

Factors affect NPL in Taiwan Banking Industry

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and Hui-Yu Chen^{****}

This study examines whether government policies have an impact on non-performing loans (NPL) ratio of domestic banks during dissimilar financial periods from 1994 to 2008. The influence variables in the NPL ratio include the followings: loan to deposit ratio (DL), debt ratio (DB), bank size (ASSETS), earnings per share (EPS), capital adequacy ratio (Basel ratio; BIS) and directors and supervisors shareholding ratio (HOLD). To comprehend the relation between a bank's ownership structure and its NPL ratio, we categorize banks according to their ownership structure: public banks, privatized banks, financial holding banks and private banks. During the 15 year period, the following conclusions can be made: Every bank can expand assets and reduce debt ratio to effectively reduce the probability of NPL ratio occurrence. During the first financial reform implementation, banks not only restrict loans to increase lending quality but also use their own capital or retained earnings to write off loans to reduce NPL ratio. Regarding HOLD, we find that when the government promotes policies to lower NPL ratio, directors and supervisors perform their supervision responsibilities more diligently.

Keywords: Government Policies; Ownership Structure; Non-performing Loans; Domestic Banks

1. Introduction

1.1 Background and Motivation

The prime banks in Taiwan are public banks established in the 1980s (namely, Bank of Taiwan, Land Bank of Taiwan, Taiwan Cooperative Bank, First Commercial Bank, Hua Nan Commercial Bank, Chang Hwa Commercial Bank and some selectively authorized private banks). These banks initially engaged in the general commercial banking business. At the time, the government was seeking political stability and durable economic growth, and thus enacted strict constraints on several financial activities. The constraints were not only on deposit and loan rates but also on general operations and establishment of new branches. As a result, the financial environment was stable and closed, and market competitiveness was also low.

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However, in the early 1990s, Taiwan's banking industry began to flourish. During that period, Taiwan government started to allow establishment of domestic private banks. As a result, Taiwan banks experienced ferocious competition among private banks for more than a decade. In order to achieve rapid economic growth, restrictions on banks were no longer suited for the pursuit of financial efficiency. Therefore, the Ministry of Finance announced the establishment of fifteen new private banks on June 26, 1991 and approved one more the following year; totaling sixteen newly established private banks. Furthermore, not only the government authorized new private banks, they also initiated privatization of state-owned banks in 1998. This act pushed public banks move towards privatization and a more competitive industry. The overall financial market at the time was saturated with an abundant number of banks. Taiwan's liberalization of the financial system basically ignored market mechanism, narrowed bank spreads and eased credit conditions entailing many operating bottlenecks.

Because the growth of private banks was less than the growth of the domestic financial industry, the profitability of most banks was declining. For the financial industry in general and for private banks in particular, mergers and cross-industry businesses are crucial. Therefore, the government announced implementation of the "Financial Holding Company Act" on July 9, 2001. The regulations allow financial holding companies (FHCs) to integrate cross-industry resources to overcome weak financial conditions because of bad debts. The implementation of these regulations allows the financial industry to integrate both horizontally and vertically. This integration broadens the banking industry and increases the degree of competition in the market.

Subsequently, 14 financial holding companies were established in Taiwan, integrating more than 50 banks, securities, insurance and financial institutions. The FHCs started to "abolish what is harmful" and for the first time in the financial reform, non-performing loan ratio dropped to less than 5% in two years, and capital adequacy ratio dropped more than 8%. This was referred to as the "258" target. After achieving this goal, the government, in order to "promote what is beneficial", also announced that it was "suspending the issuance of licenses to new domestic financial institutions' branches" to accelerate consolidation of financial institutions and enhance international competitiveness of the financial service industry in Taiwan. These actions occurred in September and October 2004 during the second period of the financial reform. They were designed to promote Taiwan as a regional financial service center. The second period of the financial reform contributed to the establishment of three financial holding companies owning over 10% of the market share before the end of 2005. In addition, the number of public banks and financial holding banks was reduced by half.

Often, the purpose of banking statute or policy is to enhance efficiency and improve bank's financial operating performance. However, since 1990, the establishment of new commercial banks has saturated the market. The promotion of financial liberalization while ignoring the legalization of the financial system led to improper internal supervision. The financial industry deteriorated because of the annual rise of non-performing loan ratio, as depicted in Figure 1 (See Appendix). From 1996 to the end of 2001, non-performing loan ratio increased two folds from 3.68% to 7.48%. Because the first reform in the banking sector had caused many overdue loans, the number of banks was reduced to 8, financial institutions to 55, and thus, the non-performing loans ratio started to decline in Taiwan's financial institutions. From 2002 to 2004, the NPL ratio dropped from 6.12% to 2.78%.

Because there were simply too many banks in the market, most banks failed to establish their

own competitive advantage. Consequently, these banks could not differentiate market segments effectively, resulting in fierce market competition; and huge profits decline. Figures 1 and 2 show that ROE of domestic banks was 1.10% in 1993 and then fell to 0.48% in 2000; and after the financial reform in 2001, it rebounded to 0.63% in 2004.

Drawing from previous literature, Tseng, Chen and Lin (2005) empirically found that bank's NPL ratio has a significantly negative impact with its operating performance. The British economic magazine (2000) also reported that "If we do not actively discourage non-performing loans in domestic banks, financial crisis will occur." Therefore, non-performing loans ratio should be resolved first before Taiwan can improve its banks' efficiency.

1.2 Purpose

A number of financial reforms of private banks contributed to the development of financial holding banks. This study examines the ownership structure and corporate characteristics of Taiwan banks to investigate the changes of NPL in different financial periods. The study aims to :

- (1) Understand banks of Taiwan in different financial periods and investigate whether NPL ratio changes with shareholder structure.
- (2) Explore whether implementation of government policies in separate financial periods influences NPL ratios; and analyze variables changes to comprehend the problem and suggest according solutions.

1.3 Scope of Study

Basing on the history of Taiwan's banking industry, it is very challenging to obtain preliminary data due to data unavailability. In order to better observe the relation between banks' ownership structure and government policy in light of NPL ratio; we divided Taiwan's financial history into four periods as follows: the establishment of new banks (1994-1997), the privatization of state-owned banks (1998-2001), the first financial reform (2002-2004) and the second financial reform (2005-2008). We analyze non-performing loans ratio of domestic banks to completely realize the impact to the banks performance through the four financial periods.

The rest of the paper is structured as below: Section 2 presents literature review on the relationship between non-performing loans and the banking industry. Section 3 presents our research methodology, explains the variables and analyzes the research method. Section 4 explores the change of non-performing loans of Taiwan's banks and presents the empirical results and analysis. Section 5 concludes and summarizes our findings.

2. Literature Review

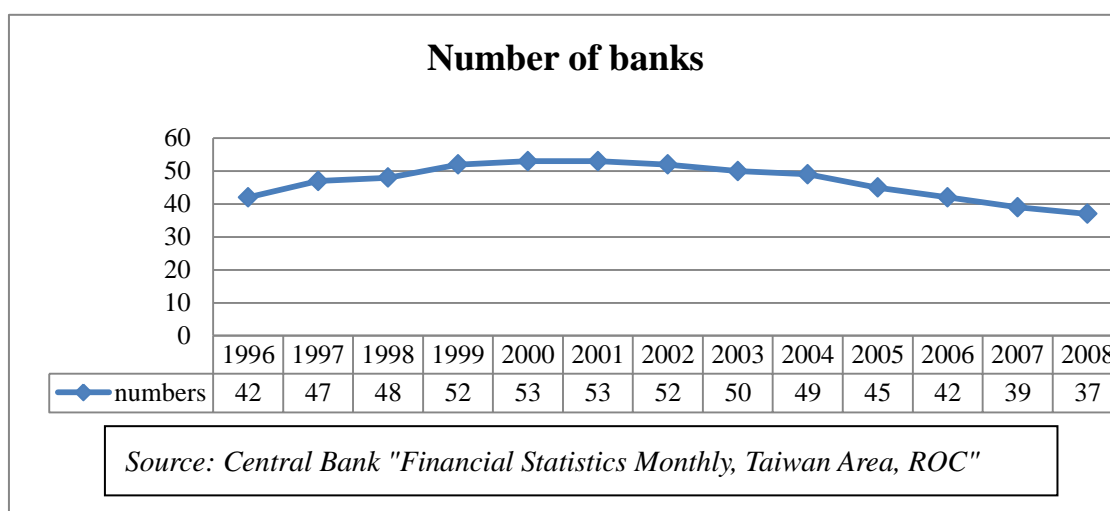
2.1 The Origin of NPL in Banks

Non-performing loan (NPL) ratio continues to rise due to certain factors. If credit officers fathom the NPL ratio's mechanism, they can take appropriate precautions against the non-performing loans ratio and safeguard the bank's assets. This research focuses on the causes entailed by bank's internal factors.

2.1.1 Financial Liberalization and Vicious Competition among Banks

The government has vigorously promoted internationalization of finance in recent years. In 1991, the government approved 15 new private banks, resulting in fierce competition among banks. The deposits and loans market changes because the number of banks rapidly increases. In the credit business, new banks are eager not only to expand their credit market size and market share but also to reduce their lending rates to compete for customers. The original banks too are eager to retain customers by absorbing surplus funds to increase their lending market share.

Figure 1: Number of banks



Therefore, the old and new banks pursue loan growth during financial liberalization but completely ignore customers' credit conditions. This pursuit gradually deteriorates credit quality and increases credit risk, entailing non-performing loans.

2.1.2 Credit Misconceptions and Operating Negligence

The misconceptions and operating negligence of credit checks, credit underwriting and poor loan make the borrowers' payment control very difficult. Loan assessments are also not being handled properly during loan approval process. Therefore, it is inevitable for banks to suffer from non-performing loans.

2.1.3 The Reduction of Loan Balance

When the market goes to a recession, the loan demand reduced significantly. This is a main reason of the decline in banks' lending business. In addition, when capital markets appear to be easing, industrial and commercial enterprises prefer to use direct financial lending facilities to raise working capital, such as NIF (Note Issuance Facility), and abandon lines of credit provided by banks, thus greatly reduce the profitability of the bank. Therefore, one reason for the NPL ratio to rise is because banks' loan balance declines significantly.

Figure 2 - Growth and Decline of Direct and Indirect Finance

Unit: NT \$ billion				
Year	Indirect finance		Direct finance	
	NT\$	%	NT\$	%
1990	68,016	89.19%	8,247	10.81%
1995	130,357	87.27%	19,023	12.73%
2000	185,458	77.07%	55,165	22.93%
2005	226,101	72.15%	87,285	27.85%
Source: Central Bank "Republic of Taiwan Financial Statistics"				

2.2 Literature of NPL Ratio

Non-Performing Loans (NPL) Ratio refers to the ratio of the principal and interest of loans not paid in a certain period to the total loan. The NPL ratio not only denotes the inability to repay the principal and interest of bank loans but also is important in evaluating the quality of bank loans. When the NPL ratio goes upward, the banks' lending quality become worse and also the depositors face larger risk.

The non-performing loans ratio not only affects bank's profitability, but also implies the level of the agency/insiders problems (the managers or insiders obtain improper benefits from banks). Gorton and Rosen (1995) found significantly negative relationship between manager shareholding ratio and banks' risk-taking activity. They indicate that when the manager shareholding ratio is under 4%, the managers accept more less risky loans. However, when the manager shareholding ratio increases to over 4%; the managers will make high-risk loans to pursue higher profits. As a result, non-performing loans increase. In contrast, Yeh, et al. (2003) specified that when the directors and supervisors' shareholding ratio was significantly low, an increase in directors' shareholding ratio reduced the possibility of insider's illegal behaviors. However, with a shareholding ratio of 15%-30%, a continuous increase in the shareholding ratio will increase the possibility of insider's illegal conduct.

However, Chien (2003) combined cross-sectional and time series data of 34 and banks to conduct regression analyses from 1995 to 2000. He demonstrated that executive shareholding ratio and board members' shareholding ratio had no significant relationship with banks' NPL ratio. Lu, et al. (2005) used ownership structure and company characteristics to analyze the relationship among ownership structure, bank characteristics, and the NPL ratio from 1996 to 2001. By using a simple regression empirical study, they found that through managerial ownership and directors and supervisors' ownership, the largest shareholders' ratio and the ratio of foreign ownership had no significant relationship with the NPL ratio; and that ownership structure had no effect on banks' operation.

This study assumes that the NPLs occur not only because of banks' inability to retrieve principals and interests but also because of the corruption of managers/insiders. Therefore, we propose the following hypotheses:

Hypothesis 1: HOLD and NPL are positively related.

In some bank ownership structures, directors' ownership also includes some government ownership. In relevant research study regarding government intervention, the ownership structure appears to have negative effects. For example, Boardman and Vining (1989) studied Canadian companies and found that government shareholding had a negative impact on firm's value in 75% cases. Lau, et al. (2000) researched mainland Chinese ownership structure on corporate performance and found that government ownership reduced corporate performance and value. Therefore, the ratio of government ownership is explored with banks' directors and supervisors' shareholder ratio.

In addition, to determine whether a bank is healthy, the non-performing loan ratio is the main indicator and the capital adequacy geometric ratio is the secondary measure. The capital adequacy ratio represents the proportion of a bank's own capital to its risk weighted assets. The capital adequacy ratio measures the stability of a bank's financial situation. Banks absorb customer deposits as sources for loan funding, and they make profits from the interest spread between deposits and loans. Therefore, the supervisory authority establishes a control and supervision mechanism to regulate the proportion of the banks' capital adequacy ratio.

Zarruk (1989) found that increased capital requirements improved bank's asset quality. However, Shrieves and Dahl's (1992) empirical results showed that capital adequacy had a positive relationship with the risk of bank assets. Ni, Cheng, and Huang (2009) used not only a regression model but also vertical and horizontal data models to analyze the reasons for NPLs volatility in banks; their empirical results showed that non-performing loans ratio and capital adequacy ratio were positively correlated. From these results, we find that banks use their retained earnings to overcome bad debts and make the proportion of the banks' capital to risk assets lower, resulting in a decreased capital adequacy ratio. A lower NPL ratio in banks seems to be driven by a lower capital adequacy ratio.

From the existing literature, many scholars hold different opinions on the relation between non-performing loans ratios and capital adequacy ratios, therefore the subject of this study is worthy of further investigation. This study considers what a higher capital adequacy ratio means to long-term bank financing capacity, solvency, and security. Therefore, we present:

Hypothesis 2: BIS and NPL are negatively related.

The reason for a high NPL ratio does not merely lie in ownership structure and capital adequacy ratio; many other relevant factors were also studied by both domestic and foreign scholars. Shrieves (1992), based on diversification theory, investment opportunities, ownership of properties and equity capital, considered that bank size and risk had a relationship. In addition, empirical results showed that the larger the bank size, the fewer the non-performing loans. DeYoung and Berger (1997) used American bank data from 1985 to 1994 and analyzed the relation of NPL ratio with loan quality, cost efficiency, and capital. The empirical results demonstrated that if a bank's cost efficiency was too low, it would result in the rise of non-performing loans. A bank's NPL ratio had a significantly negative impact on its net worth ratio: the higher the NPL ratio, the lower the net worth ratio. Yeh, et al. (2003) found that company size, financial performance, and debt ratio affected the size of the non-performing loans ratio. Chien (2003) investigated the relationship between banks, corporate governance, and other related factors that impacted bank risk-taking behavior. Using a regression model, the empirical results displayed that the numbers of a correspondent banks had a significantly

positive relationship with the NPL ratio. However, the concentration of loans and the bank size had no significant relationship with the NPL ratio. Lee and Ho (2007) used a panel data regression model and investigated 33 over-the-counter and listed banks in Taiwan. They indicated that the following lowered the NPL ratio: larger board, larger bank assets, higher equity ratio, higher deposit and loan ratio and higher fee income ratio. Lu, et al. (2005) used a simple regression analysis in an empirical study from 1996 to 2001 and mentioned that the real factors affecting the NPL ratio in Taiwan were the debt ratio, earnings per share and bank size.

Accordingly, we also consider the following hypotheses:

Hypothesis 3: DL and NPL are negatively related.

Hypothesis 4: DB and NPL are positively related.

Hypothesis 5: Assets and NPL are negatively related.

Hypothesis 6: EPS and NPL are negatively related.

In general, most studies regarding the non-performing loans ratio only focused on a short period. There was no research that considered 15 years of changes in non-performing loans ratios. Therefore, our research is able to provide a more thorough analysis on changes of the non-performing loans ratio of banks in Taiwan across different timeframes. Most previous research used panel data as the basis of their analysis and it has proven to be a useful method. Therefore, we also use panel data to discuss the factors affecting non-performing loans ratios in our paper.

3. Research Methodology

3.1 Research Sample and Data Source

This research is conducted using a regression model to explore NPL ratio across a 15 year period from 1994 to 2008. Our study period is divided into four sub-periods according to the keystones in Taiwan's financial development relative to different ownership structures of Taiwan banks, and the data are collected from Taiwan Economic Journal (TEJ) database, a highly reputable database in Taiwan.

(1) Establishment of new banks (1994-1997)

In 1991 and 1992, the government allowed the establishment of 16 new private banks, however, in this period; data are scarce and have gaps. Thus, we choose to collect data that have the most integrity from 1994 -1997 with a total of 36 samples.

(2) The privatization of state-owned banks (1998-2001)

During this time period, ownership transferred from a public share structure to a joint-stock privatized structure, i.e. the Farmers Bank of China, Taipei Bank, Taiwan Business Bank, Chang Hwa Commercial Bank, Bank of communications, First Bank, Hua Nan Bank and Bank of Kaohsiung. The study period is from 1998-2001 and constitutes a total of 46 samples.

(3) The first financial reform (2002-2004)

The government anticipated mergers between financial holding companies and banks to increase their revenue sources and decrease the number of banks in order to accomplish cross-industry consolidation. During this financial period, the consolidated financial

holding companies include Fubon Holdings, First Holdings, Hua Nan Holdings, Mega Holdings, Cathay Holdings, Yuanta Financial Holdings, SinoPac Holdings, E.SUN Financial Holdings, Taishin Financial Holdings, JihSun Holdings, China Trust Financial Holdings, Shin Kong Financial Holdings and China development Financial Holdings. This period is from 2002-2004 and has a total of 40 samples.

(4) The second financial reform (2005-2008)

Even though banks' financial quality improved noticeably after the first financial reform, the banks' profits and credit quality declined due to the fierce competition. Therefore, the government continued with the second financial reforms in 2004. This time period considers the financial holding companies the object of study from 2005-2008 with a total of 39 samples.

3.2 Research Variables

According to the reasons for variation of NPL ratios in banks and the related literature, we infer that some variables may affect the NPL ratio as independent variables. We regard each bank's NPL ratio as our dependent variable to explore the relationship between each variable and the NPL ratio in domestic banks.

3.2.1 Dependent Variable

Non-Performing Loans Ratio (NPL): NPL is defined as the ratio of the principal and interest of loans not paid in a certain period to the total loans:

$$NPL = \frac{\text{Non-performing loans} + \text{Receivables on demand}}{\text{Total loans}} \quad (1)$$

The non-performing loans ratio includes receivables on demand. A non-performing loan is a loan that is in default or close to being in default. A loan becomes non-performing loan when payment of interest and principle are past due by 90 days or more. The higher the NPL ratio, the worse the quality of the bank's lending and the lower the security of the depositors' deposit.

3.2.2 Independent Variables

Independent Variable 1: Directors and Supervisors' Shareholding ratio (HOLD). Directors and supervisors have the power of credit approval or rejection, and they affect the bank's operation through the Board of the Bank.

$$HOLD = \frac{\text{Total directors and supervisors shareholding}}{\text{Number of shares outstanding}} \quad (2)$$

The NPL ratio occurs not only because of the bank's inability to recover their principal and interest but also because of the authorities obtaining an unfair advantage over loans. Therefore, this study would like to examine the relationship between the directors and supervisors' shareholding ratio and the non-performing loans ratio.

Independent Variable 2: Capital adequacy ratio (BIS). The capital adequacy ratio is an important indicator promulgated by the Ministry of Finance for bank risk management and control. Higher capital adequacy ratio means higher long-term bank financing capacity, solvency, and security. The function of capital is to guard against heavy losses

in risky assets which entail serious cash flow problems. According to the specification of the Basel Committee and the national authorities, the capital adequacy ratio should stay above 8%. The higher the capital adequacy ratio the lower the risk in bank's operation, and this can reduce the number of non-performing loans.

Independent Variable 3: Loan to deposit Ratio (DL). To measure the usage efficiency in deposit funds, we consider the following equation:

$$\text{Loan to deposit Ratio} = \frac{\text{Total loans}}{\text{Total deposits}} \quad (3)$$

The higher the Loans-deposits ratio, the greater the total loans and the higher the NPL ratio. The NPL ratio increases with the increase in total loans. Based on "The Moral hypothesis," Lee and Ho (2007) considered that if loans were too readily available in the financial system, financial institutions would absorb these excess funds as quickly as possible. When the banks examined loans, the credit information system was not often correct, and this caused the deterioration of loan quality and the bank's credit risk.

Independent Variable 4: Debt Ratio (DB). The relationship between Total debts and Total Assets is an important indicator to measure a company's capital structure. We use the following equation for Debt Ratio:

$$\text{Debt Ratio} = \frac{\text{Total debts}}{\text{Total Assets}} \quad (4)$$

The source of enterprise funds are from their shareholders and debt financing. When debt is too high, the leverage will enable increased risk. For that reason this indicator is considered a measure of long-term solvency in banks. Lu, et al. (2005) found that debt ratio and the NPL ratio had a significantly positive correlation and proved that the higher the debt ratio, the higher in the non-performing loans ratio.

Independent Variable 5: Bank Size (Assets). Bank's size is the natural logarithm of its total assets. Total assets can be considered as the bank size and the amount of serviceable resources as follows:

$$\text{Bank Size} = \text{Lo } g(\text{assets}) \quad (5)$$

Miller and Noulas (1996) found that large-scale and profitable banks had a higher operating performance. Larger banks were more rigorous in the loan process, and thus their loan quality was also better than that of smaller banks. Consequently, in large banks, the probability of producing non-performing loans is considerably reduced. This study examines the relationship between bank assets and the non-performing loans ratio.

Independent Variable 6: Earnings per share (EPS). The higher the earnings per share, the higher the profitability per unit of capital and this implies that the bank has a better ability than other banks. Earnings per share can also represent bank profitability.

A higher NPL ratio affects the bank's profitability, resulting in lower earnings. For that reason, we choose to examine the relationship between earnings per share and the non-performing loans ratio.

3.3 Establish Empirical Model

Examining the impact of non-performing loans on each type of ownership structures of Taiwan banks, we perform a panel regression test using balanced panel data of all Taiwan banks from 1994 to 2008.

Hsiao (1986) argued that panel data methodology could control for an individual firm's heterogeneity, reduce problems associated with estimation bias and multicollinearity and specify the time-varying relation between dependent and independent variables. In addition, when using a panel regression test, we also consider the following three estimation methods: pooled ordinary least square (OLS), random effects and fixed effects. Accordingly, the following panel regression tests are shown as below:

$$NPL_{it} = \alpha_0 + \alpha_1 HOLD_{it} + \alpha_2 BIS_{it} + \alpha_3 DL_{it} + \alpha_4 DB_{it} + \alpha_5 ASSETS_{it} + \alpha_6 EPS_{it} + \varepsilon_{it}$$

The pooled OLS method estimates a common constant for all cross-sections where there are no differences among the estimated cross-sections. The difference between the fixed effects method and the random effects method is that the constants of the random effects for each section are random parameters.

We must test if fixed effects (i.e., the different constants for each group) are appropriate before assessing the validity of the fixed effects method. Accordingly, an F-test is used to determine whether the pooled OLS is more appropriate than the fixed effect model. The null hypothesis is that all of the constants are the same, and therefore the following common constant method is applicable:

$$H_0 : \alpha_1 = \alpha_2 = \dots = \alpha_n$$

The F-statistic is the following:

$$F = \frac{(R_{FE}^2 - R_{CC}^2)/(n-1)}{(1-R_{FE}^2)/(nT-n-k)} \sim F(n-1, nT-n-k),$$

Where R_{FE}^2 is the coefficient of the determination of the fixed effects model; R_{CC}^2 is the coefficient of determination of the common constant model, and n represents the number of Taiwan banks. If the F-statistic is larger than the F-test critical value, we then reject the null hypothesis, and the fixed effects method is more appropriate than the pooled OLS.

The random effects model focuses on arbitrary variables that have certain characteristics and allows us to infer regarding the population characteristics. Based on the random effects model, the matrix notation can be written as below:

$$Y = \alpha + X\beta + \mu + E,$$

Where α is the random intercept, μ is the error term of the random intercept, and $\mu \sim iid(0, \sigma_\mu^2)$.

The Hausman test determines if the fixed or random effects model should be considered. The null hypothesis is that μ and X are uncorrelated and thus random effects are consistent and

efficient (Dimitrios, 2005; Maddala, 2001).

$$H_0 : E(\mu, X) = 0.$$

The test statistic is the following:

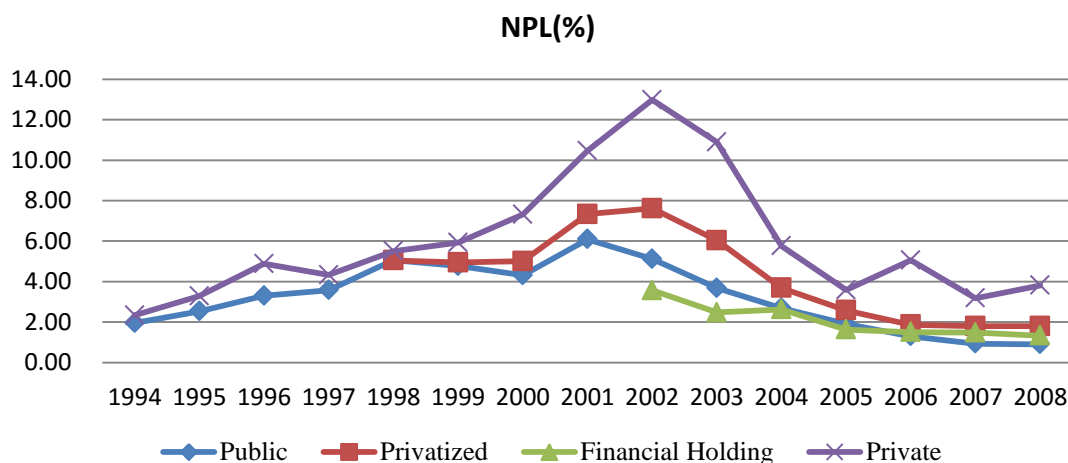
$$H = (\hat{\beta}_{FE} - \hat{\beta}_{RE})' (\Sigma_{FE} - \Sigma_{RE})^{-1} (\hat{\beta}_{FE} - \hat{\beta}_{RE}) \sim \chi^2(k),$$

Where $\hat{\beta}_{FE}$ is the estimator of the fixed effects model, and $\hat{\beta}_{RE}$ is the estimator of the random effects model. If the test statistic is large, we can reject the null hypothesis, and the random effects model is consistent, and the fixed effects model is more appropriate.

4. Empirical results

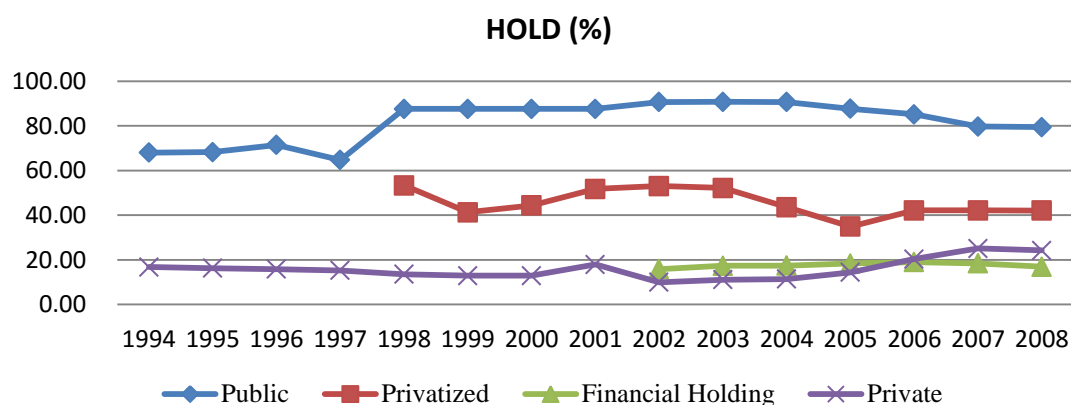
4.1 Descriptive Statistics

Figure 5: Non-performing Loans ratio of banks



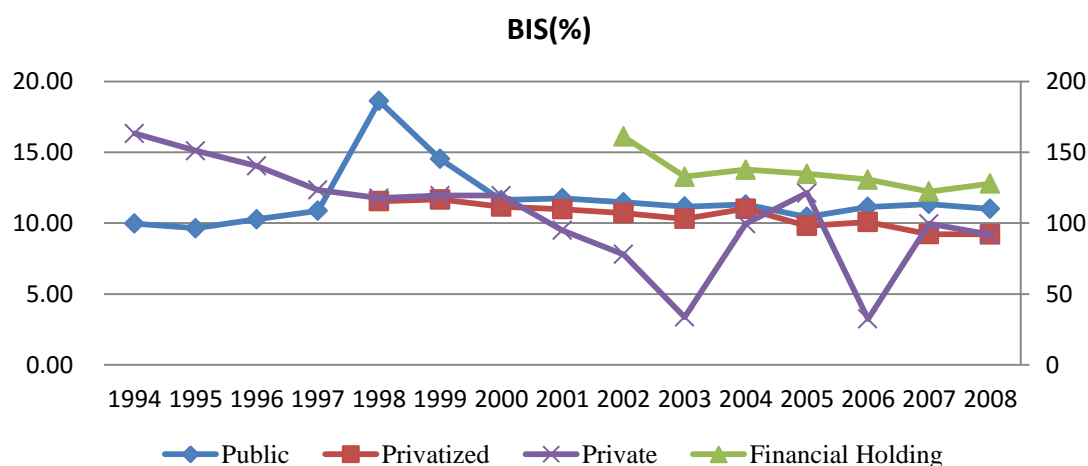
According to Figure 5, the NPL ratio started to rise in 1994, and peaked in 2002. However, during the first financial reform, the NPL ratio dropped to below 5%. After a period of steady increase, the NPL ratio began to drop significantly in 2003. We can therefore conclude that the first financial reform was effective. Because public banks have government intervention in their lending process, they tend to adopt a much more rigorous approach in lending than private banks.

Figure 3: Directors and Supervisors' Shareholding ratio of banks



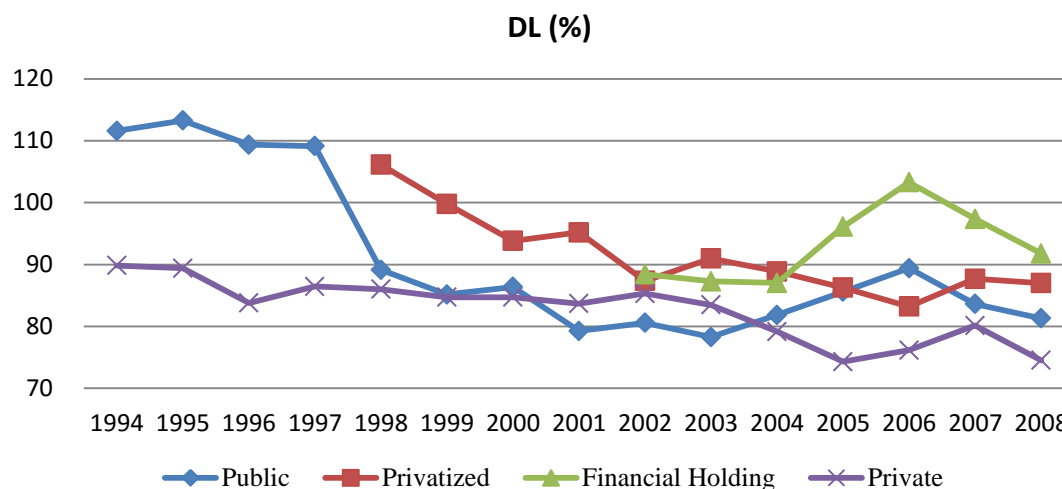
According to Figure 6, privatized public banks have higher directors and supervisors' shareholding ratio than private banks and financial holding banks. The main reason for the higher shareholding ratio is that the government still serves as supervisor or director in the privatized public banks. As long as the government holds more than 20%-30% of a private bank's shares, the government also affects the bank's major business decisions.

Figure 4: Capital Adequacy Ratio of banks



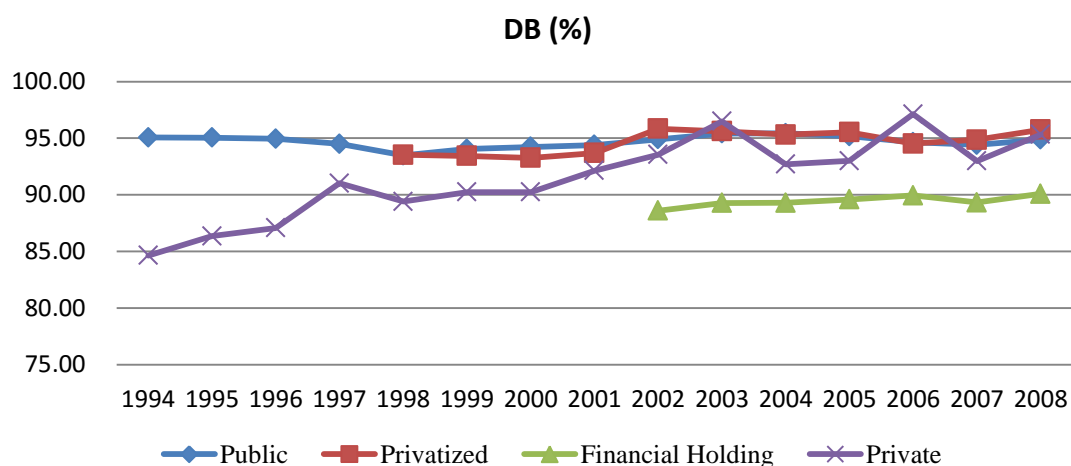
In 1988, the capital adequacy standard ratio was controlled so that it must be greater than or equal to 8%. Figure 7 shows that, in the first financial reform period, the capital adequacy ratio increased to over 8%. Therefore it is safe to conclude that the "258 target" was successfully achieved. For the FHCs, the regulation required that the minimum capital adequacy ratio be more than 100%, therefore each financial holding bank's capital adequacy ratio was more than 100%.

Figure 5: Loan to deposit Ratio of banks



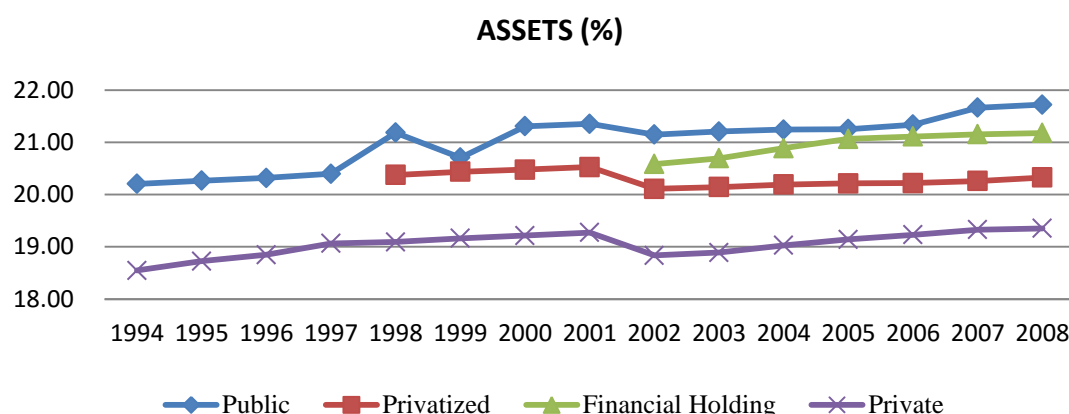
According to Figure 8, because of the prevalence of direct finance, many companies are turning to the capital markets instead of the banking system. Hence, we find a decrease in all of the banks' loan-deposit ratios.

Figure 6: Debt Ratio of banks



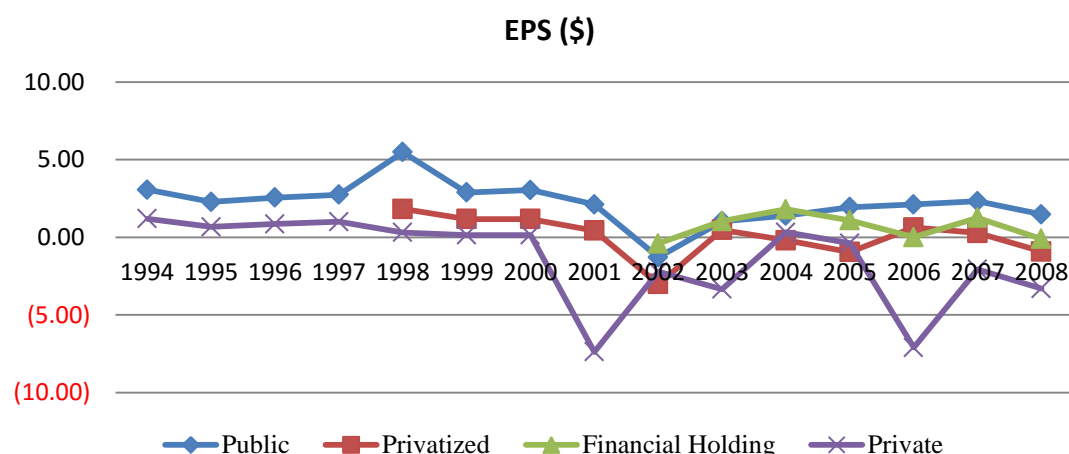
According to Figure 9, the privatized public banks and the public banks' debt ratios are higher than those of private banks and financial holding banks. We consider customers' deposits as a bank's liabilities in general. Public banks are subject to government control and protection and are more secure than private banks, therefore most people deposit in public banks. The debt ratio is lower in financial holding companies compared with other banks because of the financial holding companies' wider scope of business.

Figure 7: Bank size



According to Figure 10, public banks have greater assets because of the government support. Whether it is asset or number of branches, public banks are larger than private banks and financial holding companies because they have government's support and provide a variety of financial businesses such as insurance, securities, etc.

Figure 11: Earnings per share of banks



According to Figure 11, private banks' EPS is lower because the large number of private banks leads to extreme competition and their business also lacks differentiation, resulting in a "bloody bargain" situation in the market. In contrast, public banks and financial holding companies are larger and can produce economy of scale; therefore, their EPS is higher than private banks'.

4.2 Empirical Results

In this section, the regression of various specifications of the variables is shown as well as the empirical results of six dependent variables.

Table 1 illustrates that, in the private banking sector, HOLD has no significant effect on the NPL ratio. DL, DB and EPS have a significant negative impact on the NPL ratio (-0.0572), (-0.1539) and (-0.6341), respectively. ASSETS and BIS have a significant positive impact on

the NPL ratio (5.5118) and (0.2272), respectively. The results of the empirical test, such as DB, ASSETS and BIS, do not present the same results as most previous research. Generally speaking, smaller banks can diversify their asset risk more effectively than larger banks, and the probability of NPLs is very low. The higher a bank's NPL ratio, the higher the DB and the poorer the financial structure is. A higher bank's BIS represents higher long-term financing capacity, solvency, and security; and the NPL ratio should have a relatively low probability of occurrence. This study infers that the government's allowing for creation of 16 private banks makes the financial market unstable; therefore, we cannot use most scholars' results to explain this phenomenon. However, we can still settle that the lower the DL, the more the banks have to face an increased demand for loans, which leads to a decline in loan quality and an increase in the NPL ratio. This result is consistent with Lee and Ho (2007) under the "moral hazard hypothesis". In addition, NPL ratio reduces the bank's profitability, which means that the higher the NPL ratios, the lower the EPS, which is consistent with Lu, et al. (2005). HOLD has no significant effect on the NPL ratio, and this result is also consistent with Lu, et al. (2005). This result embodies the faith of many people that "banks will not fail". Even if banks collapse due to mismanagement, the government will maintain stability and economic development, thus ownership structure does not affect NPLs. Finally, adding the public banks into the regression, there are no changes in the original result.

In Table 2, it shows that, in the private banking sector, the real impact of the non-performing loans ratio variables include DB, ASSETS, EPS, and the BIS. DB has a positively significant effect on the NPL ratio (coefficient of 0.9813), which means that the higher the NPL ratio of a bank, the poorer its financial structure, and the higher its debt ratio. This result is again consistent with Lu, et al. (2005). ASSETS have a negatively significant effect on the NPL ratio (coefficient of -10.2357), which means that the larger banks have healthier systems and lower NPL ratios. This is consistent with Miller and Noulas (1996). BIS has a negatively significant effect on the NPL ratio (coefficient of -0.4051), which means that the higher the ratio, the more security in banks and the lower the likelihood of occurrence of the non-performing loans ratio. This is consistent with Zarruk (1989). EPS has a positively significant effect on the NPL ratio (coefficient of 0.0687). This is different from other studies. This phenomenon is inferred for the government to enhance financial efficiency. Therefore, the privatization of public banks raises competition among banks, and each bank has a large amount of loans. While banks may have increasingly higher profits, the positively significant effect of EPS on the NPL ratio may imply an increasing risk of non-performing loans. In this financial period, bank profitability increases faster than the NPL ratio.

Adding the privatized public banks into the regression, DL and HOLD are different from the private banks ratio. These variables also have a significant effect on the NPL ratio. The loans-deposits ratio has a negatively significant effect on the NPL ratio (coefficient of -0.0627), which means that people have higher confidence with government-owned banks and are also used to depositing in original banks. Therefore, the DL decrease comes from increased deposits, resulting in the increase in the bank's credit risk. Hence, DL has a negatively significant effect on a bank's credit risk, which is consistent with Lee and Ho (2007) under the "moral hazard hypothesis". In addition, HOLD has a positively significant effect on the NPL ratio (coefficient of 0.0419), which means privatized banks where the directors and supervisors' shareholding still includes 20-30% government ownership, the government ownership ratio declines gradually. Most people believe that the lower the government shareholding ratio, the lower the non-performing loans ratio, which is consistent with Lau, et al. (2000) and Boardman and Vining (1989). When it comes to government intervention, the role of ownership structure is prone to negative effects. Finally, adding the public banks into the

regression brings no change to the original result.

Panel regression test in Table 3 illustrates that in the private banking sector, the real impact of the non-performing loans ratio variables include DL, DB, ASSETS, BIS and HOLD. In addition, DB and ASSETS have the same result with the previous financial period. The DL has a positively significant effect on the NPL ratio (coefficient of 0.5051), the BIS has a positively significant effect on the NPL ratio (coefficient to 0.4363), and HOLD has a negatively significant effect on the NPL ratio (coefficient of -0.3915). Thanks to these results, it is sound to conclude that the government achieved their "258 target". In the first financial reform period, the NPL ratio was getting lower, and the banks' financial structure were also getting better. Thus, banks reduced loans and strengthened their loans' quality, and the DL decreased as well. Furthermore, banks improve their NPL by lower their capital adequacy ratio, which is consistent with Ni, Cheng, and Huang (2009). And to support the government's policy, banks returned to the correct approach to business and improved their NPL, which is consistent with Lee, et al. (2003).

Then, adding the financial holding banks into the regression, earnings per share (EPS) is different from only taking the private banks. EPS has a significantly positive impact on the NPL ratio (coefficient of 0.3236), indicating that banks use their retained earnings to write off non-performing loans. In contrast, the capital adequacy ratio and the directors and supervisors' shareholding ratio have no significant correlation with the non-performing loans ratio. Finally, adding the public banks and privatized public banks into the regression brings no change to the original results.

Panel regression test in Table 4 illustrates that in the private banking sector, the real impact of the non-performing loans ratio variables only include DB and ASSETS. The reasons are the same as the previous period. Then, adding the financial holding banks into the regression, BIS also has a positively significant effect (0.0349), and HOLD has a negatively significant effect (-0.0290) on the NPL ratio. The NPL ratio continued to reduce causes the decreased in the BIS, which is consistent with Ni, Cheng, and Huang (2009).

The government shares come from the directors and supervisors' share, which are increasingly higher in financial holding companies. Because of the greater government interference, the loan quality is improved and the NPL ratio is reduced. Finally, adding the public banks and privatized public banks into the regression, there are no changes in the original result.

In conclusion, hypothesis 1 is not supported, especially after the second financial reform; HOLD shows a significantly negative relationship with NPL. The main reason is that Taiwan government is devoted to reducing the NPL ratio to achieve the goal of the second financial reform. Besides, Taiwan government also endeavors to merge banks and concentrate the market shares. That leads to the increase in the proportion of the insiders' shareholding. Hypothesis 2 is also not supported. In most sub-periods, BIS shows a significantly negative relationship with NPL. The Taiwan banks reduce their NPL by liquidating their risky assets. Hypothesis 3 is only accepted before the financial reforms. The results indicate that after two financial reforms, DL is not a key factor that affects the NPL. Hypothesis 4 and 5 are accepted and hypothesis 6 is rejected, especially after the second sub-period. After the deregulation, the increasing of banks brings severe competition to Taiwan banking industry. The results imply that banks' main profits come from deposits. That makes the banks increase their debt and results in the increasing of NPL. However, to survive from competition, banks begin to

expand their operation field and aggrandize their scale. EPS shows a significantly positive relationship with NPL. In order to maintain the stability of the financial market, the government intervenes in the banking industry and helps the poorer performing banks. That allows banks to employ risky projects to make more profits.

5. Conclusions

The NPL ratio is an important means to measure stability of the financial market. The production of non-performing loans not only concerns the banks' characteristics but also is closely linked with government policy.

In the period of the establishment of new banks, the NPL ratio increased more than 3%. During the privatization period, the NPL ratio became worse. To improve the situation, the government implemented the first financial reform, and the NPL ratio began to decline. During the second financial reform period, the NPL ratio was much lower than that in the previous period. Regarding bank's ownership structure, private banks' NPL ratio is higher than other banks' because the public banks and privatized banks have more government ownership in their lending business. The financial holding companies integrate resources effectively; therefore their NPL ratio is relatively low.

Our empirical results display different results for different types of banks in various financial environments and under various government policies. The following is a summary of our results:

- (1) Any type of bank can expand the scale of its assets and reduce its debt ratio to effectively reduce the probability of manifestation of the NPL ratio.
- (2) During the first financial reform implementation, Taiwan banks not only restricted loans to increase lending quality but also used their own capital or surplus earnings to write off their NPL ratio.
- (3) Regarding directors and supervisors' shareholding, when government promotes the policy to lower the NPL ratio, directors and supervisors perform their supervision responsibilities better.

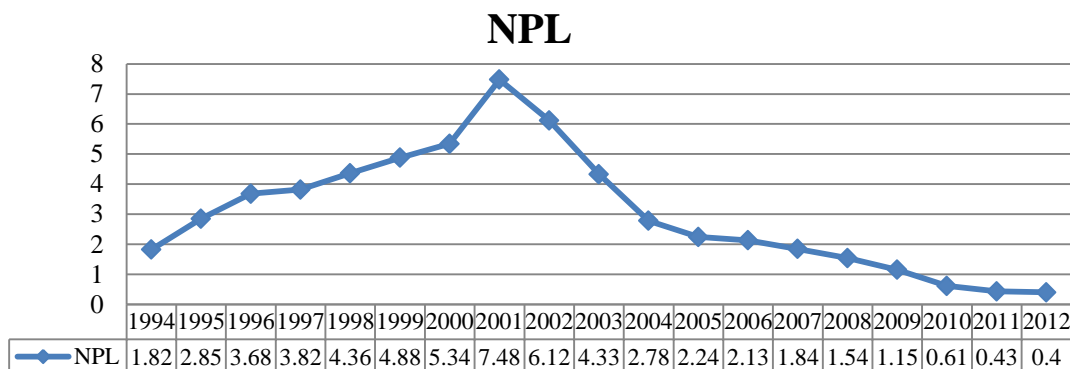
This paper is among the first to ever examine NPL relative to government policy over 15 years. Therefore, we hope to provide a more thorough analysis on changes of the non-performing loans ratio across different timeframes with regards to the case of Taiwan financial system. Future research can further explore this effect on specific type of banks in depth, such as private banks and financial holding companies, to determine their operating efficiency. Moreover, financial reforms in Taiwan convey essential financial policies that affect not only the financial industry but also Taiwan economy as a whole. Further research may cast new light and provide deeper insight on impact of financial reforms or key financial policies.

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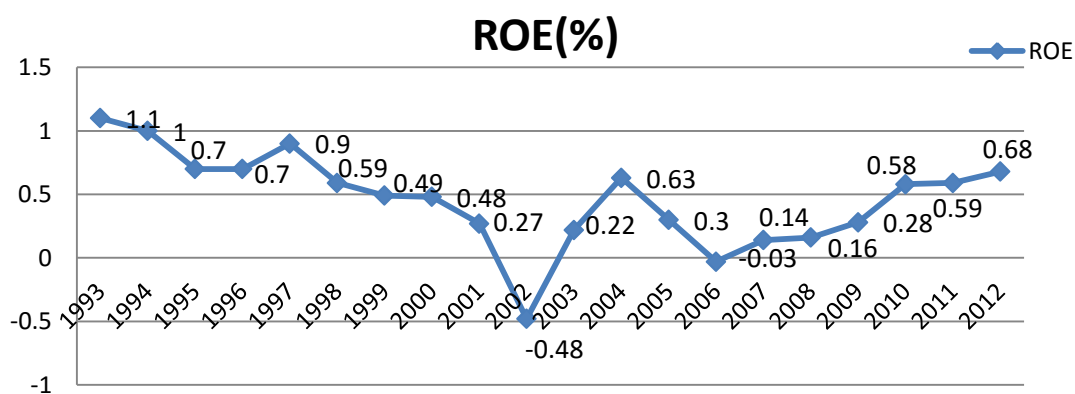
Appendix

Figure 8: Taiwan's NPL



Data Source: Central Bank of WWW - Financial indicators Annual Data

Figure 2: ROE of Taiwan's banks



Data Source: Financial Supervisory Commission - Financial Statistics

Table 1: The establishment of new banks period (1994-1997)

$NPL_{it} = \alpha_0 + \alpha_1 DL_{it} + \alpha_2 DB_{it} + \alpha_3 ASSET_{it} + \alpha_4 EPS_{it} + \alpha_5 BIS_{it} + \alpha_6 HOLD_{it} + \varepsilon_{it}$				
Variable	$\Phi+\Theta$		Φ	
	Coefficient	t-Statistic	Coefficient	t-Statistic
DL	-0.057150	-2.440732**	-0.059122	-2.246734**
DB	-0.150373	-3.297196***	-0.153861	-2.939543***
LOG(ASSETS)	5.374638	4.154482***	5.511828	3.630373***
EPS	-0.626977	-2.617532**	-0.634114	-2.266078**
BIS	0.211849	2.228374**	0.227169	2.062043**
HOLD	0.019870	0.305161	0.017905	0.164178
Adjusted R^2	0.663228		0.656568	
n	138		114	
F test	7.1723		7.5806	
model	Fixed effects		Fixed effects	

Φ : Private Bank Θ : Public Bank

Note: (*) Significant at 10% level. (**) Significant at 5% level. (***) Significant at 1% level.

Table 2: The government controlled banks privatization period (1998-2001)

$NPL_{it} = \alpha_0 + \alpha_1 DL_{it} + \alpha_2 DB_{it} + \alpha_3 ASSET_{it} + \alpha_4 EPS_{it} + \alpha_5 BIS_{it} + \alpha_6 HOLD_{it} + \varepsilon_{it}$						
Variable	①+②+③		①+③		①	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
DL	-0.062736	-1.890037*	-0.068796	-1.989745**	-0.065320	-1.405604
DB	1.031203	5.928030***	0.967955	5.199184***	0.981304	4.626709***
LOG(ASSETS)	-10.23573	-3.581669***	-9.228738	-2.995760***	-9.486308	-2.572527**
EPS	0.068658	2.621142***	0.071422	2.655386***	0.080466	2.763557***
BIS	-0.405112	-3.231947***	-0.488142	-3.383550***	-0.537657	-3.177421***
HOLD	0.041933	1.702604*	0.042467	1.683089*	0.051619	1.604751
Adjusted R^2	0.792439		0.843408		0.801049	
n	184		172		140	
F test	14.6994		14.8018		14.9917	
model	Fixed effects		Fixed effects		Fixed effects	

① : Private Bank ② : Public Bank ③ : Privatized

Note: (*) Significant at 10% level. (**) Significant at 5% level. (***) Significant at 1% level.

Table 3: The first financial reform period (2002-2004)

$NPL_{it} = \alpha_0 + \alpha_1 DL_{it} + \alpha_2 DB_{it} + \alpha_3 ASSET_{it} + \alpha_4 EPS_{it} + \alpha_5 BIS_{it} + \alpha_6 HOLD_{it} + \varepsilon_{it}$								
Variable	①+②+③+④		①+③+④		①+④		①	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
DL	0.205154	5.210846***	0.244818	5.594104***	0.285306	6.115159***	0.505094	7.526142***
DB	0.538712	6.057884***	0.629952	6.446206***	0.733732	7.184204***	1.142933	6.111210***
LOG(ASSETS)	-2.830898	-3.577142***	-3.491106	-3.993520***	-3.771819	-4.179223***	-4.892141	-2.964616***
EPS	0.144897	1.670444*	0.215702	2.277976**	0.323579	3.253380***	0.112995	0.598174
BIS	0.000330	0.029390	0.006757	0.563798	0.009334	0.770697	0.436263	2.196389**
HOLD	-0.015217	-0.493790	-0.039824	-0.738216	-0.087248	-1.076524	-0.391529	-2.921945***
Adjusted R^2	0.337339		0.367218		0.416548		0.472301	
n	119		107		98		59	
F test	11.0117		11.2524		12.5420		9.6518	
model	Random effects		Random effects		Random effects		Random effects	

① : Private Bank ② : Public Bank ③ : Privatized ④ : Financial Holding Company

Note: (*) Significant at 10% level. (**) Significant at 5% level. (***) Significant at 1% level.

Table 4: The second financial reform period (2005-2008)

$NPL_{it} = \alpha_0 + \alpha_1 DL_{it} + \alpha_2 DB_{it} + \alpha_3 ASSET_{it} + \alpha_4 EPS_{it} + \alpha_5 BIS_{it} + \alpha_6 HOLD_{it} + \varepsilon_{it}$								
Variable	①+②+③+④		①+③+④		①+④		①	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
DL	-0.000158	-0.017541	-0.000543	-0.057329	0.010730	1.373679	0.015491	0.626570
DB	0.431803	9.433023***	0.431550	9.002286***	0.397341	9.200148***	0.515582	8.164778***
LOG(ASSETS)	-3.715607	-5.310440***	-3.716499	-4.935216***	-3.057833	-7.433434***	-4.309428	-4.305425***
EPS	0.005240	0.181699	0.005009	0.165193	-0.025666	-0.901495	0.057264	1.133074
BIS	0.031400	3.618262***	0.031421	3.453798***	0.034866	5.129488***	0.035949	1.075211
HOLD	-0.028155	-2.716015***	-0.027967	-2.567902***	-0.029047	-2.712524***	-0.014745	-0.992907
Adjusted R^2	0.944152		0.94420		0.719958		0.780297	
n	145		131		122		70	
F test	55.0984		54.6513		51.8464		41.8433	
model	Fixed effects		Fixed effects		Random effects		Random effects	

① : Private Bank ② : Public Bank ③ : Privatized ④ : Financial Holding Company

Note: (*) Significant at 10% level. (**) Significant at 5% level. (***) Significant at 1% level.