

## How to explain non-performing loans by many corporate governance variables simultaneously? A corporate governance index is built to banks of China

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### Abstract

*Non-performing loan (NPL) is the route to banks failure that may even cause a financial crisis, however, good governance can minimize NPL by controlling illegitimate lending, which may foster financial stability in large. Considering this essence this study aims to investigate the impact of corporate governance on non-performing loan of banks. To attain this objective we analyze an unbalance panel of 28 Chinese commercial banks for nineteen years over 2000-2018. We use different disaggregated and composite measures of corporate governance constructed by employing the principal component analysis (PCA) to explore its interaction with NPL; moreover, to facilitate the casual interpretation we use the two-step system GMM in this study. The results indicate corporate governance have significant negative impact on NPL and suggest that the independence of the board, number of unpaid agents along with board size and holdings and separate persons as managing director and CEO are essential to*

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*ensure good governance and curbing down the NPL. Our results are consistent to different measures and models used in the study.*

**Key words:** Corporate governance Index, Non-performing loan, PCA, 2-step system GMM.

## **INTRODUCTION AND RELATED LITERATURE**

Corporate governance is considered as the most important topic to be discussed by financial entities and economic institutions in developed and transition economic countries during the last decade as several financial crisis took places around the world, especially, the ninetieth was full of crises and scandals that highlighted the low quality of monitoring and related weak accounting system beside the poor experience and transparency (Croitoru and Saltaji, 2017). The corporate governance in banks and other financial institutes in developing economies are important. Firstly, banks have an overwhelmingly dominant position in developing-economy financial systems, and are extremely important engines of economic growth (King and Levine, 1993a, b). Secondly, as financial markets are usually underdeveloped, banks in developing economies are typically the most important source of finance for the majority of firms (Levine, R. 2004).

Since fragile corporate governance and excessive risk-taking led to severe banking instability and enormous losses, effective practices of corporate governance in the banking sector become very necessary (Kirkpatrick 2009; Basel Committee on Banking Supervision, 2010; Zagorchev and Gao 2015; Zhang et al., 2016). Accordingly, a growing strand of literature studying the effectiveness of corporate governance in financial institutions during the crisis period has been developed. These studies emphasize that the corporate governance characteristics in the banking sector, such as board features, CEO pay and ownership, played an important role during the global financial crisis (Fahlenbrach and Stulz 2011; Beltratti and Stulz 2012; Erkens et al., 2012).

Additionally, the global financial crisis was marked by a considerable rise in banks' non-performing loans (henceforth NPLs) in many countries all over the world. In fact, NPLs were largely associated with banks failure and were even considered as an alarming indicator of eventual banking crisis (Reinhart and Rogoff 2010). Due to the adverse effects of NPLs on banks liquidity and profitability, González-Hermosillo (1999) and Barseghyan (2010) denote NPLs as "financial pollution". So, as Ghosh (2015) argues, minimizing NPLs is very important in order to restore a stronger banking system and promote the financial stability in the wake of the great recession. For this purpose, several studies examine the determinants that may affect banks' loan quality. These studies will distinguish between different kinds of determinants: bank specific and macroeconomic factors (Salas and Saurina 2002; Quagliariello 2007; Podpiera and Weill, 2008; Ali and Daly 2010; Nkusu 2011; Louzis et al., 2012; Castro 2013; Love and Ariss 2014; Beck et al., 2015; Ghosh 2015). Some other empirical studies, like Grove et al. (2011), Liang et al. (2013), Love and Rachinsky (2015), O'Sullivan et al. (2015) and Zagorchev and Gao (2015), prove that the corporate governance of banks affects their loan quality.

However most of these researches are conducted within the developed countries context, such as the United States, the United Kingdom, Australia, Germany and Japan and corporate governance in emerging economy has not been studied as intensively as in the developed markets (Shleifer and Vishny, 1997; Gibson, 2003; Denis and McConnel, 2005) and prior studies shed light on the necessity of using a composite corporate governance measure to evaluate the whole corporate governance system since each variable of corporate governance, taken in isolation, which in fact offers a limited picture of the bank's overall corporate governance.

Portraying this essence of further research, we investigate the direct casual effect of corporate governance on NPL of banks using an unbalance panel data of 28 Chinese commercial banks over the year 2000-2018. To present deepening insight we use disaggregated as well as aggregated measures of corporate governance constructed by PCA. To facilitate casual interpretation we use dynamic panel model -2 step system GMM for the analysis of this study. Our research contributes to the existing literature in two ways. First, it fulfills the gap

identified by Shleifer and Vishny, 1997; Gibson, 2003; Denis and McConnel, 2005. Second it overcomes the limitation of using a single corporate governance variable to measure banks overall corporate governance. Finally, to best of our knowledge, there is no study initiated regarding corporate governance and non performing loan in a developing country like china where it has become a great concern for the policy makers.

The remainder of this paper is organized as follows. Section 2 explains the data and methodology, section 3 presents the results and discussions and section 4 concludes.

## **DATA AND METHODOLOGY**

**Data:** To investigate the simultaneous effect of many governance variables on banks NPLs we use bank level data of 28 commercial banks over the years 2000-2018 which collected from different sources. We source the data of different corporate governance variables and bank size from China Stock Market & Accounting Research (CSMAR) and data of other bank specific variables – NPL and diversification from Wind Database. Data of all macro economic variables are collected from World Development Indicator database of World Bank.

**Dependent variable:** In this study Non-performing loans is the dependent variable which is measured as a ratio of gross non-performing loans to total loan. Following Ghosh (2015), sum of non-accrual loans and all loans that are past due for ninety days or more is treated as gross non-performing loan.

**Independent variable:** Previous studies use board size, supervisor size, board independence, the CEO duality, Presence of committees, the directors, supervisors and executive officers ownership and number of unpaid director, supervisors and executives to measure corporate governance. However to deepening the understanding and help policy makers in a focused manner, we use both disaggregated and composite measures of corporate governance. However, different corporate governance variables are highly correlated, substitutable or complementary in nature; hence simultaneous use of those variables

in a model may produce unreliable result. Therefore, to overcome this problem of multicollinearity and over-parameterizations, we use different corporate governance variables to construct a composite index applying the PCA. All variables are normalized before applying the PCA using minmax normalization as equation (1).

$$nmx = \frac{X_i - X_{min}}{X_{max} - X_{min}} \quad (1)$$

where,  $X_{min}$  = minimum data point and  $X_{max}$  = maximum data point.

The eigenvalues of the nine components of outreach index are 2.48, 1.99, 1.44, 0.98, 0.83, 0.61, 0.41, 0.19 and 0.03 respectively; suggest that the first three components cumulatively explain 66% variations of the nine indicators. We use first three components to construct three composite corporate governance indexes. The Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy are 0.54 and the p values for the Bartlett's test of sphericity are lower than the 0.01 significance level, which confirms the suitability of the variables used in the PCA.

**Bank-specific control variables:** The bank-specific control variables are bank size and diversification.

**Bank size:** The bank size is measured by the natural logarithm of bank total employee. Under the “too big to fail” assumption, Stern and Feldman (2004), Louzis et al. (2012) and Chaibi and Ftiti (2015) find that the bank size affects NPLs positively. Alternatively, based on the explanation of the diversification by bank size, Salas and Saurina (2002), Rajan and Dhal (2003), HU et al. (2004) and Biekpe (2011) find that the size of bank affects its level of NPLs negatively.

**Diversification:** Following Louzis et al. (2012) and Chaibi and Ftiti (2015) the diversification is measured as the ratio of non-interest income to total income. This ratio reflects the bank reliance on diverse types of income, other than interest income. Accordingly, Salas and Saurina (2002), Rajan and Dhal (2003) and HU et al. (2004) find that

the diversification opportunities are negatively related to banks NPLs. However, Stiroh (2004) suggests that the diversification affects NPLs positively.

**Macroeconomic control variables:** The interest and the unemployment rates are the macroeconomic variables will be used in our model in addition to the global financial crisis variable.

**Interest rate:** Following Castro (2013) and Chaibi and Ftiti (2015), the interest rate is measured by the real interest rate. Fofack (2005) and Castro (2013) prove that the interest rate affects the NPLs positively and its increase can weaken the borrowers' capacity to pay back the service of debt, which leads to an increase in NPLs level.

**Unemployment rate:** The unemployment rate can additionally reflect the economic situation and affect the ability of individuals and companies to repay debts. Nkusu (2011), Louzis et al. (2012), Castro (2013) and Chaibi and Ftiti (2015) find that unemployment rate has a positive impact on NPLs given that the increase of this rate can deteriorate the ability of borrowers to reimburse their credits.

**Crisis:** The global financial crisis variable will be defined by a dummy variable that equals to one during the crisis period and zero otherwise.

**Table 1: Description and source of Variables**

| Variables                    | Description  | Source               |
|------------------------------|--|----------------------|
| <b>Dependent Variables</b>   |  |                      |
| Non Performing Loan          | Ratio of non-performing loans to total loans   | Wind                 |
| <b>Independent Variables</b> |  |                      |
| Corporate Governance Index   | This index will be constructed applying Principal Component Analysis method using different corporate governance variables | Author's calculation |
| Duality                      | Equals to 2 if Chairman and General Manager of the Board of Directors are two different person otherwise 1.                | CISMAR               |
| Board Size                   | Number of Directors  | CISMAR               |
| Independence                 | Proportion of independent directors to total number of directors in the board  | CISMAR               |
| Supervisory size             | Number of member in Supervisory Board  | CISMAR               |
| Major committee              | Existence of committee among four major committee  | CISMAR               |
| Unpaid agents                | Number of unpaid directors, supervisors and executives   | CISMAR               |

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|                          |  |        |
|--------------------------|--|--------|
| Board holding            | Number of share held by Board  | CISMAR |
| Supervisory holding      | Number of shares held by the Supervisory Board                                 | CISMAR |
| Executive holding        | Number of share held by Executives   | CISMAR |
| <b>Control Variables</b> |  |        |
| Bank size                | Logarithm of bank total employee   | CISMAR |
| Diversification          | Ratio of non-interest income to total income                                   | Wind   |
| Interest rate            | Real interest rate   | WDI    |
| Unemployment             | Unemployment rate prevail in that period                                       | WDI    |
| Crisis                   | Dummy variable that equals to one during the crisis period and zero otherwise. | WDI    |

**Model:** To estimate the direct causal effect of corporate governance and NPL we use the following model.

$$NPL_{it} = \alpha + \beta_1 \sum_{j=1}^2 BS_{it} + \beta_2 \sum_{j=1}^3 ME_t + \beta_3 Corporate\ governance_{it} + v_t + \varepsilon_{it} \quad (2)$$

Where, subscripts  $i$  and  $t$  indicate bank and time respectively, the dependent variable  $NPL_{it}$  is the ratio of non-performing loan. Corporate governance  $_{it}$  is measured by either composite index constructed by PCA or disaggregated measures corporate governance.  $BS_{it,j}$  and  $ME_{it,j}$  are set of  $\{k\}$  variables controlling for bank specific and macroeconomic factors.  $\alpha$  is the constant term and  $\beta$ 's are the parameter vectors,  $v_t$  are the year dummies and  $\varepsilon_{it}$  is the unobserved disturbance. The inclusion of time dummies captures the effect of any event that affects the variables of interest for all banks and ensures that the estimates are not biased because of the occurrence of any such events. To address the possible endogeneity, we apply the following two-step system-GMM (Blundell & Bond, 1998). The lagged value of NPL is included as regressors to capture the persistence of non-performing loan.

$$NPL_{it} = \alpha + \gamma NPL_{it-1} + \beta_1 \sum_{j=1}^2 BS_{it} + \beta_2 \sum_{j=1}^3 ME_t + \beta_3 Corporate\ governance_{it} + v_t + \varepsilon_{it} \quad (3)$$

The system-GMM estimator provides consistent and efficient estimates, overcomes the unobserved effects and endogeneity problem, and is a better fit for panel studies with fewer time observations like this study. We also check the robustness of the validity of the instruments and any possible autocorrelation using the Sargan test

and Hansen J statistic of over-identifying restrictions and Arellano-Bond (AR) test respectively.

## RESULT AND DISCUSSION

**Table 2. Descriptive Statistics**

| Variable            | Observations | Mean    | Std. Dev. | Min    | Max      |
|---------------------|--------------|---------|-----------|--------|----------|
| NPL                 | 246          | 1.711   | 1.819     | 0.36   | 15.951   |
| Duality             | 231          | 1.974   | 0.159     | 1      | 2        |
| Board size          | 250          | 15.248  | 2.39      | 8      | 20       |
| Independence        | 250          | 5.204   | 1.375     | 0      | 8        |
| Supervisory size    | 252          | 8.036   | 1.888     | 2      | 13       |
| Major committee     | 252          | 3.603   | 0.928     | 0      | 4        |
| Unpaid agents       | 246          | 0.355   | 0.242     | 0      | 1        |
| Board holding       | 226          | 1130000 | 3520000   | 0      | 2.63e+07 |
| Supervisory holding | 227          | 791000  | 2420000   | 0      | 2.14e+07 |
| Executive holding   | 226          | 1150000 | 3610000   | 0      | 3.20e+07 |
| Corporate Index 1   | 206          | 0       | 1.575     | -3.364 | 9.964    |
| Corporate Index 2   | 206          | 0       | 1.413     | -4.013 | 2.786    |
| Corporate Index 3   | 206          | 0       | 1.202     | -2.455 | 5.182    |
| Bank size           | 252          | 10.226  | 1.649     | 7.209  | 14.87    |
| Diversification     | 225          | 20.357  | 9.275     | -1.587 | 51.09    |
| Interest rate       | 252          | 5.339   | 0.907     | 4.35   | 7.47     |
| Unemployment rate   | 252          | 4.474   | 0.225     | 3.252  | 4.72     |
| Crisis              | 252          | 0.167   | 0.373     | 0      | 1        |

Table 2 presents descriptive Statistics of data used in this study. The mean value and standard deviation of NPL are 1.711 and 1.819 respectively, showing an overall stable state, however, the maximum value 15.951 represents some banks are in vulnerable state. The standard deviations of different measures of corporate governance show high variations among banks. The mean value and standard deviation of diversification are 20.357 and 9.275 respectively, which also indicate high cross bank heterogeneity. All other variables show moderate variation.



**Impact of disaggregated measures of corporate governance:**

**Table 3. Baseline estimations**

| Variables           | (1)                      | (2)                      | (3)                      | (4)                      | (5)                      | (6)                      | (7)                      | (8)                      | (9)                      |
|---------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Duality             | -1.21***<br>(0.30)       |                          |                          |                          |                          |                          |                          |                          |                          |
| Board size          |                          | -1.01***<br>(0.38)       |                          |                          |                          |                          |                          |                          |                          |
| Independence        |                          |                          | -1.69***<br>(0.47)       |                          |                          |                          |                          |                          |                          |
| Supervisory size    |                          |                          |                          | -1.35**<br>(0.55)        |                          |                          |                          |                          |                          |
| Major committee     |                          |                          |                          |                          | -0.04<br>(0.73)          |                          |                          |                          |                          |
| Unpaid agents       |                          |                          |                          |                          |                          | -0.88**<br>(0.41)        |                          |                          |                          |
| Board holding       |                          |                          |                          |                          |                          |                          | -1.03*<br>(0.62)         |                          |                          |
| Supervisory holding |                          |                          |                          |                          |                          |                          |                          | -0.05<br>(1.26)          |                          |
| Executive holding   |                          |                          |                          |                          |                          |                          |                          |                          | -1.12<br>(0.70)          |
| Bank size           | 0.05<br>(0.09)           | 0.01<br>(0.10)           | -0.00<br>(0.09)          | -0.02<br>(0.10)          | 0.02<br>(0.10)           | 0.02<br>(0.10)           | 0.06<br>(0.11)           | 0.08<br>(0.11)           | 0.06<br>(0.11)           |
| Diversification     | 0.03***<br>(0.01)        | 0.02**<br>(0.01)         | 0.02**<br>(0.01)         | 0.02**<br>(0.01)         | 0.02**<br>(0.01)         | 0.02**<br>(0.01)         | 0.02<br>(0.01)           | 0.02*<br>(0.01)          | 0.02<br>(0.01)           |
| Interest rate       | -0.35***<br>(0.09)       | -0.38***<br>(0.09)       | -0.35***<br>(0.09)       | -0.38***<br>(0.09)       | -0.41***<br>(0.09)       | -0.42***<br>(0.09)       | -0.43***<br>(0.09)       | -0.42***<br>(0.09)       | -0.43***<br>(0.09)       |
| Unemployment rate   | -2.70***<br>(0.42)       | -2.71***<br>(0.42)       | -2.64***<br>(0.41)       | -2.77***<br>(0.41)       | -2.84***<br>(0.41)       | -2.92***<br>(0.42)       | -3.12***<br>(0.44)       | -3.01***<br>(0.45)       | -3.15***<br>(0.44)       |
| Crisis              | -0.14<br>(0.17)          | -0.14<br>(0.16)          | -0.12<br>(0.16)          | -0.17<br>(0.16)          | -0.13<br>(0.16)          | -0.15<br>(0.16)          | -0.12<br>(0.17)          | -0.15<br>(0.17)          | -0.11<br>(0.17)          |
| Constant            | 435.98**<br>*<br>(76.61) | 404.57**<br>*<br>(70.29) | 354.50**<br>*<br>(70.64) | 381.22**<br>*<br>(69.80) | 401.10**<br>*<br>(70.43) | 413.82**<br>*<br>(70.93) | 434.39**<br>*<br>(75.49) | 418.31**<br>*<br>(76.52) | 430.59**<br>*<br>(75.45) |
| Year dummies        | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      |
| Observations        | 217                      | 223                      | 223                      | 225                      | 225                      | 221                      | 206                      | 207                      | 206                      |
| Banks               | 28                       | 28                       | 28                       | 28                       | 28                       | 28                       | 28                       | 28                       | 28                       |
| R-squared           | 0.33                     | 0.30                     | 0.32                     | 0.30                     | 0.28                     | 0.30                     | 0.31                     | 0.28                     | 0.31                     |

Standard errors in parentheses. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

Table 3 shows the result of fixed effect estimation of equation (2). We use nine disaggregated measures of corporate governance in (1) to (9) models. All measures of corporate governance have negative impact on NPL however, duality, board size and independence is significant at 1 percent level, supervisory size and unpaid agents are significant at 5 percent level and board holding is significant at 10 percent level of significance. This finding implies presence of good governance minimizes the incident of loan default which results in lower NPL.

Bank size is positively associated with NPL in all models except model (3) and (4). Diversification is positive and significant in model (1) to (6) and in model (8), which is consistent with the findings of Salas and Saurina (2002), Rajan and Dhal (2003) and HU et al. (2004). Both interest rate and unemployment rate has a significant negative impact on NPL in all model.

**Impact of composite measures of corporate governance:**

**Table 4. Estimations with composite measures**

| Variables             | (1)<br>Fixed effect    | (2)<br>Random Effect   | (3)<br>Pooled OLS      | (4)<br>GMM           |
|-----------------------|------------------------|------------------------|------------------------|----------------------|
| NPL <sub>t-1</sub>    |                        |                        |                        | 0.713***<br>(0.018)  |
| Corporate Index 1     | -0.079<br>(0.073)      | -0.061*<br>(0.037)     | -0.061<br>(0.037)      | -0.323*<br>(0.194)   |
| Corporate Index 2     | -0.226***<br>(0.066)   | -0.123***<br>(0.037)   | -0.123***<br>(0.037)   | -0.217*<br>(0.117)   |
| Corporate Index 3     | -0.203**<br>(0.097)    | -0.162***<br>(0.057)   | -0.162***<br>(0.057)   | -0.233***<br>(0.066) |
| Bank size             | 0.033<br>(0.110)       | 0.058<br>(0.037)       | 0.058<br>(0.037)       | 0.360***<br>(0.125)  |
| Diversification       | 0.018<br>(0.012)       | 0.006<br>(0.008)       | 0.006<br>(0.008)       | -0.006<br>(0.017)    |
| Interest rate         | -0.340***<br>(0.097)   | -0.416***<br>(0.098)   | -0.416***<br>(0.098)   | -0.018<br>(0.062)    |
| Unemployment rate     | -2.992***<br>(0.459)   | -3.134***<br>(0.454)   | -3.134***<br>(0.454)   | -0.151<br>(0.266)    |
| Crisis                | -0.160<br>(0.178)      | -0.119<br>(0.180)      | -0.119<br>(0.180)      | -0.167<br>(0.120)    |
| Constant              | 433.510***<br>(83.698) | 392.866***<br>(70.467) | 392.866***<br>(70.467) | 9.160<br>(34.856)    |
| Year dummies          | Yes                    | Yes                    | Yes                    | Yes                  |
| Observations          | 193                    | 193                    | 193                    | 155                  |
| Banks                 | 28                     | 28                     |                        | 25                   |
| R-squared             | 0.378                  |                        | 0.360                  |                      |
| Number of Instruments |                        |                        |                        | 23                   |
| AR(2)                 |                        |                        |                        | 0.35                 |
| Hansen j-statistics   |                        |                        |                        | 0.90                 |

Standard errors in parentheses. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

Table 4 shows the result of fixed effect estimation, random effect estimation, pooled ordinary least square (Pooled OLS) and two-step system GMM in model (1) to (4) model respectively. We use three composite index constructed by PCA as a measure of corporate governance in all model. Corporate Index 1 is negative in all models

but significant in random effect and GMM estimation. Other two composite indexes are negative and significant in all model signifying good governance reduce NPL of banks. Bank size is positively associated with NPL in all models and significant in GMM estimation which is consistent with the result of Stern and Feldman (2004), Louzis et al. (2012) and Chaibi and Ftiti (2015). Diversification is positive in all models and negative in GMM estimation but not significant in any estimation. Both interest rate and unemployment rate has a significant negative impact on NPL in all model except GMM estimation.

## CONCLUSION

Since ninetieth century many studies have been carried out to portray the essence of corporate governance for preventing financial crisis, scams as well as ensuing profitability and return to the shareholders by maximizing transparency and minimizing agency cost. However, there is still a dearth of researches regarding its impact on minimizing NPL. In this study we try to fill this gap by analyzing an unbalanced panel of 28 banks of China over 2000-2018 and analyze whether good governance helps bank to minimize its NPL. To provide an insightful understanding we use both disaggregated and composite measures of corporate governance constructed by PCA and for the improved casual interferences we use 2-step system GMM along with other methods of panel data analysis. We found all measures of corporate governance have significant negative impact on NPL.

The study has some practical implications for both banking industry and policy makers. As some corporate governance measures, specifically Duality, Board size, Board Independence Board holding and number of unpaid agents are highly significant with large coefficient, therefore for establishing good governance the independence of the board, increasing the number of unpaid agents along with board size and holdings and separate persons as managing director and CEO are essential.

Good governance minimizes the political and non-legitimate biasness regarding loan disbursement and helps to reduce NPL. A minimum NPL will enable banks to reduce the lending rate that

benefit the economy from two different angles by increasing banks profit efficiency and borrowers cost efficiency of financing. Consequently this chain of efficiency will lead to financial stability and overall economic growth at large.

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