

*Full Length Research*

# The Effect of CEO Compensation Structures on Risk-taking: Evidence from US Financial Institutions

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Accepted 29 April, 2015; Published 30 June, 2015

**This study investigates the relationship between CEO compensation structure and risk-taking. Our sample consists of US financial listed companies from 2006 to 2012. The results show that option and bonus compensation increase firms' stock return risk and decrease the ratio of return to risk, whereas stock compensation decreases firms' stock return risk and increases the ratio of return to risk. We show that for controlling risk-taking, stock compensation dominates other types of compensation. Our results indicate that managerial incentives matter—incentives generated by executive compensation programs are correlated with risk-taking by financial institutions. We recommend that executive incentive compensation in financial institutions should mostly consist of restricted stock.**

**Key words:** Stock Option, Compensation, Risk-taking

## INTRODUCTION

Equity-based compensation, which includes stock compensation and option compensation, has been an important component of executive compensation in American S&P 1500 financial firms. One prominent argument for the dramatic collapse of the stock market capitalization of much of the banking industry in the US during the credit crisis is that executives at banks had poor incentives (e.g., Bhagat and Bolton, 2014; Bebchuk *et al.*, 2010). As a result of this argument, in their 2009 report, the Financial Stability Board advises improving compensation practices in financial institutions. The 2009 Walker Review argues that long-term incentive plans might motivate executives to adopt short-term policies that increase short-term share prices, rather than policies that enhance the firm's long-term value. Clearly, the CEO equity-based compensation structure of financial institutions has become an important issue in financial stability.

Hayes *et al.* (2012) show that since the adoption of FAS 123R in 2006, all firms have dramatically reduced (increased) their use of stock options (restricted stock) in

CEO compensation. However, it is necessary to further investigate the relationship between CEO equity-based compensation and firm risk-taking behavior since the adoption of FAS 123R. Therefore, we use a sample consisting of US financial listed companies from 2006 to 2012 to examine this issue.

Many studies have examined why firms pay their executives with equity-based compensation. For example, shareholders may choose to tie managers' pay to firm performance, thus providing incentives for a manager to take actions that increase firm value. In general, paying CEOs with equity-based compensation is meant to motivate CEOs and other executives to make their companies better, because this kind of compensation is supposed to provide a direct link between companies' performance and executives' wealth. Furthermore, equity-based compensation attracts highly skilled executives to companies, because such people will choose to work for firms that pay performance-based compensation, rather than firms that pay a fixed salary only. Goergen and Renneboog (2011) also find that stock options induce managerial risk taking, and may also increase managers' incentives to exert effort.

Despite the popularity of equity-based compensation, it has several drawbacks. First, Billet *et al.* (2010) state that options incentivize managers to engage in risky but

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inefficient projects that increase stock prices, leading to an increase in the option value. They also confirm that this negative effect is amplified when managerial power is high and shareholder rights are weak. Second, Goergen and Renneboog (2011) show that executive options dilute the assets of other shareholders, as their exercise leads to an increase in outstanding shares and hence a reduction in stock price. This dilution effect further reduces the incentives of other shareholders to monitor management.

Previous research of stock or option compensation is inconclusive. We can divide the conclusions of previous studies into three categories: option compensation is better, stock compensation is better, and whether stock or option compensation is better depends on certain conditions. In the first category, Lambert and Larcker (2004) show that restricted stock is generally not the optimal contract form and that option-based contracts with positive exercise prices have both efficiency and incentive advantages. In the second category, by analyzing the cost, value, and pay/performance sensitivity of non-tradable options held by undiversified, risk-averse executives, Hall and Murphy (2002) show that restricted stock dominates options. For the third category, Kadan and Swinkels (2008) show that stocks can dominate options as a means of motivation only if non-viability risk is substantial, as in financially distressed firms or start-ups; options dominate stocks for other firms.

For CEO equity-based compensation schemes, the choice between stock compensation and option compensation is still unclear. In this study, we determine whether stocks or options are better instruments for controlling risk-taking. Goergen and Renneboog (2011) show that option compensation incentivizes managers to engage in riskier but inefficient projects to increase stock prices, and thus increase the option value. Therefore, we ask whether option compensation leads to higher risk and whether stock compensation lead to lower risk, equal risk, or, like options, higher risk.

We test the relationship between CEO compensation structure and firms' risk, stock return, and the ratio of return to risk. There are four types of CEO compensation structure: salary, bonus, option, and stock. The results show that option and bonus compensation do indeed increase firms' risk and decrease the ratio of return to risk. However, stock compensation decreases firms' risk and increases the ratio of return to risk. In this study, we conclude that stocks dominate other compensation types for the purpose of reducing risk-taking. This study demonstrates why stock compensation is increasingly popular and why the popularity of option compensation is decreasing. Moreover, we determine the incentive effects of stock and option compensation with regards to risk-taking. Our results are consistent with and supportive of the findings of Bhagat and Bolton (2014) and Bebchuk *et al.* (2010); that is, managerial incentives matter—incen-tives generated by executive compensation programs are

correlated with risk-taking by financial institutions. We recommend that executive incentive compensation in financial institutions should mostly consist of restricted stock.

## CHRONOLOGICAL TREND IN THE STRUCTURE OF CEO EQUITY-BASED COMPENSATION

After collecting compensation data from the Compustat database, we first analyze the different components of CEO compensation. Table 1 presents the chronological trend in the structure of CEO compensation. As shown in column (1), the percentage of the total compensation made up by salary (defined as the dollar value of the base salary divided by total compensation) is 27.2% in 2006 and 27.0% in 2012. It is highest, 36.4%, in 2009. However, this compensation component is relatively stable compared to the equity-based compensation components, which are presented in columns (3) to (4). In column (2), bonuses (defined as the dollar value of a bonus divided by total compensation) decrease from 10.0% in 2006 to 6.2% in 2012. In column (3), stock compensation (defined as the grant-date fair value of stock compensation divided by total compensation) increases from 22.2 % in 2006 to 34.6% in 2012. This trend is strongest in the 2009 to 2012 period; the difference between the 2009 and 2012 values is 12.5% In contrast, as shown in column (4), option compensation decreases dramatically, from 14.3% in 2006 to 7.2% in 2012. These two trends, increasing stocks and decreasing options, are the focus of our research.

In this study, we find that the percentage of firms paying their CEOs with more stock compensation than option compensation rises dramatically over the study period. Table 2 presents the chronological trend in the percentage of firms paying their CEOs with stocks or options. Column (1) shows that this percentage rises from 41.7% in 2006 to 73.5% in 2012, demonstrating that stock compensation plays an increasingly dominant role in CEO compensation in the 2006 to 2012 period. Similarly, column (4) shows that the percentage of firms paying their CEOs with stocks (regardless of the percentages of other compensation components) rises from 53.3% in 2006 to 80.2% in 2012. Furthermore, the data in column (2) show that the percentage of firms paying their CEOs with stocks and other components only, without options, also rises dramatically from 23.8% in 2006 to 51.5% in 2012. In contrast, in column (3), the percentage of firms paying their CEOs with options and other components only, without stocks, decreases over the same period. It drops from 20.4% in 2006 to 5.5% in 2012. This trend is consistent with the findings of other recent studies. For example, Andergassen (2008) indicates that the proportion of pay from stock options has declined and Tang (2008) mentions that restricted stock plays a more dominant role in compensation

**Table 1.** Chronological trend in the structure of CEO compensation.

Year	(1) Salary (%)	(2) Bonus (%)	(3) Stocks (%)	(4) Options (%)	(5) Other (%)*	(6) Total (%)
2006	27.2	10.0	22.2	14.3	26.3	100.0
2007	30.6	9.3	22.2	15.4	22.5	100.0
2008	33.7	7.7	23.1	15.4	20.1	100.0
2009	36.4	8.6	23.1	10.4	21.5	100.0
2010	31.9	7.4	28.4	8.6	23.7	100.0
2011	29.8	5.5	32.2	9.2	23.3	100.0
2012	27.0	6.2	34.6	7.2	25.0	100.0

\*The definition of total compensation in ExecuComp (in the Compustat database) is the sum of salary, bonus, non-equity incentive plan compensation, grant-date fair value of option awards, grant-date fair value of stock awards, deferred compensation earnings reported as compensation, and other compensation. This table does not include non-equity incentive plan compensation or deferred compensation earnings reported as compensation because of the incompleteness of the ExecuComp database. The value of these two items is usually zero or empty. Therefore, the percentage of "Other" is high, about 20% to 26%.

**Table 2.** Chronological trend in the percentages of firms paying their CEOs with stocks or options.

Year	(1) With more stocks (%)	(2) With stocks only, without options (%)	(3) With options only, without stocks (%)	(4) With stocks (%)	(5) With options (%)	(6) With both stocks and options (%)
2006	41.7	23.8	20.4	53.3	50.0	29.6
2007	46.6	27.5	21.9	55.6	50.0	28.1
2008	46.9	26.4	17.6	56.9	48.1	30.5
2009	51.8	37.9	12.1	61.8	36.1	23.9
2010	62.1	42.6	6.7	70.0	34.1	27.4
2011	68.7	47.2	8.1	76.1	37.0	29.0
2012	73.5	51.5	5.5	80.2	34.1	28.7

(1) This item represents the percentage of firms paying their CEOs with a higher percentage of stocks than options. (2) This item represents the percentage of firms paying their CEOs with stocks and other components only, without options (that is, the percentage of options is 0%). (3) This item represents the percentage of firms paying their CEOs with options and other components only, without stocks (that is, the percentage of stocks is 0%). (4) This item represents the percentage of firms paying their CEOs with stocks (i.e., the percentage of stocks is higher than 0%), regardless of the percentages of other components. (5) This item represents the percentage of firms paying their CEOs with options (that is, the percentage of options is higher than 0%), regardless of the percentages of other components. (6) This item represents the percentage of firms paying their CEOs with both stocks and options (that is, the percentages of stocks and options are higher than 0%), regardless of the percentages of other components

packages in many firms.

## LITERATURE REVIEW

### The incentive effect of executive compensation in financial institutions

Does equity-based compensation increase risk for financial institutions? Many previous studies focus on this issue. Bai and Elyasiani (2013) investigate the relationship between insolvency risk and executive compensation for bank holding companies (BHCs) over the 1992-2008 period. They use CEO compensation sensitivity to risk (*vega*) and pay-share inequality

between the CEO and other executives as measures of compensation and obtain five main results. First, the sensitivity of CEO compensation to risk in BHCs has risen in response to deregulation, so that it now resembles the situation in industrial firms. Second, higher *vegas* lead to greater bank instability. Third, the association between bank stability and managerial compensation is bi-directional; higher *vegas* induce greater risk and vice versa. Fourth, BHCs in the next to largest group increase CEO *vegas* the most and have the strongest potential to create instability. Fifth, increased pay-share inequality has the opposite effect of increases in *vega*; greater pay-share inequality is associated with greater stability.

Fahlenbrach and Stulz (2011) find that bank executives

faithfully work in the interests of their long-term shareholders; the poor performance of their banks during the crisis was the result of unforeseen risk in the banks' investment and trading strategies. They investigate whether bank performance during the recent credit crisis is related to CEO incentives before the crisis. They find some evidence that banks with CEOs whose incentives are better aligned with the interests of shareholders performed worse and no evidence that they performed better. Banks with higher option compensation and a larger fraction of CEO compensation in cash bonuses did not perform worse during the crisis. Bank CEOs did not reduce their holdings of shares in anticipation of the crisis or during the crisis. Consequently, they suffered extremely large wealth losses in the wake of the crisis.

Bhagat and Bolton (2014) propose managerial incentives hypotheses: incentives generated by executive compensation programs lead to excessive risk-taking by banks, thus contributing to the current financial crisis. They study the executive compensation structure in 14 of the largest U.S. financial institutions for the 2000-2008 period. Their results are mostly consistent with and supportive of the findings of Bebchuk, Cohen, and Spamann (2010): managerial incentives matter and the incentives generated by executive compensation programs are correlated with excessive risk-taking by banks. Their results are also generally not supportive of the conclusions of Fahlenbrach and Stulz (2011) that the poor performance of banks during the crisis was the result of unforeseen risk.

### Stocks vs. options compensation

Whether stocks or options are better compensation instruments is not clear. Despite the popularity of equity-based compensation, there is considerable controversy about this kind of compensation.

First, we review some studies showing that option compensation is a better choice for CEO compensation. Lambert and Larcker (2004) use agency theory to model the optimal mix of options and stock in the compensation contract. They show that restricted stock is generally not the optimal contract form and that option-based contracts with positive exercise prices have both efficiency and incentive advantages. Palmon *et al.* (2008) argue that options that will most likely be highly valuable (that is, substantially in-the-money) on their expiration date are optimal compensation because they simulate managers' efforts and the value of shareholders' equity, when abstracted from tax considerations. Wu (2011) develops an agency model to analyze the optimality of executive stock option compensation in the presence of information manipulation. The analyses show that under most circumstances an optimal executive compensation package includes stock options rather than restricted stocks. Cadenillas *et al.* (2004) study the incentive effects

of debt on a risk-averse manager in a dynamic continuous time framework. They suggest that options are optimal for managers who are more effective in affecting firm value through effort and in firms with high momentum, large firms, and firms for which additional volatility implies a small decrease in returns. Smith and Stulz (1985) also show that because managers have significant human capital tied to the firm and are less diversified than outside shareholders, they may pass up risk-increasing positive net present value projects that would be beneficial to shareholders. Shareholders can potentially reduce this risk-related agency problem by structuring compensation to be a convex function of firm performance (e.g., through the use of stock options), which makes the manager's expected wealth an increasing function of volatility.

Second, some studies suggest that stock compensation dominates option compensation. For example, by analyzing the cost, value, and pay/performance sensitivity of non-tradable options held by undiversified, risk-averse executives, Hall and Murphy (2002) show that restricted stock dominates options. Dittmann and Maug (2007) also argue that stocks should dominate options in compensation plans and that CEOs should be granted no options. Moreover, Hayes *et al.* (2012) measure how pay-performance sensitivity (*delta*) and convexity (*vega*) in compensation change in relation to FAS 123R. They find that the changes in pay-performance sensitivity are relatively away from stock options toward other forms of performance-based pay. Therefore, their results are consistent with Hall and Murphy (2002).

Third, some researchers claim that the benefits of stock compensation versus option compensation vary depending on the conditions. For example, Feltham and Wu (2001) show that when the agent affects only the mean of the outcome, then restricted stock contracts dominate option-based contracts. In the reverse condition, option-based contracts dominate restricted stock contracts. Kadan and Swinkels (2008) show that stocks can dominate options as a means of motivation only if non-viability risk is substantial, as in financially distressed firms or start-ups, whereas options dominate stocks for other firms. Moreover, they provide empirical evidence that higher bankruptcy risk is indeed correlated with more use of stock.

One of the results of our research is related to the determinants of CEO compensation, so we also review some previous studies of the determinants of executive compensation. Smith and Watts (1992) show that large and nonregulated firms and firms with more growth opportunities have higher levels of executive compensation. Gaver and Gaver (1993) find that growth firms pay higher cash compensation to their executives. Controlling for firm size, they show that the incidence of bonus plans, performance plans, and restricted stock plans does not differ between growth and non-growth firms. Kole (1997) shows that restricted stock is most prevalent among

**Table 3a.** Sample distribution (categorized by year).

Year	Amount	Percentage (%)
2006	240	10.8
2007	320	14.5
2008	318	14.4
2009	330	14.9
2010	343	15.5
2011	335	15.1
2012	328	14.8
Total	2,214	100.0

**Table 3b.** Sample distribution (categorized by industry).

SIC Code	Industry	Amount	Percentage (%)
6000~6099	Depository Institutions	722	32.6
6100~6199	Non-depository Institutions	83	3.7
6200~6299	Security and Commodity Brokers	258	11.7
6300~6399	Insurance Carriers	495	22.4
6400~6499	Insurance Agents, Brokers, and Service	70	3.2
6500~6699	Real Estates	35	1.6
6700~6799	Holding and Other Investment Offices	551	24.9
Total		2,214	100.0

research-intensive firms and firms in innovative industries. Barron and Waddell (2003) show that executive rank is a major determinant of the extent of incentive pay. Bryan *et al.* (2000) examine the mix, incentive intensity, and economic determinants of stock-based compensation. They show that firms with high leverage ratios tend to grant their managers more restricted stock.

## METHODOLOGY

### Sample selection

Our sample firms are collected from the ExecuComp database, which has all of the compensation information for firms that belong to the S&P 1500 index, or that once belonged to this index.

First, we sort out the financial institutions (whose SIC codes are between 6000-6999). In 2006, the FAS 123R changed the reporting requirements of the DEF14A form. Under this new reporting regime, the cost of all employee stock options and other equity-based compensation arrangements have to be given in the financial statements and reflect the estimated fair value of the awards. Hayes *et al.* (2012) show that all firms dramatically reduced their use of stock options (convexity) after the adoption of FAS 123R and that the decline in option use

is strongly associated with a proxy for accounting costs. Therefore, we set the sample period as 2006 to 2012.

Second, we collect CEO compensation data from ExecuComp in the Compustat database and financial information and firm characteristics from the Compustat database. An observation is a payment by one firm to a CEO in a given year. We only focus on CEOs, so there is one observation for each firm, each year.

Third, we collect the monthly stock return data from the Center for Research on Security Prices database to calculate the yearly stock return and stock return volatility; these observations make up 90.3% of the sample. To summarize, our sample comprises 2,214 firm-year observations, from 388 different financial institutions for the 2006 to 2012 period.

### Sample distribution

Table 3a presents the total sample distribution categorized by year and Table 3b presents the total sample distribution categorized by industry. Table 3a (categorized by year) shows that the number of firms is relatively low for 2006. For 2007 to 2012, the number of firms is stable. We control for the year effect by setting year dummy variables for each regression.

Table 3b (categorized by industry) shows that the three biggest industries are depository institutions, insurance,

**Table 4.** Definition of all of the variables.

<b>Variables</b>	
<b>a. Compensation Variables</b>	<b>Definition</b>
Salary (%)	The dollar value of the base salary divided by the total compensation
Bonus (%)	The dollar value of a bonus divided by the total compensation
Stock (%)	Fair value of all of the stock awards divided by the total compensation
Option (%)	Fair value of all of the options awarded divided by the total compensation
Total Compensation (\$)	The sum of salary, bonus, grant-date fair value of stock awards, grant-date fair value of option awards, deferred compensation, and other compensation components
<b>b. Return and Volatility</b>	
Return	Cumulative 12-month stock returns
Volatility	Annualized standard deviation of monthly stock returns
<b>c. Measurement of firm characteristics</b>	
Debt Ratio	Total liabilities divided by the sum of total liabilities and the market value of equity
Asset	The total assets reported by the company
MB	Market value divided by the book value of shareholders' equity

and financial holdings, which together account for 79.9% of the sample. We control for the industry effect by setting industry dummy variables for each regression.

## Definition of variables

### Measurement of CEO compensation

Table 4 presents the definitions of all of the variables used in this study. The total CEO compensation consists of four main components: salary, bonus, stocks, and options. To compare the level of compensation between different companies and different years, in our analysis we use the percentage of the total compensation contributed by each compensation component. The following definitions are based on the ExecuComp data definitions.

For CEO cash pay, the definition of salary is the dollar value of the base salary earned by the named executive officer during the fiscal year. The percentage of salary compensation is this salary scaled by the total compensation. The definition of bonus is the dollar value of a bonus earned by the named executive officer during the fiscal year. The percentage of bonus compensation is this bonus scaled by the total compensation.

For the equity-based compensation portion of CEO pay, stock compensation includes restricted stock, restricted stock units, phantom stock, phantom stock units, and common stock equivalent units. Option compensation includes options, stock appreciation rights, and other instruments with option-like features. The valuation method for these two components is based on the grant-date fair value, as detailed in FAS123R. For restricted

stock, fair value is calculated using the closing price of the common stock on the grant date. For options, fair value is calculated using the Black-Scholes value on the grant date. The percentage of stock compensation is the grant-date fair value of the stock scaled by the total compensation, and the percentage of option compensation is the grant-date fair value of the option scaled by total compensation.

The total compensation is defined as the sum of salary, bonus, other annual compensations, total value of stocks granted, total value of options granted (using Black-Scholes), long-term incentive payouts, and all other components.

### Return and volatility

Return is defined as the cumulative 12-month stock returns. Cohen *et al.* (2007) indicate that annualized stock return significantly affects CEO compensation. Volatility is stock return volatility and is measured as the annualized standard deviation of the monthly stock return.

### Measurement of firm characteristics

Market-to-book ratio (MB) is measured by the market value of shareholders' equity divided by the book value of shareholders' equity. Asset (Asset) is used to control for firm size. Asset is defined as the total assets reported by the company. Lin *et al.* (2013) show that market-to-book ratio and firm size are significantly related to CEO compensation. Debt ratio is defined as total liabilities

**Table 5.** Descriptive statistics.

	<b>N</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Q1</b>	<b>Median</b>	<b>Q3</b>
<b>a. Dependent Variables</b>						
Stock (%)	2,214	26.77	25.67	0	24.23	45.93
Option (%)	2,214	11.32	18.13	0	0	19.27
<b>b. Return and Volatility</b>						
Yearly Stock Return	2,005	0.07	0.40	-0.11	0.08	0.26
Annualized Stock Return Volatility	2,005	0.17	0.12	0.10	0.14	0.21
<b>C. Firm Characteristics</b>						
Debt Ratio	2,129	0.67	0.25	0.52	0.70	0.88
Asset (US\$ millions)	2,129	44927.82	212567.5	1551.02	4647.41	14884.38
Market Value of Equity (US\$ millions)	2,129	4651.11	16386.51	0	715.17	2439.8
Market-to-Book Ratio	2,129	1.56	3.36	0	1.05	1.99

**Table 6.** CEO compensation structure: A comparison of four components of CEO compensation before and after the financial crisis.

	<b>Before the Financial Crisis</b>		<b>After the Financial Crisis</b>		<b>Difference in means</b>
	<b>N</b>	<b>Mean</b>	<b>N</b>	<b>Mean</b>	
Salary (%)	878	31.00%	1,336	31.30%	0.30%
Bonus (%)	878	8.90%	1,336	6.90%	-2.00%***
Stock (%)	878	22.60%	1,336	29.60%	7.00%***
Option (%)	878	15.10%	1,336	8.80%	-6.30%***

This table presents the structure of CEO compensation before the financial crisis (from 2006 to 2008) and after the financial crisis (from 2009 to 2012). The rightmost column presents the differences between the means in the cases before and after the financial crisis. All of the reported means are different at the 1% significance level (noted as '\*\*\*') except for the percentage of salary in financial institutions, which is not significantly different between the two sample periods.

divided by the sum of total liabilities and the market value of equity.

### Data descriptions

Table 5 presents the descriptive statistics of all of the variables used in this study. For the percentage of stock compensation, the mean is 26.77% and the median is 24.23%. However, for the percentage of option compensation, the mean is 11.32% and the median is 0%, which means that there is a big gap between the mean and median for option compensation. This indicates that many CEOs are paid very large amounts of option compensation. There is only a small gap between the mean and median of stock compensation. For the cumulative 12-month stock returns, the mean is 7% and the median is 8%. The mean of the annualized standard deviation of monthly stock returns is 17% and the median is 14%.

For debt ratio, the mean is 67% and the median is 70%. The mean of assets is 44927.8 million and the mean of market value of equity is 4651.1 million. For the

market-to-book ratio, the mean is 1.56 and the median is 1.05.

As earlier noted, the financial crisis focused attention on CEO compensation. Therefore, in this study, we investigate the effect of the financial crisis on the structure of equity-based compensation. Table 6 presents the CEO equity-based compensation structures before and after the financial crisis. Bhagat and Bolton (2014) demonstrate that incentives generated by executive compensation programs led to excessive risk-taking by banks, which contributed to the financial crisis. In Table 6, the rightmost column presents the differences between the means in the cases before and after the financial crisis. For the percentage of salary, there is no significant difference before and after the financial crisis. However, the percentages of bonus, stock, and option compensation all change significantly after the financial crisis. The percentage of bonus compensation drops by 2%, which is significant at the 1% level. The percentage of stock compensation increases by 7%, which is also significant at the 1% level. The percentage of option compensation drops by 6.3%, which is again significant at the 1% level. This trend is consistent with our results,

**Table 7.** The relationship between risk and stock compensation.

Financial Institutions	Risk <sub>t</sub>	Risk <sub>t-t+1</sub>	Return <sub>t</sub>	Return <sub>t-t+1</sub>	Return/Risk <sub>t</sub>	Return/ Risk <sub>t-t+1</sub>
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Intercept <sub>t-1</sub>	0.158*** (11.868)	0.202*** (14.179)	0.140*** (3.213)	-0.144*** (-2.984)	0.285 (1.051)	-1.155*** (-3.658)
Stock (%) <sub>t-1</sub>	-0.033*** (-3.200)	-0.020* (-1.744)	0.096*** (2.816)	0.126*** (3.293)	0.843*** (3.969)	1.075*** (4.299)
Debt Ratio <sub>t-1</sub>	0.069*** (6.687)	-0.033*** (-3.037)	0.104*** (3.106)	0.296*** (7.994)	0.378* (1.806)	1.769*** (7.348)
ln (Asset) <sub>t-1</sub>	-0.004** (-2.201)	-0.001 (-0.535)	-0.013** (-2.454)	0.014** (2.307)	0.045 (1.408)	0.171*** (4.389)
Market-to --Book Ratio <sub>t-1</sub>	0.000 (-0.190)	0.001 (0.955)	-0.003 (-1.049)	-0.003 (-1.019)	-0.028 (-1.617)	-0.017 (-0.887)
Year Dummies	YES	YES	YES	YES	YES	YES
Industry Dummies	YES	YES	YES	YES	YES	YES
R square	3.20%	1.40%	1.20%	8.10%	1.80%	9.60%
n	1,991	1,685	1,991	1,685	1,982	1,674

Statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. T-statistics are presented below the estimates.

which show that stock compensation now plays a more important role in CEO compensation, whereas option compensation is fading away.

Due to the changes in CEO compensation structure after the financial crisis, we control for the year effect, or the financial crisis effect, for each regression. The financial crisis dummy takes the value of 1 for every year after 2009, and 0 otherwise.

Table 6 presents the structure of CEO compensation before the financial crisis (from 2006 to 2008) and after the financial crisis (from 2009 to 2012). The rightmost column presents the differences between the means in the cases before and after the financial crisis. All of the reported means are different at the 1% significance level (noted as \*\*\*\*) except for the percentage of salary in financial institutions, which is not significantly different between the two sample periods.

### THE RISK-TAKING EFFECT OF EQUITY-BASED COMPENSATION AND FIXED COMPENSATION

Bhagat and Bolton (2014) show that incentives generated by executive compensation programs lead to excessive risk-taking. Therefore, although we do not know whether stock compensation or option compensation is better, we try to distinguish them by examining the risk-taking associated with these two kinds of compensation.

Table 7 presents the relationship between stock compensation and monthly stock return volatility (we identify this as "Risk"), stock return in the next year, in the

next two years, and stock return scaled by stock return volatility. In Table 7, columns (1) and (2) show, surprisingly, that stock compensation significantly reduces risk. In contrast, columns (5) and (6) show that stock compensation significantly increases return/risk.

Table 8 presents the relationship between option compensation and monthly stock return volatility (we identify this as "Risk"), stock return in the next year, the next two years, and stock return scaled by stock return volatility. In Table 8, columns (1) and (2) show that option compensation significantly increases risk. Similarly, column (5) shows that option compensation significantly decreases return/risk.

To summarize, stock compensation reduces risk and increases the return/risk ratio significantly. In contrast, options increase risk and decrease the return/risk ratio significantly. Although this result does not clarify whether stocks or options are better compensation structures, from the firms' risk-taking perspective, stocks dominate options because they may reduce risk and increase the return/risk ratio in financial institutions.

Table 9 presents the relationship between salary compensation and the monthly stock return volatility (we identify this as "Risk"), stock return in the next year, the next two years, and stock return scaled by stock return volatility. Columns (1), (2), (5), and (6) show that salary compensation, like option compensation, significantly increases risk and decreases the return/risk ratio.

Table 10 presents the relationship between bonus compensation and monthly stock return volatility (we identify this as "Risk"), stock return in the next year, in the



**Table 8.** The relationship between risk and option compensation.

Financial Institutions	Risk <sub>t</sub>	Risk <sub>t-t+1</sub>	Return <sub>t</sub>	Return <sub>t-t+1</sub>	Return/Risk <sub>t</sub>	Return/Risk <sub>t-t+1</sub>
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Intercept <sub>t-1</sub>	0.153*** (11.619)	0.200*** (14.109)	0.154*** (3.570)	-0.126*** (-2.612)	0.412 (1.528)	-0.999*** (-3.179)
Option (%) <sub>t-1</sub>	0.072*** (4.864)	0.035** (2.249)	-0.010 (-0.214)	-0.069 (-1.300)	-0.727** (-2.408)	-1.081*** (-3.133)
Debt Ratio <sub>t-1</sub>	0.074*** (7.207)	-0.031*** (-2.835)	0.101*** (2.990)	0.291*** (7.828)	0.310 (1.473)	1.704*** (7.031)
ln (Asset) <sub>t-1</sub>	-0.005*** (-3.353)	-0.002 (-1.076)	-0.011** (-2.084)	0.017*** (2.781)	0.074** (2.235)	0.207*** (5.236)
Market-to-Book Ratio <sub>t-1</sub>	0.000 (-0.333)	0.001 (0.884)	-0.003 (-1.154)	-0.003 (-1.022)	-0.029 (-1.641)	-0.016 (-0.836)
Year Dummies	YES	YES	YES	YES	YES	YES
Industry Dummies	YES	YES	YES	YES	YES	YES
R square	3.90%	1.50%	0.80%	7.60%	1.30%	9.10%
n	1,991	1,685	1,991	1,685	1,982	1,674

Statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. T-statistics are presented below the estimates.

**Table 9.** The relationship between risk and salary compensation.

Financial institutions	Risk <sub>t</sub>	Risk <sub>t-t+1</sub>	Return <sub>t</sub>	Return <sub>t-t+1</sub>	Return/Risk <sub>t</sub>	Return/Risk <sub>t-t+1</sub>
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Intercept <sub>t-1</sub>	0.135*** (9.485)	0.191*** (12.585)	0.180*** (3.877)	-0.106** (-2.050)	0.666** (2.296)	-0.799** (-2.370)
Salary (%) <sub>t-1</sub>	0.040*** (3.509)	0.019 (1.541)	-0.056 (-1.508)	-0.042 (-1.039)	-0.549** (-2.355)	-0.428 (-1.597)
Debt Ratio <sub>t-1</sub>	0.067*** (6.457)	-0.034*** (-3.132)	0.106*** (3.141)	0.298*** (8.017)	0.396* (1.882)	1.795*** (7.402)
ln (Asset) <sub>t-1</sub>	-0.003* (-1.938)	-0.001 (-0.455)	-0.013** (-2.376)	0.014** (2.412)	0.048 (1.222)	0.176*** (4.475)
Market-to-Book Ratio <sub>t-1</sub>	-0.001 (-0.035)	0.001 (1.027)	-0.003 (-1.177)	-0.003 (-1.109)	-0.031* (-1.797)	-0.019 (-1.022)
Year Dummies	YES	YES	YES	YES	YES	YES
Industry Dummies	YES	YES	YES	YES	YES	YES
R square	3.30%	1.40%	0.90%	7.60%	1.30%	8.70%
n	1991	1685	1991	1685	1982	1674

Statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. T-statistics are presented below the estimates.

next two years, and stock return scaled by stock return volatility. Bonus compensation increases risk and

decreases the return/risk ratio, just like option compensation and salary compensation.

Table 10. The relationship between risk and bonus compensation.

Financial institutions	Risk <sub>t</sub>	Risk <sub>t-t+1</sub>	Return <sub>t</sub>	Return <sub>t-t+1</sub>	Return/Risk <sub>t</sub>	Return/Risk <sub>t-t+1</sub>
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Intercept <sub>t-1</sub>	0.148*** (11.023)	0.195*** (13.563)	0.166** (3.778)	-0.111** (-2.288)	0.554** (2.027)	-0.863*** (-2.708)
Bonus (%) <sub>t-1</sub>	0.040** (2.306)	0.036** (1.993)	-0.087 (-1.550)	-0.102* (-1.675)	-1.099*** (-3.129)	-0.994** (-2.500)
Debt Ratio <sub>t-1</sub>	0.069*** (6.704)	-0.033*** (-3.066)	0.103*** (3.066)	0.296*** (7.994)	0.376* (1.794)	1.778*** (7.333)
ln (Asset) <sub>t-1</sub>	-0.004** (-2.380)	-0.001 (-0.545)	-0.012** (-2.266)	0.015** (2.468)	0.053 (1.601)	0.179*** (4.581)
Market-to-Book Ratio <sub>t-1</sub>	-0.001 (-0.045)	0.001 (0.988)	-0.003 (-1.174)	-0.003 (-1.082)	-0.031* (-1.794)	-0.019 (-0.980)
Year Dummies	YES	YES	YES	YES	YES	YES
Industry Dummies	YES	YES	YES	YES	YES	YES
R square	3.00%	1.50%	0.90%	7.70%	1.50%	8.90%
n	1991	1685	1991	1685	1982	1674

Statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. T-statistics are presented below the estimates.

We control for the year and industry effects in each regression. We also try controlling for the financial crisis effect instead of the year effect; the empirical results remain the same.

## CONCLUSIONS

In the 2006 to 2012 period, stock compensation plays an increasingly important role in CEO compensation, increasing from 22.2% in 2006 to 34.6% in 2012. In contrast, option compensation decreases, from 14.3% in 2006 to 7.3% in 2012. We investigate the relationship between different measures of compensation structure and risk-taking. The results show that stock compensation decreases the stock return risk of a CEO's own company and increases the ratio of return to risk, whereas option and bonus compensation increase the stock return risk of a CEO's own company and decrease the ratio of return to risk. From the point of view of risk-taking, stock compensation dominates other types of compensation.

Our results indicate that managerial incentives matter: incentives generated by executive compensation programs are correlated with risk-taking by financial institutions. We recommend that executive incentive compensation of financial institutions should mostly consist of restricted stock.

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