

**The Impact of Stockholder's Rights (Option-Based Compensation)
on Risk Management in the U.S. Banking Industry**

by

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Major Research Paper of Master of Finance

Saint Mary's University

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Abstract

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This paper investigates the relationship between option-based executive compensation and risk-taking in the U.S. banking industry over 2007-2012. We obtained a sample of 52 banks and 312 observations to prove the hypothesis we built based on the prior studies in the same field. We considered the effect of governance factors, firm level factors, and compensation structures which are all the control variables in the models to support our study. Through a series of steps in model specifications, the results show that changes of the compensation structures in the U.S. banking industry after the financial crisis are what we would predict from our hypothesis. The positive relationship between option-based compensation and the risk of the banking industry still existed. However, the relationship between them was not as strong as the results of prior studies.

Chapter 1: Introduction

Background

Professional management team should have the management skills in order to build high management efficiency and quality. When we use the term professional management, it means the separation of direct management from the ownership so that the manager can help the owners generate more benefits. Berle and Means (1932) stated that the 'agency problem' between shareholders and managers could be created by the separation of ownership from control in corporate firms. The essential reason for the agency problem is the conflict of interests between management and ownership, and that managers might put their own interests in the first place instead of the interests of shareholders because they can directly control all the activities of the firm. This agency problem goes against the supposed objective of the firm and management which is to maximize the shareholders' wealth.

In general, most bank executives are risk averse because although higher risk will bring higher possible returns for shareholders, this high level risk can give executives higher volatility which affects the stability of their positions in the bank. So, the risk preference of the executives of banks leads towards a more conservative management style.

Following the conservative style, a project with negative net present value might be accepted due to its low risk, however, they might reject the positive net present value project with relatively high risk. The incentives compensation for the

executives is the way to handle the related agency problem. Therefore, a better understanding of the agency problem will be very important for the development of the structure of the whole compensation plan for executives and risk management in the banking industry.

Option-based compensation offers the managers rights to purchase their companies' shares at a fixed price, called the exercise price, in a specific period. The amount of benefits managers could get from the option will depend on the stock price. Therefore, the manager's personal interest will be aligned with shareholder's interest through option-based compensation offers. The risk issues of moral hazard and adverse selection caused by asymmetric information between top managers and shareholders could be solved. This incentive offer is developed from stock option contracts, but unlike these, the compensation option is a non-transferable call option for specific person within the company. Warren Buffet (1998) said to his shareholders that:

"Though options, if properly structured, can be an appropriate, and even an ideal way to compensate and motivate top managers, they are more often wildly capricious in their distribution of rewards, inefficient as motivators and inordinately expensive for shareholders."

As with other industries, the banking sector has increased the weight of executive management option-based compensation, compared with the change in the weight of salary and cash bonus, prior to the credit crisis in 2007-2008.

Murphy (1999) had pointed out that the stock option based compensation increased during the last decade at the cost of base salaries in all US sectors, except

in the utilities. Senbet (2011) confirmed this citing a dramatic shift from the ends 1990's toward equity-based compensation which includes option based pay. However, after the 2007-2008 prime credit crises, increasingly experts believe that the inappropriate weight of option-based executive compensation in the banking industry was one of the causes for the crisis. Landskroner and Raviv (2010) performed studies that show the booming of the equity-based executive compensation lead to the increased risk of financial institutions—one of the key factors causing the recent financial crisis. People should learn a lesson from the painful hit of the crisis.

Based on the study, the structure of the executive compensation in the banking industry should be adjusted to avoid the same potential crisis in the future. The crisis is the most powerful evidence for the salary weighted compensation structure to overweigh the option-based incentive compensation which was associated with high potential risk for the banking industry.

The banking industry has many differences from other industries, such as the specificity of the products, capital structure and risk exposure. The government has also issued a lot of policies and regulations for the financial firms. If bank holding companies just simply copy the option-based compensation theory from other industries, this will negatively affect the companies' risk management, even the stability of whole financial system because all the executives in the industry may seek for share price maximization to better benefit themselves. Moreover, Adams and Mehran (2003) reported that the regulations in banking industry affect the

compensation structure, which means the compensation structure in the banking industry should be different from that in non-financial industries. As a result of the herding of the option-based executive compensation like other industries, many banks paid a lot for the accumulated risk from this immature compensation strategy.

Purpose of Study

The credit crisis brought a financial disaster to the U.S. economy, even the economy of the whole world in 2007-2008. Five years from the crisis, some countries have still not fully recovered. No matter in which country, a healthy banking industry is the key contributor to the stable growth of an economy. Therefore, a better understanding of the relation between the option-based compensation and the risk-taking is important for developing appropriate incentive compensation mechanisms and effective regulations in the banking industry. Thus, the adjustment of the weight of option-based compensation in the compensation package should be changed after the crisis to lower the risk for more healthy long-term performance. If the previous studies of the relation between the options based compensation and the risk-taking are effective, the risk of banks will be lower by the decreased weight of option-based executive compensation. This also can support the previous studies to show the positive relationship between option-based compensation and bank risk from a different aspect.

Statement of problem

With the booming of option-based compensation mechanism, CEO's and executives' income from stock option compensation has become one of the majority parts of their total income in the banking industry. Bebchuk and Spamann (2010) provide evidence that CEOs of modern U.S. bank holding companies received a substantial share of their compensation in options of the underlying stock, but not directly in the stocks. So, the stock price of their bank is highly related to their own benefits. Some CEOs and executives of banks, as decision makers, took less care of safety and liquidity to blindly push up the stock price for their own benefit.

There is no doubt that the interest of management of banks is effectively aligned with shareholders' interests by the option-based compensation. However, this alignment will induce that more high-risk investments will be taken because of the highly leveraged banking industry. When the crisis was coming, the banks' stock price had an increased pressure to move down. Some of the executives used a large amount of cash to buy back the outstanding stocks to keep the stock stable because their own benefits were related to the stock price. The lack of cash was increasing the liquidity risk of the whole bank industry. After the crisis, the management should think more about the safety issues of the bank, but not only the profit because the high risk with an unstable general economic background will bring further losses in order to affect their job position. Therefore, the risk managers of the banks should pay more attention to the option-based incentive compensation, and the attention will transfer to real actions showing on the public information of the banks after the crisis.

Need of study

This paper will examine the option-based top-executive compensation as one prominent factor which drives down the risk of the banks in the U.S. after the credit crisis. These studies will support the previous studies which indicate the positive relation between option-based compensation and risk of the banks. The high risk associated with the banking industry is one important part in the chain reaction of credit crisis 2007-2008. So, after the crisis, the control on the risk management of the bank should be one of the steps for the recovery process which needs to be considered by the executives.

The study will focus on the top-executive in the banking industry because their decisions have the most direct effect on the risk management. Cai et al. (2010) explained that top executives who have the power to make investment and operational decisions are the most important agents.

However, different voices on the relation between option-based compensation and credit crisis still exist. In contrast, Murphy (2012) concluded that the risk-taking incentives were reduced by outsized compensation, including bonuses of cash, stock, and options at Wall Street prior to and during financial crisis. The topic in this field is still controversial.

The following investigation in this paper will use the data after the crisis to determine the relation between option-based compensation and risk-taking in banking industry in the U.S. Based on the empirical analysis, the top executives

prefer taking excess risks due to the stock option incentive compensation because the value of the option will be increased by higher volatility of the underlying stock. The option incentive for the executives was wrecked after the crisis, so there should be low incentives to take more risk for higher option value.

The data in the investigation were collected from 2007 to 2012, because in 2007 the crisis commenced, then, the compensation policy will be changed to drive the executives to take less risk and protect the value of the banks. The data period extends to the end of 2012 because the option based executives' compensation is yearly based information. The data require a full fiscal year which means the data from 2013 does not meet the requirement.

Chapter 2: Literature and Hypotheses

As a part of the management incentive mechanism, stock-based compensation incentive has become one of the most widely accepted in many industries. This incentive mechanism can effectively build a close connection between the interests of managers and shareholders in order to reduce agency issues in the company. As Jensen and Murphy (1990) mentioned, the manager will be pushed to make the right decisions that increase shareholders wealth with a well-designed compensation policy. They explained how CEO stock options affect the investment choice, the quantity of borrowing, and capital level in banking industry.

From many studies of companies' compensation packages in different industries, option-based compensation played an important role under the stock-based compensation incentive mechanism. For example, the information showed in Lin's (2010) study, found that 98 per cent of the largest (by market value) 250 companies which were in the S&P 500 index have applied option-based compensation in the 1990s.

Several studies have proved that the significant positive relationship between equity based incentive for executives and risk-taking of their banks. (For example, Saunders et al. 1990; Demsetz et al. 1997; Cebenoyan et al. 1999). Furthermore, Fahlenbrach and Sutz (2010) indicate that the connected interests of bank CEOs and shareholders causes the excessive risk-taking by banks that contributed to the financial crisis of 2007-2008. The interest alignment between management and ownership will induce the wealth transfer from debt holders to shareholders.

Jayanthied al (2011) reported that wealth transfers occur from bondholders to shareholders as companies raised money from bondholders or debt holders to invest in risky projects. When the projects are profitable, shareholders only need to pay the debt holder the interest and keep the high potential profits. When the projects failed, the debt holders have to pay the loss because of their investments which were used in the failed project.

In the banking industry, the most traditional debt holders are the depositors which have less ability in the governance structure compared to the shareholders to affect the investment decisions of the banks — a potential wealth transfer. The wealth transfer affect is based on the increased risk. The equity holders of the bank would like to see the increases in risk because the value of the bank's stock option will be increasing based on the higher volatility within the bank. The equity holders will generate profits from the stock options. When the bank's executives' compensation package includes option-based compensation, increasing banks' risk will be the common vehicle for executives' own benefits and equity holders' benefits.

More specifically, option-based risk taking incentive compensation induces executives to take on more CDS and CDO which are non-interest income generation activities. Chava and Purnanandam (2010) argued that CEO risk-taking incentives, which include option-based incentives, induce bank CEOs to keep less cash in their bank and raise short-term debt from outside to pursue high short-term returns which is associated with higher risk. The increased level of mismatched maturity

contributes to the cash risk of the bank which are aspects related to the crisis in 2007 to 2008. Banks' accumulated default risk is highly related to the severe maturity mismatch and liquidity risk which could be caused by CEO risk-taking incentives (Campbell et al, 2008). There are also other risks related to the risk-taking incentives, such as the risk of investments which is one of the major parts for the daily operation of investment banks.

CEOs' equity-based incentives affect the decisions CEOs make which means the firms will follow the suboptimal investment policies and their incentives could conceal bad news about future growth, which leads to inaccurate valuation of the stock price (Benmelech et al, 2009 and Kim et al, 2011).

The risk-taking incentives are not only accepted by a few banks, but also the whole banking industry. Kirkpatrick (2009) explained that bank herding increases with managerial performance-based compensations which include option-based compensation. The increase of performance-based compensation induces banks into herding into high risk operations and moreover there is no penalty for this short-term risky herding activity which sacrifices a bank's long-term performance. In 2007-2008, the risk of the whole banking industry was affected, and that sparked the global financial crisis.

All of the above discussions are related to the option-based studies based on the data from the period before the crisis. But there are almost no studies about the option-based compensation based on the data after the crisis. In fact, the changes of the compensation structure of the banks in recent years are powerful support for the

prior studies. The real test is the reliability of the relation of the option-based compensation and the risk-taking of the banks. If the result of those studies is effective, the linkage of option-based compensation and the risk-taking should be as same as the desired hypothesis based on these studies. Therefore, based on the idea, a hypothesis about option-based compensation and banking risk-taking in the paper is given below.

Hypothesis:

CEO's and executives' option-based compensation is positively related to the risk taking of banking industry. After the crisis, the option-based compensation should be decreasing in the banking industry, and this decreased incentive induces the lower risk taking in the industry.

Chapter 3: Data and Methodology

In this study, the target banks are those U.S. banks listed on American stock markets. The sample banks these studies were determined through a series of steps. With Bloomberg, we first listed 5000 companies from all industries which traded on the American stock markets. Then, we sorted them by industries and obtained 136 observations under the banking industry. The 136 banks formed the initial sample for the study and as the study developed, the sample was adjusted.

The model in this study is different from the prior studies related to this topic. As the purpose of the research model is to test the relationship between the two main variables which are the risk and option-based compensation, then we needed to find the data for our sample banks. The data for the option-based compensation were obtained from Bloomberg. These include the total annual option rewards for the top five executives in each bank. Moreover, we also collected the total annual compensation for the top five executives and calculated their weight of option-based compensation in the total annual compensation. These two variables formed the main measures for the option-based compensation incentives. However, some banks did not publish information about the option- compensation to the public, and some banks do not use the option-based incentives. We had to adjust our sample banks to take account of these issues and that left 86 banks in the sample.

The other main variable, risk measure, was proxied by the stock price of the banks in the market. The reliability of this risk measure is based on the efficient-market hypothesis (Fama, 1970). This theory indicates that the price of

the stock can be affected by the information related to the company of the stock immediately and every investor in the market can easily obtain all the information that could affect the stock price at the same time. Based on this theory, the stock price can effectively explain information about the company, so the stock price will be the best guide to measure risk.

We use the daily stock price of each bank during the study period and calculate the daily stock return in this period. Furthermore, we use the stock return to get the standard deviation of each year which will be the risk measure for the banks. All the historical data of stock prices of each bank were obtained from Bloomberg. This measure will show the sample banks' total risk which is made up of many different risk factors of the company as well as the market.

Based on these variables, we can obtain the simplest model: Model 1(Equation 3.1):

$$Risk_{i,t} = f(Option_{i,t}, Weight_{i,t}) \quad 3.1$$

where $Risk_{i,t}$ is the risk measure which is the standard deviation of bank i's stock price in year t; $Option_{i,t}$ is the total annual option rewards for bank i's top five executives in year t; $Weight_{i,t}$ is the weight of option-based compensation in the total annual compensation for bank i's top five executives in year t.

After the basic model of the study, we found that the annual option rewards for the executives is related to the weight of option- based compensation. For each specific year, the bank executives are given high option rewards that could be caused by the high weight of option-based compensation of the total annual compensation

structure. In other words, this basic model has the issue of autocorrelation which means the two independent variables can be highly explained by each other.

Therefore, we will study the two option-based compensation measures individually.

We get two basic models (Model 2):

$$Risk_{i,t} = f(Option_{i,t}) \quad 3.2$$

$$Risk_{i,t} = f(Weight_{i,t}) \quad 3.3$$

Obviously, we cannot get reliable results with these two basic models, and the models have to be developed to have more explanatory power. Firstly, we considered the factor of regulation and governance because this factor can affect the risk of the banking industry. As discussed in the previous parts, the banking industry has its own specificity and exposure which is more sensitive to the health of the economy. There should be more governance and regulation to monitor the risk-taking in the banking industry.

The measure for the governance and regulation factor is researched from an index which was developed by Gompers et al (2003). This index has been used in many studies related to governance. For example, Rich et al (2010) concluded that the index measures control rights that managers enjoy apart from those that they obtained from share ownership. The data under this control will solve the problem related to the autocorrelation between the governance factor and the option compensation factors because the latter are under the equity based compensation that are related to the share ownership of the executives. The governance data were

obtained from Andrew Metrick’s website at Yale School of Management.

From the governance database we found that not all of our sample banks can be found with the index which gives the governance level of the bank. As a result we had to further re-adjust our banks sample. This left a final sample of 52, see Table 1, in the Appendix.

The models with governance factor included (Model 3) are in Equations 3.4 and 3.5

$$Risk_{i,t} = f(Option_{i,t}, Gov_{i,t}) \quad 3.4$$

$$Risk_{i,t} = f(Weight_{i,t}, Gov_{i,t}) \quad 3.5$$

where $Gov_{i,t}$ is the corporate governance index. The governance factor is an economy level effect which mainly depends on the policies and outside influence, such as state law and hostile takeover actions of competitors. In the banking industry, every bank has its own financial structure and operation strategy, so its risk not only depends on the governance effect, but also the firm level factors which could impact the bank risk.

The next step to develop the model will be considering the firm level risk factors. At this level, we pick three major factors to be included.

- The first factor is the size of the bank. Because the bank has different sizes, it will directly give the market different effects. “Too big to fail” will be the best example for the size effect of the banks to the market. Moreover, some small sized banks have less market power which may mean less ability to respond to risk. So the risk of the small size bank maybe higher based on the size.

- Another factor is the market to book ratio which indicates the effect of the bank charter value. Essentially, market to book in this study is a measure of the comparison between a bank's market book value. Book value is the accounting value which is calculated based on historical cost. The market value is the value based on information from the stock market. Book value gives us the "real" value of the firm which in contrast, market value is determined by the market, which could be higher or lower than the book value of the bank. This ratio will tell the bank if its value is increasing (decreasing) from the expectation of the market aspect.
- The last factor which cannot be ignored is the financial leverage, which is debt to equity ratio. Leverage is a measure of the debt the bank is taking, which affects the risk of the bank. For example the issue of wealth transfer will directly be linked to debt that the bank's investor invests in the risky project. The banking industry is a high leveraged industry which significantly contributes to the risk of the banks. More specifically, the bankruptcy risk will be higher when financial leverage is increasing because the limit of the loss will be relatively lower.

The model with governance factor and firm level factors (Model 4):

$$Risk_{i,t} = f(Size_{i,t}, Charter_{i,t}, Leverage_{i,t}, Gov_{i,t}, Option_{i,t}) \quad 3.6$$

$$Risk_{i,t} = f(Size_{i,t}, Charter_{i,t}, Leverage_{i,t}, Gov_{i,t}, Weight_{i,t}) \quad 3.7$$

where $Size_{i,t}$ is the natural logarithm of total assets value of the bank i in year t ;

$Charter_{i,t}$ means bank i's market-book ratio which as a variable for bank charter value effect; $Leverage_{i,t}$ is bank i's equity-assets ratio to control the effect from debt to the risk of the bank.

When the study focuses on the relation between option-based compensation incentive and the risk of the bank, we have to study the whole compensation package in depth because different packages will have different incentives to the executives. By only considering the option-based compensation it will not accurately reflect the relationship between them. Therefore we need to figure out what is the risk contribution to the total risk from other major compensation parts. In this case, we choose executives' annual salary and cash bonuses as the other two factors to the compensation part to provide a clearer perspective on option-based compensation. Based on the limited resources, at our disposal, we finally build the last model to determine the relation between option-based compensation and risk-taking of the banking industry. The model needs to include the weight of option-based compensation, and the salary and bonus factors need to be weighted.

The model with all the factors considered (Model 5):

$$Risk_{i,t} = f(Size_{i,b}, Charter_{i,b}, Leverage_{i,b}, Gov_{i,b}, Salary_{i,b}, Bonus_{i,b}, Option_{i,t}) \quad 3.8$$

$$Risk_{i,t} = f(Size_{i,b}, Charter_{i,b}, Leverage_{i,b}, Gov_{i,b}, WSalary_{i,b}, WBonus_{i,b}, Weight_{i,b}) \quad 3.9$$

where $Salary_{i,t}$ is the annual base salary paid to the bank i's top five executives in year t; $Bonus_{i,t}$ is the total value of bonuses paid to the bank i's top five executives in year t; $WSalary_{i,t}$ is the weight of annual base salary paid to the bank i's top five

executives in year t ; $WBonus_{i,t}$ is the weight of total value of bonuses paid to the bank i 's top five executives in year t ;

The main independent variables are the total amount and the weight of option-based compensation rewards for the top five executives. Based on the hypothesis of this study, the sign of the coefficient of these two variables should be positive. That means that when the amount or weight of option rewards increase (decrease), the risk of the bank should be increasing (decreasing).

The top management has the power to make decisions and strategies to control the risk of the bank. The ideas of management are not only affected by outside factors, such as the factor we study, incentive compensation, but also some inside factors to the management.

The different levels of risk aversion of executives could drive the risk of their firm. The executives with high levels of risk aversion would like to reduce the risk of the bank, even it is below the industry risk level average. The issue of personal risk aversion will affect the results of our model. When the risk aversion of the manager is high enough, the risk the manager would like to increase is not sensitive to the increase of the incentive. This will be one of the possibilities that the potential study result does not support our hypothesis.

The sign of the governance factor should be negative because the higher the governance index, means stronger governance on the bank, and so the risk should be lower. The relationship of firm level factors and the risk have been proved by lot of prior studies, for instance, the study of Chen et al (1998). In this study, these factors

are the control variables which we had know have a significant effect on the risk. The other two compensation variables have the same important level as the major factor, option-based rewards, in the study. But the salary and bonus, which are not the focus of the study, are playing the role of control variables.

The expectation of the sign of salary factor coefficient is negative because the executive who has a very high base salary will protect the high fixed compensation to take less risk. The cash bonus factor will be a more specific control variable which is hard to predict the sign of the coefficient. The reason for this is that the amount of bonus depends on the performance of the executives and the measures of the performance are different for each bank. Some banks may use the profits as a measure of the performance; some other banks may base this on the growth of the revenue to judge the performance of the executives, even based on the performance of risk control.

We re-checked the Model 5 which considers all the factors we developed. The weakest factor is the governance factor because the data originally is for 2006, a single year, and our study period is from 2007 to 2012. We can summarize that the data of governance factor must be different for the 2006 data. Model 5 supposes the governance factor will not change significantly year by year, but the real data are unknown. So we develop the last model which deletes the governance factor, although we know that this factor affects the risk of the banks.

The model with all the factors but the governance factor (Model 6):

$$Risk_{i,t} = f(Size_{i,b}, Charter_{i,b}, Leverage_{i,b}, Salary_{i,b}, Bonus_{i,b}, Option_{i,t}) \quad 3.10$$

$$Risk_{i,t} = f(Size_{i,b}, Charter_{i,b}, Leverage_{i,b}, WSalary_{i,b}, WBonus_{i,b}, Weight_{i,b}) \quad 3.11$$

Chapter 4: Empirical Results

Summary Statistics:

The summary statistics of the entire sample bank's information related to the study is in Table 4.1.

Table 4.1: Summary Statistics: 2007-2012 (52 banks)

	AVG	MAX	MIN	MID	SDV	N
SDV (risk)	3.24	9.90	1.04	2.61	1.8	312
option comp	1.56	29.43	0.00	0.32	3485202.4	312
Assets (in \$ b)	136.10	2264.91	2.04	13.90	413629.1	312
Market-book leverage	1.22	3.89	-0.73	1.12	0.6	312
salary (in \$ m)	155.20	917.90	16.87	122.40	122.6	312
total comp (in \$ m)	2.71	17.37	0.73	2.31	1743903.6	312
bonus (in \$ m)	12.06	82.24	1.35	6.52	14726819.3	312
weight of option	0.58	38.79	0.00	0.00	2938212.6	312
Gov	0.10	0.87	0.00	0.06	0.1	312
	9.69	15.00	3.00	10.00	3.0	312

Notes:

1. *SDV: standard deviation of stock returns which is the risk measure; option comp: option-based compensation for the executives; assets: total assets value; market-book: market to book ratio; leverage: debt to equity ratio; salary: total fixed salary for the executives; total comp: total value of compensation for executives; bonus: amount of bonus rewards; weight of option: weight of option-based compensation in total compensation. Gov: governance index of the bank.*
2. *Dollar values are in US\$ millions, but the asset values are in billions.*

It shows all 52 sample banks' six years data, in total 312 observations. There is a large range of bank size from \$2264 billion to \$2 billion in the study, and the size statistics result indicates the banks mostly are large banks that have a mean and median asset value of \$136.1 billion and \$13.9 billion respectively.

The corporate governance factor gives out a range from 3 to 15 which mean the banks have different governance levels. The data of executives' compensation factors have large standard deviations which are significant variations. The total annual amounts of compensation for the executives are as high as \$82.24 million and as low as \$1.35 million. The number includes options, salary and bonus parts in the study. They all have minimums of zero, and maximums of 29.43, 17.37 and 38.79 respectively. The number for leverage indicates the high leveraged banking industry, which has a mean of 155 times and maximum of 917 times. The median of the leverage is as large as 122 times.

The weights of option-based compensation in total compensation package can briefly show the situation of the low weight of the compensation in the study period. The maximum weight is far different from the median, from 0.87 to 0.06. Because the period includes the crisis years, the large gap could be caused by the significantly reduced weight after the crisis. The mean is only 0.1 which represents that the option-based incentive is not as hot as previous years as we discussed in Chapter 1.

Option-based compensation trend

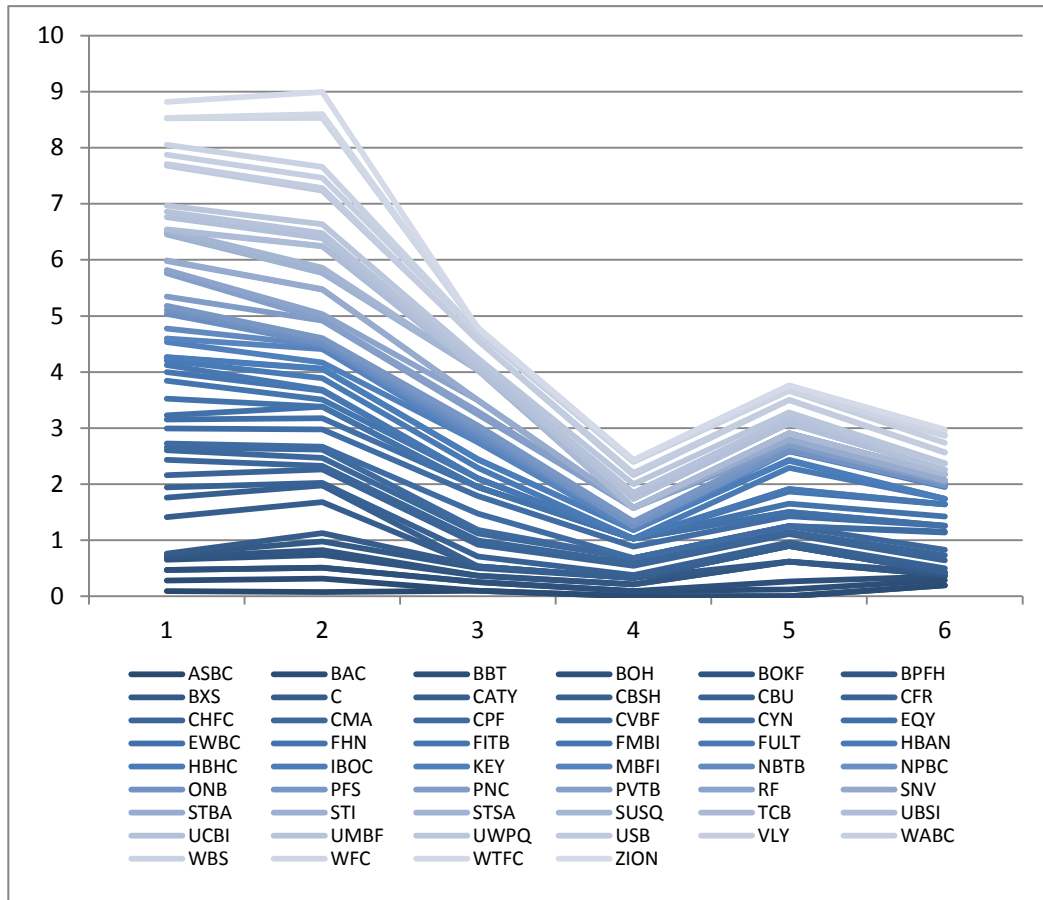
Based on the hypothesis, firstly we try to find the trend of the movement of the option-based compensation during the study period. The data used in the trend study are the weight of option based compensation in the compensation package. Because the range of the dollar amounts of the option based compensation are very large, it is

very hard and unclear to put all the option based compensation amount information in a single graph.

A chart with the weight information which has maximized range from 0 to 100 will more clearly indicate the trend (see Figure 4.1). Moreover, the total amount of compensation of different banks' executives is also highly variable. So the incentive power of the same amount of option based compensation will not be the same for different banks' executives who have different compensation levels.

We obtained the weight information of each bank from 2007 to 2012 and draw trend of the banks in a single figure. From Figure 4.1, we can find a significant down movement trend. The weight drops sharply after 2008 and ending at 2010 which is the period closest to the crisis. After 2010 (#4 on the horizontal axis), there is a slightly increase which may due to the incentive of recovering from the crisis. Then it moves down again. These results from this figure generally match with our hypothesis, even though some lines do not strongly contribute to the results.

Figure 4.1: Trend of weight of option-based compensation



Note: Vertical axis: 0-10 presents weights from 0% to 100% respectively;

Horizontal axis: 1-6 presents year from 2007 to 2012;

Each single line presents the option weight trend for each sample bank

Regression results

Before the applying of all the models, we considered the issue of heteroskedasticity and use the Breusch-Pagan test to figure out this issue. After the test for all the models, the results are lower than 0.1 which indicate all models are out of this issue. Also, based on the information of the banks, the data are a typical panel data, so we considered this factor and fixed the panel affect.

For the first model (Equation 3.1), which is the most used sample model commences with the regression of Model 2 (Equations 3.2 and 3.3) which considers the two option-based compensation factors separately. We use Stata to run the regressions of the five models of each form of the compensation, and re-organized the useful results of the models in single tables (Table 4.2 and Table 4.3).

Table 4.2:

Regression result of the models with dollar amount option-based compensation

Variable	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	3.191	2.834	5.323	5.124	4.12
(p-v)	0	0	0	0	0
Size _{i,t}			-0.118	-0.138	-0.069
(p-v)			0.09	0.12	0.07
Charter _{i,t}			-1.218	-1.532	-1.194
(p-v)			0	0	0
leverage _{i,t}			0.006	0.004	0.008
(p-v)			0	0	0
Gov _{i,t}		0.04	-0.013	-0.007	
(p-v)		0.3	0.63	0.78	
Salary _{i,t}				-0.235	-0.489
(p-v)				0.08	0.07
Option _{i,t}	0.038	0.032	0.035	0.37	0.032
(p-v)	0.26	0.23	0.12	0.08	0.05
Bonus _{i,t}				-0.543	-0.216
(p-v)				0.05	0.03
R2	0.009	0.014	0.19	0.247	0.241
N	312	312	312	312	312
N _{group}	52	52	52	52	52

Table 4.3:

Regression result of the models with weight of option-based compensation

Variable	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	3.14	2.809	4.236	4.835	3.95
	0	0	0	0	0
Size _{i,t}			-0.105	-0.112	-0.069
			0.08	0.14	0.09
Charteri _{i,t}			-1.27	-1.573	-0.139
			0	0	0
leverage _{i,t}			0.006	0.011	0.017
			0	0	0
Govi _{i,t}		0.034	-0.014	-0.054	
		0.31	0.75	0.68	
WSalary _{i,t}				-0.369	-0.754
				0.04	0.03
Weighti _{i,t}	0.901	0.952	1.8	0.937	1.215
	0.2	0.17	0.1	0.04	0.02
WBonus _{i,t}				-0.167	-0.865
				0.04	0.05
R2	0.013	0.021	0.263	0.302	0.297
N	312	312	312	312	312
Ngroup	52	52	52	52	52

From the results of Model 2, the influence of option based compensation is not significantly related to the risk of the banks, but the result is not hard to be explained. This model only has one factor to indicate the relation with the risk which is a generally complicated variable. The option based compensation is a sub-factor under the compensation affect, so that little effect could not directly strongly impact the total risk of the banks. The risk of the bank should be

determined by many factors which have much more power than the option-based compensation, plus some the banks we studied are international banks which are operating under the world's market. The overall situation of the international economy is not ideal in recent years, and that could be caused by many new risk factors. So, the risk contribution from option-based compensation should be weakening. But the sign of the coefficient of the option reward factor is as same as our expectation. Also, from the single factor regression, we can find the regression with weight of option reward factor has more explanatory power.

Model 3 (Equations 3.4 and 3.5) includes the governance factor as a control variable. The result does not give enough support to the importance of this factor as we supposed. The sign and the significance are both against our original expectation. The reason could be the data itself because of the governance data is only for 2006.

The previous chapter had discussed the motivation to use the inaccurate data. We considered the governance factor is a direct affect to the risk which cannot be ignored. There will be more explanations about the governance factor in next few models and process to drop this control variable. Both of the option-based compensation factors are not improved much compared to the Model 2.

If we inject the firm level risk factors into Model 4(Equations 3.6 and 3.7), two of three factors follow the original expectation. Charter and leverage factor are statistically significant at the 1% level, and the relation between the factors and bank risk is showing on the sign of the coefficient which means when the market to book value increasing and debt to equity decreasing, the risk of the bank will be lower. In contrast, the result of the size factor is only statistically significant at the 10% level and the negative relationship supports that large banks have lower risk than the small banks. The inclusion of three factors together significantly improved the R^2 of two forms of the model from 0.01 to 0.19 and 0.02 to 0.26 respectively to prove that firm level factors have more direct effect on risk. Compared with the firm factors, the option based rewards factors are weaker. The weight of option based compensation, is statistically significant at the 10% level, and has better performance than the dollar amount effect. The governance factor has a worse performance in this model that raises the suspect of the existence of the factor.

In Model 5(Equations 3.8 and 3.9), all factors- the governance factor, firm level factor and the detailed compensation factor, are included, and the R^2 of the two forms of the model have been increased around 0.05 for each to 0.24 and 0.26 respectively. The relatively small increase means the compensation part has limited impact on the risk of the banking industry after the financial crisis. But both three compensation factors are statistically significant at the 10% level at the compensation amount form model and at 5% level at the

compensation weight form model. The firm size variable becomes statistically insignificant, but the other two firm level variables are still statistically significant in all forms. The governance factor results come with a very large p-value which means it is highly insignificant and we decide to drop this variable to reduce the negative effects from this factor.

The Model 6 (Equations 3.10 and 3.11) which with all the factors except governance factor gives out slightly lower R^2 of both forms model means that the removal of the governance factor almost does not affect the explanatory power of the model. The results support the inaccurate governance data has a low relation with the risk of the banks in the study period. In the two forms of this model, all the factors are statistically significant at 10% or better.

After comparing the different form study of all five models, we find the performance of the compensation amount form model is worse than the weight compensation. The weight of the option-based compensation has a more direct relation to the risk of the banking industry. In general, the weight of option reward presents the compensation structure of the banks, and the amount only shows the value of the option compensation. Based on the different compensation level of different banks, the value based compensation will be biased data for the industry. However, the compensation structure data will delete the issue of the scale effect on the compensation.

We will focus on the weight form of the study to find movement of option based compensation factor from the development of the model through Model 2 through to Model 6. The constant positive sign of the coefficient of the factor can indicate the positive relationship. For the issue of statistical significance in Model 2, the high significant level indicates that there is almost no direct relation between weight of option rewards and the bank risk. However, the statistical significance is increased from the 20% level to the 2% level which may be caused by the collinearity between the factors. That means the option reward factor is related to other factors. For example, we find a sharp increase in the significance from Model 3 to Model 4 which includes firm level factors. That is the support of the effects of the option-based compensation to the investment strategy, capital structure and other operation activities which are more directly related to the risk of the banks. Therefore, the positive relationship between the option based compensation and the banks risk exists, however, the option reward factor is a sub-factor to indirectly affect the risk in banking industry. In other words, the option-based compensation will directly influence the executives' decisions to change the firm level factors, such as the investment activities, financing activities and daily operations of the bank. All the factors will directly change the price of their stock which is the base information for the calculation of the risk in the study.

Chapter 5: Conclusion

This paper examines the relationship between option-based executive compensation and risk-taking in the U.S. banking industry from 2007 to 2012. Through the study of 312 observations from 52 sample banks, the results are generally consistent with our hypothesis.

According to the result of compensation structure trend in the study period, the weight of option-based compensation in the U.S. banking industry significantly decreased. Based on the background of the high risk level in the banking industry, change means most of the banks believe that the reduction in the weight of option-based compensation could decrease the banks risk. The result strongly supports our hypothesis of this part, but it cannot clearly explain the relationship between option-based compensation and the risk.

With the regression models, we find that the results indicate a positive relationship between the option-based compensation and the risk-taking in the banking industry, although the statistical significance was not as strong as we expected. Compared with prior studies, the relationship of them before the financial crisis is much stronger than the relationship after the crisis. This result could be caused by many reasons because the risk of the banking industry and option rewards is related to a mass of factors. One possible reason could be the effect of European debt crisis which increased the risk of the whole financial market. Another possible reason could be the different understanding of the relationship between risk and option rewards.

From this study, we find that the option-based compensation is one indirect factor for the risk. The decisions of compensation structures in the banking industry will more directly affect the firm level factors. The change of these firm level factors will further influence the risk.

Appendix

Table 1: Sample banks

Code	Name
ASBC US Equity	ASSOC BANC-CORP
BAC US Equity	BANK OF AMERICA
BBT US Equity	BB&T CORP
BOH US Equity	BANK OF HAWAII
BOKF US Equity	BOK FINL CORP
BPFH US Equity	BOSTON PRIV FINL
BXS US Equity	BANCORPSOUTH INC
C US Equity	CITIGROUP INC
CATY US Equity	CATHAY GENERAL B
CBSH US Equity	COMMERCE BCSHS
CBU US Equity	COMMUNITY BANK S
CFR US Equity	CULLEN/FROST
CHFC US Equity	CHEMICAL FIN
CMA US Equity	COMERICA INC
CPF US Equity	CENTRAL PACIFIC
CVBF US Equity	CVB FINANCIAL
CYN US Equity	CITY NATL CORP
EQY_FUND_CRNCY	REL_INDEX
EWBC US Equity	EAST WEST BNCRP
FHN US Equity	FIRST HORIZON NA
FITB US Equity	FIFTH THIRD BANC
FMBI US Equity	FIRST MIDWEST/IL
FULT US Equity	FULTON FINANCIAL
HBAN US Equity	HUNTINGTON BANC
HBHC US Equity	HANCOCK HLDG CO
IBOC US Equity	INTL BANCSHARES
KEY US Equity	KEYCORP
MBFI US Equity	MB FINANCIAL
NBTB US Equity	NBT BANCORP INC
NPBC US Equity	NATL PENN BCSHS
ONB US Equity	OLD NATL BANCORP
PFS US Equity	PROVIDENT FINANC
PNC US Equity	PNC FINANCIAL SE
PVTB US Equity	PRIVATEBANCORP
RF US Equity	REGIONS FINANCI
SNV US Equity	SYNOVUS FINL
STBA US Equity	S & T BANCORP
STI US Equity	SUNTRUST BANKS
STSA US Equity	STERLING FINL/WA
SUSQ US Equity	SUSQUEHAN BNCSHS
TCB US Equity	TCF FINL CORP
UBSI US Equity	UNITED BANKSHS
UCBI US Equity	UNITED COMMUNITY
UMBF US Equity	UMB FINANCIAL
UMPQ US Equity	UMPQUA HOLDINGS
USB US Equity	US BANCORP
VLV US Equity	VALLEY NATL BANC
WABC US Equity	WESTAMERICA BANC
WBS US Equity	WEBSTER FINL
WFC US Equity	WELLS FARGO & CO
WTFC US Equity	WINTRUST FINL
ZION US Equity	ZIONS BANCORP

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