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Risk-Seeking Behavior of Financial Institutions due to Deposit Insurance: Evidence from Korea

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Abstract

The purpose of this paper is to examine how the social system of deposit insurance affected the financial market in Korea. Specifically, we want to know how much the risk-seeking behavior of financial institutions has increased or decreased. The most important feature of the deposit insurance system is to prevent the insolvency of financial institutions and to properly protect depositors. In recent studies, it has been argued that characteristics of deposit insurance bring moral hazard of financial institutions and that financial institutions make unreasonably risky investments. Therefore, in this study, we will first examine whether such previous research can be applied to the Korean financial market. Next, we will examine the appropriateness of the differential premium rate that is currently used for each financial institution in the Korean financial market. In order to test the first hypothesis, we used the Capital Asset Pricing Model (CAPM) to calculate the total risk for each financial institution. As a result, significant changes were found in all regions before and after the introduction of the deposit insurance system. As for testing the second hypothesis, we conducted a variance analysis of financial institutions' indexes before and after the introduction of the deposit insurance and we discovered significance of the total risk difference.

Keywords: Deposit Insurance, Insurance, Risk, CAPM, Financial Market.

JEL Classification Code: G12, G18, G22.

1. Introduction

The deposit insurance system is designed to prevent the rush of deposits when financial institutions confront a danger of bankruptcy. The deposit insurance system allows depositors to secure their own fixed amount of deposits systematically and at the same time, financial institutions can prevent the instability of the financial system caused by sudden deposit withdrawals.

Therefore, it can be said that the deposit insurance system is a system of social insurance designed for public purpose unlike private insurance. Thus, research on the effectiveness of the deposit insurance system is valuable for its necessity in society. Especially, such research is even more meaningful since it is the first time in Korea to research the difference between different financial institutions. This study has the following purpose and contents.

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First, the purpose of this study is to ascertain how the deposit insurance system - introduced in the Korean financial market in 1997 - affected the risk seeking behavior of financial institutions. In fact, until now most of the existing studies were based on banks. However, in this study, bank, securities, and insurance companies, which are the three main characters of Korean financial market, were analyzed. Monthly returns from 1985 to 1996 were set in advance using the differentiated index of three regions and postmarked monthly returns from 1997 to 2012 since the introduction of deposit insurance.

Secondly, we will look over how these risk seeking behaviors have changed before and after the introduction of the deposit insurance system and verify whether these changes are statistically significant. We will analyze three types of financial regions by t test, and verify whether the difference in total risk is statistically significant. If the results are validated, it can be inferred that the deposit insurance system has impacted each region. Finally, in Korea, the deposit insurance system, which is currently being implemented, has a different premium rate for each of the three financial institutions. If we only consider the basic premium rate, the bank is 0.08%, and the security company

and insurance company are 0.15%. Therefore, the results of this study will be discussed as to whether the current differential premium rate is reasonable or not.

Now, after 20 years have passed since the introduction of the deposit insurance system, we can study the effect of the deposit insurance system and figure out the differentiation of the insurance premium rate among the three regions by studying the deposit insurance system in Korea.

2. Literature review

Existing studies related to the deposit insurance have been largely conducted in three areas: corporate risk-taking behavior, optimal capital structure of firms, and premium rate calculation. Kareken and Wallace (1978) stated that the absence of deposit insurance is a factor that allows banks to operate safely and that banks are excessively risk-seeking in the presence of deposit insurance. This means that choosing the appropriate regulation can be advantageous for the government operating the system. Diamond and Dybvig (1983) studied mathematical models of the trade-off relationship between moral hazard and the risk-seeking portfolio of banks that could result from the deposit insurance system. Recently, Vesala and Jukka (2001) have led a study on the relationship of stakeholders centered on deposit insurance. Anginer and Demirguc-Kun (2002) have also examined the relation between deposit insurance and bank risk and systemic fragility in the years leading to and during the recent financial crisis.

Houston (1997) analyzed friction factors of the market and the internal capital market in the banking industry to investigate the relationship between total lending and deposit insurance, including profitability of bank, self-basis weight, and liquidity. Froot and Stein (1998) emphasized the need for risk management in terms of funding and capital structure by studying the structure of banks' risks, capital and budgets. Cebenoyan and Strahan (2004) found that banks tend to have less capital than others and tend to increase lending to firms that are seeking risk. Thus, if there is a safety net such as deposit insurance, banks will have a more risk-seeking type of capital structure. Angkinand and Wihlborg (2010) analyzed specifically how government ownership, foreign ownership and shareholder rights affect the disciplinary effect of partial deposit insurance systems in a cross-section analysis of industrial and emerging market economies.

One of the biggest issues regarding this kind of deposit insurance is how much the deposit insurance rate should be. As a result, the debate on the premium rate has continued since the introduction of the deposit insurance system. Merton (1974) developed the credit risk model as a framework of the general equilibrium model and provided a basic methodology for calculating the premium rate of premium insurance. Since then, many models of premium calculation have been studied and Chava and Jarrow (2002) have suggested that periodic returns should be used to generate a cyclical risk premium. Moreover, unlisted financial institutions have suggested a way to differentiate the systematic risk premium according to the credit rating.

In contrast to many issues of deposit insurance, this study compares the risk-seeking behaviors of financial institutions before and after the introduction of deposit insurance through index analysis. In addition, we analyzed whether these pre and post comparisons are meaningful changes and whether the premium rates of financial institutions are appropriate. This study will provide a basis for evaluating the practical effects of deposit insurance and making judgments about the effectiveness of the system. In addition, it can be the rational estimation of the deposit insurance rate, which is perceived as a permanent burden on financial institutions.

3. Data and Empirical Method

3.1. Data Description

In this study, KOSPI, bank index, security company index and insurance company index were used. The data was provided from the Bloomberg Korea branch from 1985 to 2012 based on the KOSPI index, the bank index, the security company index, and the insurance company index. In particular, index data is the data that Bloomberg used to make individual stocks a weighted average for investment. Therefore, we could reduce the non-systematic risk that may arise from the comparison of individual stocks. Since the index data was provided in 1985, it was compared to 1985 as a starting point. Until 1996, the preliminary period before the introduction of deposit insurance was 12 years. The period from 1997 to 2012 (16 years) was when the deposit insurance was introduced. Monthly yields of these data were obtained and used as basic data for analysis. We can see that there is virtually no limit of 15%, which is the daily change rate, because we used the monthly return. The figure below shows the distribution of the time series data, which also includes the case where the fluctuation of the monthly return exceeds 60%. Therefore, more accurate volatility could be tracked. We used the monthly variance of the index to test the significance of the pre and post total risk values and to test whether the total risk variance by banking sector is significant. The monthly distributions for each region are 144 data in terms of pre-total risk and 192 data in terms of the post-total risk. Through analysis of

these distributions, we could determine whether we can take the total risk and beta value calculated through CAPM as a meaningful value. And the important research methodology in this study is to prove whether it is significant for this total risk outcome value. The results were verified by T-test and ANOVA.

3.2. Beta and Total Risk estimates with CAPM

If the monthly rate of return is used as the base data and the rate of return moves in both the negative and positive direction, it can be said that the industry's tendency to take risk is high. We divide the monthly return data before and after the introduction of deposit insurance, calculate the β value for each region derived through CAPM and calculate the total risk for each region. In this way, we can see how sensitive the market is and how the risk-seeking behavior has changed before and after introduction of the deposit insurance through the total risk. The basic concept of calculating total risk and beta value used in this study is based on the following CAPM methodology.

$$E(R_i) = R_f + [E(R_m) - R_f]\beta_i$$

Where,

$E(R_i)$: Expected Return on the security i

R_f : Risk free rate

$E(R_m)$: Expected Return on Market portfolio

$[E(R_m) - R_f]$: Market Risk Premium

β_i : Beta of security i

$$R_{it} = E(R_{it}) + \beta_i \delta_{mt} + \varepsilon_{it}$$

Where,

$$\beta_{it} = \frac{Cov(R_{it}, R_{mt})}{Var(R_{mt})}$$

$$\sigma_j^2 = \beta_j^2 \sigma_m^2 + \sigma_\varepsilon^2$$

Where,

σ_j^2 : Total Risk of security i

$\beta_j^2 \sigma_m^2$: Systematic Risk

σ_ε^2 : Firm-specific Risk

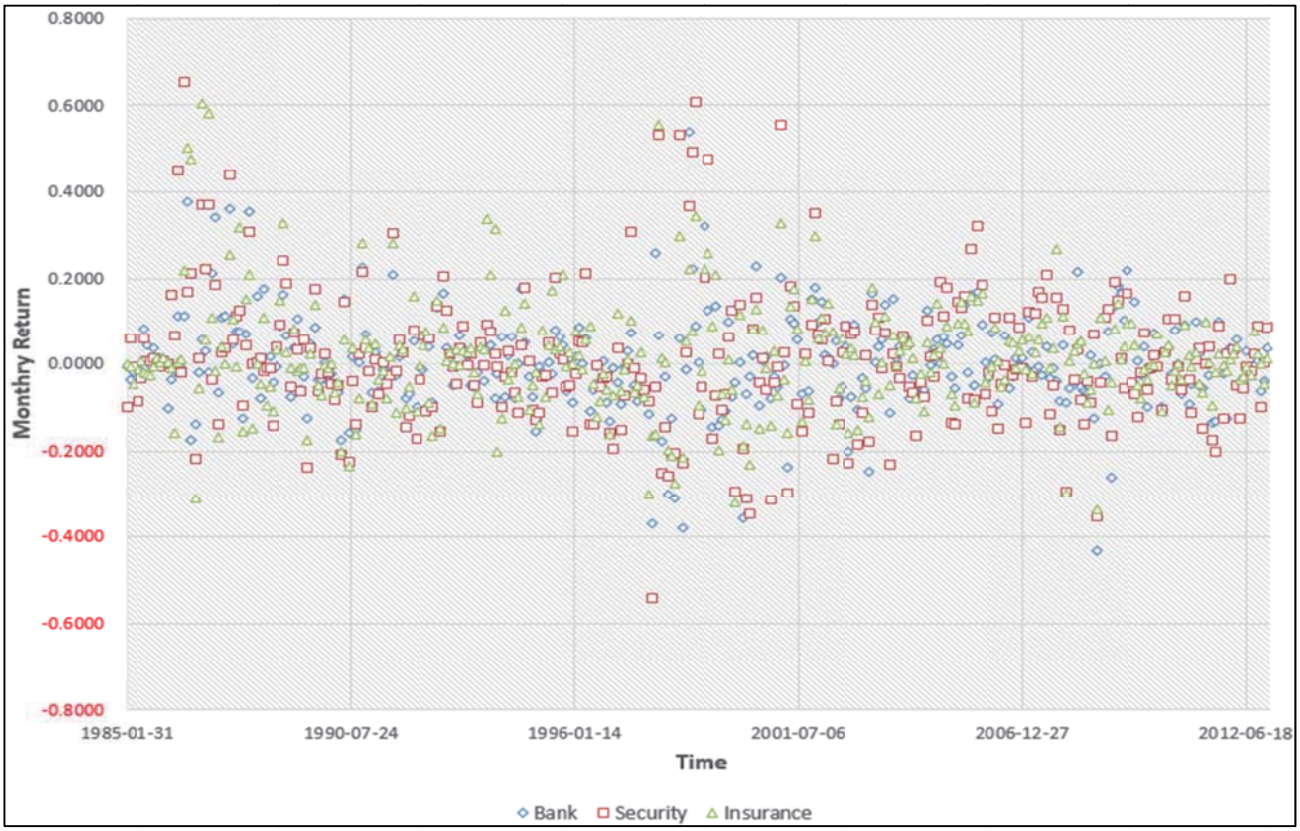

Figure 1: This diagram is a graphical representation of the monthly returns of the indexes of banks, securities and insurance from 1985 to 2012. We can compare the difference between before and after the introduction of the deposit insurance by measuring the variance of return, and we can find how sensitive it is to the market by using the covariance with the market.

The results obtained using the CAPM methodology are shown in the table below. Looking at the table, the total risk increased in banks and securities after the introduction of the deposit insurance system. However, after the introduction of the insurance system, the total risk in insurance has decreased. Although previous studies have claimed that the total risk will increase as the risk-seeking behavior increases, the data manifests that the insurance companies in Korea have a lower total risk. The significance of this phenomenon is verified through the following significance review model. If the total risk reduction of the insurance is significant, it also means that a change in the insurance rate currently being applied is required. Therefore, the validity of our analysis will be verified through the following statistical test.

Table 1: The total risk and beta of the sector before and after the introduction of deposit insurance

Group		Before 1997	After 1997
Bank (a)	β	1.045	0.905
	σ^2	0.0098	0.0143
Securities (b)	β	1.329	1.459
	σ^2	0.0181	0.0279
Insurance (c)	β	1.219	1.039
	σ^2	0.0204	0.0145

3.3. Empirical Model

H 1: There will be a significant total risk difference due to introduction of the deposit insurance system.

H 2: Banks, securities, and insurance will have significant total risk differences.

If Hypothesis 1 is proved, it is possible to take the difference of total risk of each sector before and after the deposit insurance system as a meaningful difference and further discussion on change of the value is possible. In addition, if Hypothesis 2 is proved, it can be said that the differential insurance rate system for each sector, which is currently implemented in Korea's deposit insurance system, is meaningful. Also, with Hypothesis 2 proved, we can discuss the change in standard for deciding additional insurance rate in the future according to the change of total risk that we measured.

The data collected in this study were analyzed using the SPSS 25.0 program. First, the independent sample t-test and the Wilcoxon Signed Ranks test were conducted to verify the variance of the monthly return variance from 1997 onwards. Second, one-way ANOVA and Kruskal wallis test were used to test the variance of monthly return variance by financial sector. Dunnett T3 and Mann-Whitney U test were used for post-test.

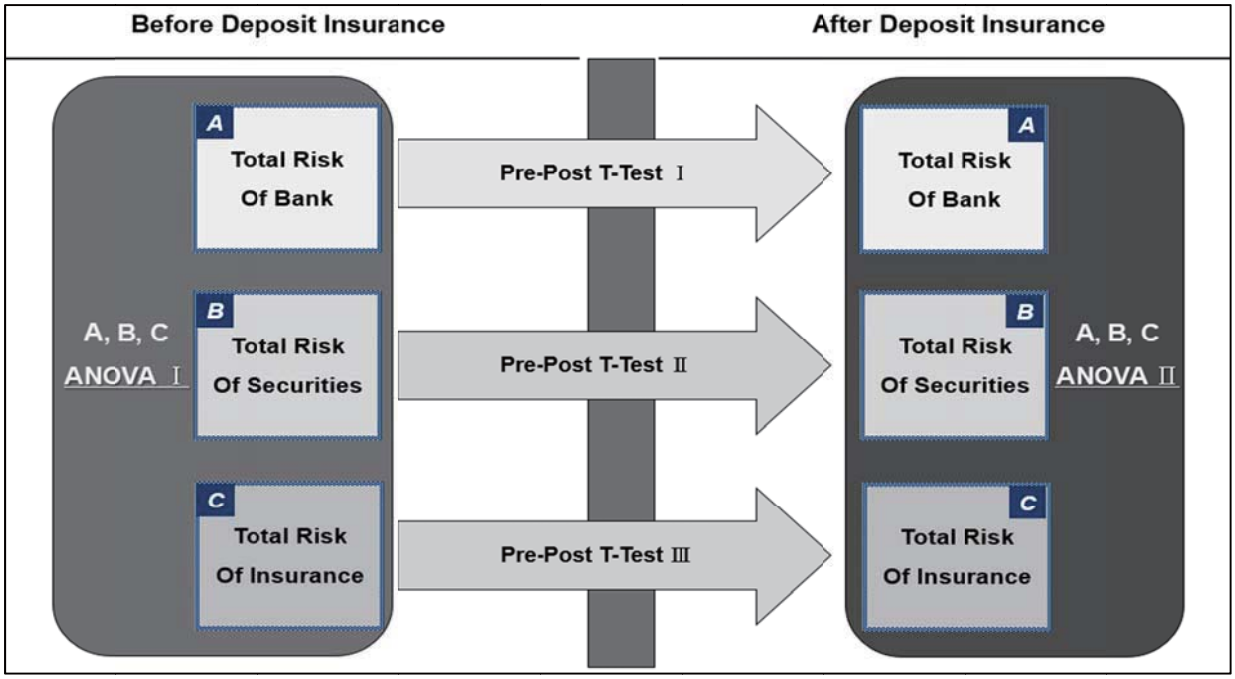

Figure 2: This figure gives a straightforward explanation for the hypothesis of this study. It is necessary to prove that the beta value and the total risk calculated through CAPM are indeed meaningful figures. Therefore, to prove the first hypothesis, we conducted a T-test using monthly total risk as the baseline data. In order to prove the second hypothesis, we analyzed the monthly total risk variance of banks, securities and insurance before and after the introduction of the system.

4. Main Results

4.1. Estimation Results: Significance of total risk difference before and after introduction of deposit insurance

Next, to determine the general tendency of each variable, the mean and standard deviation were calculated and the skewness and kurtosis values were confirmed to verify whether the data was normal or not. As shown in Table 2 below, all of the variables have a range of .912 ~ 2.407 and a kurtosis range of 1.275 ~ 7.024, except for the monthly return variance of the securities after the introduction of the system. The absolute value of the kurtosis is less than 3 and the kurtosis is 10, proving that the data has normal distribution. However, after the introduction of the system, the variance of monthly returns of securities exceeded 10. Thus, it was confirmed that it did not meet the basic assumption for normal distribution. In the analysis after this, the nonparametric statistical method was used to analyze this variable.

Table 2: Technical Variables of Major Variables (by Region, Monthly Total Risk)

	Mean	Std. Dev.	Skewness	Kurtosis
Bank (before)	.0003	.0003	1.513	2.819
Security (before)	.0004	.0003	1.262	2.459
Insurance (before)	.0003	.0002	.912	1.275
Bank (after)	.0007	.0008	2.407	7.024
Security (after)	.0011	.0012	2.960	12.709
Insurance (after)	.0007	.0007	2.250	5.875

The figure below shows the monthly return variance of each of the three pre- and post-crisis regions. As a result, we can see that distribution of the monthly returns has increased since the introduction of the system in all regions. In addition, although dispersion is increasing, the volatility of the dispersion is stabilizing downward.

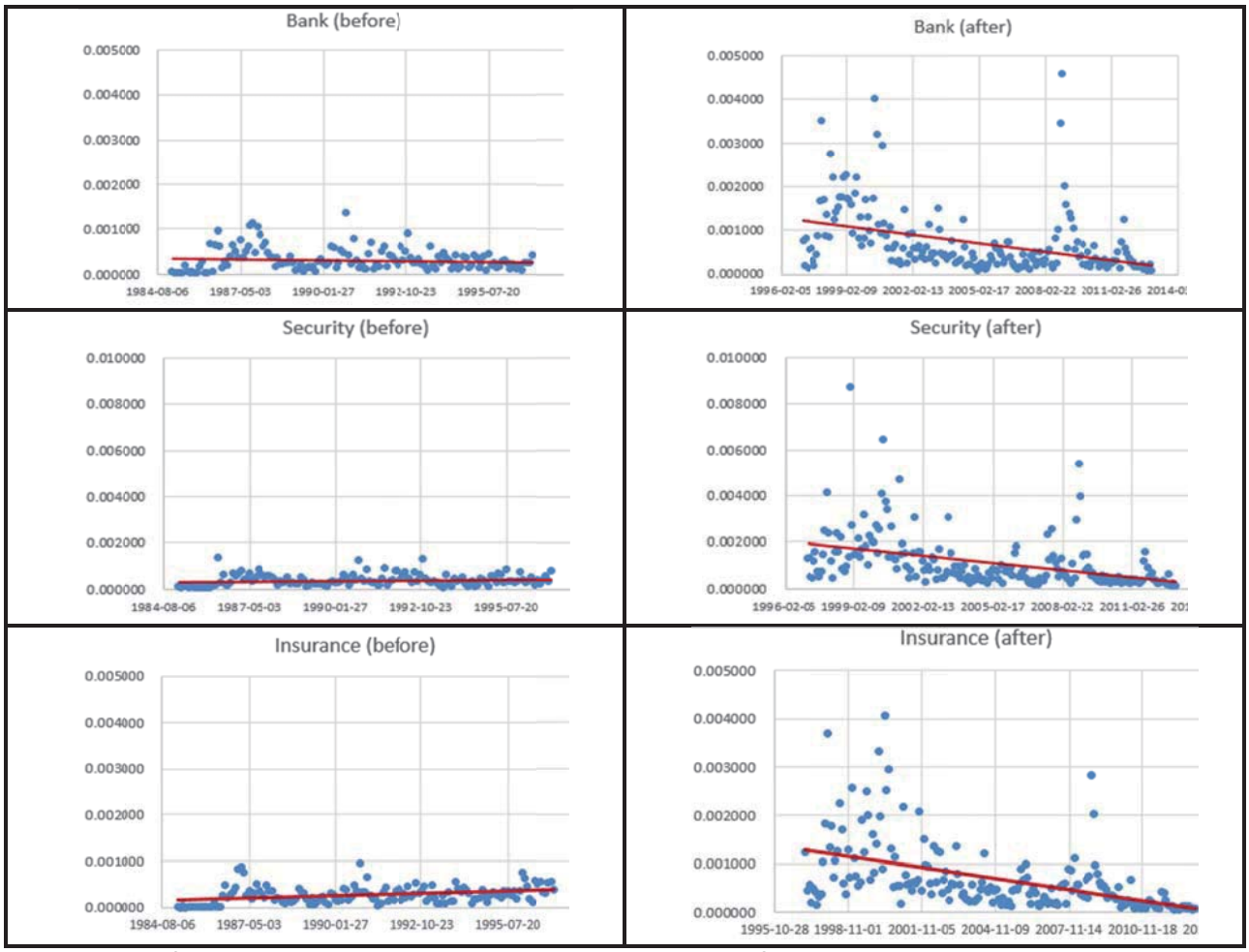

Figure 3: This figure is the data that is calculated by dividing the monthly return of banks, securities and insurance indices monthly.

In order to verify the difference in the monthly return variance according to different type of industry, banks and insurance were tested by independent t-test and securities were checked by Wilcoxon Signed Ranks test. The results are shown in Table 3. The result indicates that the difference of the monthly return variance after the introduction of the system is the bank (t = -6.89 p <.001), securities (Z = -8.86 p <.001) and insurance (t = -7.73 p. 001), respectively. Specifically, banking, securities and insurance have a larger monthly variance of return after introducing the system.

Table 3: Verification of monthly variance by each sector

Variable	Group	N	M±SD or M rank	*t* or *Z*
Bank	Before	144	.0003±.0003	-6.89***
	After	192	.0007±.0008	
Security	Before	144	114.29	-8.86***
	After	192	209.16	
Insurance	Before	144	.0003±.0002	-7.73***
	After	192	.0007±.0007	

***p<.001

4.2. Estimation Results: Analysis of variance within the region through analysis of variance of banks, securities and insurance

4.2.1. Difference of variance of the monthly return before deposit insurance

In order to verify the difference of monthly variance before the introduction of the system according to different type of industry, one-way ANOVA was conducted and Dunnett T3 was applied in post - test. The results are shown in table 4. As a result of the analysis, it was found that the monthly variance difference before the introduction of the system based on each industry was significant. (F = 5.53, p <.01) Specifically, it was confirmed that the monthly variance of securities was higher than that of insurance. Considering the results of Table 4, it can be said that there is a significant difference in distribution between bank, securities and insurance before introduction of deposit insurance. Therefore, the differential premium rate system, currently applied in Korea, is a reasonable system.

Table 4: Difference of the variance of the monthly return before deposit insurance

Group	*N*	*M±SD*	*F*	*Dunnett T3*
Bank (before)	144	.0003±.0003	5.53**	C>b
Security(before)	144	.0004±.0003		
Insurance(before)	144	.0003±.0002		

**p<.01

4.2.2. Difference of variance of the monthly return after deposit insurance

The Kruskal wallis test was conducted to examine the variance of monthly return variance after introducing the system for each sector. The results are shown in Table 5. The result implies that the difference of monthly return variance after the introduction of the system according to the industry was significant (= 30.13, p <.001). Specifically, it was confirmed that the rate of change in interest rates of securities was higher than that of banks and insurance.

Table 5: Differentiating the monthly variance of profit after introducing the system according to the type of industry

Group	N	Mean Rank	X^2	Mann-Whitney U
Bank (after)	192	264.82	30.13***	b>a, c
Security(after)	192	342.21		
Insurance(after)	192	258.47		

***p <.001

Through the analysis of significance before and after the introduction of the system and the analysis of variance analysis of each bank, securities and insurance area, we could conclude that the total risk and beta value initially derived from the CAPM are significant. Therefore, Hypothesis 1 (there will be a significant total risk difference due to the introduction of the deposit insurance system) and Hypothesis 2 (bank, securities and insurance will have a significant total risk difference) proved to be valid. We can now discuss the differences in pre and post total risk for each financial institution and address the importance of the results from variance analysis.

5. Concluding Remarks

The deposit insurance system was introduced in many countries to avoid the 'Bank Run' of financial market. In fact, this system played a major role in protecting depositors' assets and maintaining financial stability when there is an external shock to financial market. However, there has been a lack of research into the changes in financial market before and after the introduction of deposit insurance. In particular, unlike the previous studies that focused on bank, this study extended the scope of analysis to securities and insurance companies.

Using CAPM, we calculated the beta and the total risk for bank, securities and insurance and this research also verified whether such values are significant. As a result, changes in the total risk after the introduction of the deposit

insurance system showed meaningful results. Not only that, it was shown that while the total risk of banks and securities firms increased, the total risk for insurance companies declined. As a result, the deposit insurance system has caused a total risk increase in banks and security companies in the Korean financial market, but it has reduced the total risk for insurance company. Therefore, it seems that additional research is needed to investigate what causes such reduction of the total risk for insurance company.

Next, the analysis of variance covers all periods before and after the introduction of the insurance system as to whether the differential premium rate system operated by Korean financial market is reasonable enough. The result showed that there was a difference in the variance of the total risk for financial institutions and accordingly, we can conclude that the method of differentiating insurance rates by institution is still reasonable. However, since the portion of the insurance industry's total risk after the introduction of the deposit insurance system has not been reflected in the differential premium rate system, it is necessary to discuss the premium rate system linked to the increase or decrease in the total risk. Particularly, although the difference in total risk variance between securities and insurance appears to be large, they are paying same deposit insurance premium. Additional research is needed discus these irrational premium problem.

The deposit insurance system has significantly contributed to stabilization of the financial market in Korea. Although there were many financial market crises since the introduction of the system, the deposit insurance system played an important role in protecting depositors' assets and preventing bank-run. While we cannot deny such an important role of deposit insurance, it is time to make up for sophisticated problems such as more elaborate and accurate measurement of premium rates.

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