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Is option-based compensation restrained by largest potential risk exposure? Evidence from the banking industry

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Abstract

Excessive risk taking induced by equity-based executive compensation is more (less) of a concern to the shareholders if the largest potential risk exposure is large (small). This study empirically shows that the intensity of option-based compensation to a bank's CEO decreases with the bank's largest potential risk exposure and its largest potential increase in risk exposure. These findings suggest a possibility of banks self-regulating their compensation structures.

Keywords: Executive compensation; banking; risk.

JEL classifications: G2; G3.

1. Introduction

Banks' compensation policies have been debated since the 2008 financial crisis. Past studies on executive compensation in the banking industry found a positive impact of option-based compensation on risk taking, making a case for regulatory intervention. For instance, Chen *et al*. (2006) found that option-based executive compensation induces banks to take higher risks and hence concluded that regulators should monitor banks' compensation structures. Other studies, such as those by Bai and Elyasiani (2013) and Bhagat and Bolton (2014), reported similar findings.

This study hypothesizes that the intensity of option-based compensation to a bank's CEO is restrained by the bank's largest potential risk exposure because excessive risk taking induced by equity-based compensation is more (less) of a concern to the bank's shareholders if the largest potential risk exposure is large (small). Based on a sample of U.S. banks, findings from this study support the hypothesis, implying that banks could self-regulate their own risk-inducing compensation structures.

The remainder of this article is organized as follows. Section 2 states the hypothesis and develops an empirical framework for hypothesis testing. Section 3 describes an approach to projecting a bank's largest potential risk exposure. Sections 4 and 5 describe the data and report findings, respectively. Finally, Section 6 draws conclusions.

2. Hypothesis and Empirical Framework

Suppose the actual risk taking of a bank is bounded upward by the bank's largest potential risk exposure given the bank's current fundamentals (e.g., firm size, financial leverage, and operating leverage). From a principal–agent perspective, while option-based compensation induces a bank's CEO (i.e., the agent) to take higher risks, this study hypothesizes that the intensity of option-based compensation to a bank's CEO decreases with the bank's largest potential risk exposure because excessive risk taking induced by option-based compensation is more (less) of a concern to the bank's shareholders (i.e., the principal) if the largest potential risk exposure is large (small). This gives rise to the following hypothesis: *The intensity of option-based compensation to a bank's CEO is restrained by the bank's largest potential risk exposure.*

Following Chen *et al.* (1998, 2006), this study considers four types of bank risk influenced by management decisions: total return risk (s_{1it}); nonsystematic risk (s_{2it}); market risk (s_{3it}); and interest rate risk (s_{4it}). Let OPT_{it} be the intensity of option-based compensation defined as the value of stock options granted as a percentage of the salary and bonus paid to bank *i*'s CEO in year *t*, S_{it}^{max} = (s_{1it}^{max}, …, s_{4it}^{max}) the highest potential risk level, and $S_{it} =$ (s_{1it}, …, s_{4it}) the risk level actually taken by the CEO. While S_{it} is endogenous, S_{it}^{max} is exogenous because it is projected from the risk taking of peer banks using the stochastic frontier approach (see the next section). The hypothesis can be tested by the following regression:

$$\text{Model 1: } OPT_{it} = \alpha + \beta Z_{it} + \delta S_{it}^{max} + \eta_{it} \tag{1}$$

where α is a constant term; η_{it} is an error term; and δ is a vector of coefficients δ_1, …, δ_4 for s_{1it}^{max}, …, s_{4it}^{max}. Moreover, β is a vector of coefficients β_1, …, β_5 for Z_{it} containing the following control variables:

- bank size measured by total assets ($ASSET_{it}$);
- bank performance measured by $PERF_{it}$ = $\rho_{it} W_{i,t-1}$, where ρ_{it} is the inflation-adjusted rate of return to shareholders and $W_{i,t-1}$ is the beginning-of-period market value (Jensen and Murthy, 1990);
- CEO age (AGE_{it});

- presence of executive director indicated by $EDIR_{it}$ = 1 if the CEO also serves as a director of the bank; and
- time trend (*TIME*).

Non-interest income and geographic diversification were found to be statistically insignificant by Chen *et al*. (2006) and thus excluded from Z_{it}.

Model 1 supports the hypothesis if δ < 0, i.e., the intensity of option-based compensation decreases with bank i's largest potential risk exposure. The actual level of risk (S_{it}) chosen by the CEO does not enter Model 1 under the assumption that what restrains the intensity of option-based compensation is the bank's largest potential risk exposure. Alternatively, the hypothesis can be tested by the following regression:

$$\text{Model 2: } OPT_{it} = \alpha + \beta Z_{it} + \delta(S_{it}^{max} - S_{it-1}) + \eta_{it}. \qquad (2)$$

Model 2 replaces S_{it}^{max} with $S_{it}^{max} - S_{it-1}$, where the latter is the largest potential increase in risk exposure. S_{it-1} instead of S_{it} is used in Model 2 to avoid endogeneity. Model 2 is consistent with the hypothesis if δ < 0.

3. Projection of the largest potential risk exposure

Consider the following two-index market model of Chen *et al.* (2006) for bank *i* = 1, …, *N* in year *t*:

$$R_{it} = a_{it} + b_{it}R_t^m + \gamma_{it}R_t^s + e_{it}, \qquad (3)$$

where R_{it} contains bank *i*'s daily stock returns in year *t*; R_t^m contains the daily returns on the equally weighted market index; R_t^s contains the daily three-month T-bill yields to proxy short-term interest rates; and e_{it} is an error term. Equation (3) gives four market-based measures for bank *i*'s actual risk taking in year *t* as follows:

- total return risk (s_{1it}) measured by the standard deviation of daily stock returns;
- nonsystematic risk (s_{2it}) measured by the standard deviation of e_{it};

- market risk (s_{3it}) measured by the value of b_{it}; and
- interest rate risk (s_{4it}) measured by the absolute value of γ_{it}.

To project $S_{it}^{max} = (s_{1it}^{max}, \ldots, s_{4it}^{max})$ from $S_{it} = (s_{1it}, \ldots, s_{4it})$, consider the following stochastic frontier model for each of $s_{1it}, \ldots, s_{4it}$.

$$s_{it}^{max} = f(X_{it}), \tag{4}$$

and

$$s_{it} = f(X_{it}) d_{it} \exp(v_{it}). \tag{5}$$

Equation (5) is linear in logs, and thus:

$$\ln(s_{it}) = \ln[f(X_{it})] + \ln(d_{it}) + v_{it}, \tag{6}$$

where s_{it}^{max} is assumed to be a function of X_{it} containing bank *i*'s total assets, debt-to-equity ratio (financial leverage), and fixed-to-total-assets ratio (operating leverage); d_{it} is a random variable to be estimated in the interval (0,1]; and v_{it} is an i.i.d. normally distributed error term. d_{it} indicates the distance between s_{it} and s_{it}^{max}, which is the potentially largest proportional increase in bank *i*'s risk exposure without altering X_{it}. Since d_{it} is unobservable, this study applies Battese and Coelli's (1992) stochastic frontier approach for panel data using the risk taking of peer banks as a benchmark to estimate d_{it}. An upper risk frontier (i.e., s_{it}^{max}) is then projected from d_{it} using Equation (6).

4. Data

Annual CEO compensation data for 121 commercial banks, including regional banks, asset management & custody banks, diversified banks, and thrifts & mortgage finance, over the 2009–2017 period were collected from Compustat ExecuComp. The sample banks' financial data were then taken from Compustat and the Center for Research in Security Prices (CRSP). The unbalanced panel has 973 firm-year observations.

5. Results

Each bank's annual observation of S_{it} was estimated year-by-year from Equation (3) using daily CRSP stock data. S_{it}^{max} for each i and t was then projected using the estimate of d_{it} from Equations (4) – (6). Figure 1 displays the estimates of d_{it} for each risk measure, showing that a majority of the sample banks attained 80%-90% of their highest potential interest rate risk and 20%-40% of their highest potential total return risk, nonsystematic risk, and market risk.

** insert Figure 1 here **

As OPT_{it} is a left-censored variable, Equations (1) and (2) were estimated using the random-effects Tobit approach. The estimation results are reported in Table 1. The Wald chi-square statistics indicate that the model specifications are statistically significant. Firm effects explain approximately 40% of the variance as indicated by the estimate of ρ.

** insert Table 1 here **

Model 1 tests the hypothesis of this study by estimating the impact of S_{it}^{max} on OPT_{it}. Supporting the hypothesis, the significantly negative coefficients on s_{1it}^{max}, s_{3it}^{max}, and s_{4it}^{max} suggest that the intensity of option-based compensation to a bank's CEO decreases with the bank's highest potential total return risk, market risk, and interest rate risk, respectively.[1] However, the negative coefficient on s_{2it}^{max} (i.e., non-systematic risk) is statistically insignificant. The significantly positive coefficient on *TIME* is consistent with Hubbard and Palia's (1995) documentation of an upward trend in the intensity of option-based compensation to bank executives. The other control variables,

[1] The correlation coefficients between s_{1it}^{max}, s_{3it}^{max}, and s_{4it}^{max} range from 0.17 – 0.54, which are unlikely to cause substantial multicollinearity in Equations (1) – (2).

$ASSET_{it}$ $PERF_{it}$, AGE_{it}, and $EDIR_{it}$, are all statistically insignificant, indicating the relative importance of S_{it}^{max} in explaining the variance of OPT_{it}.

Model 2 tests the hypothesis by including $S_{it}^{max} - S_{it-1}$ instead of S_{it}^{max} in the regression. Consistent with the hypothesis, the significantly negative coefficients on $s_{1it}^{max} - s_{1it-1}$, $s_{2it}^{max} - s_{2it-1}$, and $s_{3it}^{max} - s_{3it-1}$ suggest that the intensity of option-based compensation to a bank's CEO decreases with the bank's largest potential increase in total return risk, nonsystematic risk, and market risk, respectively. However, the intensity of option-based compensation is insignificantly associated with the largest potential increase in interest rate risk (i.e., $s_{4it}^{max} - s_{4it-1}$). Taken together, the findings from Models 1 and 2 support this study's hypothesis.

6. Conclusions

This study hypothesizes that the intensity of option-based compensation to a bank's CEO is restrained by the bank's largest potential risk exposure. Supporting this hypothesis, the empirical findings suggest that the intensity of option-based compensation to a bank's CEO decreases with the bank's highest potential total return risk, market risk, and interest rate risk, and decreases with the bank's largest potential increase in total return risk, nonsystematic risk, and market risk. While past research made a case for regulators to monitor banks' risk-inducing compensation structures, this study's findings suggest a possibility of banks self-regulating their compensation structures.

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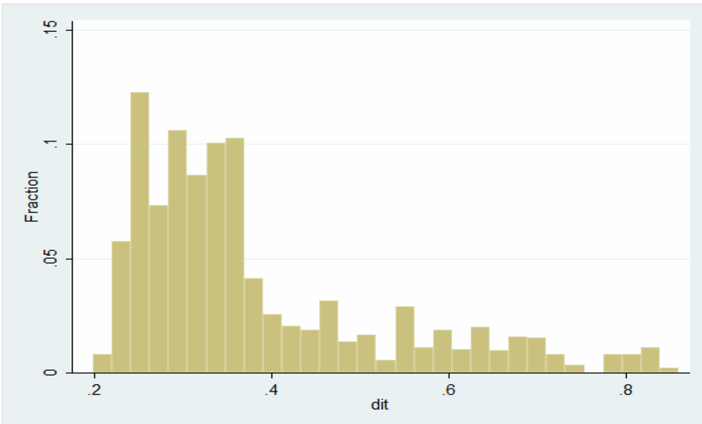
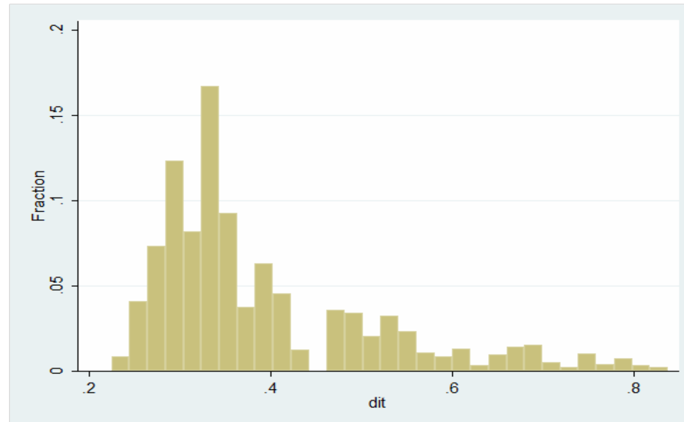
Figure 1: Distribution of d_{it}

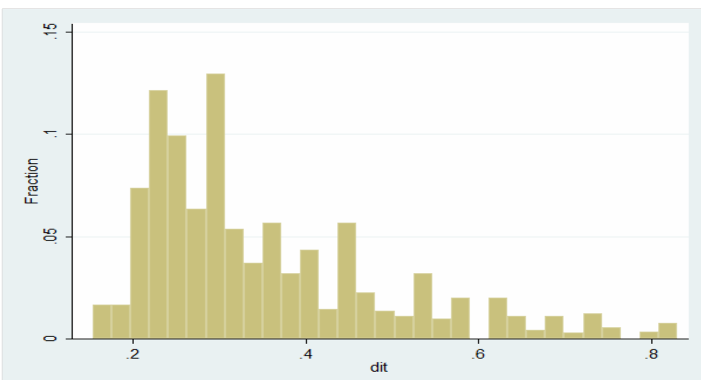
(a) Distribution of d_{it} for total return risk



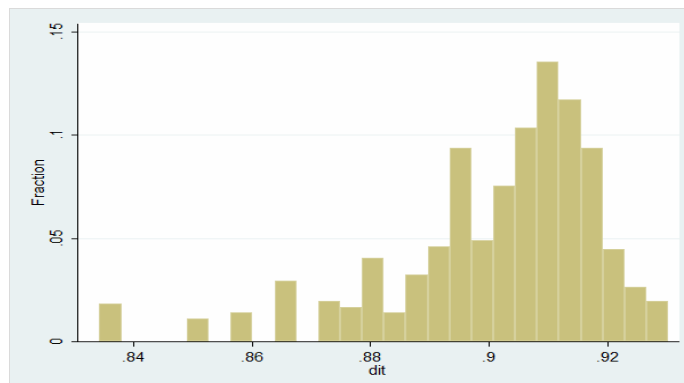
(b) Distribution of d_{it} for nonsystematic risk



(c) Distribution of d_{it} for market risk



(d) Distribution of d_{it} for interest rate risk



Note: The width of each bar represents a specific range of d_{it}.

Table 1: Hypothesis Testing

Independent variable	Model 1	Model 2
s_{1it}^{max}	–622.032**	
	(0.000)	
s_{2it}^{max}	–1.131	
	(0.193)	
s_{3it}^{max}	–4.907**	
	(0.008)	
s_{4it}^{max}	–0.455*	
	(0.035)	
$s_{1it}^{max} - s_{1it-1}$		–863.800**
		(0.000)
$s_{2it}^{max} - s_{2it-1}$		–2.487*
		(0.032)
$s_{3it}^{max} - s_{3it-1}$		–7.031*
		(0.010)
$s_{4it}^{max} - s_{4it-1}$		–3.546
		(0.114)
$ASSET_{it}$	0.0000178	0.0000132
	(0.229)	(0.385)
$PERF_{it}$	–0.0018921	–0.0019549
	(0.663)	(0.651)
AGE_{it}	0.039	0.034
	(0.272)	(0.348)
$EDIR_{it}$	1.549	1.677
	(0.216)	(0.180)
$TIME$	1.361**	1.426**
	(0.000)	(0.000)
Constant	24.978**	27.605**
	(0.000)	(0.000)
ρ	0.421	0.422
Wald chi-square	81.56**	81.75**
	(0.000)	(0.000)

Notes: The dependent variable (OPT_{it}) is the value of stock options granted as a percentage of the salary and bonus paid to bank i's CEO in year t. s_{1it}^{max}, s_{2it}^{max}, s_{3it}^{max}, and s_{4it}^{max} are the upper frontiers of total return risk (s_{1it}), nonsystematic risk (s_{2it}), market risk (s_{3it}), and interest rate risk (s_{4it}). ρ is the fraction of variance due to firm effects. Values in parentheses are p values. * - significant at 5% level. ** - significant at 1% level.