will have a positive effect on the stock price and ultimately increase the CEO wealth. Stock options as part of executive compensation can help decrease the risk preference and the goal difference between shareholders and executives since shareholders are always interested in maximizing their own wealth. The alignment between firm performance and compensation can help executives make decisions that will reward them as well as reward the shareholders (Amihud and Lev, 1981). Smith and Stulz (1985) also documents that equity-based

compensation awarded to managers can overcome managerial risk aversion behavior and encourage them to engage in efficient risk-taking behavior.

Langsam, Kreuze and Newell (1997) find that stock options are very beneficial for top executives. Moreover, stock options are cash free to the companies and most options are not required to be reported as expenses. The authors also argue that firms take the difference of option price and market price as a deduction when calculating taxable income. Therefore, both parties benefit through stock option in executive compensation packages. Carola and Dirk (2010) argue that the idea behind stock option compensation is to link executive compensation to share price, thus providing incentives for CEOs to improve the shareholder value. Hence, stock options became the largest component of executive compensation during 1980s and 1990s. The authors also find that CEO pay has increased dramatically over the last 30 years. The increase is noticed for all sizes of firms but the growth has been much steeper for larger firms. However, after the stock market decline in the early 2000 stock options have lost some of its strength. As equity-based incentives become more popular in executive compensation, managers tend to become more flexible to risk taking behavior. Other studies also have found alternative mechanisms to efficiently utilize equity-based incentives in executive compensation. For example, Edmans et al., (2012) implement the Dynamic Incentive Account technique to constantly motivate executives to exert effort in improving firm performance for both current and future periods.

On the other hand, studies have found that such incentives are actually decreasing the value of the firm. According to Ross (2004) stock options to CEO compensation can make executives more risk averse, which may result in underinvestment. Moreover, through executive stock options, managers can become short sighted and focus on short-term stock price (Peng & Roell, 2008). Sanders and Hambrick (2007) show that more option-loaded executives tend to pursue higher risk taking decision without thinking much about the

downside, which leads them to produce big losses rather than big gains. Furthermore, the well-known Greenbury Report (1995) in UK points out that share price increase might not result from CEO actions but reflect inflation and general market movements. Therefore, there is a mixed review on the efficacy of incentive compensation of CEO and this paper addresses the issue by showing that equity-based incentives play a prominent role when considering the effect of executive compensation on firm performance.

2.2 Other Form of Pay and Compensation Level

Prior research on executive compensation has focused mostly on the four basic components of the CEO compensation: base salary, annual bonus tied to accounting performance, stock options, and long-term incentive plans in the form of restricted stock plans and multi-year accounting-based performance plan (Murphy, 1999). Michaud and Gai (2009) use 6 similar categories to measure executive compensation. Even though stock options became extremely popular in executive pay, other components of the pay have also increased over the years.

Ozkan (2011) finds a positive and significant relationship between CEO cash compensation and firm performance. Also, Gaver and Gaver (1998) find a significant positive relation between CEO cash compensation and positive above line earnings. These studies indicate the importance of cash compensation in executive compensation packages. In addition, Leone, Wu and Zimmerman (2006) document that executive cash compensation is twice more sensitive to negative stock returns than to positive stock returns. Shaw and Zhang (2010) suggest that CEO cash compensation is not penalized for firms that are not performing well. These findings show the impact of total cash compensation on executive compensation and this paper uses it as one of the control variables.

Therefore, studies have shown that apart from stock incentive, other forms of pay also have considerable impacts on executive compensation, and it is natural to expect that more

forms of pay are yet to be pursued. For example, Carola and Dirk (2010) consider perquisite, which is a part of agency conflicts (Jensen & Meckling 1976) to be a form of executive pay. Rajan and Wulf (2006) also justify perks to be an efficient mechanisms to increase managerial productivity. Even though other forms of pay has some impact on executive compensation, equity-based incentive has the most significant impact on executive pay package as it can be tied up with shareholders wealth maximization need.

In the literature there have been concerns about the level of CEO compensation package. Most general public finds the compensation packages to be higher than they should be (Bebchuk and Fried, 2005). Hurtt, Kreuze and Langsam (1998) find that CEOs of Social Choice firms are paid higher than CEOs from other firms even though the performance of CEOs are measured through shareholder returns. Furthermore, Michaud and Gai (2009), and Cooper, Gulen and Rau (2014) find no evidence that CEO compensation has any effect on future stock-price performance, suggesting that shareholders are not receiving what they are paying for. Therefore, there is a demand from shareholders for monitoring executive compensation. However, Gox, Imhof and Kunz (2011) argue that shareholders having a say in executive compensation can lead to more complicated scenarios. They find that while a shareholders' say is ineffective in limiting the rise in executive compensation, it can increase executive compensation for poorly governed firms. Moreover, shareholders' say can interrupt the CEO focus from investment incentives and eventually decrease the firm value.

To help monitor and justify CEO compensation package, research started looking at executive compensation from a third party point of view. Ozkan (2011) finds that institutional shareholders play a vital role in determining the CEO compensation level. She shows a positive and significant relationship between institutional shareholders and CEO pay-for-performance sensitivities of option grants. Cadman, Carter and Hillegeist (2010) find evidence on the importance of compensation advisors to setup an efficient contract between

firms and executives. Their studies also find no biasness from advisors toward excessive CEO pay and the widespread usage of advisors. Hence, corporations are trying to control and justify the optimum level of executive pay. They are actively involving outside consults to justify and setup an efficient contract that can benefit both the executive and the firm.

To setup an efficient contract, both shareholders and executives have to be benefited from the contract. Equity-based compensation can act as an important factor in setting-up such contract since, it provides an opportunity for the executive to increase their wealth by increasing the stock performance of the firm. Langsam, Kreuze and Newell (1997) report evidence that while the executive compensation in the United States increased drastically in the 1990s, the increase in executive pay level started rising from the mid-1900s. In the 1960s, the rise was about 41 times that in a typical U.S. factory worker and in 1990, it became 157 times. During this rise, the equity-based incentives became extremely popular as it did not require to be recognized as an expense and it helps motivate managers to take decisions that will optimize firm performance. Therefore, equity-based incentives in the executive compensation rose by 45% in 1995.

2.3 Pay for performance

Jensen and Murphy (1990) introduce pay-performance sensitivity as a way to measure the relation between executive compensation and firm performance. The authors find a small relationship between executive compensation and firm performance. The relationship is tested using different approaches, which are then compared with each other. The results reveal that there is a very low variability in executive compensation and that bonuses are not highly sensitive to performance, suggesting the absence of decent pay-for-performance sensitivities for executives. Recall that executive compensation can play an important role in solving agency problems and help lead to maximizing shareholder wealth. Therefore, a lack of strong pay-for-performance incentives for executives raise several potential questions in

the executive compensation literature. The reason why the authors find a small relationship is due to the time period of their data ranging from 1974 to 1986. Recall that incentive compensation became extremely popular during mid-1990s as equity-based compensation rose by 45% in 1995.

The idea of adding equity-based incentives to executive compensation packages to improve firm performance has been refuted by several studies because researchers find no positive relationship between CEO pay and firm performance (Cooper, Gulen and Rau, 2014, Michuad and Gai, 2009 and Brick, Palmon and Wald, 2006). This may seem perplexing to shareholders, since executives are paid to perform and to ensure value maximization for shareholders.

Cooper, Gulen and Rau (2014) find evidence that a highly paid CEO with an overconfident attitude tends to engage in value destroying activities which lead to significantly lower stock returns. Firms with the highest paid and overconfident CEOs deliver lower future returns relative to those with the other CEOs and experience lower operating performance. Therefore, as the authors conclude, excess incentive pay (restricted stock, options and other forms of long term compensation) has a significant, negative relationship with future one-year abnormal returns. Even though these findings can give a negative signal on the stock option grant to executive compensation, Cooper, Gulen and Rau (2014) do not use pay-performance sensitivity as a measure of pay-for-performance. The authors estimate incentive compensation as the difference between total compensation and total cash compensation (TDC1-TCC). Hence, it is not clear that there is a negative relationship between firm performance and executive incentives. Michaud and Gai (2009) also report that there is no positive effect on firm performance through executive compensation. Furthermore, incentive packages to the executives do not have any effect on firm`s performance. The authors find only cash bonus to have a significant positive effect on firm

performance. Then again, the authors do not use pay-performance sensitivity as measure of pay-for-performance. Furthermore, they do not use stock returns as a firm performance measure.

Benmelech, Kandel and Veronesi (2010) link equity-based compensation to consequent stock price downfall. Therefore, the result is poor firm performance. Managers engage in fraudulent behavior, which leads to overvaluation of stock prices and in turn to a crash in stock price. Core, Holthausen and Larcker (1999) also find evidence that the excess executive compensation is negatively related to stock-price performance. They suggest that weaker corporate governance structure leads to greater agency conflicts, which cause higher executive compensation firms and that with poor governance perform below expectation. Similarly, Ariely et al., (2009) find that the increase in rewards can cause damaging effects on firm performance. Brick, Palmon and Wald (2006) find a similar negative relation between future return on assets and excess CEO compensation by relating CEO compensation directly to directors' compensation. They prove a significant positive relation between CEO and director compensation and find that firm performance is negatively related to excess director compensation. Cheng and Farber (2008) show that a decrease in the option-based executive compensation improves firm profitability. They suggest that as option-based incentives decrease, CEOs' motivation to take excessive risk reduces, and leads to improve the profitability. Malmendier and Tate (2008) coin the term "CEO Disease" referring to a pattern that executives tend to underperform after reaching a valuable position in the organization. The authors find a strong negative relationship between the superstar executive pay system and stock-price performance. Even though the stock performance declines, these executives are paid significantly more through equity-based compensation, especially in firms with poor corporate governance. Additionally, these CEOs consume more perquisites due to agency conflicts (Jensen and Meckling 1976) and thus divert from shareholder value

maximization. All these findings are suggesting that executives are not working for the shareholders. However, this paper is significantly different from all these studies as it uses different measures of executive incentive. Furthermore, this paper is using various aspects of firm performance to see the relationship between incentive compensation and firm performance. For example, Langsam, Kreuze and Newell (1997) study the relation between executive compensation and traditional performance variables. The study reveals that executive compensation has no relation to most of the traditional performance measures. Then again, this paper uses completely different measure for firm performance and executive incentives.

Murphy (1999) examines the effect of CEO pay-performance sensitivity on firm performance and suggests that CEOs do understand the impact of their decisions on accounting profits but have very little understanding on how their decisions are influencing the shareholder value. Moreover, research shows that factor driving executive compensation is the firm size, which is used by researchers for benchmarking. Baker, Jensen, and Murphy (1988) show evidence that large firms pay their executives more than small firms. However, such pattern is expected since larger firms has more capital to support such action.

Despite the negative relationship in many studies, the practice of restricted stock grant has increased significantly by 2011. Most of the growth in executive compensation since 1990 has been due to the significant increase in equity-based pay. Restricted stock grants have risen to 36% of the executive pay (Murphy 2012), suggesting that stock grant can have positive impact on executive incentives. Murphy (2012) shows that government intervention in executive compensation has been a major driver in executive pay and that this idea has been largely ignored by most researchers. Government intervenes indirectly through accounting rules, securities laws, and tax policies that cause an impact on the level and structure of executive pay. Murphy (2012) points out that government intervention in

executive compensation is a new dimension in the pay-for-performance analysis as the interest of the government is significantly different from the interest of the shareholders, directors or executives. The government intervention can make significant changes in the literature because shareholders want to increase the executive pay with firm's performance, but the government wants to control such increases through the different impositions. In addition, the author also mention that while both grant-date and realized pay are legitimate measures of executive compensation, researchers who are regressing grant-date pay level on firm's performance tend to conclude that there is no executive incentives for performance. The result is contradicted by the result from regressing executives' realized pay on firm performance. Murphy (2012) strongly argue that the realized pay is significantly related to firm's performance.

Similarly, Larcker and Tayan (2011) consider no "pay for performance" in CEO compensation as a myth of corporate governance. CEOs can realize the considerable amount of wealth through stock price appreciation due to their possession of stock options from executive compensation. Moreover, the authors also argue that the concept of CEOs being overpaid is a myth as well. Core and Larcker (2002) find the evidence of improvement in firm performance relative to the level of managerial equity ownership. The authors use a "target ownership plan" approach, where a sample of firm with low stock returns is adopted. The managerial stock ownership increases significantly for the firms adopting the plan within a short period and leads to the excess stock price returns, which become statistically significant. Bulan, Sanyal and Yan (2010) find a positive relationship between CEO pay-for-performance and the real side of firm's performance. They consider restricted stock grants to be an efficient and effective tool to align CEO goals with those of shareholders', since stock grants can be a means of rewarding performance. Hence, the authors suggest that the

sensitivity of CEO wealth to percentage changes in stock return volatility (VEGA) can enhance the firm's productivity, which is considered as a genuine performance.

Overall, previous studies have discovered a wide range of connections between executive compensation and firm performance. Some approaches result in positive significant relationships, whereas others have found negative significant associations. Thus, this paper enrich the current debate in executive compensation literature by analyzing the subject from different aspects and compares the results with one another.

I examine the efficacy of incentive compensation by conducting a study on the relationship between executive compensation and firm performance. I attempt to answer whether executive incentive compensation has an impact on the overall performance of the firm. I examine the relationship of pay-performance sensitivity (PPS) with different firm performance measures and compare the results of the findings in the literature. I start with the relationship by measuring firm performance from stock-price performance. I move on the analysis with the operating performance. Furthermore, I compute pay-volatility sensitivity (PVS) to see the relationship to the firm's risk taking and then compare the findings with PPS.

2.4 Pay-volatility Sensitivity

Recall that manager's risk-taking can have a significant influence on the firm performance. Hence, another conflict of interest arises between shareholders and executives due to typical behavior of executives being risk-averse. Since equity can be considered an option on the asset, the value of equity increases with the risk of asset. Even though shareholders can remove any unsystematic risk by diversifying their portfolio, executives find that their wealth is mostly tied up with the firm and their riskiness cannot be diversified. As discussed earlier, CEOs are more concerned about the losses associated to risk, thus being

hesitant in taking much needed risk (Amihud and Lev, 1983). Furthermore, risk aversion behavior can reduce firm's risk and results in reducing the wealth of shareholders. However, equity-based compensation to managers can overcome the managerial risk aversion and motivate them to engage in efficient risk-taking behavior (Smith and Stulz, 1985). Alternatively, stock options to CEO compensation can make executives more risk averse, which may result in underinvestment (Ross, 2004). Hence, an optimal contract should motivate executives to take more risk.

Studies in PVS show mixed results on the impact of PVS on firm risk. Akindayomi and Warsame (2009) argue that shareholders and executives have different goals and risk preferences. CEOs want to maintain and increase their incomes and reputation, which are linked to their firm performance. As risk and return are closely connected together (Fama, 1976) in the sense that managers with equity-based compensation must take higher risk to appreciate more compensation, studies have found that such risks are actually decreasing the value of the firm. Sanders and Hambrick (2007) show that more option-loaded executives tend to pursue higher risk taking decision without thinking much about the downside risk, which leads them to produce big losses rather than big gains. Furthermore, the well-known Greenbury Report (1995) in UK points out that the share price increase might not result from CEO actions but reflect inflation and general market movements.

On the other hand, Low (2009) documents strong empirical evidence for the impact of equity-based compensation on managers' tendency of taking risk. The author finds evidence that VEGA helps align managerial risk-taking behavior with shareholders' interest. Coles, Daniel and Naveen (2006) also find evidence of positive effect of tock return volatility on VEGA. They suggest that the higher executive VEGA results in riskier firm policies.

This study provides evidence in reducing doubts from the mixed results in the literature of CEO risk-taking behavior by estimating the relationship between executive's incentive compensation and firm's total risk and by examining how equity-based incentive can significantly help reduce the agency conflict.

3. Hypotheses Development

Recall that executive compensation is considered important in reducing agency conflicts. When both executives and shareholders hold different sets of goals and risk preferences, an agency problem is inherent. For CEO to work for the best interest of shareholders, both parties must come to an optimal contract, which potentially maximizes stock returns and improves firm value. Researchers (Jensen and Murphy, 1990; Dow and Raposo, 2005; Akindayomi and Warsame, 2009) over the years have proposed that executive compensation, when aligned with shareholder interests, can help mitigate agency problems. With a potentially optimal contract, executives adjust their action strategies to maximize shareholder value and also increase their personal wealth through the same activities.

Prior studies use different measures of firm performance. Bulan, Sanyal, and Yan (2010) argue that productivity is an important measure of firm performance and any improvement in it is beneficial. Michaud and Gai (2009), on the other hand, use Return on Equity (ROE), Average Return on Equity (Avg ROE) and Economic Value Added (EVA) to portray performance of firms. The authors identify EVA to be one of the most important components to measure firm performance as EVA shows whether the firm is adding value to shareholders and generating profit over cost of capital, and what assets are tied to generate revenue. Therefore, using different methods in measuring firm performance and executive compensation, researchers have tried to explain the relationship between these two variables. In this paper, I will measure firm performance through stock performance, operating performance and risk-taking to see how the relationship behaves when seen from these

different aspects. Therefore, the paper have three hypotheses to test the relationship between incentive compensation and firm performance.

Recall that, Core and Larcker (2002) find improvement in the firm's performance with the increase in the level of managerial equity ownership. They find evidence that excess returns increase with managerial stock ownership for firms with poor stock-price performance. Similarly, Larcker and Tayan (2011) disprove the myth of pay-for-performance and suggest that executives can generate a huge amount of wealth through stock price increase that they own through performance incentives. Akindayomi and Warsame (2009) study the relationship between firm value and executive stock option grants and find that future earnings increase with every dollar of granted stock options. Thus, they suggest that executive stock options have characteristics to bring improvement in the firm's performance.

Bulan, Sanyal and Yan (2010) examine the sensitivity of executive wealth with a percentage change in the firm's stock price performance (Delta). They show that incentives for both executives and shareholders can become well aligned with an increase in delta as the aligned incentives will lead to higher firm productivity. While they show that the delta has significant influence on the productivity, they also find an adverse effect of high executive delta on the productivity. The adverse effects suggest that executives are reluctant to take more risk as the value of their portfolios becomes very sensitive to small changes in the firm's stock price performance. The authors find both a positive slope region which is consistent with incentive alignment and a negative slope region, which signals executive risk-aversion due to high delta. Hence, the study shows an inverse-U shaped relationship between executive delta and firm performance.

Firm performance depends on executive activities, since each action of the executive results in an outcome driving the firm's performance. Therefore, efficient executive decisions

can steer the performance of the firm in the best interest of shareholders. The connection between firm performance and executive activities provides executives with an option to ensure that the performance of the firm can reach its maximum level and it is possible to perform better than the industry standard. Subsequently, incentive compensation can motivate the executives to deliver the better performance. The idea of providing incentives to the executives is to motivate them to bring the firm's performance to an optimal level. If the incentives are designed to be aligned with firm performance, then executives will be motivated to improve the firm's performance while expecting a reward in return.

Therefore, Hypothesis 1 is:

H1: There is a positive relationship between incentive compensation and firm performance, where incentive compensation is measured by pay-performance sensitivity (PPS) and firm performance is measured by stock price performance.

Similarly, studies have focused on the relationship between executive compensation and firm performance by measuring firm performance with operating performance. As stock price performance reflects the expectations by the stock market, operating performance provides an insight into the accounting performance of the firm. The Mehran's (1995) results on firm performance suggest that Tobin's Q and return on assets are positively related to the percentage of executive's total compensation that is equity-based. Therefore, the author concludes that CEO incentives are affected by compensation and can have measurable impacts on corporate efficiency. Abowd (1990) also examines the impact of pay-performance sensitivity on firm performance. He finds a significant positive relationship between after-tax operating performance and pay-performance sensitivity. Above-median pay-performance sensitivity of the firm can cause higher probability of above-median future performance. Thus, the author argues that increasing incentive compensation can improve firm

performance. Lewellen et al. (1992) look at firms' economic performance with the level of compensation. They find that the total compensation of a firm's top management is positively related to differences in both common stock returns and operating profitability and suggest that incentive compensation tend to enhance the performance of a firm.

These findings point out the importance of operating performance as another measure to evaluate the relation between incentive compensation and firm performance. Therefore, I design hypothesis 2a and 2b in order to see the relationship of PPS with firm's operating performance.

H2a: There is a positive relationship between incentive compensation and firm performance, where the incentive compensation is measured by pay-performance sensitivity (PPS) and the firm performance is measured by operating performance.

H2b: There is a positive relationship between incentive compensation and firm performance, after operating performance is adjusted for industry.

The conflict of interest between shareholders and executives arises due to the typical behavior of executives being risk-averse and undiversified with respect to their firm's stock-price performance. Equity-based compensation is introduced to mitigate the conflict and motivates the top management to engage in risk-taking behavior. The concerns in such environment are raised when executives get involved in too much risk because executives are rewarded for taking upside risk and are not penalized for any downside risk (Murphy, 2012). Murphy (2012), points out that with stock option holdings, executives gain from stock price increase as the stock price exceeds the exercise price, while their losses are limited to zero. Therefore, executives are more inclined to take excessive risk and can be encouraged to take on projects that deliver negative NPV. As Murphy (2012) recognizes, if a firm is an all-equity firm, shareholders bear both gains and losses of the firm and are not interested in any

investment project with negative NPV. On the other hand, if the firm is levered, equity holders enjoy all of the gains above obligation to bond holders, their losses are limited to the value of their initial equity stake. Therefore, shareholders are less concerned about too much risk in a levered firm. Alternatively, debtholder are concern about excessive risk as their assets are tied to the firm. Hence, there exists a conflict of interest between shareholders and debtholders (Jensen and Meckling, 1976). However, according to Murphy (2012), the limited liability feature of equity is the main reason behind creating risk-taking incentives. The idea of risk-taking behavior is not the main concern behind the recent controversy over executive compensation. Scholars are more concerned about the excessive risk-taking behavior that can destroy the firm value.

Shareholders are interested in ensuring incentive for executives so that it encourages risk-taking behavior. Haugen and Senbet (1981) argue that executive stock option has the potential to encourage risk-taking behavior since any increase in stock return volatility increases the value of the options. Murphy (2012) also finds that the stock option value monotonically increases with the stock price volatility. Hence, these findings suggest that options can be used to provide executives with the incentive to increase volatility in stock returns. Bulan, Sanyal and Yan (2010) investigate the relationship between the sensitivity of CEO option value and stock return volatility to examine whether risk-averse executives can be encouraged to take on risk increasing projects since the value of the option increases with the firm risk. They use percentage changes in stock return volatility (VEGA) to measure the risk-taking incentives from the stock option grants. The authors find a positive relationship between risk-taking incentives and productivity, and suggest that executive VEGA increases firm productivity. This is consistent with the idea that stock option grants can make executives less concerned about the risk.

Coles, Daniel and Naveen (2006) find evidence of positive effect of stock return volatility on both VEGA and Delta. Their study focuses on firm policies with executive compensation and finds a strong relationship suggesting that the higher executive VEGA results in the riskier firm policies. Low (2009) examines the executive risk-taking behavior with the executive VEGA as well. Low (2009) argues that if the increase in VEGA motivates managerial risk-taking, then firms with low executive VEGA should have a large reduction in firm risk. That is high VEGA helps offset the risk aversion behavior of executives towards risky projects. The author finds evidence that increased VEGA helps align managerial risk-taking behavior with shareholders' interest.

Adding the idea of increasing stock return volatility into the value of option holding, I design hypotheses 3 to capture the relation between executive incentives and risk taking activities.

Therefore, Hypothesis 3 is:

H3: There is a positive relationship between incentive compensation and risk taking, where incentive compensation is measured by pay-volatility sensitivity (PVS).

4. Data and Sample Pattern

4.1 Data

The compensation data of this study are obtained from the Execucomp database. The sample period ranges from the year 1992 to 2013. Starting with firms in the Execucomp database, I augment the data by merging it with CRSP and Compustat. The process creates a sample with 2,788 unique firms during 1992 to 2013.

To compute the pay-performance sensitivity (PPS) and pay-volatility sensitivity (PVS), I use COPEROL and YEAR as key unique identifiers. COPEROL identifies each executive and YEAR identifies the period of executive holding the CEO position. By

selecting only CEO data from Executive dataset, I obtain 2,788 unique firms. The Accounting changes imposed by Financial Accounting Standards Board (FASB) and the required compensation discloser mandated by Securities and Exchanges Commission (SEC) made Execucomp to change its compensation data reporting standards in order to align with the changes. Therefore, during initial data screening, pre-2006 and post-2006 information are identified for separate PPS and PVS estimation. Using the information from Execucomp dataset, I merge the sample dataset into both Compustat and CRSP databases. From Compustat, I gather annual information about Total Asset (AT, item#6), Earnings Before Depreciation (EBITDA, item#13) and Book Value Per Share (BKVLPS, item#10) from year 1992 to 2013. These variables are used to compute the operating performance of the firm to test Hypothesis 2a and Hypothesis 2b and to calculate the Book-to-market ratio of the Fama-French three factor model. Finally, the monthly stock prices for the same period are collected from CRSP and merged with the sample data.

The descriptive statistics of the variables are shown in Table 1. Panel A shows the descriptive statistics for analyzing stock performance on pay-performance sensitivity. The dependent variable, excess return, has a mean of 0.155 with a standard deviation of 0.666. My main variable, log PPS, has a mean of 3.885 with standard deviation of 1.798. To estimate the relationship between stock price performance and PPS, I use 151,343 observations ranging from 1992 to 2013. Panel B reports the descriptive statistics related to my second hypothesis. The firm performance measures, ROA and industry adjusted ROA, have mean values of 0.125 and 0.0044 with standard deviation values of 0.116 and 0.113, respectively. Log PPS has almost the same figures as Panel A. The mean of log PPS in Panel B is 3.912 with its standard deviation of 1.792. Finally, Panel C of Table 1 shows the descriptive statistics for the third model which tests the relationship between risk taking and pay-volatility sensitivity (PVS). The total number of observation for this model is 147,778.

The mean and standard deviation for incentive measure (PVS) are 59.471 and 165.86, respectively.

Table 2 presents correlations between key variables. The correlation between excess return and PPS is positive at 0.029. For operating performance, the correlation between ROA and PPS is positive with a value of 0.02. Similarly, the industry adjusted operating performance has positive correlation with PPS at 0.033. However, both risk taking-1 and risk taking-2 have negative correlation with PVS.

Table 3 shows the distribution of all the industries that are in the sample data. I use the SIC code to classify the data into different industries. In the sample of 2788 unique firms, I have firms from every industry ranging from Agricultural to Conglomerate in Execucomp. The biggest proportion of my sample comes from the industrial manufacturing sector. It is 26.2% of the entire sample. Agricultural and conglomerate constitute the lowest fraction of the data sample (0.4% and 0.3% respectively). Subsequently, 15.5% of my data sample is from the financial service industry. Overall, the entire sample covers a wide range of industry sectors, which provides assurance that the sample firms for the analysis reflect the representative image of the population.

4.2 Sample Pattern

Table 4 reports excess returns by firm sizes, book-to-market rations and PPS. Panel A shows average excess returns, which are sorted firms into two size groups and independently sorted firms into three BM groups. Since the sample size is reduced by sorting, it is not good to use the Fama-French breakpoints for benchmark. I use my dataset to identify breakpoints and allocate stocks according to its group. To do this, I follow the same methodology as in Fama and French (1993).

In Panel A, average excess returns typically fall from small stocks to big stocks (Size effect). The low BM column is the only exception. However, the value effect which is the relation between average excess returns and BM ratios, appears much more consistent. The excess returns increase with the BM ratio. It is noted that the value effect is strongest among small stocks, as average excess return rises from -0.0107 to 0.6725.

In Panel B of Table 4, displays average excess returns, which are independently sorted by Size and pay-performance sensitivity (PPS). The panel demonstrates patterns similar to Size-BM. While the average excess returns increase in firm size from 0.0329 to 0.0875 for the low BM column, the average excess returns decrease from 0.2111 to 0.1557 for medium BM, and from 0.2662 to 0.2278 for high BM, as the firm size increases. It appears that, for all size groups, average excess returns increase as PPS increases. In small firms, the average excess returns increase from 0.0329 to 0.2662 as PPS increases. This pattern is preserved for large firms as average excess returns increase from 0.0875 to 0.2278. Therefore, executives with higher pay-performance sensitivity tend to deliver higher excess returns.

5. Methodology

The methodology is broken down into two parts. First, I describe the method used to compute the pay-performance sensitivity (PPS) and the pay-volatility sensitivity (PVS). Second, I present the regression models used to examine the relation between firm performance and executive compensation.

5.1 Pay-performance sensitivity (PPS) and pay-volatility sensitivity (PVS)

To formulate PPS and PVS, I closely follow the methodology of Daniel, Li and Naveen (2013) which in turn follows Core and Guay (2002), and the Black-Scholes (1973) option valuation model modified by Merton (1973) to include firm dividends.

The option value based on the Black-Scholes (1973) formula for European call option modified for dividend payout by Merton (1973) is given as

$$Option Value = \left[Se^{-dT} N(Z) - Xe^{-rT} N\left(Z - \sigma T^{\left(\frac{1}{2}\right)} \right) \right]$$

Where,

$$Z = [Ln(\frac{S}{X}) + T(r - d + \frac{\sigma^2}{2})] / \sigma T^{(\frac{1}{2})},$$

$N = cumulative\ probability\ function\ for\ the\ normal\ distribution$

$S = price\ of\ the\ underlying\ stock$

$X = Exercise\ price\ of\ the\ option$

$\sigma = expected\ stock\ return\ volatility\ over\ the\ life\ of\ the\ option$

$r = natural\ logarithm\ of\ risk\ free\ interest\ rate$

$T = time\ to\ maturity\ of\ the\ option\ in\ years$

$d = natural\ logarithm\ of\ exepected\ dividend\ yield\ over\ the\ life\ of\ the\ option$

Due to the change in the reporting format by Execucomp, the incentive calculation is divided into two parts, pre-2006 and post-2006. Moreover, the calculations are further divided into two parts based on exercisable option and unexercisable options. To compute the incentive compensation provided by stock potions, I use variables defined in Table 5.

Following the Daniel, Li and Naveen (2013), I estimate for the maturity dates using the option expiration date and fiscal year-end date, and Dividend Yield post 2006. For volatility measures, I need to calculate the BS-volatility post-2006 since Execucomp stopped providing this variable in 2006. I follow the Execucomp methodology closely for estimating post-2006 volatility. I use the annualized standard deviation of stock returns rolling over 60 months prior to the fiscal period. Risk-free rates are collected from the Federal Reserve[1]

[1] The risk-free rate was pulled from the Federal Reserve' website. http://www.federalreserve.gov/releases/h15/data.htm

corresponding to the maturity of options. The rates are converted from percentage to fit in the Black-Scholes model by dividing them by 100. Once all the variables are estimated, I finally compute pay-performance sensitivity and pay-volatility sensitivity using the methodologies described in the following sections.

5.1.1 Pay-performance sensitivity (PPS)

Pay-performance sensitivity is defined as the "Dollar change in wealth associated with a 1% change in the firm's stock price" (Daniel et al., 2013 and Core and Guay, 2002). PPS measures the wealth change of CEOs with respect to the percentage change in the firm's stock price performance. Therefore, it captures the incentives provided to executives, whose activities increase the firm performance.

By utilizing the Black-Scholes-Merton model, I estimate the pay-performance sensitivity (respect to 1% change in stock price) as:

$$\left[\partial(\text{wealth change})/\partial(\text{price})\right]*\left(\frac{\text{price}}{100}\right)=\left[e^{-dT}N(Z)*(\#\text{option holding})+\#\text{shr.own}\right]*\left(\frac{\text{price}}{100}\right)$$

where #shr.own = Number of shares owned by the CEO.

5.1.2 Pay-volatility sensitivity (PVS)

Pay-volatility sensitivity is defined as the "Dollar change in wealth associated with 0.01 change in the annualized standard deviation of stock returns" (Daniel et al., 2013 and Core and Guay, 2002). PVS measures the wealth change of executive's wealth with respect to the change in the firm's return volatilities. Since the value of stock option increases with the stock return volatilities, the equity-based executive compensation provides incentives for executives to increase such volatilities (Murphy 2012). Therefore, PVS captures the incentives provided to executives, whose activities increase the stock return volatilities.

Adopting the Black-Scholes-Merton model, I estimate the pay-volatility sensitivity (respect to 0.01 change in stock return volatility) as:

$$\left[\partial(option\,value)/\partial(stock\,volatility)\right]*(0.01)=e^{-dT}N'(Z)ST^{\frac{1}{2}}*(0.01),$$

Where $N' = normal\,density\;function.$

Computing pay-performance sensitivity and pay-volatility sensitivity, I take natural log of PPS to make it compatible for the Fama-French 3 Factor model and other regression models.

5.2 Fama-French Three Factor Model and Regressions Estimation

I run multiple regressions to test different hypotheses. To test Hypothesis-1, I use the Fama-French Three Factor model to examine the relationship between executive compensation and firm's stock price performance. For testing the remaining hypotheses, I perform regression estimation with different control variables and dependent variables in order to investigate the relationship between executive compensation and firm performance: stock price performance and operating performance.

5.2.1 Fama-French Three Factor Model

For the Fama French 3 factor model, I compute the dependent variable to test the Hypothesis-1. Measuring the firm performance through stock price performance requires estimation of the stock returns to each firm in my sample. As PPS and PVS are estimated annually, the stock price performance needs to be measured annually as well. Therefore, I compound the monthly stock returns to annualize stock returns as

$$compounded\;return=[(1+Jan)*(1+Feb)*....*(1+Dec)]-1$$

The Fama-French 3 factor model considers three unique independent variables that take into account the market factor (market return minus the risk-free rate), the size factor

(small minus big) and the value factor (high minus low). I estimate these three factors according to Fama and French (1993). The market factor is estimated by gathering the "value-weighed market returns" of each period and then subtracting the risk-free rate from the returns. While collecting value-weighted market returns, I ensure to incorporate the dividend factor into the returns. The market factor is then annualized to fit in the model with PPS and annual stock price performance.

To calculate the size factor, the data are rearranged based on each firm's assets to reflect the firm size. For each year, firms are divided into two parts "small" and "big" based on their market equity value. Then each size factor is categorized into three parts, low, medium and high. The lowest 30% of all the small firms are assigned as "small low", the small firms with assets between 30% and 70% are assigned "small medium". The highest 30% of all the small firms are assigned "small high". A similar category is used for the big firms. Then "small minus big (smb)" is calculated using the following formula,

$$smb = \frac{1}{3} * [small\ low + small\ medium + small\ high] - \frac{1}{3} * [big\ low + big\ medium + big\ high]$$

To estimate the "value factor", the book to market (B/M) ratios are calculated using book value per share. The data are then rearranged based on the firm's B/M ratio to reflect the firm value. For every year, firms are distributed into two groups "high" and "low" based on their B/M values. In addition, each group is further divided into two groups: small and big. The group "high small" is assigned to the set of the high B/M ratio with lowest 30% of firm value. Also, the group with highest 30% of firm value in the high B/M ratio is assigned "high big". The same process is applied to low firms. Therefore, I obtain two groups for each of the tree "value factor" based on top and bottom 30% from the set. Finally, I estimate the quantity "high minus low (hml)" using the following expression,

$$hml = \frac{1}{2} * [high\,small + high\,big] - \frac{1}{2} * [low\,small + low\,big]$$

Once all the factors are estimated, I setup the Fama-French regression model by taking the annualized return as the dependent variable and the log of PPS as one of the independent variables to test Hypothesis-1. The Fama-French Regression is conducted to examine the relationship between pay-performance sensitivity and stock returns.

5.2.2 Regression Estimation

To test Hypothesis 1, I run multiple regressions with variables that are different from those in the Fama-French model. The accounting variables are formed using information from the Compustat database. While the incentive measure (PPS) remains the same as in the Fama-French three factor model, the total cash compensation (TCC) includes both salary and bonus. I use stock price and book value of stockholder's equity to calculate book-to-market (BM). For market capitalization, I use market value of firm's equity from CRSP at the end of calendar years. The model also includes one year lag of returns and three year lag of returns for each firm. Lastly, I compute the asset growth as one year percentage change in total assets. All the variables are estimated annually to match with the incentive (PPS) estimation. Once all the variables are computed, I perform two sets of regressions. One set has stock returns regressed on PPS and other variables measured as of the same year. The other set has stock returns of the following year regressed on lagged PPS and other variables measured as of the same year.

To test hypotheses 2a and 2b, I estimate the operating performance (ROA) measure of firms by using earnings before interest, EBITDA (Compustat data item # 13) and year-end total assets (Compustat data item # 13). Return on assets (ROA) is computed by taking the ratio of EBITDA over total assets. To examine the relationship between incentive compensation and firm's operating performance, I replace stock returns with return on assets

(ROA) measured as of the fiscal year end matched with the same calendar year and regress ROA on PPS and cash compensation with control variables measured as of the same year. Furthermore, I classify the ROA into different industries and then subtract the industry median to adjust for the industry effects. Later, I replace the operating performance with industry adjusted operating performance and examine the relationship between incentive compensation and industry adjusted operating performance to test Hypothesis 2b.

In addition, I estimate the model for both operating performance and industry adjusted operating performance by regressing on the lagged values of all the variables. Therefore, one-year-forward operating performance measured in the following calendar year is regressed on lagged PPS and cash compensation with control variables measured as of the current year. The results of this regression are shown in Table 10.

While the study has used pay-performance sensitivity (PPS) as the incentive measure of executives so far, I move to the pay-volatility sensitivity (PVS) measure to test Hypothesis 3. It is well known that the value of stock option increases with stock return volatility (Murphy 2012). Therefore, executives are motivated to take more risk if their compensation package includes rewards to volatility. Low (2009) argues that firms tend to reduce executive's risk aversion behavior by increasing PVS. Thus, I examine the relationship between executive's PVS and firm total risk. To test Hypothesis 3, I use two different risk taking measures. Risk taking 1 is the log variance of daily stock returns over annualized fiscal year (Low, 2009 and Coles et al., 2006) and risk taking 2 is the standard deviation of return on assets (John et al., 2008). As control variables, I use total asset (size) to control for size, return on assets (ROA) to control for profitability, market-to-book (MB) as a proxy for investment opportunity, and total cash compensation (TCC) as a proxy for the level of executive's risk aversion. Coles et al. (2006) show that executives can change the firm risk through leverage, capital expenditures, and research and development expenditures.

Therefore, any changes to these firm policies can induce firm's risk change through reasons other than manager's risk aversion (Low, 2009). Hence, I also control for firm policy through Net Capital Expenditure (NETCAPEX), Leverage and R&D Expenditure (RD).

6. Results

To examine the relationship between executive compensation and firm performance, I conduct multiple tests with various proxies and control variables because I am interested in the relationship between different aspects of incentive compensation and firm performance. I begin the analysis using a sample of 2,788 unique firms with all available information needed to perform the tests. The time period includes the entire database period of Execucomp: 1992 – 2013. Once I collect all the information for my sample, I conduct a series of multiple regressions to determine the relationship between incentive compensation and firm performance. For each hypothesis, I change my dependent and independent variables according to the tests.

6.1 The relationship between pay-performance sensitivity and firm's stock performance

The first regression set to test this relationship involves the Fama-French three factor model. I regress annualized stock return on the pay-performance sensitivity and three Fama-French factors. The econometric models are as follows:

$$R_{it} - R_f = \alpha_{it} + \beta_{it} mkt_{it} + s_{it} smb_{it} + h_{it} hml_{it} + p_{it} pps_{it} + e_{it} \quad (1)$$

$$R_{it} - R_f = \alpha_{it} + \beta_{it} mkt_{it} + s_{it} smb_{it} + h_{it} hml_{it} + p_{it} \left(\frac{pps_{it} + pps_{it-1}}{2}\right) + e_{it} \quad (2)$$

$$R_{it} - R_f = \alpha_{it} + \beta_{it} mkt_{it} + s_{it} smb_{it} + h_{it} hml_{it} + p_{it} \left(\frac{pps_{it} + pps_{it-1} + pps_{it-2}}{3}\right) + e_{it} \quad (3)$$

$$R_{it} - R_f = \alpha_{it} + \beta_{it} mkt_{it} + s_{it} smb_{it} + h_{it} hml_{it} + p_{it} pps_{it} + q_{it} pps_{it-1} + k_{it-2} pps_{it-2} + e_{it} \quad (4)$$

The results for these estimations are presented in Table 6. Eq. (1) is the Fama-French three factor model with PPS as an additional variable. Column 2 of Table 6 represents this equation. The coefficient on Log PPS in the Fama-French model is positive and significant ($p < 0.001$) as 0.0473. Eq. (2) replaces Log PPS with average of Log PPS and one-period-lag of Log PPS, and eq. (3) replaces Log PPS with average of Log PPS, one-period-lag of Log PPS and two-period-lag of Log PPS. The coefficient of executive incentives in eq. (2) is 0.0523 and in eq. (3) is 0.05. It is noted that both coefficients are significant and very close to each other. In eq. (4), one-period-lag of Log PPS and two-period-lag of Log PPS are regressed with excess returns. The coefficient of one-period-lag of Log PPS is 0.01349, which is significant ($p<0.001$), while the coefficient of two-period-lag of Log PPS is -0.00953, which is also significant ($p<0.001$). However, in column 4 of Table 6, the coefficient of the average executive incentive over two periods of lag is positive and significant. Therefore, these results show a positive relationship between excess returns and executives' pay-performance sensitivity, implying that as executives are compensated more from stock options and stock grants, their firms experience higher stock price performance.

To further test the relationship between stock price performance and incentive compensation, I run additional regressions using different control variables. I replace the Fama-French three factors with Total Cash Compensation, Firm Market Capitalization, Book-to-Market ratio, Lag 1 year and Lag 2 years of returns, and Assets growth. The econometric model is as follows:

$$R_{it} - R_f = \alpha_{it} + p_{it}\,pps_{it} + t_{it}\,ttc_{it} + f_{it}\,fmc_{it} + b_{it}\,bm_{it} + \rho_{it-1} r_{it-1} + \tau_{it-2} r_{it-2} + a_{it}\,ag_{it} + e_{it} \qquad (5)$$

For eq. (5), I run a series of regressions, which are presented in Table 7. Column 3 examines the relationship between excess returns and incentive compensation, with total cash compensation as control variables. The coefficient of Log PPS, 0.0665, is significant ($p <$

0.001). As more control variables are added to the model, the adjusted R-square improves from 0.024 (column 3) to 0.633 (column 5). Finally, the regression for eq. (5) presents a significant positive coefficient of Log PPS with a magnitude of 0.01939. To further assure the results obtained for testing Hypothesis-1, I regress the above variables on one-year-forward stock price performance. The results are shown in Table 8 and the econometric model is as follows:

$$R_{it+1} - R_f = \alpha_{it} + p_{it}\, pps_{it} + t_{it} ttc_{it} + f_{it}\, fmc_{it} + b_{it} bm_{it} + \rho_{it-1} r_{it-1} + \tau_{it-2} r_{it-2} + a_{it} ag_{it} + e_{it} \quad (6)$$

The results of eq. (6) are similar to those of eq. (5). For every regression in Table 8, the coefficient of Log PPS is positive and significant. In column 5 regression, the relationship of Log PPS with one-year-forward excess returns is positive and significant with the coefficient of 0.00916 ($p < 0.001$). These findings contradict the findings of Cooper, Gulen and Rau (2014) but are aligned with the findings of the one-year-forward empirical model of Akindayomi and Warame (2009). Therefore, my results of positive loading on the coefficient of pay-performance sensitivity on all of the above equations imply that there is a positive relationship between incentive compensation and firm performance, where incentive compensation is measured by pay-performance sensitivity (PPS) and firm performance is measured by stock price performance. Hypothesis-1 is supported.

6.2 The relationship between pay-performance sensitivity and firm's operating performance

In Hypothesis 1, I look at the relationship between executive compensation and firm performance by using stock price performance as firm performance measure. Hypotheses 2a and 2b consider firm performance through operating performance. I measure firm's operating performance by return on asset (ROA) which is the ratio of earnings before depreciation over total assets. For Hypothesis-2b, I adjust operating performance for industry effects to

examine a much refined effects of executive incentives. Computing the operating performance, I execute two separate regressions for each hypothesis. The results are shown in Table 9 and Table 10.

Table 9 presents two regressions; one for ROA and the other for industry adjusted ROA. I measure firm's operating performance as of fiscal year t regressed on lagged ROA as of t-1 and on incentive compensation and other variables as of year t. The econometric models are as follows:

$$ROA_{it} = \alpha_{it} + p_{it}\,pps_{it} + t_{it}\,ttc_{it} + \lambda_{it-1}\,roa_{it-1} + f_{it}\,fmc_{it} + b_{it}\,bm_{it} + \rho_{it-1}\,r_{it-1} + \tau_{it-2}\,r_{it-2} + a_{it}\,ag_{it} + e_{it} \quad (7)$$

$$AdjROA_{it} = \alpha_{it} + p_{it}\,pps_{it} + t_{it}\,ttc_{it} + \lambda_{it-1}\,roa_{it-1} + f_{it}\,fmc_{it} + b_{it}\,bm_{it} + \rho_{it-1}\,r_{it-1} + \tau_{it-2}\,r_{it-2} + a_{it}\,ag_{it} + e_{it} \quad (8)$$

The coefficients α1 of Log PPS for both equations are positively significant ($p < 0.001$ for eq. (7) and $p < 0.001$ for eq. (8), suggesting a positive relationship between incentive compensation and firm's operating performance. The second regression shows a Log PPS coefficient of 0.00052. In eq. (7) (3rd regression), I control for total cash compensation (TCC) and find that the coefficient of Log PPS is 0.00064 ($p < 0.001$). A similar result is obtained when the operating performance is adjusted for industry. On the other hand, even though total cash compensation is negatively related to operating performance, the relationship between incentive compensation and operating performance becomes positive and significant after operating performance is adjusted for industry. The adjusted R-square for this model is 0.8777 for ROA and 0.7744 for industry adjusted ROA.

To test Hypothesis 2a and 2b further, I analyze the relationship of executive incentive with one-year-forward ROA and industry-adjusted ROA. Table 10 represents two sets of regression; one for ROA and the other for industry-adjusted ROA. It presents one-year-forward firm operating performance as of fiscal year t+1 regressed on lagged ROA, and on

incentive compensation and other variables as of year t. The econometric models are as follows:

$$ROA_{it+1} = \alpha_{it} + p_{it}\,pps_{it} + t_{it}\,ttc_{it} + \lambda_{it-1}\,roa_{it-1} + f_{it}\,fmc_{it} + b_{it}\,bm_{it} + \rho_{it-1}\,r_{it-1} + \tau_{it-2}\,r_{it-2} + a_{it}\,ag_{it} + e_{it} \quad (9)$$

$$AdjROA_{it+1} = \alpha_{it} + p_{it}\,pps_{it} + t_{it}\,ttc_{it} + \lambda_{it-1}\,roa_{it-1} + f_{it}\,fmc_{it} + b_{it}\,bm_{it} + \rho_{it-1}\,r_{it-1} + \tau_{it-2}\,r_{it-2} + a_{it}\,ag_{it} + e_{it} \quad (10)$$

The results of one-year-forward model is also similar to the previous model. The coefficient of pay-performance sensitivity is positively related to both operating performance and industry adjusted operating performance. Moreover, Log PPS is positive even after controlling for TCC. While these results contradict the literature of no pay-for-performance, they are consistent with the findings of Abowd (1990) and Mehran (1995). The results imply that there is a positive relationship between incentive compensation and firm performance, where incentive compensation is measured by pay-performance sensitivity (PPS) and firm performance are measured by both operating performance and industry adjusted operating performance. Hence, Hypotheses 2a and 2b are both supported. It appears that there is a positive relationship between incentive compensation and firm performance.

6.3 The relationship between pay-volatility sensitivity and firm's risk taking

The literature on managerial risk taking examines the relationship between incentive compensation and stock return volatility. In Hypothesis 3, I change the incentive measure of executive compensation from PPS to pay-volatility sensitivity (PVS) and replace firm performance with firm's risk taking. I regress the risk taking measures on PVS, Firm Policy variables and lagged control variables to test the hypothesis. The results are presented in Table 11 with the economic models are as follows:

$$Risk1_{it} = \alpha_{it} + p_{it}\,pvs_{it} + t_{it}\,ttc_{it} + c_{it-1}\,control_{it-1} + f_{it}\,firmpolicy_{it} + e_{it} \quad (11)$$

$$Risk2_{it} = \alpha_{it} + p_{it}\, pvs_{it} + t_{it} ttc_{it} + c_{it-1} control_{it-1} + f_{it}\, firmpolicy_{it} + e_{it} \quad (12)$$

The results of Eq. (11) and Eq. (12) are similar to each other. The coefficients for both equations show that PVS is positively related to risk taking, even though each risk taking is measured differently. The prior research shows the importance of controlling for firm policy in examining the relationship between risk taking and pay-performance volatility (Coles et al., 2006). The first regression without controlling for any firm policy has the coefficient of pay-volatility sensitivity as 0.00012 ($p < 0.001$). Controlling for firm policy variables, the coefficient of pay-volatility sensitivity remains positive with the increased adjusted R-square from 0.1917 to 0.2179. With risk taking 2, I run a similar regression model as presented in Table 11. With each of the two regression equations, I have a positive coefficient for PVS, but the magnitudes of the coefficient differ noticeably. The results are consistent with the findings by Low (2009) and Coles et al., (2006). My findings of positive loading on the coefficient of pay-volatility sensitivity with the risk taking models imply that there is a positive relationship between incentive compensation and risk taking, where incentive compensation is measured by pay-volatility sensitivity (PVS). Hence, Hypothesis 3 is supported.

6.4 Robustness

Endogeneity has been an issue for empirical research as estimates derive from OLS/panel regression in many cases are unreliable. One of the major causes of endogeneity is an omitted variable issue. This occurs when some variables that can have a significant influence on independent and dependent variables are not included in the model. As Brown, Beekes and Verhoeven (2011) argue, the most common way to address endogeneity is to use instrumental variables. Therefore, to test the reliability of my results, I perform simultaneous equation modeling (three-stage least square) with executive age and firm size as instrumental

variables. Executive age can affect CEOs in their decision on firm performance and risk-taking as they become more knowledgeable over time. The experience they gain over time will help them make better decisions and improve firm performance. In terms of firm size, it has been recognized that large firms tend to have lower PPS than small firms. Therefore, firm size can have a significant role in explaining incentive compensation. In this three-stage least square approach, the 1st step predicts the values for the endogenous regressors followed by stage two, where residuals are obtained to estimates the cross equation correlation matrix. Finally, in the 3rd stage the model conducts the estimation step. The economic models are as follows:

$$R_{it} - R_f = \alpha_{it} + p_{it} pps_{it} + t_{it} tcc_{it} + f_{it} fmc_{it} + \rho_{it-1} r_{it-1} + \tau_{it-2} r_{it-2} + a_{it} age_{it} + e_{it} \quad (13)$$

$$pps_{it} = \alpha_{it} + \beta_{it}(R_{it} - R_f) + t_{it} tcc_{it} + f_{it} fmc_{it} + \rho_{it-1} r_{it-1} + s_{it} size_{it} + e_{it} \quad (14)$$

$$ROA_{it} = \alpha_{it} + p_{it} pps + t_{it} tcc_{it} + f_{it} fmc_{it} + \rho_{it-1} r_{it-1} + \tau_{it-2} r_{it-2} + a_{it} age_{it} + b_{it} bm_{it} + \lambda_{it-1} roa_{it-1} + e_{it} \quad (15)$$

$$pps_{it} = \alpha_{it} + \gamma_{it} ROA_{it} + t_{it} tcc_{it} + f_{it} fmc_{it} + \rho_{it-1} r_{it-1} + s_{it} size_{it} + b_{it} bm_{it} + \lambda_{it-1} roa_{it-1} + e_{it} \quad (16)$$

The results of simultaneous equation modeling are shown in Table 12. In the first set of results, where firm performance is measured through stock price performance, I find excess returns to be positively related to PPS. The coefficient of PPS is significant ($p<0.001$) at 0.104. The Weighted R-square of modeling is 0.5295. Moreover, when firm performance is measured through operating performance, the coefficient of PPS in that model is also found to be positive as 0.011. The relationship between ROA and PPS in this model is also significant ($p < 0.001$) and the weighted R-square of the model is 0.8388. The results of the three-stage least squares (3SLS) show a positive significant coefficient for pay-performance sensitivity with both firm performance measures. The results from simultaneous equations

strengthen that there is a positive relationship between incentive compensation and firm performance, supporting the equity-based compensation to executives.

6.5 What explains the positive relationship between incentive compensation and firm performance?

Using various measures in executive compensation and in firm performance, I have found a positive relationship between incentive compensation and firm performance during my sample period. Equity-based compensation became extremely popular in 1990s and accounted for about 45% of the executive's entire compensation package by 1995 (Langsam, Kreuze and Newell, 1997). The increase in equity-based compensation provide executives an opportunity to increase their wealth by increasing stock price performance. Furthermore, as Murphy (2012) argues, while researchers regressing grant date pay levels on performance find no pay-for-performance, they find that the realized pay of executives is strongly related to firm performance. The realized pay (by definition) depends on the firm's current and past performance. Therefore, it is the most useful measure in evaluating whether rewards have been aligned with firm performance. Moreover, the positive relationship between incentive compensation and firm performance is expected since equity-based compensation provides incentives to executives better than salary and bonus. Therefore, even a small percentage increase in firm's stock price will provide executives sufficient incentive to work harder and to increase their wealth (Larcker and Tayan, 2011).

The positive relationship between PVS and risk taking is explained by Murphy (2012) with the idea of increasing the value of options by increasing stock return volatility. Therefore, if the increase in volatility results in increase in option values, PVS provides an incentive to the executives to increase such volatilities by taking more risk. Therefore, the higher PVS encourages executives to take more risk, as it reduces executive's risk aversion

behavior. Executives take more risk because they have an opportunity to increase their wealth through appreciation of equity-based compensation if they are more open to risk taking.

7. Conclusion

Executive compensation continues to be one of the most debated topics in finance research. However, the practice in CEO compensation during the past few decades raises concerns about its efficacy. Even though equity-based compensation tends to increase the CEO pay over time, researchers still argue about the effectiveness of incentive compensation in improving firm's stock price, operating performance, and/or firm's risk takings. The objective of this study is to examine whether the incentive compensation improves firm performance. The results provide evidence to the literature that the equity-based compensation helps align the interest of managers to that of shareholder as mangers become motivated with the opportunity to increase their wealth through firm performance improvements.

Using Execucomp database, this study finds that the incentive compensation measured by pay-performance sensitivity (PPS) is positively associated with firm performance measured by stock price and operating performance. Furthermore, the paper also finds that the incentive compensation measured by pay-volatility sensitivity (PVS) is positively associated with firm's total risk taking. In addition to the positive relationship between incentive compensation and firm performance, it is also found that executives with higher PPS tend to increase firm performance both in stock prices and in earning from operation.

This study contributes to the executive compensation literature by first examining whether managerial incentives provided by equity-based compensation improve stock price performance and/or operating performance. While most studies in the literature focus on

executive compensation as a whole or as individual components of firm performance, I investigate the direct relation between pay-performance sensitivities (PPS) and firm performance and between pay-volatility sensitivities (PVS) and risk taking. Second, although information on managers' PPS is publicly available and must have been reflected into stock prices in efficient capital markets, I find that managers with higher PPS increase firm performance both in stock prices and in earnings from operation. Third, while managers in the modern corporations have little share-ownership into their firms, agency conflicts between shareholders and managers can be significantly reduced by granting equity-based compensation to mangers. Hence, the current trend toward a high level of executive compensation provided mostly by equity-based compensations might be a natural practice among corporations.

Overall, the findings of this study support the rationale of equity-based compensation to the executive, as it provides an opportunity for executives to increase their wealth by aligning their interests with those of shareholder.

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Appendix

Table 1: Descriptive Statistics

Panel A Stock Performance on Pay-Performance Sensitivity

Variable	n	Mean	St.Dev.	Min	Q_1	Median	Q_3	Max
Excess Return	151343	0.155	0.666	-1.037	-0.156	0.082	0.339	26.147
PPS	151343	3.885	1.798	-79.342	2.791	3.876	4.991	13.472
HML	151343	3.159	15.954	-39.40	-3.46	3.71	15.14	27.24
SMB	151343	3.298	11.816	-23.29	-3.73	0.39	7.78	28.41
Mkt_Rf	151343	8.151	18.879	-38.39	0.83	10.69	20.21	35.15

Panel B Operating Performance on Pay-Performance Sensitivity

Variable	n	Mean	St.Dev.	Min	Q_1	Median	Q_3	Max
ROA	156108	0.125	0.116	-2.989	0.072	0.125	0.180	1.388
Adjusted ROA	156108	0.0044	0.113	-3.125	-0.035	0.0002	0.048	1.237
PPS	156108	3.912	1.792	-79.342	2.813	3.904	5.013	13.472
TCC	156108	6.216	0.796	-6.907	5.720	6.140	6.636	11.706
Returns	156108	0.188	0.655	-0.986	0.113	0.113	0.369	26.19
Market	156108	21.135	1.645	13.764	20.004	21.004	22.182	27.156
BM	156108	-0.635	41.139	-5310.7	0.00687	0.015	0.033	601.67
Asset Growth	156108	0.374	9.106	-0.991	-0.021	0.057	0.171	1930.0

Panel C Risk Taking on Pay-Volatility Sensitivity

Variable	n	Mean	St.Dev.	Min	Q_1	Median	Q_3	Max
Risk Taking-1	147778	-7.452	0.951	-10.759	-8.127	-7.503	-6.823	-2.741
Risk Taking-2	147778	0.039	0.074	0.0001	0.012	0.024	0.045	11.03
PVS	147778	59.471	165.68	0.00001	6.152	17.657	50.705	1251.34
TCC	147778	6.214	0.788	-6.91	5.72	6.143	6.64	11.7
Total Assets	147778	14128	78662	3.432	509.29	1644.621	5932	3221972
Market	147778	1.981	1.721	0.298	1.139	1.493	2.195	78.564
RD	147778	0.031	0.065	0.00	0.00	0.00	0.033	1.545
NetCapex	147778	0.052	0.062	-1.420	0.014	0.036	0.069	1.008
Leverage	147778	0.221	0.193	0.00	0.006	0.020	0.329	4.910

Table 2: Sample correlations of key variables of multivariate analysis

	Exce	RO	Ind_Adj_R	Risk	Risk	PPS	PVS	TC	RD	Levera	Net
Excess	1										
ROA	0.089	1									
Ind_Adj_R	0.087	0.94	1								
Risk	0.019	-	-0.238	1							
Risk	0.049	-	-0.123	0.227	1						
PPS	0.029	0.02	0.033	0.005	0.001	1					
PVS	-	0.05	0.063	-0.097	-0.031	0.21	1				
TCC	0.019	0.04	0.081	-.105	-0.053	0.04	0.32	1			
RD	0.025	-	-0.349	0.277	0.225	0.01	0.00	-	1		
Leverage	-	-	-0.108	-0.052	-0.032	-	0.00	0.07	-	1	
NetCapex	-	0.18	0.105	0.080	0.046	0.01	-	-	-	0.056	1

Table 3: Sample Distribution by 1-digit SIC industry

SIC	Industry	Number	(%)
0	Agricultural	11	0.4%
1	Mining and Exploration	144	5.2%
2	Dairy, Livestock and Chemicals	394	14.1%
3	Industrial Manufacturing	731	26.2%
4	Transportation, Communication and Waste Management	294	10.5%
5	Wholesale and Retail Stores	303	10.9%
6	Financial Services	433	15.5%
7	Other Services	351	12.6%
8	Health and Education	118	4.2%
9	Conglomerate	9	0.3%
Total:		2788	100%

Table 4: Size, BM and pay-performance sensitivity (PPS) patterns in excess returns

Average annual excess returns for portfolios formed on Size and BM, Size and PPS; sample is from 1992 to 2013. Stocks are allocated to two Size groups (Small and Big) using the sample breakpoints (50-percentile). Stocks are further allocated independently to three BM groups (Low, Medium and High), again using our own breakpoints (30-percentile and 70-percentile). Panel A represents Size-BM portfolios. Similarly, Panel B shows Size-PPS portfolios. Instead of allocating stocks independently to three BM groups, stocks are allocated into three PPS groups. The table shows average of annual excess return.

	Low	Medium	High
Panel A: Size-BM Portfolios			
Small	-0.0107	0.2367	0.6725
Big	0.0059	0.0958	0.3116
Panel B: Size-PPS Portfolios			
Small	0.0329	0.2111	0.2662
Big	0.0875	0.1557	0.2278

Table 5: Variable Definitions

The table shows the definition of variables that are used in the regressions as control variables and firm policy variables and in the estimation of pay-performance sensitivity and pay-volatility sensitivity.

Panel A: Variable Definitions for PPS and PVS estimation	
Estimation Variables	Definition
Option Exercisable and Option Unexercisable	Number of vested and unvested options awards
Expric	Option Exercise Price
Exdate	Option Expiration Date
Price (PRCCF)	Year End Close Price of Stock
Volatility	Estimate Stock Volatility (60 months rolling)
Dividend	Estimated Dividend Yield. Average of dividend yield over the current and two prior years, winsorized to 5th and 95th levels.
Risk Free Rate	Fiscal year end risk free rate corresponding to maturity of the options. Historical data from Federal Reserve.

Panel B: Variable Definitions for Regression	
Control Variables	Definition
Asset Growth	(Assetst – Assetst-1) / Assetst-1
Size	Log (Total Assets) t-1
MB	((Total assets – Common Equity) + (Price Fiscal Year Close* Common Shares Outstanding)) / Total Assets) t-1
ROA	Operating income before depreciation / Total Assets
Leverage	((Debt in Current Liabilities + Long Term Debt Total) / Total Assets) t
NetCapex	((Capital Expenditure – Sale of Property, Plant and Equipment) / Total Assets) t
RD	(Research and Development Expense / Total Assets) t

Table 6: Three-Factor Regression of Pay-Performance Sensitivity on Firm's Excess Returns

$$R_{it} - R_f = \alpha_{it} + \beta_{it} mkt_{it} + s_{it} smb_{it} + h_{it} hml_{it} + p_{it} pps_{it} + e_{it}$$

Dependent variable is the annual excess return regressed on the Fama-French market factor (Mkt-Rf), value factor (HML), size factor (SMB) and on pay-performance sensitivity (PPS). PPS is also lagged for one year (Lag-1 log PPS) and two years (Lag-2 log PPS). Lag-1 Avg PPS is the average of PPS and one-year lag PPS, whereas, Lag-2 Avg PPS is the average of PPS, one-year lag PPS and two-year lag PPS. The sample is from 1992 to 2013 and the t-statistics are reported in the parentheses.

Excess Returns	(1)	(2)	(3)	(4)	(5)
Lag-2 Log PPS					-0.00953*** (-8.25)
Lag-1 Log PPS					0.01349*** (11.28)
Lag-2 Avg PPS				0.05000*** (43.30)	
Lag-1 Avg PPS			0.05239*** (49.82)		
Log PPS		0.04732*** (52.44)			0.04605*** (39.87)
HML	0.00201*** (17.65)	0.00199*** (17.64)	0.00198*** (17.16)	0.00197*** (16.68)	0.00191*** (16.25)
SMB	0.00545*** (35.41)	0.00528*** (34.57)	0.00526*** (34.28)	0.00528*** (34.01)	0.00527*** (34.10)
Mkt-Rf	0.00932*** (106.79)	0.00913*** (105.57)	0.00918*** (105.49)	0.00924*** (105.13)	0.00911*** (103.92)
Constant	0.05560*** (30.30)	-0.12615*** (-32.23)	-0.14669*** (-32.87)	-0.13850*** (-28.40)	-0.1372*** (-28.21)
Obs	151343	151343	147724	142010	142010
Adj R2	0.0890	0.1052	0.1051	0.1036	0.1094

Table 7: Regression of Pay-Performance Sensitivity on Firm's Excess Returns

$$R_{it} - R_f = \alpha_{it} + p_{it}\, pps_{it} + t_{it} ttc_{it} + f_{it}\, fmc_{it} + b_{it} bm_{it} + \rho_{it-1} r_{it-1} + \tau_{it-2} r_{it-2} + a_{it} ag_{it} + e_{it}$$

Dependent variable, annual excess returns measured over January-December of calendar year t, is regressed on incentive compensation and other variables measured as of year t. Incentive compensation is measured through pay-performance sensitivity and cash compensation is the total cash compensation (TTC) collected from Execucomp. Explanatory variables include one year and three years lag of stock returns, asset growth, market capitalization and BM ratio (Book-to-market ratio defined by Fama-French three factor model (1996)). The sample is from 1992 to 2013 and the t-statistics are reported in the parentheses.

Excess Returns	(1)	(2)	(3)	(4)	(5)
Log-PPS	0.05166***		0.06652***	0.06662***	0.01939***
	(56.30)		(61.31)	(57.01)	(24.51)
Total Cash Compensation		0.01798***	-0.06238***	-0.06115***	-0.01813***
		(8.62)	(-25.53)	(-23.92)	-10.86)
Firm Market Capitalization				-0.00129	0.00113
				(-1.04)	(1.37)
Book-to-market ratio				0.000212***	0.000062*
				(5.31)	(2.45)
Lagged 1 year Returns					0.85749***
					(431.63)
Lagged 2 year Returns					-0.13316***
					(-67.07)
Asset Growth					0.000335**
					(2.91)
Constant	-0.04385***	0.04647***	0.28577***	0.30509***	0.03679**
	(-11.11)	(3.55)	(21.17)	(12.72)	(2.29)
Obs	156108	156108	156108	156108	139968
Adj R2	0.0199	0.0005	0.0240	0.0241	0.6333

Table 8: Regression of Pay-Performance Sensitivity on Firm's one-year forward Excess Returns

$$R_{it+1} - R_f = \alpha_{it} + p_{it}\, pps_{it} + t_{it} ttc_{it} + f_{it}\, fmc_{it} + b_{it} bm_{it} + \rho_{it-1} r_{it-1} + \tau_{it-2} r_{it-2} + a_{it} ag_{it} + e_{it}$$

Dependent variable, one-year-forward excess returns measured over January-December of calendar year t+1, is regressed on lagged of incentive compensation and other variables measured as of year t. Incentive compensation is measured through pay-performance sensitivity and cash compensation is the total cash compensation (TTC) collected from Execucomp. Explanatory variables include one year and three years lag of stock returns, lagged asset growth, market capitalization and BM ratio (Book-to-market ratio defined by Fama-French three factor model (1996)). The sample is from 1992 to 2013 and the t-statistics are reported in the parentheses.

Excess Returns	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Log-PPS	0.03634***		0.04673***	0.04938***	0.00916***
	(38.69)		(42.01)	(41.14)	(11.57)
Total Cash Compensation		0.01283***	-0.04340***	-0.03802***	-0.00689***
		(6.06)	(-17.40)	(-14.58)	(-4.12)
Firm Market Capitalization				-0.00837***	-0.000730
				(-6.59)	(-0.88)
Book-to-market ratio				0.000208***	0.000081*
				(4.97)	(2.88)
Lagged 1 year Returns					0.86075***
					(433.20)
Lagged 2 year Returns					-0.13138***
					(-66.02)
Asset Growth					0.00051**
					(3.54)
Constant	0.01483**	0.07766***	0.24399***	0.37714***	0.04566**
	(3.66)	(5.85)	(17.71)	(15.34)	(2.83)
Obs	152409	152409	152409	152409	139968
Adj R^2	0.0097	0.0002	0.0117	0.0121	0.6317

Table 9: Regression of Pay-Performance Sensitivity on Firm's Operating Performance (ROA)

Dependent variable, ROA measured in calendar year t, is regressed on incentive compensation and other variables measured as of December of year t. Incentive compensation is measured through pay-performance sensitivity and cash compensation is the total cash compensation (TTC) collected from Execucomp. Explanatory variables include one year and three years lag of stock returns and lag of ROA. Other variables at t are regressed as asset growth, market capitalization and BM ratio (Book-to-market ratio defined by Fama-French three factor model (1996)). The sample is from 1992 to 2013 and the t-statistics are reported in the parentheses.

	Operating Performance (ROA)				**Industry Adjusted Operating Performance (ROA)**		
	(1)	(2)	(3)		(1)	(2)	(3)
Log-PPS		0.00052***	0.00064***			0.00164***	0.00109***
		(7.09)	(8.10)			(16.86)	(10.45)
Total Cash Compensation	-0.00019		-0.00068***		0.00400***		0.00316***
	(-1.23)		(-4.10)		(19.56)		(14.39)
Lagged ROA	0.93082***	0.93031***	0.93017***		0.83299***	0.83124***	0.83189***
	(971.20)	(968.06)	(967.38)		(658.69)	(655.20)	(655.79)
Firm Market Capitalization	0.0017***	0.00135***	0.00145***		0.00482***	0.00482***	0.00439***
	(22.17)	(17.02)	(17.50)		(47.68)	(45.91)	(40.26)
Book-to-market ratio	0.0000021	0.0000012	0.000002		0.000005	0.000002	0.0000032
	(1.00)	(0.88)	(0.72)		(1.39)	(0.44)	(1.02)
Lagged 1 year Returns	0.00076**	0.00067**	0.00643**		0.000629*	(0.000277)	0.000419
	(3.88)	(3.40)	(3.25)		(2.42)	(1.06)	(1.61)
Lagged 2 year Returns	0.00107***	0.00099***	0.00098***		0.00141***	0.00121***	0.00126***
	(5.38)	(5.00)	(4.94)		(5.40)	(4.62)	(4.83)
Asset Growth	0.000039**	0.000039**	0.00004**		0.000009	0.000009	0.00000963
	(3.46)	(3.47)	(3.46)		(0.63)	(0.61)	(0.64)
Constant	-0.02659***	-0.02245***	-0.02059***		-0.22811***	-0.20932***	-0.21791***
	(-18.63)	(-14.55)	(-12.81)		(-121.14)	(-102.77)	(-102.75)
Obs	139968	139968	139968		139968	139968	139968
Adj R^2	0.8777	0.8777	0.8777		0.7742	0.7740	0.7744

Table 10: Regression of Pay-Performance Sensitivity on Firm's One-year forward Operating Performance (ROA)

Dependent variable, one-year- forward ROA measured in calendar year t+1, is regressed on lagged of incentive compensation and other variables measured as of year t. Incentive compensation is measured through pay-performance sensitivity and cash compensation is the total cash compensation (TTC) collected from Execucomp. Explanatory variables include one year and three years lag of stock returns, lagged ROA, asset growth, market capitalization and BM ratio (Book-to-market ratio defined by Fama-French three factor model (1996)). The sample is from 1992 to 2013 and the t-statistics are reported in the parentheses.

	One- year forward Operating Performance (ROA)				**One-year forward Industry Adjusted Operating Performance (ROA)**		
	(1)	(2)	(3)		(1)	(2)	(3)
Log-PPS		0.00056***	0.00063***			0.00163***	0.00103***
		(7.59)	(7.87)			(16.74)	(9.91)
Total Cash Compensation	-0.00011		-0.00037*		0.00422***		0.00342***
	(0.72)		(-2.21)		(20.59)		(15.55)
Lagged ROA	0.93109***	0.93056***	0.93049***		0.83339***	0.83131***	0.83297***
	(972.75)	(969.91)	(969.31)		(660.05)	(656.73)	(657.45)
Firm Market Capitalization	0.00159***	0.00129***	0.00134***		0.00463***	0.00469***	0.00422***
	(20.65)	(16.16)	(16.14)		(45.66)	(44.49)	(38.54)
Book-to-market ratio	0.0000029	0.0000025	0.000002		0.000005	0.000002	0.0000040
	(1.06)	(0.89)	(0.79)		(1.43)	(0.43)	(1.09)
Lagged 1 year Returns	0.00088***	0.00080***	0.00079***		0.00095**	0.000723	0.000811**
	(4.47)	(4.08)	(4.03)		(3.66)	(2.77)	(3.10)
Lagged 2 year Returns	0.00106***	0.00097***	0.00096***		0.00140***	0.00117***	0.00125***
	(5.33)	(4.91)	(4.86)		(5.53)	(4.45)	(4.77)
Asset Growth	-0.0000028	-0.0000031	-0.0000032		0.000011	0.0000087	0.00000985
	(-0.20)	(-0.22)	(-0.23)		(0.57)	(0.47)	(0.53)
Constant	-0.02610***	-0.02122***	-0.02023***		-0.22550***	-0.20659***	-0.21576***
	(-18.28)	(-13.72)	(-12.57)		(-119.68)	(-101.3)	(-101.55)
Obs	139968	139968	139968		139968	139968	139968
Adj R^2	0.8776	0.8777	0.8777		0.7739	0.7737	0.7741

Table 11: Regression of Pay-Volatility Sensitivity on Firm's Risk Taking

The table represents the relationship between pay-volatility Sensitivity on different risk taking measures. Risk Taking-1 is the Log variance of daily stock return of fiscal year annualized and Risk Taking-2 is the standard deviation of ROA prior 5 years. Incentive compensation is measured through pay-volatility Sensitivity (PVS) and cash compensation is the total cash compensation (TTC) collected from Execucomp. The control variables are lagged one year (as of t-1). The Firm Policy variables are as of year t. The sample is from 1992 to 2013 and the t-statistics are reported in the parentheses.

		Risk Taking-1			Risk Taking-2	
		(1)	(2)		(1)	(2)
Executive Compensation	PVS	0.00012*** (8.21)	0.000091*** (6.52)		0.000006*** (5.61)	0.000008*** (7.12)
	Total Cash Compensation	0.03677*** (10.75)	0.0444*** (13.18)		0.00102*** (3.63)	0.00143*** (5.03)
Control Variables	Size	-0.23727*** (-147.83)	-0.2296*** (-140.42)		-0.00077*** (-58.75)	-0.00728*** (-53.13)
	ROA	-0.2226*** (-71.90)	-0.2545*** (-79.39)		-0.0022*** (-8.73)	0.00029 (1.16)
	Market to Book ratio	0.0552*** (37.74)	0.0446*** (29.74)		0.00602*** (50.16)	0.00513*** (41.19)
Firm Policy	Leverage		0.4107*** (32.66)			0.00715*** (6.85)
	NetCapex		1.2798*** (32.41)			0.0445*** (13.60)
	RD		2.564*** (54.78)			0.1353*** (34.86)
Constant		-6.538*** (-319.08)	-6.915*** (-325.24)		0.0706*** (42.05)	0.05646*** (32.02)
Obs		136712	136712		136712	136712
Adj R^2		0.1917	0.2179		0.0621	0.0713

Table 12: Simultaneous Equation Modeling (3SLS): PPS, ROA and Excess Returns

The table represents the relationship between Pay-Performance Sensitivity on different firm performance measures. Dependent variables, Excess Return, ROA and PPS measured in calendar year t, is regressed on incentive compensation and other variables measured as of December of year t. Instrumentals variables are age and size. Incentive compensation is measured through pay-performance sensitivity and cash compensation is the total cash compensation (TTC) collected from Execucomp. Instrumental variables include size of the firms and age of executives. Other variables are 1-year and 3-year lag of returns, 1-year of ROA, market capitalization and BM ratio (Book-to-market ratio defined by Fama-French three factor model (1996)). The sample is from 1992 to 2013 and the t-statistics are reported in the parentheses.

	Stock Performance		Operating Performance	
	PPS	Excess Return	ROA	PPS
PPS		0.104*** (26.36)	0.011*** (25.65)	
Excess Return	-0.945*** (-13.57)			
ROA				29.39*** (3.79)
Total Cash Compensation	0.846*** (128.04)	-0.076*** (-23.07)	-0.009*** (-25.45)	0.815*** (17.37)
Firm Market Capitalization	0.733*** (124.82)	-0.031*** (-16.40)	-0.003*** (-14.25)	0.55*** (14.10)
Lagged 1 year Returns	0.922*** (17.12)	0.83*** (295.76)	-0.0025*** (-8.90)	0.18*** (16.95)
Lagged 2 years Returns		-0.143*** (-53.38)	0.017*** (16.88)	
Size	-0.369*** (-68.70)			-0.233*** (-7.88)
Age		-0.198*** (-16.08)	0.017*** (16.88)	
Lag ROA			0.921*** (679.04)	-27.16*** (-3.80)
Book-to-Market ratio			-0.00002*** (-14.25)	0.0011*** (6.78)
Weighted R2	0.5295	0.5295	0.8388	0.8388