Executive compensation and risk-taking of Chinese banks

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Abstract: We document a significantly positive relationship between executive compensation and risk-taking of Chinese listed banks over the 2007–2018 period. The finding is robust to the risk measures (Z-score, systematic risk and stock return volatility) used, the way to calculate executive compensation, and model specifications as well as estimation techniques. Further analysis suggests that bank past performance (captured by return on equity) strongly moderates the relationship between executive compensation and risk-taking. We also find a modest U-shaped association of bank Z-score with executive compensation. Our study appears to support the regulation on executive compensation for the sake of bank stability.

Keywords: Executive compensation; Bank risk-taking; Bank performance; Z-score

JEL classification: G21, G28

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1. Introduction

The 2008 global financial crisis (GFC) has triggered a hot debate on the connection between executive compensation and bank risk-taking. Bolton et al. (2015) argue that structuring executive incentives to maximize shareholder value in banks tends to encourage excess risk-taking. Empirical studies on U.S. banks show that bank risk-taking is *positively* associated with the sensitivity of executive compensation to risk (Bai and Elyasiani, 2013; Gande and Kalpathy, 2017), the incentives generated by executive compensation programs (Bhagat and Bolton, 2014), and the percentages of short-term and long-term incentive compensation (Guo et al., 2015). In contrast, Shah et al. (2017) uncover a *negative* relationship between bonuses (restricted share and option grants) awarded to bank executives and risk-taking of U.S. banks in the pre-GFC (post-GFC) period. Clearly, the literature is inconclusive regarding the connection between executive compensation and bank risk-taking.

Given that bank executive compensation scheme (see Conyon and He, 2011, 2016) and governance arrangements (see Fan et al., 2007, 2014) in China differs much from that in the U.S., we ask whether and how executive compensation matters for risk-taking of Chinese banks. This question is of utmost importance and interest due to the gradually dominating role of Chinese banks in the global financial system. According to the Banker's list of Top 1000 World Banks, 136 Chinese banks entered the list of which four took the Top 4 spots in terms of their assets.[1] These four banks were also identified as global systemically important banks (G-SIBs) by the Financial Stability Board since 2015.[2] No doubt, studies about executive compensation and risk-taking of Chinese banks should have important policy implications not only for bank governance and risk management in China but also for the internationally financial regulatory reform. However, related studies specially focusing on Chinese banks are surprisingly scarce probably because the information about bank executive compensation was not publicly available before.

Therefore, this paper aims to provide the first evidence for the impact of the level of executive compensation on risk-taking of Chinese banks. We document that executive compensation has a positive impact on bank risk-taking (proxied by Z-score). The finding is robust

[1] See https://www.thebanker.com/Top-1000 for the ranking of 2019 Top 1000 World Banks.

[2] See https://www.fsb.org/2019/11/2019-list-of-global-systemically-important-banks-g-sibs/ for the 2019 list of global systemically important banks.

to model specifications, estimation techniques, executive compensation measures and proxies for bank risk-taking. Additional analyses show that: 1) there is a modest U-shaped association of bank Z-score with executive compensation; 2) bank performance (captured by return on equity) strongly moderates the relationship between executive compensation and risk-taking; and 3) the widely examined variables board size and state ownership have insignificant impact on bank Z-score, while bank size and ownership concentration significantly and positively affect bank Z-score.

Our paper is closely related to the recent literature which examines the relationship between bank risk-taking and executive compensation. Some research has examined the impact of executive compensation on risk-taking of U.S. banks (Bai and Elyasiani, 2013; Bhagat and Bolton, 2014; Gande and Kalpathy, 2017; Guo et al., 2015; Shah et al., 2017; Tian and Yang, 2014), but the impact has not been systemically explored for banks in China. We expand this literature by exploring the impact for Chinese banks. Moreover, we uncover the moderated effect of bank past performance on the relationship between executive compensation and bank risk-taking. To the best of our knowledge, this moderation effect has not been explored in the literature. Our paper also belongs to the fast-growing literature on Chinese banks. Recent studies have examined Chinese banks from different perspectives, such as systemic risk (e.g., Huang et al., 2019), regulation (e.g., Jiang et al., 2019), efficiency (Zhang et al., 2012), political connection (Hung et al., 2017), ownership dispersion of banks (Bian and Deng, 2017). We contribute to this literature by providing empirical evidence for the connection of executive compensation and bank risk-taking, which is beneficial to China's current regulation practice and improvement.

2. Methodology and data

To examine the impact of executive compensation on bank risk-taking, we start from the following two-way fixed effects panel regression with heteroskedasticity robust standard errors:

$$Risk_{it+1} = \beta_0 + \beta_1 Compensation_{it} + \beta_{it} Control_{it} + \lambda_t + u_i + \varepsilon_{it}, \quad (1)$$

where $Risk_{it+1}$ and $Compensation_{it}$ indicate bank *i*'s risk-taking and executive compensation in year *t*+1, respectively; $Control_{it}$ includes a series of control variables; λ_t and u_i denote year and bank fixed effects, respectively; and ε_{it} is the error term. Following Laeven and Levine (2009), we use the natural logarithm of the Z-score ($\ln Zscore$) as our main measure for bank risk-taking. A bank's Z-score equals the sum of its return on assets (ROA) and equity-to-asset ratio divided by

the standard deviation of ROA, such that a lower Z-score indicates that the bank is riskier. As a robustness check, we employ two market-based risk measures, systematic risk (*Beta*) and total risk (*Volatility*), as proxies for bank risk-taking. *Beta*, estimated from the capital asset pricing model, captures the reaction of bank stock returns to the movements of the stock market index, while *Volatility* is the standard deviation of bank stock returns. Both measures are calculated for each bank on the basis of daily stock returns within a year.

For the key explanatory variable $Compensation$, we use the natural logarithm of the aggregate annual compensation of the top three executives ($\ln Rew3Exe$) as our main analysis. For sensitivity analysis, we also calculate the natural logarithm of the aggregate annual compensation of the top three directors ($\ln Rew3Dir$) and of the top three executives plus the top three directors ($\ln Rew3Exe3Dir$). To control for variables that may have impact on bank risk-taking, we consider the following variables: 1) bank size captured by the natural logarithm of total assets ($\ln Assets$); 2) solvency captured by equity-to-liability ratio ($EquLia$); 3) ownership concentration of the top five shareholders (*OwnCon*); 4) return on equity (*ROE*); 5) board size defined as the number of directors (*BoardSize*); 6) state shares percentage (*StateshrPct*); 7) the natural logarithm of net profit ($\ln NetProfit$); and, 8) yearly growth of a bank's total assets ($AssetGrowth$). These variables are widely adopted in bank literature (e.g., Bhagat et al., 2015; Bian and Deng, 2017; Gormley et al., 2012; Haq and Heaney, 2012; Laeven and Levine, 2009). In addition to these variables, we include both time and bank fixed effects to relieve the concern of omitted variables.

We estimate Eq. (1) with the key explanatory and control variables lagged on period along with time and bank fixed effects to mitigate possible endogeneity and omitted bias (c.f. Bai et al., 2019). Moreover, each continuous variable is winsorized at its 1st and 99th percentiles before running our regressions to guard against the potential effects of outliers. In addition, we apply the stepwise regression with backward elimination approach to remove insignificant variables to avoid serious multicollinearity. To further address possible endogeneity bias due to inverse causality between some covariates and the dependent variable, we also estimate Eq. (1) with the two-stage least squares (2SLS) procedure and the Generalized Method of Moments (GMM) panel methodology to obtain consistent estimates, as suggested by Bai and Elyasiani (2013) and Altunbaş et al. (2019).

Our dataset includes the 16 largest banks listed in the Chinese stock market where their aggregate assets account for more than 70% of the total assets of all Chinese commercial banks (Huang et al., 2019). Our main analysis focuses on the period of 2007–2018 as the Chinese banking restructuring reform was basically completed at the end of 2006 (Huang et al., 2019) whereas data on bank executive compensation in 2019 has not been released yet. We collect data for the above variables from the RESSET database and present their descriptive statistics in Table 1.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
ln*Zscore*	191	3.628	.377	2.39	4.525
Volatility	186	.02	.009	.007	.045
Beta	186	.859	.274	.152	1.761
ln*Rew3Exe*	178	15.627	.652	14.245	17.236
ln*Rew3Dir*	178	15.474	.756	13.305	17.362
ln*Rew3Exe3Dir*	178	16.266	.668	15.018	17.929
ln*Assets*	192	28.708	1.297	25.048	30.952
EquLia	192	6.638	2.097	-12.06	15.037
OwnCon	188	.635	.238	.246	1
ROE	189	17.845	4.626	4.176	41.125
BoardSize	187	20.802	4.135	11	33
StateshrPct	188	7.999	18.754	0	100
ln*NetProfit*	192	24.057	1.373	20.236	26.419
AssetGrowth	192	19.173	12.384	-4.272	73.015

Notes: This table presents descriptive statistics for the bank-level variables used in our paper. ln*Zscore* is the natural logarithm of Z-score. *Volatility* is the standard deviation of bank stock returns. *Beta* captures the reaction of bank stock returns to the movements of the stock market index. ln*Rew3Exe* and ln*Rew3Dir* are the natural logarithm of rewards to the Top 3 executives and the Top 3 directors, respectively. ln*Rew3Exe3Dir* is the natural logarithm of total rewards to the Top 3 executives and the Top 3 directors. ln*Assets* is the natural logarithm of bank assets. *EquLia* indicates the equity-to-liability ratio. *OwnCon* is the sum of shares percentage of the Top 5 shareholders. *ROE* is return on equity. *BoardSize* is the number of directors. *StateshrPct* is the percentage of state shares. ln*NetProfit* is the natural logarithm of net profit. *AssetGrowth* is yearly growth of a bank's total assets. Data source: RESSET (www.resset.com).

3. Empirical results

This section presents the results about the impact of executive compensation on bank risk-taking. We start from the investigation of the linear impact of executive compensation with different estimation techniques. Then we examine whether the impact could be nonlinear and whether the impact persists for other risk measures. At last, we explore whether the impact is affected by other bank characteristics.

Table 2. Baseline results on executive compensation and bank risk-taking

	Fixed effects				2SLS	GMM
	(1)	(2)	(3)	(4)	(5)	(6)
ln*Rew3Exe*	-0.080**	-0.063**			-0.081**	-0.082**
	(-2.619)	(-2.328)			(-2.103)	(-2.161)
ln*Assets*	0.266***	0.293***	0.277***	0.273***	-0.009	-0.007
	(4.021)	(3.544)	(4.280)	(4.207)	(-0.525)	(-0.414)
EquLia	0.120***	0.125***	0.119***	0.119***	0.204***	0.205***
	(6.377)	(6.558)	(6.039)	(6.266)	(13.887)	(13.994)
OwnCon	0.579**	0.451*	0.566**	0.575**	0.115	0.101
	(2.700)	(1.772)	(2.569)	(2.689)	(1.063)	(0.954)
ROE	0.024***	0.021***	0.024***	0.024***	0.021***	0.021***
	(3.093)	(3.302)	(3.097)	(3.073)	(4.650)	(4.914)
BoardSize		0.000				
		(0.075)				
StateshrPct		-0.001				
		(-1.034)				
ln*NetProfit*		-0.058				
		(-0.603)				
AssetGrowth		0.000				
		(0.088)				
ln*Rew3Dir*			-0.055*			
			(-2.084)			
ln*Rew3Exe3Dir*				-0.086**		
				(-2.788)		
β_0	-4.265*	-3.832*	-4.984**	-4.321**	3.368***	3.330***
	(-2.094)	(-1.981)	(-2.424)	(-2.147)	(4.299)	(4.264)
Obs.	176	173	177	176	169	169
R-squared	0.936	0.942	0.934	0.936	0.518	0.518
Year fixed effects	Yes	Yes	Yes	Yes		
Bank fixed effects	Yes	Yes	Yes	Yes		
Hansen (P-value)					0.489	0.489

Notes: This table reports estimation results of Eq. (1) under different specifications by different estimation techniques. The dependent variable is the natural logarithm of Z-score. The independent variables are lagged with one-year in models (1) to (4), which are panel regressions with fixed effects. Models (5) and (6) are estimated using the 2SLS and GMM approaches, respectively, with robust standard errors during the same period. The Hansen J statistic tests the validity of the instruments used with the null hypothesis that the instruments are not correlated with the residuals, and rejection of the hypothesis implies that the instruments are not valid. The numbers in parenthesis are *t*-statistics. ***, ** and * indicate the significance at the 1%, 5% and 10% levels, respectively.

Table 2 presents the baseline results of our fixed effects model (see Eq. 1) compared with those estimated with the 2SLS and GMM techniques. Model (1) is the estimates recommended by

the stepwise regression with backward elimination approach. We find that the coefficient of ln*Rew3Exe* is -0.08, which is statistically significant at the 5% level. As the dependent variable (ln*Zscore*) indicates the distance from default, the results of Model (1) suggest that bank risk-taking is positively associated with executive compensation. The coefficients of the four control variables included in Model (1) have expected signs and are significant, suggesting that higher values in bank size (ln*Assets*), solvency (*EquLia*), ownership concentration (*OwnCon*) and performance (*ROE*) result in lower bank risk. Model (2) shows that the above findings remain unchanged when controlling for more variables widely chosen in related studies. Models (3) and (4) show that our findings still hold when we change the way to measure executive compensation. Models (5) and (6) apply the 2SLS and GMM techniques to address possible endogeneity and the estimates show that the impact of executive compensation on bank risk-taking remain significant. Overall, Models (2)-(6) appear to support our finding drawn from Model (1) that executive compensation has a significant and positive impact on bank risk-taking.

Our finding is supported by the theoretical analysis of Bolton et al. (2015) and in line with the findings of several studies on U.S. banks (see Bhagat and Bolton, 2014; Gande and Kalpathy, 2017; Guo et al., 2015), but contrary to the findings of Shah et al. (2017). Given that the literature is inconclusive as to the effect of executive compensation on bank risk-taking, we further examine whether there might be a nonlinear relationship between executive compensation and bank risk-taking, and whether the relationship holds when risk is captured differently. To this end, on the basis of Model (1) shown in Table 2, we add a squared term of executive compensation (ln*Rew3Exe*) to the model and rerun the regression. The results are shown in Column (1) of Table 3. The coefficients of ln*Rew3Exe* and its squared term are only significant at the 10% level. The results suggest that executive compensation has a modest nonlinear effect on bank risk-taking captured by Z-score. When we employ the market-based risk measures (*Volatility* and *Beta*) as proxies for bank risk-taking, the nonlinear effect of executive compensation is not observed, see Columns (3) and (5) of Table 3. In contrast, the linear effect is evident. Results shown in Columns (2) and (4) of Table 3 suggest that banks' total risk (*Volatility*) and systematic risk (*Beta*) are significantly and positively associated with executive compensation. Overall, these results appear to support our main finding drawn from Table 2.

Table 3. Additional results for nonlinear effects and market-based risk measures

Dependent variable	ln*Zscore*	*Volatility*	*Volatility*	*Beta*	*Beta*
	(1)	(2)	(3)	(4)	(5)
ln*Rew3Exe*	-1.706*	0.002**	-0.005	0.093*	0.474
	(-1.863)	(2.304)	(-0.253)	(1.990)	(0.362)
ln*Rew3Exe*×ln*Rew3Exe*	0.053*		0.000		-0.012
	(1.813)		(0.335)		(-0.290)
ln*Assets*	0.268***	-0.004***	-0.004***	-0.047	-0.048
	(4.432)	(-3.047)	(-3.057)	(-0.538)	(-0.540)
EquLia	0.117***	-0.000	-0.000	0.019	0.020
	(6.000)	(-1.202)	(-1.221)	(0.788)	(0.845)
OwnCon	0.565**	0.001	0.001	-0.394*	-0.391*
	(2.769)	(0.219)	(0.207)	(-1.868)	(-1.854)
ROE	0.024***	-0.000	-0.000	0.008	0.009
	(3.105)	(-0.474)	(-0.486)	(1.035)	(1.061)
β_0	8.207	0.128***	0.174	0.722	-2.205
	(1.048)	(3.143)	(1.191)	(0.295)	(-0.225)
Obs.	176	176	176	176	176
R-squared	0.938	0.924	0.924	0.744	0.744
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: This table reports estimation results of Eq. (1) under different specifications with fixed effects. The numbers in parenthesis are *t*-statistics. ***, ** and * indicate the significance at the 1%, 5% and 10% levels, respectively.

To understand through which channel executive compensation affects bank risk-taking, we expand Model (1) shown in Table 2 with the interactions of executive compensation with the selected control variables and rerun the regressions. Before adding the interaction terms, we demean the variables to be interacted following the suggestion of Balli and Sørensen (2013). For instance, the interaction of executive compensation with ROE (D_ln*Rew3Exe*×*ROE*) is calculated by the difference of ln*Rew3Exe* and its mean multiplied by the difference of *ROE* and its mean. In this way, models with interaction terms are more robust and interpretative (Balli and Sørensen, 2013). Table 4 presents the estimates of our baseline model augmented with interaction terms.

Column (1) shown in Table 4 is simply copied from Table 2 for easy comparison. We include the interaction terms of executive compensation with bank size, equity-to-liability ratio, ownership concentration and ROE to Column (1) and the results are presented in Columns (2) to (5) of Table 4, respectively. We find that only the interaction with ROE is statistically significant. The results suggest that if a bank achieves its average ROE, the effect of executive compensation on bank risk-taking is not affected, see Column (5) compared with Column (1). However, if a bank

performs better relative to its historical average ROE, the effect of executive compensation on bank risk-taking would be enlarged, and vice versa. An intuitive story behind these results may be that bank executives are more confident and willing to take more risk if they help the bank to earn more in the past. However, if the bank performs worse than in the past, they will be more risk-averse probably due to the pressure from financial supervisors or bank shareholders who would force them to reduce bank risk. A deeper investigation on executive characteristics would be helpful for understanding the connection between executive compensation and bank risk-taking and promoting bank governance, while this is beyond the scope of this paper.

Table 4: Interaction effects of executive compensation with bank characteristics

	(1)	(2)	(3)	(4)	(5)
ln*Rew3Exe*	-0.080**	-0.082**	-0.080**	-0.076**	-0.080**
	(-2.619)	(-2.732)	(-2.534)	(-2.489)	(-2.847)
ln*Assets*	0.266***	0.268***	0.264***	0.269***	0.267***
	(4.021)	(4.089)	(3.997)	(4.063)	(4.455)
EquLia	0.120***	0.120***	0.119***	0.119***	0.119***
	(6.377)	(6.469)	(6.354)	(6.385)	(6.481)
OwnCon	0.579**	0.559**	0.604**	0.500**	0.420*
	(2.700)	(2.555)	(2.639)	(2.914)	(1.990)
ROE	0.024***	0.024***	0.024***	0.022***	0.023***
	(3.093)	(3.026)	(3.086)	(3.044)	(3.200)
D_ln*Rew3Exe*×ln*Assets*		0.029			
		(0.748)			
D_ln*Rew3Exe*×*EquLia*			-0.017		
			(-0.815)		
D_ln*Rew3Exe*×*OwnCon5*				-0.562	
				(-1.567)	
D_ln*Rew3Exe*×*ROE*					-0.021***
					(-2.976)
β_0	-4.265*	-4.317**	-4.258*	-4.357**	-4.182**
	(-2.094)	(-2.142)	(-2.056)	(-2.138)	(-2.372)
Obs.	176	176	176	176	176
R-squared	0.936	0.936	0.936	0.937	0.939
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: This table reports estimation results of Eq. (1) with the inclusion of interaction terms of executive compensation with control variables used in the models. Before adding the interaction terms, we demean the variables to be interacted following the suggestion of Balli and Sørensen (2013). The dependent variable is the natural logarithm of Z-score. The numbers in parenthesis are *t*-statistics. ***, ** and * indicate the significance at the 1%, 5% and 10% levels, respectively.

4. Conclusion

This paper examines whether and how executive compensation matter bank risk-taking in China. Using Z-score, systematic risk and stock return volatility as three proxies for bank risk-taking, we uncover a positive relationship between executive compensation and risk-taking for Chinese banks. This finding is similar to several studies for U.S. banks (Bai and Elyasiani, 2013; Bhagat and Bolton, 2014; Gande and Kalpathy, 2017; Guo et al., 2015). In addition, we find that the relationship between executive compensation and risk-taking is positively moderated by bank past performance, which therefore calls for attention to bank performance when reforming executive compensation system for the sake of bank stability. As for future research on Chinese banks, one may proceed to explore the mechanisms of executive compensation's effects and investigate the structure of compensation in detail when more data are released.

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