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RISK DIVERSIFICATION AND CORPORATE CONTROL

This study empirically examines how the efficacy of managerial stock ownership in changing agency problem or principal-agent problem is affected by the degree of the bank's risk diversification of asset portfolios using the sample of Korean banking industry. Coefficient of determination (R²) of the market model regression, which is the empirical specification of the CAPM (capital asset pricing model), is used as the measure of bank's risk diversification of asset portfolios. We found that the banks with higher degree of risk diversification increased risk more significantly than the banks with lower risk diversification as managerial ownership increases. Thus, the efficacy of managerial ownership appeared to be greater for the banks with higher risk diversification. This study suggests that a closer and more frequent monitoring by bank regulator is needed for the banks that have increased managerial ownership or insider holdings to prevent banking industry from being excessively risky without profitability being improved.

Keywords: agency problem; managerial stock ownership; corporate control; risk diversification; banking industry.

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ДИВЕРСИФІКАЦІЯ РИЗИКІВ І КОРПОРАТИВНЕ УПРАВЛІННЯ

У статті показано, як рівень диверсифікації банківських ризиків у портфелі активів залежить від ефективності підходу управлінців-акціонерів до питань принципала-агента на прикладі корейської банківської галузі. Для виміру диверсифікації ризиків у портфелі активів використано коефіцієнт змішаної кореляції регресії ринкової моделі, що є варіацією моделі оцінки фінансових активів САРМ. Виявлено, що банки з вищим рівнем диверсифікації ризиків підвищували міру ризику у міру трансформації управлінців в акціонерів, тому ефективність управління є вищою у банків з вищим рівнем диверсифікації ризиків. Передбачається, що необхідним є ретельне зовнішнє регулювання діяльності банку в разі придбання акцій його менеджерами, щоб попередити надмірний рівень ризиків за відсутності підвищення при цьому прибутковості.

Ключові слова: агентська проблема, управлінці-акціонери, корпоративний контроль, диверсифікація ризиків, банківська галузь.

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ДИВЕРСИФИКАЦИЯ РИСКОВ И КОРПОРАТИВНОЕ УПРАВЛЕНИЕ

В статье показано, как уровень диверсификации банковских рисков в портфеле активов зависит от эффективности подхода управленцев-акционеров к вопросам принципала-агента на примере корейской банковской отрасли. Для измерения банковской диверсификации рисков в портфеле активов использован коэффициент смешанной корреляции регрессии рыночной модели, являющейся вариацией модели оценки финансовых активов САРМ. Обнаружено, что банки с более высоким уровнем диверсификации рисков повышали степень риска по мере превращения управленцев в акционеров, поэтому эффективность управления выше у банков с более высоким уровнем диверсификации рисков. Предполагается, что необходимо более тщательное внешнее регулирование деятельности банка в случае приобретения акций его менеджерами, чтобы предупредить чрезмерный уровень рисков в случае отсутствия повышения прибыльности.

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Ключевые слова: агентская проблема, управленцы-акционеры, корпоративный контроль, диверсификация рисков, банковская отрасль.

I. Introduction. In finance literature it is known that stockholders would have strong incentives for risk-taking to maximize their wealth from residual cash flows. This is because their possible losses from failure of risk-taking are limited to a fixed amount of their equity investment in a company due to limited liability contract. On the other hand, managers whose compensation packages are mostly predetermined would have less incentives for risk-taking than stockholders. They would act in somewhat risk-averting manner not to incur the costs associated with risk-taking such as possible loss of job, perquisite consumption benefits they enjoyed as managers etc. Discrepancies of interests and risk-taking attitudes between stockholders and managers of firms, and the consequent loss of firm value and stock price decrease are known as an agency problem or principal-agent problem². However, agency problem is expected to decrease through managerial stock ownership. Stock ownership to managers allows them enjoy the benefits as owners, and therefore, managers when granted stock ownership would have greater incentives to align their goals and interests with those of stockholders by pursuing riskier strategies. Of course, managers would compare both positive and negative effects associated with managerial ownership and increase risk-taking, and make an optimal decision on the change in their behavior.

Agency problem or the conflict of interest problem between owners and managers is more complicated in banking because of the presence of another party, i.e., the bank regulator that sets rules and regulations on banking system, and monitors the behavior of individual banks. Several previous studies empirically examined the relationships among managerial ownership, banking industry's regulations and risk-taking. Most of these studies employed the empirical method of partitioning the full sample period into multiple sub-sample periods depending on the degree of regulations, and compare behavioral differences of banks across different regulatory regimes. Buser, Chen and Kane (1981), Saunders, Strock and Travlos (1990) examined the interactive relationships among managerial ownership, risk-taking and banking regulations. They found that managers in the banks with large proportion of stocks have greater incentives to take risk than the banks with lower proportion of stocks when banking regulations are loose. Chen, Steiner and Whyte (1998), on the other hand, found that managerial ownership and risk-taking have a significantly negative relationship based on the data over tightened banking regulation period. Cebenoyan, Cooperman and Register (1999) performed a similar analysis using thrift industry. Furthermore, they extended the analysis to profitability test. They found that the thrifts with higher managerial ownership pursue unprofitable risky strategies when banking regulations are loose and bank charter values are lower, but pursue profitable risky strategies when banking regulations are strict and bank charter values are higher.

In this study we try to add additional evidences to the previous researches on the agency problem in banking, however, focusing on different side of the issue. The pur-

² For a thorough discussion and references to many studies on agency problem, see Jensen and Meckling (1976), Benston et al. (1986), Kane (1990), and Saunders et al. (1990).

pose of this study is to empirically examine how the relation between managerial ownership and risk-taking is related to the degree of bank's risk diversification of asset portfolios.

Other things being equal, the higher (better) the degree of risk diversification of asset portfolios of a bank is, the lower the probability of bankruptcy of a bank would be. Then, in response to managerial stock ownership or insider holdings, bank managers with greater risk diversification would have more flexible and safer incentives to increase risk without caring much about the possibility of failure and further bad consequences of bankruptcy. Thus, if managerial ownership is effective in reducing agency problem or in inducing managers to be more aggressive and pursue riskier strategies, it may be presumed that the efficacy of managerial stock ownership would be greater for the banks with higher risk diversification.

Methodologically, however, instead of following the conventional approach as mentioned above, our analysis is based on the proxy variable estimated from stock market information, which may capture rapidly changing risk status of banks efficiently, and would be closely reflected in the monitoring of bank behavior by the regulator. In addition to the variables on balance sheet and other accounting statements, measuring banks' ongoing risk-taking behavior and potential profitability under continuous monitoring system of bank supervision is getting one of an increasingly important regulation tools of the bank regulator. We presume that the degree of risk diversification of asset portfolios of a bank is one of the very important variables capturing the level of the bank's true risk in very rapidly and dynamically fluctuating financial market³. Specifically, we use the coefficient of determination (R^2) of the market model regression, which is the empirical specification of CAPM (capital asset pricing model), as the proxy for the degree of bank's risk diversification of asset portfolios to examine the main issue of this study. We believe that a stock market index or market portfolio which is used as the independent variable in the market model regression would reflect the diversity and general movement of entire economy very efficiently. Then, R^2 of the market model of an individual firm would be a very good proxy reflecting the degree to which the firm is related to the diversity and general movement of the economy. Thus, R^2 of the market model could be used as a very good measure of the firm's risk diversification. That is, the banks with higher (better) risk diversification would have higher R^2 s than the banks with lower (worse) risk diversification. Several previous studies such as Barnea and Logue (1973), Roll (1988), and Demsetz and Strahan (1997) used R^2 of market model as the proxy for firm's risk diversification.

Using R^2 of the market model as the measure of bank's risk diversification, this study examines how the relation between managerial ownership and risk-taking, or the efficacy of managerial ownership on changing agency problem is affected by the degree of bank's risk diversification. As mentioned above, the expected benefits managers can achieve as owners from risk-taking would be hypothesized to exceed the expected costs or losses they have to incur as managers from bad scenarios as the bank's risk diversification is higher. That is, it may be hypothesized that the efficacy of managerial stock ownership would be greater for the banks with higher risk diversification.

³ In the latter part of this study, we include the traditionally used balance sheet risk characteristic variables of banks, too, such as capital-to-asset ratio and nonperforming loan ratio.

In the next section, we describe the sample of banks. In section 3 we describe the hypotheses to be tested and the regression model used to test them. In section 4 we present the empirical results and in section 5 offer concluding remarks.

II. Sample and Data. The data for this study are collected from several sources. Balance sheet data for each bank are taken from the Statistics of Bank Management for each year (2002 to 2008) published by the Korean Financial Supervisory Service. Stock return data for each bank are obtained from the Korea Securities Research Institute-Stock Database (KSRI-SD). The data for managerial or insider holdings are collected from the database of Korea Listed Company Association (KLCA) and annual report of each bank. There were total 14 banks in Korean banking industry including both national and regional banks 2002 through 2005 and 13 banks afterwards.

Table 1 provides the comparison of the sample descriptive statistics between higher risk-diversification (R^2) banks and lower risk-diversification (R^2) banks, and t-statistics for the difference of means between the two groups. It is shown that higher risk-diversification banks maintain significantly lower capital-to-asset ratio, and significantly higher fixed asset ratio than lower risk-diversification banks. Thus, based on finance literature's implications, higher risk-diversification banks appeared to have riskier financial and operating structures. Nonperforming loan ratio is lower and return on asset is greater for higher risk-diversification banks, however, they are not statistically significant. There is not much difference in the ratio of managerial ownership measured as the proportion of the equity held by officers and directors of a bank between the two groups. Volatility of stock returns measured as the standard deviation is significantly lower for higher risk-diversification banks.

Table 1. Sample descriptive statistics

	Higher Risk Diversification	Lower Risk Diversification	T-statistics
Capital-to-asset	0.041	0.059	-3.52***
Fixed asset-to-asset	0.032	0.021	1.95*
Nonperforming loans	1.237	1.272	-0.38
Return on asset	0.803	0.741	0.27
Managerial ownership	0.265	0.271	-0.10
Volatility of stock returns	0.063	0.097	-2.14**
Number of observations	95		

*, **, *** indicate statistical significance at the 10, 5, or 1% significance levels, respectively.

III. Testing Model, Variables and Hypothesis. To examine the relation between risk diversification and managerial ownership, we pool the cross-sectional and time-series data of the sample banks over 2002-2008, and estimate the following fixed-effect regression model (1) including the risk-diversification dummy interaction variable, $D \times$ managerial ownership. Fixed-effect specification removes a potential problem of omitted latent variables in the OLS (ordinary least square) estimation that could occur when the individual-specific component of the error term is correlated with the regressors in the model.

$$\begin{aligned}
 (\text{Volatility of stock returns})_{i,t} = & \delta_0 + \delta_{11} (\text{Managerial Ownership})_{i,t} \\
 & + \delta_{12} (D \times \text{Managerial Ownership})_{i,t} + \sum \delta_k X_{k,i,t} + \varepsilon_{i,t}
 \end{aligned}$$

D is the dummy variable for higher risk diversification taking the value of 1 if the bank belongs to the higher (better) risk-diversification group and 0 if it belongs to the lower (worse) risk-diversification group. Each year over 2002–2008, the full sample banks are partitioned at the median for R^2 of the market model regression in which stock market index (KOSPI; Korea composite stock price index) is used as the independent variable and individual stock return is used as the dependent variable. Then, the bank with higher (lower) R^2 than the median is classified as the higher (lower) risk-diversification group.

We assume that bank's risk-taking is endogenously determined from exogenously given ownership structure. We measure the bank's risk-taking as the volatility (standard deviation) of daily stock returns. Since all the balance sheet variables are year-end values, both the degree of risk diversification (R^2) and the volatility stock returns of each bank are estimated from the bank's 4th quarter daily stock returns. Managerial ownership is measured as the proportion of insider holdings, or the proportion of the equity held by officers and directors of a bank. Financial leverage, operational leverage, and GDP growth rate are used as the control variables for the banks' risk-taking ($x_{k,i,t}$ represents the K^{th} control variable for bank i at time t , $k=1,2,3$). Following the previous researches, book values of capital-to-asset ratio and fixed asset ratio are used as the measures of financial and operational leverage. Based on the presumption that higher leverage induces firms to pursue riskier strategies, a negative coefficient is expected on financial leverage, and a positive coefficient is expected on operational leverage, respectively⁴.

We test the main hypothesis, how the efficacy of managerial ownership on agency problem is related to the degree of the bank's risk diversification of asset portfolios by examining the sign and statistical significance of the coefficient δ_{12} in equation (1). Other things being equal, expected benefits are hypothesized to be greater than the expected costs associated with managerial ownership and the following risk-taking as the bank's risk diversification is higher. That is, δ_{12} is hypothesized to be a significantly positive coefficient if the efficacy of managerial stock ownership is greater for the banks with higher risk diversification⁵.

Hypothesis: $\delta_{12} > 0$.

VI. Empirical Results.

4.1. Full sample test. Table 2 presents the results for the estimation of the above fixed effects regression equation. It is shown that the coefficient δ_{12} is significantly positive, indicating that the efficacy of managerial ownership is greater for the banks with higher risk diversification, and this result is consistent with our hypothesis. Thus,

⁴First, before conducting the main hypothesis of the study, we estimate a preliminary regression without including the main hypothesis-term, D x Managerial Ownership, in the above equation. The result is shown below.

$$(\text{Volatility of stock returns}) = 0.8516^{***} + 0.0281^{**}(\text{Managerial Ownership}) + 0.6274(\text{Financial Leverage}) - 0.0361(\text{Operational Leverage})$$

As shown in the result, the significant positive coefficient on managerial ownership indicates that the banks' risk-taking becomes greater as managerial ownership increases. Thus, the sample of this study appears to support the efficacy of managerial ownership in reducing bank agency problem. *, **, *** indicate the statistical significance at the 10, 5, 1% levels, respectively.

⁵The coefficient δ_{11} , of course, indicates how the banks with lower risk diversification change their risk-taking as managerial ownership changes.

agency problem could be mitigated by increasing managerial ownership, especially when the bank's asset portfolios are well diversified. As for two control variables, capital ratio and fixed-asset ratio, both coefficients are not significant.

Table 2. Fixed-effect panel regression results for risk-taking (Full sample)

	Slope coefficient	t-statistics
Constant	0.8271***	5.38
Managerial ownership	0.0164*	1.72
$D \times \text{Managerial Ownership}$	0.0093**	1.99
Financial Leverage	0.4982	1.38
Operational Leverage	-0.0718	-0.56
GDP growth	0.5810	0.91
F-statistics	20.19***	
Adjusted R ²	0.24	
Number of observations	95	

*, **, *** indicate statistical significance at the 10, 5 or 1% significance levels, respectively. $D = 1$ if the R² of a bank is greater than the median of all the banks each year, and 0 if it is lower.

4.2. Partitioned sample test. In the above test, we found that the efficacy of managerial ownership appears to be greater for the banks with higher risk diversification. In this section, we partition the full sample into two sub-samples based on the risk characteristics of the banks. Based on the two most carefully monitored balance sheet variables by bank regulator, capital-to-asset ratio and nonperforming loan ratio, the full sample banks are partitioned into two groups at the median for each variable: safer banks and riskier banks. Safer (riskier) banks include the banks with higher (lower) capital-to-asset ratio and lower (higher) nonperforming loan ratio.

After partitioning the full sample into two groups, we examine how the efficacy of managerial ownership in changing bank risk-taking differs between the two groups by estimating the following fixed effect regression model (2). In the model, D_1 is the dummy variable for higher risk diversification as in the section 4.1, taking the value of 1 if the bank belongs to the higher risk-diversification group and 0 if it belongs to the lower risk-diversification group. D_2 is the dummy variable for safer risk characteristics taking the value of 1 if the bank belongs to higher capital-to-asset ratio (lower nonperforming loan ratio), and 0 if it belongs to lower capital-to-asset ratio (higher nonperforming loan ratio). Then, the coefficient δ_{13} will reflect how much the change in the risk-taking of the banks with higher risk diversification and higher capital-to-asset ratio (or lower nonperforming loan ratio) differs from that of the banks with higher risk diversification and lower capital-to-asset ratio (or higher nonperforming loan ratio)⁶.

$$\begin{aligned} (\text{Volatility of stock returns})_{i,t} = & \delta_0 + \delta_{11}(\text{Managerial Ownership})_{i,t} \\ & + \delta_{12}(D_1 \times \text{Managerial Ownership})_{i,t} + \\ & \delta_{13}(D_1 \times D_2 \times \text{Managerial Ownership})_{i,t} + \sum \delta_k x_{k,i,t} + \varepsilon_{i,t} \end{aligned}$$

Tables 3 and 4 present the results for the test in which bank risk characteristic is measured as the bank capital-to-asset ratio and nonperforming loan ratio, respectively. It is shown that δ_{13} is significantly positive in both tables. This result indicates that the positive association between risk diversification and the efficacy of manage-

⁶ Then, the coefficient δ_{12} represents the degree to which the banks with higher risk diversification and lower capital-to-asset ratio (or higher nonperforming loan ratio) change their risk-taking with respect to the change in managerial ownership.

rial ownership is more strongly and significantly observed for the set of banks with safer risk characteristics such as higher capital ratio and lower nonperforming loan ratio. This result can be understood if we consider that higher capital ratio and lower nonperforming loan ratio could serve as buffers against risk-taking as higher risk diversification does minimizing the possibility of incurring the worst consequences from risk-taking.

Table 3. Fixed-effect panel regression results for risk-taking

	Slope coefficient	t-statistics
Constant	0.7561***	6.17
Managerial ownership	0.0219*	1.67
$D_1 \times$ Managerial Ownership	0.0105*	1.81
$D_1 \times D_2 \times$ Managerial Ownership	0.0082*	1.80
Financial Leverage	0.5192	1.10
Operational Leverage	-0.0481	-0.47
GDP growth	0.5561	0.94
F-statistics	18.28***	
Adjusted R ²	0.26	
Number of observations	95	

This table shows the slope coefficients and t-statistics from the fixed-effect panel regression for the partitioned sample at the median of capital-to-asset ratio each year over 2002-2008. *, **, *** indicate statistical significance at the 10, 5 or 1% significance levels, respectively. $D_1 = 1$ if R^2 of a bank is greater than the median of all the banks each year, and 0 if it is lower. $D_2 = 1$ if the capital-to-asset ratio of a bank is greater than the median of all the banks each year, and 0 if it is lower.

Table 4. Fixed-effect panel regression results for risk-taking

	Slope coefficient	t-statistics
Constant	0.8201***	6.01
Managerial ownership	0.0172*	1.72
$D_1 \times$ Managerial Ownership	0.0168*	1.65
$D_1 \times D_2 \times$ Managerial Ownership	0.0173**	2.05
Financial Leverage	0.3417	1.32
Operational Leverage	-0.0627	-0.81
GDP growth	0.5810	0.82
F-statistics	20.16***	
Adjusted R ²	0.25	
Number of observations	95	

This table shows the slope coefficients and t-statistics from fixed-effect panel regression for the partitioned sample at the median of nonperforming loan ratio each year over 2002-2008. *, **, *** indicate statistical significance at the 10, 5 or 1% significance levels, respectively. $D_1 = 1$ if the R^2 of a bank is greater than the median of all the banks each year, and 0 if it is lower. $D_2 = 1$ if the nonperforming loan ratio of a bank is lower than the median of all the banks each year, and 0 if it is greater.

4.3. Performance test. In the above, we found that managers in the banks with higher risk diversification tend to have greater risk-taking incentives as managerial ownership increases than in the other group of banks. To evaluate the effectiveness of this greater risk-taking, we need to examine whether it resulted in better performance or higher profitability. If it results in higher profitability, we may be able to evaluate that managers have optimally increased risk than before, which would increase firm value. But if the increase in risk-taking does not turn out profitable, we may have to be cautious in supporting the efficacy of increased risk-taking on reducing agency problem.

To examine whether the increased risk-taking of the banks with higher risk diversification as managerial ownership increases resulted in higher profitability, we estimate the same fixed effect regression model (1), using bank profitability measured by the return on asset as the dependent variable.

Table 5. Fixed-effect panel regression results for performance

	Slope coefficient	t-statistics
Constant	0.1528*	1.84
Managerial ownership	-0.0716	-1.05
$D \times \text{Managerial Ownership}$	0.0591	0.96
Financial Leverage	0.0318	1.04
Operational Leverage	0.2861*	1.70
GDP growth	0.0316*	1.87
F-statistics	8.29***	
Adjusted R ²	0.31	
Number of observations	95	

This table shows the slope coefficients and t-statistics from the fixed-effect panel regression for the full sample, 2002-2008. *, **, *** indicate statistical significance at the 10, 5 or 1% significance levels, respectively. $D = 1$ if the R^2 of a bank is greater than the median of all the banks each year, and 0 if it is lower.

As shown in Table 5, the coefficient δ_{12} is positive, however, is not statistically significant. So we conclude that the increased risk-taking of the banks with higher risk diversification as managerial ownership increases has not resulted in significantly higher profitability than for the other banks. Overall, combining this result with the results in the previous section regarding risk-taking, granting managerial ownership appeared to be effective in mitigating agency problem by inducing banks to take more risk, however, it did not result in better performance. Thus, we may have to be very cautious in supporting the efficacy of managerial ownership in reducing agency problem. This study suggests that a closer and more frequent monitoring by bank regulator is needed for the banks that have increased managerial ownership or insider holdings to prevent banking industry from being excessively risky without profitability being improved.

VI. Concluding Remarks. This study empirically examines how the efficacy of managerial stock ownership in changing agency problem or principal-agent problem is affected by the degree of the bank's risk diversification of asset portfolios using the sample of Korean banking industry. Coefficient of determination (R^2) of the market model regression, which is the empirical specification of the CAPM (capital asset pricing model), is used as the measure of bank's risk diversification of asset portfolios. We found that the banks with higher degree of risk diversification increased risk more significantly than the banks with lower risk diversification as managerial ownership increases. Thus, the efficacy of managerial ownership appeared to be greater for the banks with higher risk diversification. Considering that the managers in higher risk diversification would less incur the negative consequences from risk-taking than the managers in lower risk diversification, their willingness to align their interests with those of stockholders would be greater. Thus, agency problem could be reduced by increasing managerial ownership, especially when the bank's asset portfolios are well diversified. However, we have not found any evidence that such change in risk-taking behavior resulted in better performance. Thus, we may have to be very cautious in

supporting the efficacy of managerial ownership in reducing agency problem. This study suggests that a closer and more frequent monitoring by bank regulator is needed for the banks that have increased managerial ownership or insider holdings to prevent banking industry from being excessively risky without profitability being improved. In the tests for the partitioned samples, the positive association between risk diversification and the efficacy of managerial ownership is more strongly and significantly observed for the set of banks with safer risk characteristics such as higher capital ratio and lower nonperforming loan ratio.

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