THE IMPACT OF PROBLEM LOAN, OWNERSHIP STRUCTURE, AND MARKET STRUCTURE UPON THE BANK PERFORMANCE

Andy Chein*

Abstract

Some research on the causes of bank failure finds that failing institutions had large proportions of problem loans prior to failure, and that the extra costs of administering these loans reduced the bank performance. At this moment, if bank management goes after maximizing one's utility, not the bank performance, in addition confronting from rising competitive environment, it would be quite dangerous. So, this article studies the impact of problem loan, ownership structure, and market structure upon the bank performance with the basis of cost efficiency. Empirical results show that problem loan, ownership structure, and market structure have a significant effect upon the bank performance.

Keywords: problem loan, ownership structure, market structure

*National Kaohsiung First University of Science and Technology, Kaohsiung, Taiwan
Email: andychien@ccms.nkfust.edu.tw
Tel: 886-7-6011000 #3111; Fax: 886-7-6011039

1.Introduction

For the dramatic changes of financial environment, rising competition in the banking services has been spurred on by deregulation. After the government agency opening new bank chartering in 1991, the intensity of competition has grown to make banks face a far heavier burden. Hence, how to improve ones' operating efficiency to confront big challenge in the future should be the most important and urgent mission for the banks. But, the relevant literatures often put the direction of main research in the measurement of the bank performance, but infrequently focus upon the factor influencing performance. So, this paper tries to fill up the above deficiency through the determinants of banks performance.

The quality of making loans in recent years was confronting some deterioration, and the adverse situation may make the bank management expend more cost to deal with. Hence, how the problem loan affect bank performance will be an important issue to explore. Because the studies about the ownership structure influencing bank performance are diverse, so this paper attempts to comprehend the possibility that the CEO can reconcile the benefit between principal and agent. The traditional literature point out the bank with high market concentration, its profit could be relatively high. But, some articles cast doubt on this argument and develop a contrary opinion. When the trend of consolidation is growing, this study seeks to find out the impact that the banks may suffer due to the rising market concentration.

This article modifies the stochastic frontier production model of Schmidt and Sickles (1984) and Cornwell et al. (1990), and transforms it into a stochastic frontier dual cost model. Thus, the model is mainly expressed as the function of problem loan, ownership structure, and market structure.

2.Literature

Quite a lot of studies probe into the performance of the bank. Farrell (1957) pioneers the frontier concept into the production function. Farrell defines the efficient production function (or frontier) and recognizes the output that a perfectly efficient firm could obtain from any given combination of inputs. That means if a perfectly efficient firm uses the same input proportion, it can achieve the maximum output in its production frontier and takes the value of 100 per cent. But, the efficiency will become indefinitely small if the amounts of input per unit output become indefinitely large. Forsund et al. (1980) divide the frontier studies into the four empirical models: deterministic nonparametric frontier approach, deterministic parametric frontier approach, deterministic statistical frontier approach, and stochastic frontier approach.

The representative method of deterministic nonparametric frontier approach is data envelopment analysis (DEA). The merit of DEA is no need to specify the form of the production function. However, a crucial weakness of DEA is that it neglects the influence of random error. The deterministic parametric frontier approach estimates the parameters

through the specification of the production function, but it does not make special statistical assumption to the random error. The deterministic statistical frontier approach makes assumption to the random error in order to get a statistical property of estimates, but may result in some bias if the assumption is wrong. The stochastic frontier approach specifies a functional form but with an error term including random error and inefficiency.

Schmidt and Sickles (1984) use fixed effect and random effect model to estimate a stochastic frontier production function with panel data in an attempt to solve three serious difficulties that stochastic frontier approach may suffer. Cornwell et al. (1990) revise slightly to the above way. And, their approach can estimate time-varying efficiency levels for individual firms without invoking strong distributional assumptions for technical inefficiency or random noise. Because the stochastic frontier approaches of Schmidt and Sickles (1984) and Cornwell et al. (1990) are better than the other efficiency measurement ways, this paper uses them as the basis of the empirical model. Considering the multi-product characteristics of banks, so the paper modifies the stochastic frontier production function with panel data to the stochastic frontier dual cost function with panel data. The dual cost function adopts a transcendental logarithmic (translog) model to allow the substitution elasticity of input factor being flexible.

Mester (1993) applies the logit regression method to investigate efficiency in mutual stock and stock S&Ls using 1991 data on U.S. S&Ls. But, the result shows that the problem loans do not have significant influence on the cost efficiency. Berger and DeYoung (1997) employ Granger-causality techniques to test hypotheses regarding the relationships among loan quality, cost efficiency, and bank capital. The data suggest that problem loans precede reductions in measured cost efficiency. Besides, a number of researchers find that failing banks tend to have large proportions of problem loans. So this study tries to examine the relationship between problem loans and bank performance.

Pi and Timme (1993) utilize the ordinary least squares to find an inconsistent relationship between cost efficiency and CEO ownership for the bank holding companies from 1987-1990. Berger and Hannan (1998) utilize ordinary least squares and two stage least squares methods to probe into the impact of board ownership on cost efficiency for the bank holding companies from 1980-1989. But, there is no obvious relation to exist between both of board ownership and cost efficiency. Because the result of academic topic on the ownership structure and bank cost efficiency is diverse, so this paper tries to explore linearity and nonlinearity among the ownership structure and cost efficiency. Besides, this study takes CEO ownership, board of directors ownership, and

major shareholders equity as the proxy variables of ownership structure.

According to the analysis of the traditional structure-conduct-performance(SCP) such as Heggestad (1977), Short (1979) and Hannan (1991), the banks with higher market concentration obtain more profit. Berger and Humphrey (1997) give explanation that it may be due to market-power explanations in which banks in concentrated markets exercise market power in pricing and earn supernormal profits. However, Berger and Hannan (1998) find the banks with higher market concentration, their cost efficiency is lower instead. This phenomenon can be explained by the quote from Hicks (1935): the best of all monopoly profits is a quiet life. It means that the banks with higher market concentration may prefer to pursue a "quiet life" than to maximize operating efficiency within a less competitive pressure. So, this paper seeks to study the relationship between the market structure and cost efficiency of banks. In addition, this article takes market concentration and market share, as the proxy variables of market structure.

3.Methodology
3.1.Hypothesis

Hypothesis 1: The problem loan has a negative relationship with bank performance.

According to Berger and DeYoung (1997), after the loans becoming past due or nonaccruing, the bank begins to expend extra costs to deal these problem loans. Under this circumstance, one can expect increases in nonperforming loans to cause decreases in measured cost efficiency.

Hypothesis 2-1: The CEO ownership structure has a nonlinear relationship with banks performance.

Hypothesis 2-2: The board of directors ownership structure has a nonlinear relationship with banks performance.

The convergence-of-interests hypothesis suggests a uniformly positive relationship between management ownership and firm value, but the entrenchment hypothesis suggests that market valuation can be adversely affected for some range of high ownership stakes. Thus, Stulz (1988) predict a nonlinear relationship between management ownership and market valuation of the firm's assets. And, Morck et al. (1988) support the above prediction.

Hypothesis 2-3: The major shareholders equity has a positive relationship with banks performance.

According to the viewpoint of Berle and Mean (1932) and Jensen and Meckling (1976), there may exist a positive relationship between main shareholders ownership concentration and cost efficiency. Since the agency cost will decline as major shareholders equity increases.

Hypothesis 3: The market structure has a negative relationship with banks performance.

Berger and Hannan (1998) apply the easy life theory to explain the cost efficiency for banks with relatively monopolized market structure will be lower. As the management prefers to enjoy an easy life due to lower competitive pressure, as well not making efforts to go after the maximization of cost efficiency.

3.2. Variables and sources
In total cost, mainly includes labor cost, fund cost and capital equipment cost.

In price of input, mainly includes price of labor, price of fund, and price of capital equipment.

In output, as considering the bank can offer multi-product, mainly includes short-term net investments and net amounts of loans and discounting.

In problem loan, the proxy variable is nonperforming loan divided by the total loans.

The CEO ownership is measured by the shareholding ratio of general manager.

The board of directors ownership is measured by the shareholding ratio of board of directors.

The major shareholders equity is measured by the shareholding ratio of top 4 shareholders.

The proxy variable of market structure is Herfindahl index of market concentration to measure.

The other variables include market share, size, and age, which are measured by market share of sales, total asset, and time period to establish, respectively.

The sources are mainly from TEJ database.

3.3. Specification of empirical model
The stochastic frontier dual cost function is specified as follows:

$$\ln C_{it} = \alpha_i + \sum_{j=1}^{3}\beta_j \ln w_{it}^j + \sum_{l=1}^{2}\beta_l \ln Y_{it}^l + \beta_t t + \frac{1}{2}\sum_{j=1}^{3}\sum_{k=1}^{3}\beta_{jk} \ln w_{it}^j \ln w_{it}^k$$
$$+ \sum_{j=1}^{3}\sum_{l=1}^{2}\beta_{jl} \ln w_{it}^j \ln Y_{it}^l + \sum_{j=1}^{3}\beta_{jt} \ln w_{it}^j t + \frac{1}{2}\sum_{l=1}^{2}\sum_{m=1}^{2}\beta_{lm} \ln Y_{it}^l \ln Y_{it}^m$$
$$+ \frac{1}{2}\beta_{tt} t^2 + v_{it}$$

(1)

where C is total cost, w^j and w^k is price of input factor, j(k)=1, 2, 3, represents labor, fund, and capital

equipment, Y^l (Y^m) is output level, l(m)=1, 2, represents short-term net investments and net amounts of loans and discounting, i represents bank i, t represent period t.

Let $\hat{u}_{it} = \hat{\alpha}_i + \hat{\beta}_t t + \frac{1}{2}\hat{\beta}_{it} t^2$, then the cost

efficiency of bank i will equal to $\exp(\min(\hat{u}_{it}) - \hat{u}_{it})$.

The next step is to express cost efficiency as the function of problem loan, ownership structure, market structure and other relevant factors.

3.4. Econometric method
This study combines cross section and time series data to run the pooled regression. Before estimating, one should determine the type of intercept: the ordinary least squares method assumes that intercept is the same within all samples; the fixed effect model assumes that there are different intercepts in the cross section sample; the random effect model assumes that intercept is a random variable. Whether the fixed effect model superior to the ordinary least squares, one can use F statistic to test. Whether the random effect model superior to the ordinary least squares, one can use LM statistic to test. Whether the random effect model superior to the fixed effect model, one can use Hausman statistic to test.

3.5. Samples
The samples include 34 banks listed on the TWSE (Taiwan Stock Exchange) and OTC (Over-the-Counter), where there are 18 older bank and 16 newer banks. The former established before 1991, and the latter established after 1991.

4. Empirical results

The tests of bank performance pooling regression are shown in table 1. The results demonstrate the fixed effect model is superior to the ordinary least squares, the random effect model is superior to the ordinary least squares method, and the fixed effect model is superior to the random effect model again.

Table 1. The tests of bank performance pooling regression

Model	H_0: OLS H_1: Fixed Effect Model	H_0: OLS H_1: Random Effect Model	H_0: Random Effect Model H_1: Fixed Effect Model
Statistics	F-value= 9.9144	LM = 258.7363	$\chi^2 = 127.9726$
	(p=0.0000)	(p=0.0000)	(p=0.0000)
Results	Reject H_0	Reject H_0	Reject H_0

Subsequently, table2 measures bank performance by the fixed effect model. From table 2, one can see

the cost efficiency of bank at any time during the entire sample period. In the meantime, the trend of bank performance is decline.[96] If one distinguishes the whole banks into older banks and newer banks, their average cost efficiency would be 30.74% and 42.32%. The average cost efficiency of older banks is significantly less than the average cost efficiency of newer banks.[97] The reason may be that older banks most are public banks, which less concerned about the efficiency. In contrast, all newer banks are private banks, which pay more attention to the efficiency.

The tests of bank performance determinants pooling regression are shown in table 3. The results illustrate the fixed effect model is superior to the ordinary least squares, the random effect model is superior to the ordinary least squares method, and the fixed effect model is superior to the random effect model.

So, table 4 is the pooling regression for bank performance determinants by fixed effect model.

The empirical results show that the problem loan is negatively related with the cost efficiency of bank. The CEO ownership is negatively related with the cost efficiency of bank, and CEO ownership's square is positively related with the cost efficiency of bank, implying a non-linear relationship between CEO ownership and cost efficiency of bank. The board of directors ownership is positively related with the cost efficiency of bank, and board of directors ownership's square is negatively related with the cost efficiency of bank, implying a non-linear relationship between board of directors ownership and cost efficiency of bank. The major shareholders equity has no effect on cost efficiency of bank. The market concentration is positively related with the cost efficiency of bank. But, the market share and size have no effect on cost efficiency of bank. The age is negatively related with the cost efficiency of bank.

5.Conclusions

Generally, most study for banks focus on the issue concerning the measurement of bank performance, seldom examines the topic about the factors influencing the bank performance. So this paper investigates the problem loan, ownership, and market structure how to influence the bank performance from the view of the determinants of bank performance. Because the problem loan is negatively related with the bank performance, how to lower credit risk and to enhance management quality will be an urgent response mechanism for the bank management. Since there is a non-linear U-shaped relationship between CEO ownership and cost efficiency of bank, thus the

lower or higher CEO ownership seems to help improving the bank performance. While there is a non-linear inverse relationship between board of directors ownership and cost efficiency of bank, thus the moderate board of directors ownership appears to facilitate the bank performance in progress. As the market concentration is positively related with the cost efficiency of bank, meaning that higher market concentration helps to get the bank performance well, excluding the preference for easy life owing to the monopolistic market structure.

Table 2. The cost efficiency of bank- fixed effect model

Bank	1995	1996	1997	1998	1999
Bank1	42.24%	29.68%	17.48%	8.63%	3.57%
Bank2	40.35%	28.35%	16.70%	8.25%	3.41%
Bank3	40.56%	28.50%	16.79%	8.29%	3.43%
Bank4	59.37%	41.72%	24.57%	12.13%	5.02%
Bank5	65.48%	46.01%	27.10%	13.38%	5.54%
Bank6	70.61%	49.61%	29.22%	14.43%	5.97%
Bank7	73.84%	51.89%	30.56%	15.09%	6.24%
Bank8	68.56%	48.17%	28.37%	14.01%	5.80%
Bank9	78.85%	55.41%	32.63%	16.11%	6.67%
Bank10	68.25%	47.95%	28.24%	13.95%	5.77%
Bank11	57.36%	40.30%	23.74%	11.72%	4.85%
Bank12	64.13%	45.06%	26.54%	13.10%	5.42%
Bank13	100.00%	70.27%	41.39%	20.43%	8.46%
Bank14	58.51%	41.11%	24.21%	11.96%	4.95%
Bank15	92.48%	64.99%	38.28%	18.90%	7.82%
Bank16	92.33%	64.88%	38.21%	18.87%	7.81%
Bank17	56.21%	39.49%	23.26%	11.48%	4.75%
Bank18	91.41%	64.23%	37.83%	18.68%	7.73%
Bank19	46.17%	32.44%	19.11%	9.43%	3.90%
Bank20	87.19%	61.27%	36.09%	17.82%	7.37%
Bank21	82.95%	58.28%	34.33%	16.95%	7.01%
Bank22	87.20%	61.27%	36.09%	17.82%	7.37%
Bank23	82.78%	58.16%	34.26%	16.91%	7.00%
Bank24	85.81%	60.29%	35.51%	17.53%	7.26%
Bank25	83.27%	58.51%	34.46%	17.01%	7.04%
Bank26	86.14%	60.52%	35.65%	17.60%	7.28%
Bank27	83.43%	58.62%	34.53%	17.05%	7.06%
Bank28	92.62%	65.08%	38.33%	18.93%	7.83%
Bank29	88.14%	61.93%	36.48%	18.01%	7.45%
Bank30	89.75%	63.07%	37.15%	18.34%	7.59%
Bank31	90.75%	63.77%	37.56%	18.54%	7.67%
Bank32	92.72%	65.15%	38.37%	18.95%	7.84%
Bank33	85.64%	60.18%	35.44%	17.50%	7.24%
Bank34	72.53%	50.96%	30.02%	14.82%	6.13%

---

[96] The average cost efficiency from 1995 to 1999 is 75.22%, 52.86%, 31.13%, 15.37%, and 6.36%, respectively.

[97] The test statistic of two sample t test for equal means is -2.81, its p value is 0.0057.

Table 3. The test of bank performance determinants

Model	H$_0$: OLS H$_1$: Fixed Effect Model	H$_0$: OLS H$_1$: Random Effect Model	H$_0$: Random Effect Model H$_1$: Fixed Effect Model
Statistics	F-value= 7.0974	LM = 28.5222	χ^2 = 77.3220
	(p=0.0000)	(p=0.0000)	(p=0.0000)
Results	Reject H$_0$	Reject H$_0$	Reject H$_0$

Table 4. The regression of bank performance determinants- fixed effect model

Explainable variables	Coefficient estimates	t-statistics	p value
Problem loan	-0.4701*	-1.6931	0.0920
CEO ownership	-0.6442***	-4.4672	0.0000
CEO ownership's square	1.2433***	4.7209	0.0000
Board of directors ownership	0.8711**	2.5954	0.0102
Board of directors ownership's square	-0.9836***	-2.7621	0.0063
Major shareholders equity	-0.2953	-1.5947	0.1124
Market concentration	65.8730***	3.4852	0.0000
Market share	-0.2278	-0.1382	0.8902
Size	-0.0779	-1.2294	0.2204
Age	-0.2980***	-6.0724	0.0000
R-squared	0.9785	Adjusted R-squared	0.9711

*** denotes signification at the 1%; ** at 5%; and * at 10% level

References

1. Berger, A., and R. DeYoung, (1997), "Problem Loan and Cost Efficiency in Commercial Banks," Journal of Banking and Finance 21, 849-870.
2. Berger, A., and T. Hannan, (1998), "The Efficiency Cost of Market Power in the Banking Industry: A Test of the "Quiet Life" and Related Hypotheses," Review of Economics and Statistics 3, 454-465.
3. Berger, A., and D. Humphrey, (1997), "Efficiency of Financial Institutions: International Survey and Directions for Future Research," European Journal of Operational Research 98,175-212.
4. Berle, A., and G. Means, (1932), The Modern Corporate and Private Property, New York: MaCmillan.
5. Cornwell, C., P. Schmidt, and R. Sickles, (1990), "Production Frontiers with Cross Sectional and Time Series Variation in Efficiency Levels," Journal of Econometrics 46, 185-200.
6. Farrell, M., (1957), "The Measurement of Productive Efficiency," Journal of the Royal Statistical Society A, general 120, 3, 253-281.
7. Forsund, F., C. Lovell, and P. Schmidt, (1980), "A Survey of Frontier Production Functions and Their Relationship to Efficiency Measurement," Journal of Econometrics 13, 5-25.
8. Hannan, T., (1991), "Bank Commercial Loan Markets and the Role of Market Structure: Evidence from Surveys of Commercial Lending," Journal of Banking and Finance 15, 133-149.
9. Heggestad, A., (1977), "Market Structure, Risk, and Profitability in Commercial Banking," Journal of Finance 32, 1207-1216.
10. Jensen, M., and W. Meckling, (1976), "Theory of the Firm: Managerial Behavior, Agency Costs, and Capital Structure," Journal of Finance Economics 3, 305-360.
11. Mester, L., (1993), "Efficiency in the Saving and Loan Industry," Journal of Banking and Finance 17, 267-286.
12. Morck, R., A. Shliefer, and R. Vishny, (1988), "Management Ownership and Markets Valuation: An Empirical Analysis," Journal of Financial Economics 20, 293-315.
13. Pi, L., and S. G. Timme, (1993), "Corporate Control and Bank Efficiency," Journal of Banking and finance 17, 515-530.
14. Schmidt, P., and R. Sickles, (1984), "Production frontier and Panel Data," Journal of Business and Economic Statistics 2, 367-374.
15. Short, B., (1979), "The Relation between Commercial Bank Profits Rates and Banking Concentration in Canada, Western Europe, and Japan," Journal of Banking and Finance 3, 209-219.
16. Stulz, R., (1988), "Managerial Control of Voting Rights: Financing Policies and the Market for Corporate Control," Journal of Financial Economics 20, 25-54.

VIRTUS *NTERPRESS* ®