“Asset size, risk-taking and profitability in Korean banking industry”

AUTHORS	Seok Weon Lee
ARTICLE INFO	Seok Weon Lee (2008). Asset size, risk-taking and profitability in Korean banking industry. *Banks and Bank Systems*, *3*(4)
RELEASED ON	Friday, 06 February 2009
JOURNAL	"Banks and Bank Systems"
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES **0**

NUMBER OF FIGURES **0**

NUMBER OF TABLES **0**

Seok Weon Lee (Korea)

Asset size, risk-taking and profitability in Korean banking industry

Abstract

From the cross-sectional data of Korean banks before and after the regulation of banking industry was tightened in the late 1997, we find significant evidences that larger banks have very perverse, unprofitable risk-taking incentives, but only when the regulations are loose. Thus, the typical moral hazard of larger banks does exist only in the period of deregulation in our sample. After regulations are tightened, the perverse risk-taking behavior disappears and risk-taking behavior becomes more profitable. Based on our findings, the following policy implication could be derived. If consolation and merger are believed to be one of the easiest ways to capture greater market share and make higher profit, and many banks follow this wave and trend, regulators that are required to maintain the safe and sound environment for banking should understand that the resulting net effect of this pattern on the bank's risk and profitability, and therefore, on the safety and soundness of the entire banking industry will depend on the extent to which such activities are accompanied by proper monitoring of regulators.

Keywords: asset size, risk taking, moral hazard, profitability, bank regulation.
JEL Classification: G29.

Introduction

Many researchers in the banking literature tend to presume that size and safety do not go hand in hand, especially when risk is measured as ex-ante risk-taking incentives. They provide many results that large banks, while better diversified than small banks in asset-portfolio composition, are not less risky than small banks. Rather, large banks tend to use their diversification advantage to increase the riskiness of their activities such as by increasing risky lending and operating with less capital but not to operate at lower levels of overall risk. Generally, large banks realize a cost advantage over small banks because of their ability to operate with less capital. It is generally agreed that the less the capital (the higher the leverage), the riskier the firm is, because of both leverage effect and the moral-hazard-incentives of stockholders associated with limited liability. Furthermore, investors would not have great incentives to monitor the risk-taking behavior of large banks because they may believe that regulators will not allow the failures of large banks due to the potential damage to the economy. Therefore, large banks would have some moral hazard incentives to try to take advantage of this less monitoring motivation to increase their riskiness. Liang and Rhoades (1991) find that large banks operate with lower capital ratios to pursue riskier activities. McAllister and McManus (1993) also show that large banks operate with lower capital ratios. Akhavein, Berger and Humphrey (1997) show that the profit efficiency associated with large-bank mergers is, at least in part, attributable to a shift in outputs from low-risk securities to higher-risk loans.

However, whether the riskier activities pursued by large banks enhance profit of the banks is questionable. If the riskier activities do not contribute to higher profits, or result in worse performance, this may have to be interpreted as a typical moral hazard effect suggested by finance literature. Empirical results with respect to the relationship between large banks' risk-taking and profit are rather mixed up. Benston, Hunter, and Wall (1955) show some results supporting that size and the levels of cash flow are positively correlated. Boyd and Runkle (1993) find different results.

In this paper, we examine whether larger banks in Korean banking industry pursue riskier activities than smaller banks during the period of 1994-2005, employing both the measures for ex-ante risk-taking incentives and those for ex-post risk-taking. Especially, we compare the risk-taking behavior of large banks for two different regulatory regimes: the period of deregulation (pre-1998) vs. the period of tight and strict regulation (post-1998). Following the predictions and findings of many researchers, we believe that the ability of stockholders to maximize their profit by greater risk-taking would be enhanced in periods of deregulation and regulatory forbearance. Consequently, we presume that if larger banks had greater risk-taking incentives than smaller banks, this pattern would be stronger and more transparent when regulations are loose. To overcome the financial crisis in the late 1997, the regulations of the Korean banking industry became very tight and strict after 1997. Thus it would be a good sample period to examine the above issue. Furthermore, we examine whether the riskier activities pursued by large banks enhance profit. By this profitability test, ex-post we evaluate whether the risk-taking behavior of banks was driven by perverse moral hazard incentives or by deliberate and careful decision making.

From the cross-sectional data of Korean banks before and after the regulation of banking industry was tightened in the late 1997, we find significant

evidences that larger banks have very perverse, unprofitable risk-taking incentives, but only when the regulations are loose. Thus, the typical moral hazard of larger banks does exist only in the period of deregulation in our sample. After regulations are tightened, the perverse risk-taking behavior disappears and risk-taking behavior becomes more profitable. Based on our findings, the following policy implication could be derived. If consolation and merger are believed to be one of the easiest ways to capture greater market share and make higher profit, and many banks follow this wave and trend, regulators that are required to maintain the safe and sound environment for banking should understand that the resulting net effect of this pattern on the bank's risk and profitability, and therefore, on the safety and soundness of the entire banking industry will depend on the extent to which such activities are accompanied by proper monitoring of regulators.

In the next section, we describe the sample of banks. In section 2, we describe the hypotheses to be tested and the regression model used to test them. In section 3, we present the empirical results and in the lest section offer concluding remarks.

1. Sample and data

We collect the balance sheet data of banks such as asset size, equity capital, loans, fixed assets, non-performing loans, and return on asset from the Statistics of Bank Management for each year, from 1994 to 2005, published by the Korean Financial Supervisory Service.

2. Testable hypotheses, testing models and correlation test

To examine how the risk-taking incentives of banks are associated with asset size, we estimate the following cross-sectional, univariate regression equation for each year during the period of 1994-2005 to eliminate serial-correlation problem. We omit 1997 because 1997 is a transitional year for the introduction of new regulations.

$$(Risk\text{-}taking)_i = \beta_0 + \beta_1(Asset\ size)_i + \varepsilon_i . \quad (1)$$

Risk-taking for each individual bank *i* is proxied by alternative balance sheet measures. We employ capital-to-asset ratio, loan-to-asset ratio, and fixed asset-to-asset ratio as the measures for the bank's ex-ante risk-taking incentives, and non-performing loans-to-loans ratio as the measure for the bank's ex-post risk-taking.

The first one is the capital-to-asset ratio. As discussed in this paper's introduction, lower capital-to-asset ratio is believed to represent greater risk-taking incentives. The second one is the ratio of loans to total asset. Generally, loans are considered to be risky assets and are given high risk weight at the calculation of BIS (Bank for International Settlement) capital ratio. It is generally agreed that the greater the loan ratio of a bank, the more vulnerable the performance of the bank is to future economic conditions. Thus, other things being equal, higher loan-to-asset ratio is believed to represent higher risk-taking incentives. The third one is the fixed asset-to-asset ratio or operational leverage. It is very well known that operational leverage acts in a similar way to financial leverage (capital-to-asset ratio) in increasing firm risk. Thus, other things being equal, higher fixed asset-to-asset ratio is believed to represent higher risk-taking. We test our hypotheses for two interpretations of risk-taking measures, the ex-ante risk-taking incentives and the ex-post risk-taking. We believe that ex-ante risk-taking incentives are more germane and include the ex-post risk-taking for completeness of our test. As the measure for ex-post risk-taking, we employ the bank's non-performing loans-to-loans ratio.

3. Empirical results for regression analysis

3.1. Measures for ex-ante risk-taking incentives. Tables 1-3 present the results for the change in moral hazard of large banks associated with three different measures for ex-ante risk-taking incentives over the period of 1994-2005. Table 1 presents the results for the case where the risk of a bank is measured by its financial leverage, capital-to-asset ratio. As shown in the table, the slope coefficient is significantly negative for the period of 1994-1996, indicating that the larger banks have moral hazard associated with low capital when the regulations of the banking industry are loose. However, for the period of 1998-2005 after the regulations are tightened, the significant negative sign does not exist. All the coefficients are statistically insignificant. Indeed, most of the coefficients have positive sign. This may indicate that the regulations introduced in this period have been effective in moderating risk-taking in large banks to have low capital ratio.

Table 1. Regression results for capital-to-asset ratio

Year	Intercept	Slope coefficient	t-value of the slope coefficient	p-value of the slope coefficient	R^2	Standard error of regression	F-statistic
1994	0.0863***	-1.3×10^{-7} ***	-3.07	0.0055	0.30	0.0235	9.4359 ***
1995	0.0715***	-8.4×10^{-8} ***	-2.91	0.0078	0.27	0.0202	8.4846 ***
1996	0.0618***	-5.8×10^{-8} ***	-2.82	0.0096	0.26	0.0169	7.9795 ***

Table 1 (cont.). Regression results for capital-to-asset ratio

Year	Intercept	Slope coefficient	t-value of the slope coefficient	p-value of the slope coefficient	R^2	Standard error of regression	F-statistic
1998	0.0085***	3.7×10^{-8}	1.61	0.1236	0.12	0.0273	2.6096 ***
1999	0.0328***	1.08×10^{-8}	1.13	0.2740	0.08	0.0099	1.2893 **
2000	0.0335***	7.56×10^{-9}	1.08	0.2966	0.07	0.0080	1.1692 **
2001	0.0346***	6.88×10^{-9}	1.55	0.1439	0.16	0.0078	2.4175 ***
2002	0.0409***	-8.3×10^{-10}	-0.20	0.8381	0.08	0.0081	0.0436
2003	0.0445***	-4.1×10^{-9}	-1.13	0.2805	0.10	0.0077	1.2772 **
2004	0.0479***	6.56×10^{-10}	0.17	0.8649	0.10	0.0075	0.0302
2005	0.0501***	8.33×10^{-9}	1.66	0.1227	0.18	0.0103	2.7557 ***

Note: $(\text{Capital-to-asset})_i = \beta_0 + \beta_1(\text{Asset size})_i + \varepsilon_i$.
This table shows the cross-sectional univariate regression results for capital-to-asset ratio. *, **, or *** indicate statistical significance at the 10, 5, or 1% significance level, respectively.

Table 2 presents the results for the change in moral hazard of large banks associated with loan-to-asset ratio. As shown in the table, the slope coefficient is significantly positive for the period of 1994-1996, indicating that the larger banks have moral hazard associated with high loan ratio when the regulations of the banking industry are loose. However, for the period of 1998-2005 after the regulations are tightened, the significant positive sign does not exist. All the coefficients are statistically insignificant. The regulations introduced in this period have been effective in moderating risk-taking in large banks to have high loan ratio.

Table 2. Regression results for loan-to-asset ratio

Year	Intercept	Slope coefficient	t-value of the slope coefficient	p-value of the slope coefficient	R^2	Standard error of regression	F-statistic
1994	0.4203***	1.81×10^{-7} *	1.97	0.0605	0.15	0.0520	3.9129 ***
1995	0.4027***	6.43×10^{-8} **	2.09	0.0477	0.16	0.0451	4.3748 ***
1996	0.3968***	1.29×10^{-7} **	2.21	0.0370	0.18	0.0483	4.8986 ***
1998	0.3698***	6.75×10^{-8}	1.45	0.1639	0.10	0.0544	2.1058 ***
1999	0.3946***	7.49×10^{-8}	1.31	0.2081	0.10	0.0598	1.7297 **
2000	0.4350***	5.99×10^{-8}	1.05	0.3076	0.07	0.0655	1.1152 **
2001	0.4489***	1.02×10^{-8}	0.31	0.7570	0.01	0.0578	0.0998
2002	0.5219***	3.54×10^{-9}	0.12	0.9002	0.00	0.0566	0.0163
2003	0.5568***	-9.1×10^{-9}	-0.29	0.7698	0.01	0.0643	0.0895
2004	0.5555***	5.68×10^{-9}	0.17	0.8614	0.00	0.0631	0.0317
2005	0.5563***	2.43×10^{-10}	0.01	0.9933	0.00	0.0585	0.0000

Note: $(\text{Loan-to-asset})_i = \beta_0 + \beta_1(\text{Asset size})_i + \varepsilon_i$.
This table shows the cross-sectional univariate regression results for loan-to-asset ratio. *, **, or *** indicate statistical significance at the 10, 5, or 1% significance level, respectively.

Table 3 presents the results for the change in moral hazard of large banks associated with operational leverage, fixed asset-to-asset ratio. As shown in the table, the slope coefficient is positive for the period of 1994-1996 as we expected. However, none is statistically significant, and therefore, we do not have any strong evidence that the larger banks have moral hazard associated with operational leverage when the regulations of the banking industry are loose. However, for the period 1999-2005 after the regulations are tightened, the coefficient is significantly negative indicating that the larger banks have significantly reduced the risk-taking incentives to have high fixed-asset ratio.

Table 3. Regression results for fixed asset-to-asset ratio

Year	Intercept	Slope coefficient	t-value of the slope coefficient	p-value of the slope coefficient	R^2	Standard error of regression	F-statistic
1994	19.7712***	8.09×10^{-6}	0.44	0.6622	0.01	10.3972	0.1960
1995	21.3821***	1.66×10^{-5}	0.97	0.3403	0.04	11.9628	0.9479 **
1996	22.7294***	1.05×10^{-5}	0.76	0.4535	0.02	11.3816	0.5813 *
1998	155.80***	0.02×10^{-4}	0.46	0.6514	0.01	572.03	0.2109

Table 3 (cont.). Regression results for fixed asset-to-asset ratio

Year	Intercept	Slope coefficient	t-value of the slope coefficient	p-value of the slope coefficient	R^2	Standard error of regression	F-statistic
1999	67.8810***	-4.1×10^{-5} **	-2.21	0.0426	0.25	19.6014	4.9274 ***
2000	69.8130***	-5.1×10^{-5} ***	-3.09	0.0073	0.39	19.1003	9.5902 ***
2001	55.3019***	-2.3×10^{-5} **	-2.50	0.0265	0.32	16.2713	6.2552 ***
2002	43.0117***	-1.2×10^{-5} *	-2.01	0.0677	0.25	11.8677	4.0321 ***
2003	39.1866***	-1.0×10^{-5} **	-2.31	0.0392	0.31	9.4422	5.3567 ***
2004	36.3469***	-1.1×10^{-5} **	-2.76	0.0172	0.38	7.8418	7.6257 ***
2005	30.2745***	-8.1×10^{-6} **	-2.72	0.0422	0.30	7.3210	5.1639 ***

Note: $(\text{Fixed asset-to-asset})_i = \beta_0 + \beta_1(\text{Asset size})_i + \varepsilon_i$.
This table shows the cross-sectional univariate regression results for fixed asset-to-asset ratio. *, **, or *** indicate statistical significance at the 10, 5, or 1% significance level, respectively.

3.2. Ex-post risk-taking measure and profitability. Tables 4 and 5 present the results for the ex-post evaluation of large banks risk-taking behavior employing non-performing loans' ratio (ex-post risk-taking measure) and return on asset (profitability measure), respectively. Table 4 shows that the slope coefficient on asset size with respect to non-performing loan ratio is significantly positive during the period of 1994-1995. This result, combined with the results found in the previous sections, indicates that the greater risk-taking of larger banks associated with low capital and high loan ratio turns out to be very unprofitable, and therefore, could be a strong evidence that the larger banks have perverse moral hazard incentives when the regulations are loose. Overall, the greater the asset size is, the greater the risk-taking incentives are, but the more problem assets larger banks have. This is the typical moral hazard effect suggested by the literature. This conclusion is supported by the insignificant coefficient with respect to return on asset in Table 5 as well. However, after the regulations are tightened, the perverse moral hazard of larger banks disappears as indicated mainly by the insignificant coefficients with respect to non-performing loan ratio. Tables 4 and 5, respectively, show that the non-performing loan ratio of larger banks is significantly decreased and their return on asset is significantly increased in 1998 right after the regulation is tightened, indicating larger banks try to improve their risk status toward safer ones and pursue more profitable and deliberate strategies.

Table 4. Regression results for non-performing loans-to-loans ratio

Year	Intercept	Slope coefficient	t-value of the slope coefficient	p-value of the slope coefficient	R^2	Standard error of regression	F-statistic
1994	2.1050***	1.65×10^{-5} ***	4.81	0.0000	0.51	1.9460	23.23 ***
1995	3.0524***	7.33×10^{-6} **	2.58	0.0164	0.22	1.9874	6.6969***
1996	3.5318***	1.52×10^{-6}	0.63	0.5347	0.02	2.0016	0.3972
1998	12.68***	-1.1×10^{-5} *	-1.86	0.0799	0.16	6.6672	3.4432 ***
1999	9.3103***	-1.8×10^{-6}	-0.49	0.6276	0.02	3.7226	0.2452
2000	9.2209***	-4.6×10^{-6}	-1.26	0.2279	0.09	4.2413	1.5804 ***
2001	3.0272***	-1.7×10^{-7}	-0.18	0.8583	0.00	1.6948	0.0331
2002	1.7302***	1.86×10^{-7}	0.46	0.6526	0.02	0.8258	0.2130
2003	1.5853***	4.75×10^{-7}	1.12	0.2840	0.09	0.8930	1.2577 **
2004	1.5222***	1.6×10^{-7}	0.62	0.5440	0.03	0.5095	0.3899
2005	0.9853***	4.7×10^{-8}	0.41	0.6838	0.01	0.2323	0.1741

Note: $(\text{Non-performing loans-to-loans})_i = \beta_0 + \beta_1(\text{Asset size})_i + \varepsilon_i$
This table shows the cross-sectional univariate regression results for non-performing loans-to-loans ratio. *, **, or *** indicate statistical significance at the 10, 5, or 1% significance level, respectively.

Table 5. Regression results for return on asset

Year	Intercept	Slope coefficient	t-value of the slope coefficient	p-value of the slope coefficient	R^2	Standard error of regression	F-statistic
1994	0.4845***	-2.8×10^{-7}	-0.56	0.5801	0.01	0.2849	0.3153
1995	0.3166***	1.64×10^{-8}	0.03	0.9746	0.00	0.3579	0.0010
1996	0.3121***	-1.1×10^{-7}	-0.27	0.7862	0.00	0.3466	0.0752
1998	-6.6010***	7.17×10^{-6} ***	2.81	0.0113	0.30	2.9802	7.9458 ***
1999	-0.9201***	-5.2×10^{-7}	-0.21	0.8358	0.00	2.5915	0.0444

Table 5 (cont.). Regression results for return on asset

Year	Intercept	Slope coefficient	t-value of the slope coefficient	p-value of the slope coefficient	R^2	Standard error of regression	F-statistic
2000	-1.3227***	1.45×10^{-6}	0.98	0.3420	0.06	1.7113	0.9624 *
2001	0.3894***	4.0×10^{-7}	1.32	0.2094	0.12	0.5414	1.7433 ***
2002	0.6423***	-3.5×10^{-8}	-0.12	0.9006	0.00	0.5691	0.0162
2003	0.5619***	-3.7×10^{-7}	-1.04	0.3156	0.09	0.7533	1.0966 **
2004	0.7482***	1.35×10^{-7}	0.54	0.5974	0.02	0.4937	0.2942
2005	0.9023***	2.89×10^{-7}	0.91	0.3777	0.06	0.6491	0.8387 *

Note: $(\text{Return on asset})_i = \beta_0 + \beta_1(\text{Asset size})_i + \varepsilon_i$.
This table shows the cross-sectional univariate regression results for return on asset. *, **, or *** indicate statistical significance at the 10, 5, or 1% significance level, respectively.

Concluding comments

From the cross-sectional data of Korean banks before and after the regulation of banking industry was tightened in the late 1997, we find significant evidences that larger banks have very perverse, unprofitable risk-taking incentives, but only when the regulations are loose. Thus, the typical moral hazard of larger banks does exist only in the period of deregulation in our sample. After regulations are tightened, the perverse risk-taking behavior disappears and risk-taking behavior becomes more profitable. Based on our findings, the following policy implication could be derived. If consolation and merger are believed to be one of the easiest ways to capture greater market share and make higher profit, and many banks follow this wave and trend, regulators that are required to maintain the safe and sound environment for banking should understand that the resulting net effect of this pattern on the bank's risk and profitability, and therefore, on the safety and soundness of the entire banking industry will depend on the extent to which such activities are accompanied by proper monitoring of regulators.

References

1. Akhavein, J.D., Berger, A.N., and Humphrey, D.B. (1997). "The Effects of Bank Megamergers on Efficiency and Prices", *Review of industrial Organization* 12.
2. Benston, G., R. Eisenbeis, P. Horvitz, E. Kane, and G. Kaufman. (1986). "Perspectives on Safe and Sound Banking: Past, Present, and Future", *Cambridge, Mass.:MIT Press*.
3. Chen, A.H., M. Cornett, S. Mazumdar, and H. Teheranian. (1999). "An Empirical Analysis of the Effects of the FDICIA of 1991 on Commercial Banks," *Research in Finance* 17, pp. 41-64.
4. Demsetz, R.S., and Strahan, P.E. (1997). "Diversification, Size, and Risk at Bank Holding Companies," *Journal of Money, Credit, and Banking* 29, pp. 300-313.
5. Galloway, T.M., W.B. Lee, and D.M. Roden. (1997). "Banks' changing incentives and opportunities for risk taking", *Journal of Banking and Finance* 21, pp. 509-527.
6. Gunther, J.W., and Robinson, K.J. (1990). "Empirically assessing the role of moral hazard in increasing the risk exposure of Texas banks", *Federal Reserve Bank of Dallas Economic Review*.
7. Mckenzie, J.A., Cole, R.A., and Brown, R.A. (1992). "Moral hazard, portfolio allocation, and asset returns for thrift institutions", *Journal of Financial Research,* pp. 315-339.
8. O'Hara, M. and W. Shaw. (1990). "Deposit Insurance and wealth Effects: The Value of Being "Too Big to Fail", *Journal of Finance* 5, pp. 1587-1600.
9. Saunders A., E. Strock, and N.G. Travlos. (1990). "Ownership Structure, Deregulation, and Bank Risk Taking", *Journal of Finance* 2, pp. 643-654.