

Depositor Discipline of Mutual Savings Banks in Korea

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Abstract

This paper verified whether coverage limit-exceeding depositors withdraw or decrease their deposits based on the risk-seeking behavior of mutual savings banks even if the number of depositors are small and whether mutual savings banks in management crises present a relatively high-risk premium to attract deposits in order to verify the existence of depositor discipline for mutual savings banks. This is contrary to the perception that depositor discipline will not function as most of the deposits in mutual savings banks are included as targets for protection by the deposit insurance system. Next, the results of a verification of regional characteristics showed that there were no regional differences in depositor discipline. This seems to be because the information and communication technology in Korea is so developed that there is no information gap between urban and rural areas. Lastly, we divided the analysis period for mutual savings banks into the periods 2007 to 2010 before insolvencies were visible, 2011 to 2014 when restructuring was taking place, and 2015 to 2016 after the completion of the restructuring. The results were that asset soundness had a tendency to be given more importance when restructuring was ongoing, and after restructuring was complete. Despite these analysis results, this paper still has some issues to face, which we would like to identify in the following. First, to allow depositor discipline to function, information about mutual savings banks must be disclosed more transparently to ordinary depositors. Next if the monitoring by the supervisory organizations is lacking and if not even the depositor discipline is functioning properly, it is necessary to reevaluate the current deposit insurance system as a whole, to lower coverage limits to make depositor discipline function properly.

Keywords: Deposit Insurance, Moral hazard, Market Discipline, Depositor Discipline, Mutual Savings Banks

1. Introduction

As a result of numerous rounds of restructuring, the number of mutual savings banks in Korea, one of the representative financial institutions for the working classes, has greatly decreased in Korea from 231 in 1997 to 80 as of June 2017. However, despite efforts at restructuring, the management conditions in mutual savings banks remain in a vulnerable state, and it is difficult to predict when the effects of another round of restructuring will occur. Generally, mutual savings banks have a simple business model of attracting depositors by providing a relatively higher deposit interest rate than banks, lending to high-risk borrowers at a high loan interest rate and earning profits through the interest margin between the two. However, due to the deterioration of the economic environment after 2009, many large savings banks went bankrupt or were merged as the soundness of loan assets rapidly deteriorated. Some scholars argue that this result for mutual savings banks is due to the delay in regulation by supervisory authorities and the dysfunction of the deposit insurance system. That is, the supervisory authorities did not properly monitor the risk taking of the mutual savings banks, and there is no incentive to monitor the mutual savings banks as most of the depositors had deposit amounts below the deposit insurance coverage amount. From this context, this dissertation's purpose is to verify the existence of market discipline, especially focusing on depositor discipline regarding mutual savings banks. That is, the purpose is to examine whether a few large depositors make market discipline work even in a situation where most depositors have covered deposits below 50 million won. For this purpose, we use financial data from mutual savings banks and macroeconomic indicators, to examine the response of depositors following various indices of mutual savings banks using changes in uninsured deposits exceeding the coverage limit of 50 million won, net excess deposits (note 1), and deposit interest rates.

First, in Section 2, we will examine the current status and characteristics of mutual savings banks. In Section 3, we will summarize the concepts of market discipline and depositor discipline as well as related literature in Korean and overseas research, and in Section 4, we will describe basic data and the analysis model. Next, in Section 5, we will summarize the results of the empirical analysis, and finally, in Section 6, we will conclude by describing future improvement directions.

2. The Current Status and Characteristics of Mutual Savings Banks

2.1 The Current Status of Mutual Savings Banks

After 2010, as the insolvency of project finance (PF) loans came into full force, the number of savings banks greatly decreased as restructuring was conducted to solve this issue. <Table 1> shows the status of savings banks restructuring. Savings banks numbered 110 in late 2007 but, after going through the crisis caused by non-performing loans, were reduced to 79 as of December 2016. If we examine this by year, the restructuring of savings banks rapidly increased after 2011 with 12 banks in 2011 and 11 banks in 2012 closing, and in 2013 and 2014 when ongoing restructuring was implemented, five banks and four banks were closed, respectively.

Table 1. Status of Savings Banks Restructuring by Year (As of November, '14, Unit: Banks)

Category	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	
Number of Banks at start of period	110	108	106	105	105	98	93	89	80	79	
Reduction	Purchase and Assumption(P&A)	4	2	2	1	12	11	5	4	-	-
	M&A(Mergers)	-	-	-	-	-	-	1	8	1	-
	Insolvency	-	-	-	-	-	-	-	-	-	-
Increase	Establishment	2	-	1	1	5	6	2	3	-	-
Number of Banks at end of period	108	106	105	105	98	93	89	80	79	79	

Source: Financial Supervisory Service, Financial Statistics Information System

As such restructuring was conducted, the asset size of mutual savings banks was reduced by a large amount after reaching its peak in June 2010. This is because many savings banks that were restructured were large savings banks, and existing savings banks were not able to find suitable places to invest their assets, leading to difficulties in securing sources of profit, which then caused the asset size of savings banks to greatly decrease. As a result, they were faced with a situation in which the existence of the savings banking industry itself was at risk.

<Table 2> shows the balance of loans and deposits, as well as asset change of savings banks. The net credit of savings banks decreased by about 37% from 43.6 trillion won in June 2007 to 27.3 trillion won in June 2014 when restructuring was being conducted, before recovering to 39.5 trillion won in June 2016 when restructuring was concluded. Meanwhile, as the need for capital raising decreased following the reduction in loan amounts, the deposits of savings banks started decreasing after recording a peak of 76.4 trillion won in 2010 to 30.7 trillion won in June 2014, before remaining at 39.2 trillion as of June 2016 following some increases.

Table 2. Balance of loans and deposits, and asset change in savings banks (Unit: Trillion won, %)

	End of Jun. '07	End of Jun. '08	End of Jun. '09	End of Jun. '10	End of Jun. '11	End of Jun. '12	End of Jun. '013	End of Jun. '14	End of Jun. '15	End of Jun. '16
Net credit	43.5	50.7	57.0	62.4	58.3	40.5	29.1	27.6	32.2	39.5
Corporate loans	35.7	43.2	49.2	53.5	48.1	29.3	19.4	17.8	19.1	22.5
Household loans	7.1	7.0	6.9	7.4	9.3	10.6	9.3	9.2	12.5	16.5
Deposits	46.5	56.0	65.9	76.4	71.1	51.5	36.9	30.7	34.3	39.2
Loan-deposit ratio	93.5	90.5	86.5	81.7	82.0	78.6	78.9	89.9	93.9	100.8
Delinquency rate	13.7	14.0	15.8	12.8	15.8	21.6	21.5	17.9	11.6	7.6
Assets	53.1	63.5	74.8	86.3	69.8	50.6	42.8	36.8	40.2	47.5

Source: Financial Supervisory Service, Financial Statistics Information System

As restructuring of saving banks were conducted, the delinquency rate is in a declining trend since its peak in the 2013 accounting period. According to <Table 2>, the delinquency rate of total loans in saving banks fell from the record 21.6% in June 2012 to 7.6% in June 2016. As delinquency rate and non-performing loans increased, excluding the first quarter of 2011, the net incomes of savings banks have continuously shown losses since the June 2009 accounting period, and as net incomes were negative, the return on assets (ROA) also was negative from 2009 until 2015 when restructuring was completed, then net income returned into the black (refer to <Table 3>).

Table 3. The Profitability and Soundness Trends of Savings Banks

Category	End of Jun. '08	End of Jun. '09	End of Jun. '10	End of Jun. '11	End of Jun. '12	End of Jun. '13	End of Jun. '14	End of Jun. '15	End of Jun. '16
Net Income (100 million won)	336.7	△56.6	△766.8	△6,049.1	△2,809.3	△1,125.2	△508.0	460.7	479.9
ROA(%)	0.58	△0.08	△1.39	△7.13	△4.40	△2.47	△1.31	1.23	2.07
BIS Ratio (%)	9.08	9.43	9.05	0.84	4.07	9.88	14.28	14.24	14.53

Source: Financial Supervisory Service, Financial Statistics Information System

2.2 Mutual Savings Banks and Depositor Discipline

As explained above, regarding the situation in which the soundness of mutual savings banks is deteriorating due to pursuing high risk following the payment of high interest rates, the need is being raised for the re-establishment of discipline for mutual savings banks as a means to improve this situation. Below, we examine the problems regarding the regulatory discipline and depositor discipline of mutual savings banks.

After 2011, when the management situation of mutual savings banks worsened, the ratio of deposits below the coverage limit of 50 million won steadily increased to the point when the ratio of deposits below 50 million won rose to 94.94% in December 2012. Generally, if we assume the depositors behave rationally, depositors under the deposit insurance system will minimize the possibility of deposit loss by decreasing their deposit to within the coverage limit. From this motivation, we can see that the management crisis of savings banks somewhat activated the discipline of withdrawing deposits from savings banks by large depositors, even when considering the fact that the ratio of deposits below 50 million won in mutual savings banks is relatively higher than banks that have many corporate clients. In the case of large deposits that have a relatively larger opportunity cost of deposit loss in the case that the mutual savings bank becomes insolvent, they will try to withdraw their deposits before the mutual savings banks become insolvent. Therefore, these depositors and creditor with over 50 million won will act as the agents of market discipline.

Table 4. Covered Deposit Trends in Banks and Mutual Saving Banks (Units: trillion won, %)

	2007.12	2008.12	2009.12	2010.12	2011.12	2012.12	2013.12	2014.12	2015.12	2016.12
Insured Deposits	493,667	597,938	729,286	766,017	514,992	426,203	326,708	321,772	368,180	444,098
Deposits exceeding 50 million won	71,758	61,108	76,175	69,123	31,710	21,568	18,049	20,141	24,082	44,903
Deposits less than 50 million won	432,437	536,830	653,111	696,894	483,281	404,635	308,660	301,631	344,099	399,195
Ratio of deposits below 50 million won	87.60	89.78	89.55	90.98	93.84	94.94	94.48	93.74	93.46	89.89

Source: Korea Deposit Insurance Corporation

3. The Concepts of Depositor Discipline

3.1 Market Discipline and Depositor Discipline

According to Berger (1991), market discipline can be interpreted as the stakeholders of financial institutions that need to bear additional costs following risk-seeking acting with appropriate behavior matching their increased costs. The financial industry generally is an industry that requires oversight by an outside party of the stability of the financial system. The oversight by outside parties—that is, discipline—can largely be divided into the following three types.

The first is regulatory discipline through direct regulation and oversight by the supervisory authorities. In the case of financial institutions compared with other industries, the asymmetry of information is severe so that there is a limit in the monitoring of moral hazard of financial institutions that can be done by outside parties such as creditors. Therefore, in most countries, in place of these outside parties, the government monitors and regulates the actions of financial institutions to try to approach the goal of stability in the financial system. Soundness regulations, including capital adequacy ratio regulations and business regulations, can be seen as representative examples of this. However, according to Dewatripont and Tirole (1994), in the case that the supervisory authorities set their goal as the maximization of export social welfare

(note 2) or when regulatory forbearance occurs due to issues related to responsibility following monitoring failures or the pursuit of personal gain, there need to be regulations to compensate for this. That is, in the case when the supervisory authorities are responsible for prior monitoring and ex-post inspection, even if they discover ex-post corruption by financial institutions, this will lead to their acknowledgement that their own prior monitoring was lacking, so that the supervisory authority which places importance on their own reputation will try to hide this fact. A representative case of this is the monitoring failure of the US Savings and Loans (S&L) in the 1980s. Next is making discipline work by establishing internal control structures for the managers of financial institutions. Discipline through these internal controls can be divided into direct control over the manager through institutional organizations, such as the outside director system, and motivation through monetary incentives to the manager, such as stock options. However, the monitoring of the manager through the outside director system relies greatly on the information gathering ability of outside directors, but in reality, it is difficult for outside directors to gain accurate inside information, and there are many cases in Korea where non-experts are appointed as outside directors so that the system is not able to function effectively. Meanwhile incentive structures, such as stock options and performance-linked bonus systems, are a way to suppress the incentives for managers to profit from risk taking by establishing a compensation structure for the manager. However, the excessive amount of stock options provided can have the flaw of encouraging the pursuit of high risk, high reward by the manager, thus, the recent trend has been that the number of companies adopting this system is gradually declining. Last of all is to control the behavior of managers by activating market discipline of stakeholders in the private sector. In the case where stakeholders such as shareholders and creditors (including depositors) have a possibility of losses from the excessive risk-seeking of financial institutions, they withdraw their deposits or act to sell their stock and debts to avoid these losses, or demand compensation corresponding to this risk. Therefore, this behavior by stakeholders has the effect of suppressing excessive risk-seeking by financial institutions. That is, market discipline is the effect of the actions of stakeholders based on personal interests suppressing excessive risk-seeking behavior by financial institutions. However, what is important here is the behavior of the shareholders. Under the limited liability system, when shareholders judge that the possibility of recovery is low due to financial difficulty, they exhibit behavior matching the interest of managers by taking risk-seeking actions like owning put options. However, in the case of creditors, even if profitability increases for the financial institution as a result of risk-loving behavior while they cannot partake in the excess profits due to their contracts, which allow them only to receive agreed upon profits, in the case that the financial institution becomes insolvent, they face the risk of taking that loss (note 3). Therefore for market discipline to properly work, discipline by creditors is important. However, generally in the case that the deposit insurance system is introduced for the purpose of financial system stability, and partial protection system is implemented for the protection of small sum depositors, the main agents executing market discipline are limited to large sum depositors and creditors. This is because the existence of the deposit insurance system generally guarantees the payment of deposits for small sum depositors, which eliminates the incentive to monitor the management status of financial institutions. Instead, the deposit insurance organization guarantees the payment of deposits within the coverage limit and monitors the risk-seeking behavior of the financial institution as the proxy for the depositors. However, in the case when the deposit coverage limit is set too high decreasing the ratio of large sum depositors, or in the case that the deposit insurance corporation is not able to impose an appropriate risk premium based on the riskiness of the financial institution, the institutional mechanisms that can regulate the moral hazard of depositors in financial institutions decreases. Kane (1989) finds important causes of the S&L crisis in regulatory forbearance, such as the fixed insurance system and delays in declaring bankruptcy, and Demircuc-Kunt and Detragiache (2002), during their analysis of the relationship between financial system stability and deposit insurance systems in 61 countries around the world from 1980 to 1997, argued that the stability of financial systems were harmed in countries that had an explicit deposit insurance system. However, the fact that deposit insurance systems contribute to the stability of financial systems by preventing bank runs

and increase the utility of society as a whole through their prior monitoring function and ex-post resolution function cannot be denied. (Mussa (1986)) Therefore, to keep these positive functions of the deposit insurance system while suppressing the moral hazard of financial institutions, regulatory discipline and market discipline must function properly and the deposit insurance system must also be designed to allow these market disciplines to function. This is because market discipline can be efficient as it has lower social costs compared to ordinary regulatory discipline. According to Peria and Schmukler(2001), market discipline has the following advantages. First, the existence of market discipline can decrease the causes of moral hazard in financial institutions that follow the guarantee by the government after the introduction of the deposit insurance system. Second, market discipline forces relatively inefficient financial institutions to be operated more efficiently, or in the case this does not occur, acts as pressure to force the institution out of the market, leading to the preemptive prevention of inefficient operations. Third, in the case that monitoring of the financial institution occurs efficiently through the market, the social cost following the supervision of the financial institution can be decreased.

3.2 Empirical Research on Depositor Discipline

Currently, most countries have selected the partial protection system with the purpose of preemptively preventing such depositor moral hazard(note 4). Therefore, depositors who own deposits exceeding the coverage limit have an incentive to monitor financial institutions as there is a good possibility that they will take losses to the deposit amounts that exceed the coverage limits in the case that the financial institution faces a management crisis due to excessive risk seeking (note 5). However, insured depositors are not always indifferent to the management status of financial institutions. Kane (1987) presents research results stating that generally insured depositors also rely somewhat on the management status of financial institutions when deciding whether to deposit or not, although not in the same way as uninsured depositors. In addition, according to Park and Peristiani (1998), it was shown that insured depositors also consider the riskiness of financial institutions. Therefore, insured depositors can also play a role in certain circumstances to allow market discipline to function.

Research on depositor discipline can largely be divided into research that verifies that existence of depositor discipline through comparative analysis of many countries, and research that verifies this existence through the behavior of depositors in a single country. A representative example of the former is Demirguc-Kunt and Levin (2004), who argued that the higher the coverage limit and the wider the coverage scope of deposit insurance in a country, the weaker the financial system was. In addition, Demirguc-Kunt and Detragiache (2002) utilized data by country to report that countries that operate deposit insurance systems or have higher coverage limits are more likely to face financial crises. Meanwhile Hosono et al. (2004) utilized the data from 60 countries to show that the depositors of countries with strong government regulation and oversight had a low response to deposit interest rate as an indicator of risk. In addition, Peria and Schmukler (2001) showed the depositor discipline was functioning through analysis of Argentina, Chile, and Mexico. Research on depositor discipline by country was mostly centered around the United States and was mainly focused on jumbo CDs or subordinated debt that were not protected by the deposit insurance system. Ellis and Flanney (1992) analyzed the correlation between the interest rates of CDs issued between 1982 and 1998 with the riskiness of banks and concluded that depositor discipline did not appear even in the case of large banks. In addition, the results of analysis by Park (1995) on interest rates, and the likelihood of insolvency and asset size of financial institutions, focusing on uninsured deposits showed that some depositor discipline existed but that there was no risk premium following asset size. In addition, Billet et al. (1998) proved the fact that a credit rating downgrade by Moody's increases the dependence by the bank on covered deposits. Meanwhile, research using analysis of financial institutions other than banks include Goldberg and Hudgins (1996, 2002), and Park and Peristiani (1998). Goldberg and Hudgins (1996) using savings association data from 1986 to 1989 proved that the more the financial institution came closer to impending bankruptcy, the more the ratio of uninsured deposits by depositors decreased. In the research of Goldberg and Hudgins (2002) with a different analysis period, they showed that the covered deposits increased in savings associations facing insolvency and that savings associations that were facing bankruptcy were more passive at attracting covered deposits than saving associations that had already gone bankrupt. In addition, Park and Peristiani (1998) also showed that the risk of savings associations and increases in uninsured deposits had a negative (-) relationship, while it has a positive (+) relationship with interest rates.

Meanwhile, in Korea, research that analyzes market discipline and depositor discipline using the financial statements of financial institutions is extremely limited. This is because disclosure of business information of financial institutions before the foreign exchange crisis was very limited, and this information did not go through a verification process making its reliability low. Therefore, research on market discipline in Korea mainly occurred after 2000, and representative research includes Chun and Oh (2001), Chun (2002), and Park (2002). Chun and Oh (2001) investigated whether the market discipline of depositors and creditors functioned targeting commercial banks, they analyzed the relationship between savings deposits and capital adequacy ratio, and whether additional interest rates were demanded dividing the time periods of before 1997, when the full amount guarantee system was implemented, the foreign exchange

crisis period, and after 2001 when the partial guarantee system we implemented, and they found that before the foreign exchange crisis while some depositor discipline existed, during the foreign exchange crisis period when the full amount guarantee system was implemented, depositor discipline did not function, and that later as we shifted to the partial guarantee system the depositor discipline is somewhat functioning. In addition, Park (2002) utilized half yearly data from 1990 to 2001 to examine whether depositor discipline was functioning using deposit change amounts and deposit interest rates to reach a similar result to Chun (2002).

Meanwhile for research on depositor discipline targeting saving banks there are the examples of Park (2009), Choi (2012), and Kim (2017). Park (2009) utilized data from 2003 to 2007, and Choi (2012) utilized data from 2001 to 2010 to analyze depositor discipline in savings banks. The results showed that for savings banks, depositor discipline was somewhat functioning. Kim (2017) utilized quarterly data from 2006 to 2016 to analyze market discipline of savings banks and using the results it was argued that market discipline functions for savings banks. However, Kim (2017) divided the 2011-2014 period when bankruptcy of savings banks was ongoing into 2011-2012 and 2013-2016 in order to broadly interpret the restructuring period of savings banks. Therefore it can be said that this research is different in that unlike the research described above it uses analysis that divides the periods into the period before insolvency, during insolvency, and after insolvency; as well as various dependent variables to analyze whether market discipline is functioning. In the next section, we will explain the model and related data to verify whether depositor discipline exists for mutual savings banks.

4. Data and Methodology

Generally, in the case when depositor discipline is properly functioning, when the riskiness of financial institutions increases, the depositors reduce their deposits or demand additional premium for the additional risk, and as a result, the funding costs of financial institutions generally increase. Existing research verifies this generally by using the two methods of verifying whether depositor discipline exists based on the increase and decrease of deposits exceeding the coverage limit and changes in interest rates or based on simultaneous analysis of both sides. That is, deposits that exceed the coverage limit that are excluded as targets of protection have a stronger tendency for risk aversion compared to ordinary depositors. Therefore, it verifies whether depositor discipline is functioning through the behavior of uninsured depositors for jumbo CDs or large time deposits. In existing research targeting Korean banks, depositor discipline is analyzed through ordinary deposits or uninsured deposits and not deposits exceeding the coverage limit. However, deposits exceeding the coverage limit and uninsured deposits differ when looking at their precise meaning, and in order to more clearly judge whether depositor discipline is functioning, it is more appropriate to analyze the deposits exceeding the coverage limit, which is paid when actual financial institutions are closed. For these reasons, in this paper, analysis was conducted dividing the deposits exceeding the coverage limit of million won, and the net excess deposit which only includes the amount that exceeds the coverage limit from deposits exceeding the limit.

The dependent variables related to the above deposits are calculated using the increase in deposits. The increase rate in deposits used the log difference increase rate compared to the previous year. Meanwhile, deposit interest rates utilized the deposit interest rate for each savings bank announced by the Korea Deposit Insurance Corporation. Generally, deposit interest rates use the average balance of deposits for each quarter divided by the amount of interest paid. However, in this case it is difficult to verify whether a premium equivalent to the risk that uninsured depositors bear is paid, so in this research the deposit interest rates collected by the Korea Deposit Insurance Corporation are used. Next, for independent variables that represent the risk seeking of savings banks the BIS capital adequacy ratio (note 6), collateral loan ratio, liquidity ratio, NPL ratio, and costs-assets ratio were selected. The BIS capital adequacy ratio is a representative indicator that shows capital adequacy, and in the case the BIS capital adequacy ratio is high the ratio of uninsured deposits is expected to increase. This is because even in the case when the mutual savings bank becomes insolvent, if it has enough equity to cancel this out, losses may not occur for the depositors. For the same reason, the variables of collateral loan ratio and liquidity ratio were selected as variables that decrease the risk for depositors. In addition, the NPL ratio is used as an indicator of asset soundness, and in the case that depositor discipline is functioning, when the NPL ratio increases deposit amounts are expected to decrease. Last of all, the reason that the costs-assets ratio was selected was because in the case of mutual savings banks it is presumed that generally it will have relationship banking type loans and deposits due to its characteristics as a regional financial institution, so that when employees actively participate in actions to attract deposits, it is expected that costs will increase as well as deposit amounts. In addition to this, we selected the value of log applied to total assets as a variable in order to exclude the effects based on the size of the mutual savings bank. Inflation rate, savings rate, and composite price index of stocks fluctuations were used as variables that not only represent the riskiness of mutual savings banks but also as macroeconomic variables that have the same effect on all mutual savings banks. The reason that macroeconomic indicators were used as independent variables was because of the consideration given to the characteristics of mutual savings banks which react sensitively to business fluctuations. The inflation rate was included to examine the change in coverage limit following inflation, the composite price index of stocks fluctuations represents the preference toward alternative assets, and the savings rate was used to examine the propensity to save by depositors. The analysis

period used the half yearly information from June 2007 to December 2016 from usable financial information on mutual savings banks. In order to more clearly analyze depositor discipline targeting Korean mutual savings banks, analysis was divided into three periods: before restructuring of savings banks (2007–2010), restructuring period (2011–2014), and after restructuring of savings banks was completed (2015–2016). The number of mutual savings banks targeted for analysis was 121 including mutual savings banks whose operations were halted during the target period, and these were verified using the unbalanced Panel. In order to select a suitable model for panel analysis combining cross-section and time series a few verification tasks are required. Generally the estimation model selection in a panel analysis changes based on whether a fixed value is used for the constant term or a random value is used. Therefore, for the constant term of the estimation equation, whether there is equality must be verified using F-statistic, and if the null hypothesis that the constant term is equal is not rejected than ordinary least squares (OLS) is selected, in the case it is rejected than the fixed effect model, and in the case it is not rejected than the random effect model is used. The random effect model here unlike the fixed effect model has the advantage that it can be used even in the case a time invariant explanatory variable exists and it can improve the efficiency of the estimated values. Therefore as this paper has a time invariant explanatory variable, we used the random effect model.

The empirical model we use to estimate the relationship between risk taking and excess deposit is represented in equation (1). We also investigate whether net excess deposit enhances risk-taking, as modeled in equation (2). Lastly, we analysis using deposit interest rate to risk premium about risk raking behavior in equation (3). All the explanatory variables are lagged by one period from the dependent variable to clarify the causality with risk or firm performance. We employ panel regression methodology in order to estimate equations.

$$Excess\ Deposit_{it} = \beta_1 \times Risk\ Taking_{it} + \beta_2 Macro_t + \varepsilon_{it} \quad (1)$$

$$Net\ Excess\ Deposit_{it} = \beta_1 \times Risk\ Taking_{it} + \beta_2 Macro_t + \varepsilon_{it} \quad (2)$$

$$Deposit\ Interest\ Rate_{it} = \beta_1 \times Risk\ Taking_{it} + \beta_2 Macro_t + \varepsilon_{it} \quad (3)$$

where i and t represent particular savings banks and time.

Here, the $Risk\ Taking_{it}$ variables are the factors that are affected risk taking behavior of the individual savings bank. We use BIS ratio, collateral loan ratio, non-performing loan ratio, liquidity ratio, costs-assets ratio, deposit interest rate as the risk-taking factors. And $Macro_t$ is a macro variable that affects the overall management of the savings banks. We use stock market index fluctuation, savings rate, inflation rate as the macro economic variable that is affected the depositor's behavior.

Table 5. Explanation of Variables

Dependent Variables	Content
UNI	The sum of deposits exceeding 50 million won and the deposits of financial institutions (excess deposits)
DEP	The sum of deposits amounts in excess of the 50 million won coverage limit from deposits that exceed 50 million won (net excess deposits)
RATE	Deposit interest rate
Independent Variables	
BIS	BIS Capital adequacy ratio (half yearly)
COL	Collateral loan ratio (collateral loans/total loans)
NPL	Non-performing loan ratio (non-performing loans/total loans)
LIQ	Liquidity ratio (current assets with less than three months maturity/current liabilities)
COA	Costs-assets ratio (selling, general and administrative expense/total assets)
RATE	Deposit interest rate
KOSPI	Stock market index fluctuation
SAVING	Savings rate (unconsumed portion of disposable income/disposable income)
INF	Inflation rate
Regional dummy	1 in the case of savings banks in the capital region, 0 for other regions

5. Analysis Results

In this analysis, a half year of data from mutual savings banks from 2007 to 2016 were utilized. <Table 6> is the descriptive analysis of the variables used in the panel analysis model, and <Table 7> represents the correlation coefficient between the variables. We can see that uninsured deposits have a negative (-) relationship with collateral loan ratio and stock market index fluctuation, and net uninsured deposits have a similar correlation with uninsured deposits. The negative correlation between deposit interest rate and the deposit variables that represent market discipline can be interpreted to be due to increases in deposit interest rates to be considered by the market to be a sign that the soundness of the savings bank has worsened due to cases such as when soundness is greatly weakened following investment in risky assets such as PF loans caused by savings banks raising capital at high interest rates, and therefore the market decreases deposits that exceed the insured deposit amounts. Generally, if we examine the uninsured depositors which are expected to have depositor discipline function, increase in uninsured deposits was shown to be statistically significant to the variables of collateral loan ratio and NPL ratio which represent asset soundness. However, unlike general expectations, the collateral loan ratio had a negative correlation, and the NPL ratio was shown to have a positive correlation.

Table 6. Descriptive Analysis

Variable	Observation coefficient	Mean	Std. Dev.	Min	Max
Excess deposits	1764	1.17	1.74	0	50.51
Net excess deposit	1763	1.40	4.13	-6.24	93.00
Deposit interest rate	1899	4.42	1.40	0.33	11.94
Capital adequacy ratio	1907	13.00	21.02	-187.20	490.15
Return on assets	1907	-0.40	4.77	-65.19	25.53
Collateral loan ratio	1906	0.79	0.17	0.12	1.00
NPL ratio	1691	0.15	0.13	0	0.91
Cost-assets ratio	1907	0.013	0	0	0.12
Liquidity ratio	1905	1.58	1.23	0.08	29.34
Total assets (ln)	1907	12.79	1.05	8.29	15.56
Savings rate	1907	34.21	1.04	32.30	35.90
Stock market index fluctuation	1907	6.37	20.75	-40.70	49.7
Inflation rate	1907	2.46	1.26	0.60	4.80

Table 7. Correlation Between Variables

	UNI	DEP	BIS	ROA	COL	NPL	LOQ	COA	ASSET	RATE	SAVING	KOSPI	INF
UNI	1												
DEP	0.9346	1											
BIS	0.1182	0.1162	1										
ROA	0.2148	0.1822	0.3067	1									
COL	-0.0271	-0.0214	0.0861	0.0631	1								
NPL	-0.2255	-0.188	-0.1983	-0.5787	-0.1264	1							
LIQ	-0.0467	-0.0491	0.1692	-0.0151	-0.293	0.0724	1						
COA	0.0059	0.0215	0.2935	0.0331	-0.0656	0.0652	0.2065	1					
ASSET	0.0552	0.0426	-0.2504	-0.0201	-0.1446	-0.0963	-0.2083	-0.0721	1				
RATE	-0.1307	-0.1191	-0.2339	-0.1262	-0.0026	-0.0359	-0.2649	-0.037	0.1552	1			
SAVING	-0.0145	-0.0038	0.0936	0.0468	-0.0049	0.0189	0.1601	0.004	-0.0076	-0.6772	1		
KOSPI	0.0134	0.002	-0.0292	-0.0266	0.0273	-0.0075	-0.0269	-0.09	0.0497	-0.1675	0.0102	1	
INF	-0.1429	-0.1109	-0.1257	-0.0823	0.014	-0.0911	-0.1669	-0.0342	0.0358	0.7788	-0.484	-0.1637	1

The results of estimation for the entire period for mutual savings banks are summarized in <Table 8>. If we

examine the uninsured excess deposits, which are generally expected to have depositor discipline functioning, they were shown to be statistically meaningful to collateral loan ratio and NPL ratio, which represent asset soundness, as well as costs-assets ratio, return on assets, and deposit interest rate. However, unlike general expectations, it was analyzed that collateral loan ratio and deposit interest rates have a negative correlation. Especially in the case of collateral loan ratio, unlike the collateral loans of commercial banks, the collateral loans of mutual savings banks are relatively high in moveable assets and subordinated debt so that it is difficult to properly evaluate the value of the collateral (note 7). Regarding deposits, that coefficient is not large so that even through it is meaningful in the 1% level; it was interpreted to not have a large impact on the behavior of depositors. Meanwhile, the BIS capital adequacy ratio, which represents asset soundness, was shown to be meaningful at the 10% level. Combining these, it was analyzed that the depositor discipline of mutual savings banks through uninsured excess deposits were somewhat functioning. What is interesting about mutual savings banks is that the costs-assets ratio was shown to be statistically meaningful for all dependent variables. This can be interpreted as the excessive sales activities of mutual savings banks ultimately lead to weakening profits and large depositors consider excessive cost expenditures to be the deterioration in the soundness of the savings banks leading them to decrease the size of their deposits.

Next in the analysis using net excess deposits as the dependent variable, the same depositor discipline as the deposits exceeding the coverage limit was shown to be functioning, allowing us to reach the conclusion that uninsured depositors change their behavior based on whether the mutual savings bank is risk seeking or not. This is because the deposits mainly consist of time deposits and the ratio of demand deposits is not large so that generally it is considered a way to manage excess cash, so it can be interpreted that the depositor pays even more attention to its safety.

Meanwhile, regarding deposit interest rates, most of the variables showed results of being statistically meaningful so that we can clearly see that the interest rate levels of mutual savings banks are determined related to the riskiness of the mutual savings bank. That is, that indicators of soundness, such as capital adequacy ratio and NPL ratio, have a negative (-) correlation with deposit interest rates show that the more sound the savings bank is the lower the deposit interest rate they are paying. In addition, the higher the return on assets and the costs-assets ratio, the more they acted as factors to decrease deposit interest rates. That is this can be interpreted as savings banks with high profits more easily attract deposits and therefore have a lower interest rate. However, regarding asset size and cost-assets ratio, it was shown to be meaningful which shows that deposit interest rates are relative impacted by size and employee effort. Next, the stock index and savings ratio were shown to decrease covered limit excess deposits, and this can be interpreted as when the profitability of alternative assets increase the deposits of savings banks decrease. Related to inflation, it caused an increase in nominal interest rates related to deposit interest rates, but could be seen to have a negative effect on deposit amounts due to increases in consumption amounts. Ultimately, the results of estimation on all the mutual savings banks showed that the depositor discipline was functioning properly, and it is conjectured that interest rate levels are greatly affected by the riskiness of mutual savings banks. Last of all, to examine whether the characteristics of depositors differ by region, we added the regional dummy dividing the Seoul and Gyeonggi regions as the metropolitan area and other regions, but it was shown to not be statistically meaningful. This indicated that there was no information gap between regions.

Table 8. Estimated Results (Entire Period)

Independent Variable	Excess deposits	Net excess deposits	Deposit interest rate
Constant term	3.5326*** (0.5912)	4.1184*** (0.7852)	19.2497*** (0.7370)
Capital adequacy ratio (BIS)	0.0015* (0.0009)	0.0018 (0.0011)	-0.0041*** (0.0014)
Return on assets (ROA)	0.0086** (0.0040)	0.0095** (0.0052)	-0.0089* (0.0052)
Collateral loan ratio (COL)	-0.2613*** (0.0772)	-0.2942*** (0.0999)	0.1048 (0.1419)
NPL ratio (NPL)	-0.8227*** (0.1273)	-0.8543*** (0.1672)	-0.3168* (0.1912)
Cost-assets ratio (COST)	-5.8555*** (1.6279)	-8.3422*** (2.1511)	-12.2084*** (2.4150)
Liquidity ratio (LIQ)	0.0050 (0.0135)	0.0162 (0.0178)	0.0203 (0.0198)
Total assets (ln ASSET)	0.0184 (0.0155)	0.0175 (0.0198)	0.1626*** (0.0330)

Deposit interest rate (RATE)	-0.0703*** (0.0167)	-0.1024*** (0.0222)	
Savings rate (SAVING)	-0.0885*** (0.0154)	-0.1017*** (0.0206)	-0.5316*** (0.0174)
Stock market index fluctuation (KOSPI)	-0.0008 (0.0006)	-0.0013 (0.0008)	-0.0066*** (0.0008)
Inflation rate (INF)	-0.0366** (0.0144)	-0.0197 (0.0192)	0.5813*** (0.0147)
Regional dummy (dummy)	0.0343 (0.0297)	0.0491 (0.0377)	0.0013 (0.0712)
Adjusted R ²	0.1156	0.0870	0.7599

Note: The superscript ***, **, * represent significance levels of 1%, 5%, 10%, respectively

Next, we divided the analysis periods of the savings banks into 2007–2010 before the restructuring went into full swing, 2011–2014 when restructuring was underway, and 2015–2016 after the restructuring was completed, to see if the depositor discipline appeared differently in each period.

First, in the 2007 to 2010 period before insolvency was taking place, the collateral loan ratio, costs-assets ratio, and the liquidity ratio all were shown to be meaningfully related to deposits exceeding the coverage limit and the net excess deposits. This is similar to the analysis results for the entire period. Furthermore, we can see that in the 2011 to 2014 period when insolvency was taking place in addition to the variables above, deposit amounts were shown to be meaningfully impacted by variables related to asset soundness, such as capital adequacy ratio and the NPL ratio. That is, capital adequacy ratio is a factor that increases deposits exceeding the coverage limit, and as the NPL ratio represents the size of non-performing loans, it acts as a factor that decreases deposits exceeding the coverage limit.

Lastly, during the 2015 to 2016 period when the insolvency of mutual savings banks was being completed, acquisitions by other financial companies, such as banks, continued leading to large improvements in soundness, so that indicators that represent soundness were shown to be not meaningful to deposits exceeding the coverage limit. The characteristic of this period, as explained above, is that as savings banks were acquired by financial companies such as banks, their asset size increased so that unlike in the past, their asset size become considered an indicator for the profitability and soundness of savings banks. Thus, it was analyzed that the larger the asset size grew, the more deposits exceeding the coverage limit increased. Regarding deposits exceeding the coverage limit and net excess deposits, there was no clear difference between the two dependent variables, so that it could be seen that depositors did not differentiate deposits exceeding the coverage limit and net excess deposits but rather perceived the entire deposit amount as a single variable.

Table 9. Estimated Results (Period Before Insolvency: the first half of 2007–the second half of 2010)

Independent Variable	Excess deposits	Net excess deposits	Deposit interest rate
Constant term	2.6131*** (0.4701)	3.9160*** (0.6766)	13.2763*** (0.8837)
Capital adequacy ratio (BIS)	-0.0002 (0.0012)	-0.0005 (0.0017)	-0.0187*** (0.00287)
Return on assets (ROA)	0.0009 (0.0041)	-0.0014 (0.0059)	0.0218*** (0.00768)
Collateral loan ratio (COL)	-0.1883** (0.0864)	-0.2362* (0.1250)	0.1065 (0.2217)
NPL ratio (NPL)	-0.1685 (0.1408)	-0.3845* (0.2051)	0.0299 (0.3362)
Cost-assets ratio (COST)	-5.4764** (2.2885)	-9.4956*** (3.2929)	-1.2939 (5.1211)
Liquidity ratio (LIQ)	0.0877*** (0.0118)	0.1013*** (0.0170)	0.0115 (0.0265)
Total assets (ln ASSET)	0.0104 (0.0142)	-0.0028 (0.0204)	0.0976** (0.0384)

Deposit interest rate (RATE)	-0.0638*** (0.0181)	-0.1079*** (0.0261)	
Savings rate (SAVING)	-0.0704*** (0.0114)	-0.0946*** (0.0164)	-0.2753*** (0.0212)
Stock market index fluctuation (KOSPI)	0.0021*** (0.0006)	0.0013 (0.0008)	-0.0156*** (0.0011)
Inflation rate (INF)	0.0283* (0.0152)	0.0260 (0.0219)	0.1240*** (0.0325)
Regional dummy (dummy)	0.0235 (0.0274)	0.0292 (0.0394)	0.2030*** (0.0753)
Adjusted R ²	0.1822	0.1399	0.5936

Note: The superscripts ***, **, * represent significance levels of 1%, 5%, 10%, respectively.

Table 10. Estimated Results (Period of Insolvency: the first half of 2011–the second half of 2014)

Independent Variable	Excess deposits	Net excess deposits	Deposit interest rate
Constant term	5.4660** (2.6784)	4.5936 (3.5145)	16.9588*** (2.2028)
Capital adequacy ratio (BIS)	0.0040** (0.0016)	0.0051** (0.0021)	-0.0056*** (0.0013)
Return on assets (ROA)	0.0059 (0.0063)	0.0092 (0.0083)	-0.0052 (0.0046)
Collateral loan ratio (COL)	-0.2888** (0.1280)	-0.3198* (0.1680)	-0.1481 (0.1091)
NPL ratio (NPL)	-0.5357*** (0.2035)	-0.4475* (0.2679)	0.0661 (0.1638)
Cost-assets ratio (COST)	-6.7419** (2.9783)	-9.3323** (3.9084)	-7.9854*** (2.5122)
Liquidity ratio (LIQ)	-0.0427 (0.0261)	-0.0294 (0.0342)	0.0590*** (0.0217)
Total assets (ln ASSET)	-0.0195 (0.0292)	-0.0254 (0.0383)	0.1084*** (0.0246)
Deposit interest rate (RATE)	-0.1955*** (0.0442)	-0.2127*** (0.0580)	
Savings rate (SAVING)	-0.1218 (0.0769)	-0.0935 (0.1010)	-0.4408*** (0.0639)
Stock market index fluctuation (KOSPI)	-0.0097*** (0.0032)	-0.0101** (0.0042)	-0.0227*** (0.0026)
Inflation rate (INF)	-0.0039 (0.0295)	0.0140 (0.0387)	0.5058*** (0.0164)
Regional dummy (dummy)	0.1269** (0.0528)	0.1457** (0.0692)	-0.0286 (0.0456)
Adjusted R ²	0.1700	0.1205	0.6363

Note: The superscripts ***, **, * represent significance levels of 1%, 5%, 10%, respectively.

Table 11. Estimated Results (Period After Insolvency: the first half of 2015–the second half of 2016)

Independent Variable	Excess deposits	Net excess deposits	Deposit interest rate
Constant term	3.6735 (2.4417)	4.9066 (3.7650)	6.8279*** (0.6814)
Capital adequacy ratio (BIS)	-0.0024 (0.0015)	-0.0026 (0.0022)	-0.0005 (0.0007)
Return on assets (ROA)	0.0050 (0.0147)	0.0140 (0.0221)	-0.0019 (0.0055)
Collateral loan ratio (COL)	-0.1999 (0.1613)	-0.2662 (0.2288)	-0.0911 (0.0848)
NPL ratio (NPL)	-0.7847* (0.4045)	-1.1555* (0.5842)	0.3165* (0.1626)
Cost-assets ratio (COST)	-2.0203 (2.6102)	-2.7836 (3.9377)	5.2934*** (0.8169)
Liquidity ratio (LIQ)	0.0898** (0.0380)	0.0961* (0.0565)	0.01239 (0.0129)
Total assets (ln ASSET)	0.1216*** (0.0372)	0.1339*** (0.0514)	0.0851*** (0.0214)
Deposit interest rate (RATE)	-0.1753 (0.1430)	-0.2716 (0.2084)	
Savings rate (SAVING)	-0.1266* (0.0648)	-0.1580 (0.1002)	-0.1466*** (0.0181)
Stock market index fluctuation (KOSPI)	-0.0026 (0.0066)	-0.0050 (0.0105)	0.0109*** (0.0017)
Inflation rate (INF)	0.0538 (0.0932)	0.0708 (0.1399)	-0.3988*** (0.0239)
Regional dummy (dummy)	-0.0500 (0.0678)	-0.0145 (0.0940)	-0.0579 (0.0424)
Adjusted R ²	0.1195	0.0939	0.5235

Note: The superscripts ***, **, * represent significance levels of 1%, 5%, 10%, respectively.

6. Conclusion and Implications

This paper verified whether coverage limit-exceeding depositors withdraw or decrease their deposits based on the risk-seeking behavior of mutual savings banks and whether mutual savings banks in management crises present a relatively high-risk premium to attract deposits in order to verify the existence of depositor discipline for mutual savings banks. A summary of the major analysis results are as follows.

For mutual savings banks, it was generally shown that depositor discipline was functioning properly. This is contrary to the perception that depositor discipline will not function as most of the deposits in mutual savings banks are included as targets for protection by the deposit insurance system. Next, the results of a verification of regional characteristics showed that there were no regional differences in depositor discipline. This seems to be because the information and communication technology in Korea is so developed that there is no information gap between urban and rural areas. Lastly, we divided the analysis period for mutual savings banks into the periods 2007 to 2010 before insolvencies were visible, 2011 to 2014 when restructuring was taking place, and 2015 to 2016 after the completion of the restructuring. The results were that asset soundness had a tendency to be given more importance when restructuring was ongoing, and after restructuring was complete, it was shown that improvements in asset soundness led to asset size having a positive effect on the size of deposits that exceed the coverage limit. Despite these analysis results, this paper still has some issues to face, which we would like to identify in the following.

First is the fact that information asymmetry for mutual savings banks are severe so that it is difficult for depositors to properly judge the management status of mutual savings banks. As can be seen from past cases when mutual savings banks' businesses were suspended, there was a large difference in the information disclosed by the mutual savings banks and the actual status of the mutual savings banks. Therefore, to allow depositor discipline to function, information about

mutual savings banks must be disclosed more transparently to ordinary depositors.

Next is the problem regarding the ways to have market discipline function under the current deposit protection system for mutual savings banks where the majority consists of small depositors. In a situation where regulatory discipline is not functioning properly due to regulatory forbearance by the supervisory authorities, the reality is that the coverage limit is relatively excessive, making it harder for depositor discipline to function compared to when the coverage limit is low. In this case, as in the insolvencies of savings banks in the past, if the monitoring by the supervisory organizations is lacking and if not even the depositor discipline is functioning properly, this could lead to uncertainty in the financial system as a whole. Therefore, it is necessary to reevaluate the current deposit insurance system as a whole, to lower coverage limits to make depositor discipline function properly in order to suppress the risk-seeking behavior by mutual savings banks, and therefore suppress financial system uncertainty.

Lastly in order to avoid the actual lowering of the deposit insurance coverage if the economy grows, we must consider raising the deposit insurance coverage. And also, it is necessary to increase the coverage during financial crisis so that depositors are not disturbed, but it remains a future research.

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Notes

- Note 1. Excess deposits of 50 million refer to deposits that are eligible for deposit protection but exceed the protection limit, and net excess deposits refer to deposit amounts that the depositor can directly lose in the case that the financial institution becomes insolvent, which excludes the protection limit amount of 50 million won.
- Note 2. This is the case in which the interest of the shareholders and managers take priority over the interest of depositors under the premise that the supervisory authorities decide whether to intervene based on the impact on social welfare.
- Note 3. Therefore, it is explained that a relation-dependent control structure, where shareholders control the financial institution when performance is satisfactory, and creditors control it when performance deteriorates, is advisable.
- Note 4. According to Demirguc- Kunt et al. (2014) 74 of the 101 countries (73.3%) have adopted limited coverage deposit insurance system.
- Note 5. The owners of uninsured deposits only receive protection for deposit amounts within the coverage limit and only receive a portion similar to general creditors for deposit amounts exceeding the limit.
- Note 6. The BIS capital adequacy ratio of mutual savings banks before 2005 was announced in half year intervals, therefore for dates before this, it was assumed that the capital adequacy ratio did not change during the half-year.
- Note 7. A large portion of collateral exists as collateral on objects such as cars, so there is the dimension that it is difficult to accurately evaluate value for these.