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The Effect of a Risk-Based Deposit Insurance Program In Korea

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**The Effect of a Risk-Based Deposit Insurance Program
In Korea**

Youngil Oh

April, 2016

Graduate Capstone

Martin School of Public Policy and Administration

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Executive Summary

Countries introduce a deposit insurance system to prevent bank-run and stabilize the financial market by protecting depositors. However, deposit insurance with a flat-rate system induces the insured banks to take more risky activities, an example of moral hazard. To deal with this problem, the Korea Deposit Insurance Corporation ('KDIC') adopted a Risk-Based Insurance Program ('RBIP') for the Savings Banks ('SBs') on July 1, 2013, by charging a higher rate for the weak SBs and a lower rate for the healthy SBs. To mitigate the initial drastic impact on the SBs in an economic regression, the KDIC had reduced the difference between the regular rate and the higher rate by 90% and the difference between the regular rate and the lower rate by 50%, which is called a soft landing period.

In this paper, I tested the hypothesis that the RBIP in the soft landing period is not sufficient to motivate the SBs to reduce their risk. Also, I tested another hypothesis that the healthy SBs respond better to reduce the risk level rather than the weak SB, because the lower rate as the motivation is more attractive than the higher rate.

I constructed a balanced panel data for the SBs in Korea, and I employed a fixed effect model with instrumental variables to deal with an unobservable individual effect and an endogenous variable. The RBIP rate in the soft landing period was not sufficient, and the reason is that the weak SBs are predicted to increase the risk contrary to the purposed direction of the RBIP.

Based on my finding, it can be concluded that the KDIC should expand the current differential rate for the weak SBs at least, if it wants to achieve the goal of restricting the risk of the SBs.

1. Introduction

All banks are required to pay the insurance premium to the deposit insurer every year. In return for this payment, the banks are free from a threat of bank-run because depositors believe that their deposit will be safe even if their bank fails. In Korea, the insurance premium rate had been the same for all Savings Banks ('SBs') until June 30, 2013. Starting from July 1, 2013¹, a differential insurance premium rate program called 'Risk-Based Insurance Program' ('RBIP') went into effect for all SBs. Under the new program, the deposit insurer (the Korean Deposit Insurance Corporation, 'KDIC') can charge a higher insurance rate to a SB with high risk

The purpose of the RBIP is to provide a motivation for the SBs heavily exposed to risks to reduce their risk. The healthy SBs can take advantage of the discounted insurance rate. By contrast, the weak SBs will pay a financial punishment. So the weak SBs are expected to decrease the risky behaviors to diminish the penalty. Through this mechanism, the RBIP is anticipated to decrease the possibility of financial failure of the SBs.

But some experts doubt that RBIP will have a substantial influence on the SBs, because the current scale of the differential rates (-0.02%p, +0.004%p) is too narrow to motivate the SBs to change behavior during the soft landing period. I therefore would want to investigate the effectiveness of the current RBIP designed by the KDIC. This study pays attention to the point of whether the SBs reduce the risk during the soft landing period, and how the healthy or weak SBs will behave in the RBIP. The results of this study will be expected to be necessary and meaningful information to help the KDIC to improve the RBIP.

¹Other than Savings banks whose accounting year runs from July to June, the RBIP went into effect on January 1, 2013 for commercial banks.

2. Literature Review

Theoretical Background

In most countries, governments make an effort to regulate risks of banks by using financial safety nets. According to the Financial Stability Forum (2001), financial safety nets consist of three elements: (i) a deposit insurance system; (ii) a central bank (as a lender of last resort); and (iii) a regulatory framework. The deposit insurance system is fundamental to promote financial stability in the banking system. Anticipating that deposits are guaranteed under a deposit insurance system, depositors will not rush to withdraw their money deposited in the bank, thereby averting a contagious bank-run and reducing the social costs of a banking crisis (Abdullah S. & Adlina S, 2014). Despite its stabilizing effect, a flat-rate deposit insurance has the negative effect of raising moral hazard (Chu, 2003). Theoretical works mostly confirm that a flat-rate deposit insurance is responsible for increasing the risk-taking activity in banks arising via moral hazard (Davis and Obasi, 2009).

A flat-rate system has an influence on increasing moral hazard in two ways. First, the flat-rate deposit insurance induces insured banks to pursue more risks because they can capture any profits while incurring no additional insurance expense. Second, the flat-rate deposit insurance reduces incentives of depositors to monitor banks' moral hazard. In a world with no deposit insurance, a risky bank will have to pay depositors more interest to attract them. In a world with deposit insurance, however, depositors do not need to demand more interest because the deposit insurer will guarantee their deposits, regardless whether the bank takes high risk. Thus deposit insurance gives banks incentives to take added risks (McCoy 2007).

In dealing with the increased moral hazard of banks, various financial studies have been

developed. In the guidance to curtail moral hazard, the IADI (International Association of Deposit Insurers) states various means, including: (1) regulatory discipline, i.e. bank regulations, such as capital minimum requirement, and prompt corrective action order ; (2) market discipline, i.e. monitoring by depositors² or creditors; and (3) managerial self-discipline, i.e. the prevention of large risks. Among regulatory means, the RBIP could be recommended as one of the important tools.

If deposit insurance premiums are linked to risk (namely RBIP), the added cost may deter excessive risk-taking activities and help mitigate moral hazard (IADI guidance, 2013). Because it causes high insurance expense. Since each bank pays a different insurance rate, its ability to attract the depositors will be different from the others. The RBIP would prompt the insured banks to think twice before embarking on a higher risk activity because the insured banks have to pay a higher premium. It is believed that because of this penalty, banks would have the incentives to reduce their risk exposure (Abdullah S. & Adlina S, 2014).

However, the IADI gives notice that RBIP is most likely to have its desired effect on banks' risk-taking when the industry is healthy or sound. Introducing RBIP when a substantial number of banks are vulnerable or weak may lead to their further decline. Also, Prescott (2002) derived the theoretical conclusion that if a deposit insurer does not know which investment strategy a bank takes, the RBIP alone cannot control moral hazard. He emphasized that supervisory activities like safety and soundness exams, audits, and off-site surveillance play a crucial role in the successful RBIP implementation.

2 The deposit insurer sets a coverage limit under which an individual's deposits are partially guaranteed. The deposits exceeding to the limit will be excluded from the coverage. So, depositors will voluntarily pay attention to the soundness of the bank.

Empirical Examination

The majority of researchers have found that a flat-rate system gives banks an incentive to increase risk-taking. As to the effect of the RBIP, only a few studies have been reported so far. Since the RBIP generally tends to be introduced along with some regulatory measures, it is hard to extract its sole net effect out of those measures. Consider the case of the USA. In 1991, when the Federal Deposit Insurance Corporation Improvement Act ('FDICIA') was passed, a RBIP and Prompt Corrective Action (PCA)³ were introduced together for the commercial banks. Consequently, the effect of RBIP cannot be easy to be separated from that of the PCA. Comparing post-FDICIA with pre-FDICIA, though, Lisa Birr (2001) explained that the regulatory changes proposed by the FDICIA were effective in their ultimate goals: lowering risk-taking behaviors by commercial banks. This finding does not identify a separate positive effect of the RBIP, however.

Cornett, Mehran and Therantian (1998) examined the impact of announcement that the RBIP will be introduced. During 1991-1993, on 13 each day when the announcement had been released, they tracked the movement of the stock prices of banks and investigated whether there was excess return on the those stocks as a way to test the impact of RBIP announcement. Their empirical results lead to the conclusion that stock prices of well-capitalized banks reacted significantly and positively to announcement that signaled an introduction of RBIP. On the other hand, less-capitalized banks had the significant negative returns on those event days. They found out that the stock market responds strongly to the announcement for the RBIP.

Chang and Chen (2002) examined the risk-shifting behaviors of Taiwan's commercial

³ The PCA provisions became effective in December 1992 (Section 131 of FDICIA). It requires the federal regulators to take an action against the under-capitalized banks to impose penalties, such as submission an acceptable plan to restore their less-capital or restriction of paying dividends.

banks before and after the RBIP the Taiwanese government adopted. They found that the RBIP had no effect in restraining risk-taking behavior for commercial banks in Taiwan. They explained that the internal trends of financial liberalization and internationalization might be some of the reasons why it failed. Although the RBIP system was adopted, financial liberalization decreases the regulatory discipline, and provides the commercial banks with an environment where higher risks are taken easily without restriction. Furthermore, the differential rate between the grades - 0.0025%p or 0.005%p - is too small to prevent bank from taking high risks.

Abdullah S. & Adlina S. (2014) examined how the transition from a flat-rate system into a RBIP affects the risk-taking behaviors of banks in Malaysia. After the RBIP, banks' credit risk is estimated to increase by 76.9%, and an operational risk is estimated to increase by 26.2%. They pointed out that the main reason why the RBIP did not have the expected effect may result from an inadequate risk evaluation by the deposit insurer. Too small a premium for the higher risk creates a favorable regulatory circumstance for the small banks to increase their risk-taking, because these banks are not penalized with higher premiums. Therefore, the implementation of the RBIP in Malaysia aggravates the moral hazard problem especially in the small conventional banks instead of reducing it.

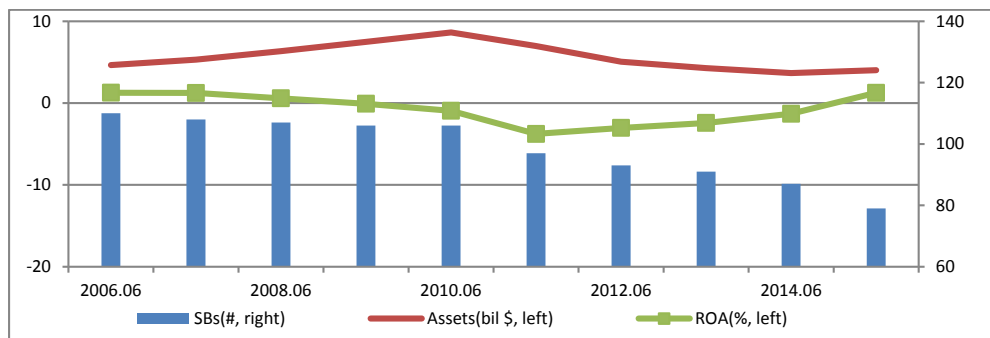
The empirical results, except the case of the FDIC, do not support the theoretical direction and expert's expectations. It implies that only when other environments are favorable to implement the RBIP and the differential rate is enough high, the RBIP will has a substantial effect to reduce the risk of banks.

3. Research Design

3.1. Risk-Based Insurance Program in Korea

In Korea, there are two types of depository banks. Commercial Banks offer banking services for everyone across the country. Savings Banks (SBs) are only allowed to offer banking services within a particular local area, so their scale is limited. As of December 2010, the total number of SBs is 105. Twenty-four SBs were closed dramatically between 2011 and 2012 due to the continuing economic regression after a global financial crisis in 2008.

Figure 1. The Number of SBs, Asset, and Return On Asset(ROA)



The remaining SBs barely survived. It seemed that depositors became concerned about the financial vulnerability of the SBs and moved their funds elsewhere. In response to an adverse environment, the Financial Services Commission ('FSC') took several actions. It allowed the KDIC to investigate the potentially problematic SBs starting from March 2012, the minimum capital ratio which the SBs must meet was raised from 5% to 6% starting from July 2012. And, the Bank of Korea also lowered the standard interest rate six times since July, 2012. These policies helped the SBs to recover gradually from difficult time since 2012 so far.

Also, to resolve the moral hazard which was pointed out as the reason for the SBs'

failures in 2011~2012, the RBIP went into effect for the SBs on July1, 2013. The implementation of the RBIP is based on a law⁴ passed by the South Korean Congress. Under the law, the KDIC had designed the RBIP structure in 2012 and shared the evaluation method with all remaining SBs. This evaluation model consists of a quantitative method (80%) and a qualitative method (20%). In the quantitative method, three types risks are measured as a score,

- 1) ability to cope with a crisis (Indicators :Bank for International Settlements ratio etc.),
- 2) asset soundness (Indicators :Non-Performance ratio etc.),
- 3)recovery ability from losses (Indicators : Return On Asset etc.).

After the KDIC evaluates the risk level of each SB, it classifies each SB into one of the three groups (Grade 1, Grade 2, Grade 3). Then each SB is charged a differential rate (lower, 0, higher) according to the group, the rate which is added to the regular rate of 0.4%. According to the law, the KDIC can set the penalty rate up to the legal limit of 0.04%p. Also, it can set the discounted rate up to the legal limit of -0.04%p.

At the time when the RBIP was designed, the SBs had a hard time in struggling to survive. As the IADI guided, the KDIC worried that the RBIP might lead the vulnerable SBs to further decline. The KDIC, to avert the negative impact on the struggling SBs, decided to set a soft landing period from 2013 to 2016. During this period, the lower rate was reduced to be 50% smaller (-0.04%p → -0.02%p) than the legal limit. Also, the higher rate was reduced to be 90% smaller (+0.04%p → +0.004%p) than the legal limit (KDIC 2014 annual report). The higher rate for the weak SBs was thought of as a heavy burden enough to make their financial state worse. So, a higher rate range (0.004) was smaller than a lower rate range (0.02). As a result of the reduced differential rates, in November 2014 the first year after the implementation of the RBIP,

⁴ Article 30 (1) of the Depositor Protection Act was amended in February 2009.

the KDIC announced that the insurance premium income from all SBs had decreased by about \$1.5million in comparison with a flat-rate system (2014.11.14, KDIC). It indicates that the severely reduced higher rate for the weak SB led the whole premium income to decrease.

Table1. The differential rates in RBIP of the KDIC

| Grade | Soft Landing Period | | Normalization Period | | |
|-------------------|---------------------|---------|----------------------|-----------|---------|
| | 2013.7~2015.6 | ~2016.6 | 2017~2018 | 2019~2020 | 2021~ |
| Grade 1 (healthy) | -0.02%p | -0.02%p | -0.02%p | -0.028%p | -0.04%p |
| Grade 2 | - | - | - | - | - |
| Grade 3 (weak) | +0.004%p | +0.01%p | +0.02%p | +0.028%p | +0.04%p |

(source :KDIC 2014 annual report, 54p)

3.2. Hypotheses

According to the theory, the RBIP offers a motivation for banks to reduce the risk. However, empirical studies in other countries failed to support it. Chang and Chen (2002), and Abdullah S. & Adlina S. (2014) pointed out the possible reasons : 1) in case the deposit insurer conducts an inadequate evaluation, 2) in case the differential rate is too small to have an influence on the banks, 3) in case other time or institutional trend intervenes with the effect of the RBIP.

Initially, the KDIC paid more attention to a stable operation of the RBIP by diminishing the financial burden on the SBs. To do so, it has decreased the differential rates. Additionally, the reduced higher rate of +0.004%p is as small as +0.005%p of Taiwan, where the differential rate was found too small to affect the banks. Thus, unlike the rationale of the theory, I presume that the current differential rates of the KDIC are too small to have an impact on the SBs. I want to build the hypothesis as follows :

(Hypothesis 1) The RBIP in the soft landing period is not sufficient to motivate the SBs to reduce their risk.

In the soft-landing period, the lower rate range (0.02) for the healthy SBs is greater than the higher rate range (0.004) for the weak SB. The incentive of the healthy SBs will be stronger than one for the weak SBs. It will drive the healthy SBs to be more sensitive to reduce risks. So, I specify the second hypothesis as follows :

(Hypothesis 2) During the soft-landing period, the motivation for the healthy SBs will be stronger to reduce their risks than one for the weak SBs.

3.3. Data and Variables

3.3.1 Data

I collect the SBs' financial data for four years starting from July 2011 to June 2015, and the observed frequency is every half year. During the study period, the 70 SBs had kept operating the business. Among them the five SBs, as the outliers, are excluded from this study because two SBs showed the extremely high BIS ratio and three SBs fell under a different regulation rule by the FSC. Finally, financial data on the 65 SBs over 8 half years is obtained through the website⁵ by Financial Supervisory Service in Korea. Using this data source, I constructed a balanced panel data set which consists of 520 observations.

5 <http://fisis.fss.or.kr/fss/fsi/id/fssmain.jsp>

Table2 : Data

| types | Details | note |
|-------------------|----------------|---------------------|
| Number of SBs | 65 | total : 520 (=65*8) |
| Observation times | 8 (half years) | |

3.3.2 Dependent variable

In this paper, the risk level of the SBs is the dependent variable. Risk can be defined as the chance of loss. In general, there are two ways of measuring the risk ; capital market based measure or accounting based measure. With regard to the former, some scholars have measured the risk by using the volatility (standard deviation) of each bank's ROA, because high volatility is a sign of higher risk (Cebenoyan and Strahan, 2004). However it is hard to get information unless the bank's stock is listed. Unfortunately, there is no SB whose stock is listed in the Korean stock market.

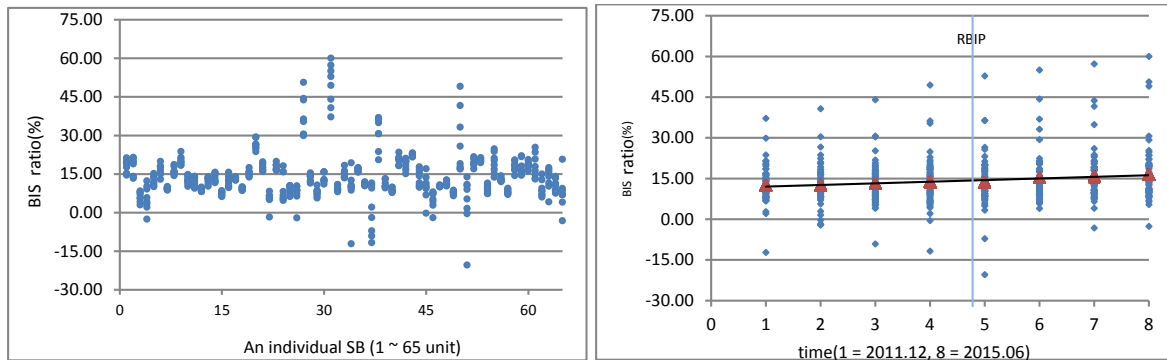
Instead there is an accounting based risk measure. Capital adequacy ratio, a percentage of a bank's capital to its risk-weighted asset, means how much capital the bank has in order to deal with the unexpected loss or risk. If the risk increases, it will increase the risk-weighted asset, then the capital to the risk-weighted asset will become relatively small, finally the capital adequacy ratio will decrease. As an international standard indicator, the Bank for International Settlements ratio ('BIS ratio')⁶ has been developed to ensure that banks can absorb a reasonable level of losses before becoming insolvent. Also, the KDIC uses the BIS ratio to evaluate the SBs' risk.

The 'BIS ratio' is used as a proxy variable for the risk. When it comes to the BIS ratio, it covers the risks, such as the insolvency risk, credit risk. Over this study period, the average 'BIS

⁶BIS ratio = Capital/ Risk-Weighted Asset

ratio of all SBs are distributed around 15%, which has grown gradually over time.

Figure 2: The distribution of the BIS ratio of the SBs over the study time period



3.3.3. Variables of Interest

The 'RBIP' is a dummy variable. If the time is after July 1 2013, its value is 1. Otherwise 0.

The 'healthy SBs' is also a dummy variable that stands for a financially strong enough SBs to endure the unexpected loss. At the end of previous time period, if a SB's BIS ratio exceeds an average BIS ratio of all SBs, the value of the 'healthy SBs' will be 1. Otherwise, 0, meaning the weak SBs. This value can change every half year depending on a SB's performance at the end of each period. And 'RBIP & healthy SBs' is an interaction term which connects the 'RBIP' with the 'healthy SBs'.

3.3.4. Control variables

The moral hazard induced by adopting the deposit insurance system is kept in check through several factors: regulatory, market, and self-discipline. Since those factors restrict the risk level of a SB, I will employ them as the control variables. With regard to the regulatory

discipline, if a financial performance is less than a minimum criteria (BIS 5%), a SB will be given a special administrative command by the FSC. Then risky activities will be prohibited. If a financial performance is put below the other criteria (BIS 5%+2%p), the KDIC would investigate whether there are improper behaviors. I built 'specially regulated SBs', which is a dummy variable. If a SB comes under those circumstance within a time period of t-1 or t-2, its value will be 1 at a time t, because the special command or special investigation is made at least 6 month after finding a low BIS ratio.

Next, depositors with short-term deposits (one year or less) will tend to be sensitive to the interest rate, pursuing a high earning. But if a depository SB is closed due to insolvency, depositors would have to wait to be repaid usually 3 months until the needed procedures end. So, they have a motivation to avoid a SB with high risk when selecting a SB in which to put their deposit. This behavior acts to monitor a risk level of the SB. I built the variable of 'weight of short-term deposits', expressed as a percentage to an amount of debt in a SB.

In case of self-discipline, a type of ownership or a share rate of ownership will be useful. The 'individual ownership' is a dummy variable, if yes, its value is 1. Otherwise an organization is 0. Usually, an individual owner struggles to monitor the managers' behaviors, and then this SB is likely to be exposed to higher risk. And if the 'stock rate of ownership' is greater, she will have more interest in monitoring what the managers are doing well for the bank.

To control for the effect of size of the SB, I will use the variable of an 'asset'.

Table 3: Summary of the variables

| variable type | variable names | Unit of measure | Expected Direction |
|---------------|-------------------------------|--|--------------------|
| Dependent | BIS ratio | % | - |
| Interest | RBIP | 1, if yes 0, not | Not sufficient |
| | healthy SBs | 1, if a SB exceed an average BIS ratio at t-1. If not, 0 | - |
| | RBIP & healthy SBs | Interaction term | More sensitive |
| Control | pecially regulated SBs | 1, if yes 0, not | Positive |
| | weight of short-term deposits | % | Positive |
| | individual ownership | 1, if yes 0, not | Negative |
| | stock rate of ownership | % | Positive |
| | asset | Log | Negative |

Table 4: Descriptive statistics for the variables

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|-------------------------------|-----|-------|-----------|--------|-------|
| BIS ratio | 520 | 14.14 | 8.65 | -20.41 | 60.04 |
| RBIP | 520 | 0.50 | 0.50 | 0 | 1 |
| healthy SBs | 520 | 0.45 | 0.50 | 0 | 1 |
| RBIP & healthy SBs | 520 | 0.21 | 0.49 | 0 | 1 |
| pecially regulated SBs | 520 | 0.26 | 0.44 | 0 | 1 |
| weight of short-term deposits | 520 | 91.51 | 7.69 | 11.82 | 99.43 |
| Individual ownership | 520 | 0.53 | 0.50 | 0 | 1 |
| stock rate of ownership | 520 | 0.59 | 0.29 | 0.13 | 1 |
| asset | 520 | 12.61 | 0.86 | 10.33 | 15.18 |

3.4. Model

Even though each SB has a uniform risk management system under the same regulation, an individual risk preference which is unobserved will make a distinct risk culture. This risk preference affects the SB to decide whether to purchase the high risk product or attract the short-term deposits. This is likely to be correlated with 'asset', or 'weight of short-term deposits'. The fixed effect model will be appropriate to control for individual risk preference.

Then in the fixed effect model, there is an endogeneity problem caused by the reverse causality between 'asset' and 'BIS ratio'. The increase of an 'asset' will decrease the 'BIS ratio' mechanically because it is a denominator in calculating the BIS ratio but also for economic reasons as size the target 'BIS ratio' affects the risk (risk-weighted asset). To deal with the endogenous variable 'asset', the two instrumental variables are used .One is a 'lagged asset', and the other is the 'number of employees' at time t. It assumes that both instrumental variables have a relationship with the change of 'asset' and do not directly affect the 'BIS ratio' (dependent variable). To consider the endogenous variable, the Fixed Effect with the Instrumental Variable (Instrumental variables and two-stage least squares for panel-data models) will be employed.

In addition, I will consider the time effect. The reason is that the 'BIS ratio' is strongly affected by the economic macro variable, such as an interest rate, and GDP growth rate. Actually BIS ratio has grown over study time period. To extract out these macro effects properly, I will use the time dummy variables (λ_t) before and after the RBIP respectively. After all, my final fitted models are follows :

<Model(1) - For hypothesis 1>

$$\text{BIS ratio}_{it} = \beta_1 \text{RBIP}_{it} + \beta_2 \text{ specially regulated SB}_{it} + \beta_3 \text{ weight of short-term deposits}_{it} +$$

$$\beta_4 \text{individual ownership}_{it} + \beta_5 \text{stockrate of ownership}_{it} + \beta_6 \text{asset}_{it} + u_i + \lambda_t + \varepsilon_{it} \text{-----} \quad (1)$$

where 'asset' is an endogenous variable, then the two instrumental variables (lagged asset, number of the employees) are used. 'u_i' stands for an individual effect, and 'λ_t' stands for a time effect. And, 'ε' is an error term.

<Model(2) - For hypothesis 2>

$$\text{BIS ratio}_{it} = \beta_1 \text{RBIP}_{it} + \beta_2 \text{healthy SBs}_{it} + \beta_3 \text{RBIP \& healthy SBs}_{it} + \beta_4 \text{especially regulated SBs}_{it} + \beta_5 \text{weight of short-term deposits}_{it} + \beta_6 \text{individual ownership}_{it} + \beta_7 \text{stockrate of ownership}_{it} + \beta_8 \text{asset}_{it} + u_i + \lambda_t + \varepsilon_{it} \text{-----} \quad (2)$$

where 'RBIP & healthy SBs' is the interaction term to test for the sensitivity of the healthy SBs to the BIS ratio in the RBIP.

4. Results and Implication

4.1 Validity Check

The Hausman test showed that the fixed effect is more appropriate than the random effect by rejecting the null hypothesis that the fixed effect is uncorrelated with the explanatory variables. Thus the fixed effect model is used to test my hypothesis.

The IVs (lagged asset, number of the employees) used to control the endogenous variable of 'asset' should meet the two requirements : relevance and exclusion restriction. First requirement - relevance - is tested through the Anderson and Cragg-Donald-Wald test. By

rejecting the null hypothesis⁷, these results show that the IVs are sufficiently correlated with the endogenous variable 'asset'. Second requirement - exclusion restriction - is indirectly tested through the Sargan test. By accepting the null hypothesis⁸, it supports the assumption that the IVs do not directly affect the dependent variable 'BIS ratio'. In sum, it shows that the hypotheses that the fitted models with IVs will work correctly are not rejected in the data.

4.2 Results

As Figure 2 showed above, the average BIS ratio has increased over time. In the result of the model (1), the coefficient estimates of the time dummies are significantly positive at 10%, 5%, 1% level. It implies that time effect such as the GDP growth rate explains the change of the 'BIS ratio'. But since the p-value (0.836) of the coefficient of 'RBIP' in the model (1) exceeds the significant level, it shows that the 'RBIP' is not associated with the 'BIS ratio'. The conclusion is that the RBIP was instituted during a period of improving bank condition, and there is no evidence that the 'RBIP' motivates the SBs to increase the 'BIS ratio'. Its result supports Hypothesis 1.

In the model (2), the interaction term 'RBIP & healthy SBs' can be interpreted how well the healthy SBs increase the BIS ratio compared to the weak SBs in the RBIP. The coefficient of the 'RBIP' in the model (2) means the effect on the weak SBs, and the effect on the healthy SBs is the coefficient of 'RBIP' + 'RBIP & healthy SBs'.

In the result of the model (2), the coefficient estimate of 'RBIP & healthy SBs' has a significantly positive value of 2.088 at the 1% level, then it concludes that when the RBIP is implemented, the 'healthy SBs' is more sensitive to increase the BIS ratio by 2.088%p than the

7 The null hypothesis that the IV is not correlated with the endogenous variable.

8 The null is that the IV is not correlated with the residuals (dependant variable).

weak SBs. It supports the Hypothesis 2. Also, the 'RBIP' has significantly negative value of -1.136 at the 10% level. This result shows that the weak SBs will decrease the BIS ratio by -1.136%p when the RBIP is implemented rather than not implemented. This is in the opposite direction of the effect of the RBIP. As for the 'healthy SBs', they have the significant positive value of 0.952 (= -1.136 + 2.088). There is an evidence that the RBIP affects the 'healthy SBs' to increase the BIS ratio by 0.952%p. This model (2) shows that the effects of the RBIP are more positive on 'healthy SBs', more negative on weak SBs, not as intended.

Besides the variables of interest in this study, the control variables are predicted to have the significant results as expected. Specifically, the 'weight of short-term deposits' representing the market discipline shows the significantly positive association with the BIS ratio in the model (1) at 10% level and the model (2) at 5% level. It means that as the weight of short term deposit increases by 1%, the BIS ratio is predicted to increase by roughly 0.05%p. And if the SB is under 'individual ownership', its BIS ratio is predicted to decrease by -2.7%p~-2.8%p. If the 'stock rate of ownership' increases by 1%p, it is predicted to increase the BIS ratio by roughly 0.05%p.

Contrary to the expectation, the 'specially regulated SBs' in the model (1) has a negative relation to 'BIS ratio'. It seems that it is already financially vulnerable, so it is difficult to restore the normality, even though it gets a special order. And the 'asset' is found insignificant variable. It means that the size of the SB is not significant factor to affect to BIS ratio.

Table 5: Results

| VARIABLES | Model (1) | Model (2) |
|-------------------------------|-----------------------|-----------------------|
| Dependant | BIS ratio | BIS ratio |
| RBIP | -0.168 (0.598) | -1.136* (0.639) |
| healthy SBs | | 1.927** (0.790) |
| RBIP × healthy SBs | | 2.088*** (0.613) |
| pecially regulated SBs | -0.921* (0.470) | -0.664 (0.458) |
| weight of short-term deposits | 0.0502* (0.0263) | 0.0532** (0.0258) |
| individual ownership | -2.709*** (0.842) | -2.809*** (0.825) |
| stock rate of ownership | 0.0503*** (0.0190) | 0.0508*** (0.0184) |
| asset | -1.629 (2.096) | -0.781 (2.044) |
| time1 | -1.070* (0.612) | -1.240** (0.600) |
| time2 | -1.022* (0.610) | -1.046* (0.591) |
| time3 | -0.488 (0.601) | -0.603 (0.584) |
| time6 | 1.791*** (0.608) | 1.847*** (0.588) |
| time7 | 2.065*** (0.604) | 2.223*** (0.586) |
| time8 | 3.057*** (0.609) | 3.181*** (0.590) |
| Observations | 520 | 520 |
| Number of SBs | 65 | 65 |
| R-squared | 0.217 | 0.268 |

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

4.3 Implication

The separate effect of the RBIP on the both sides of the SBs shows that the weak SBs are predicted to respond in the opposite direction to the healthy SBs. The weak SBs are predicted to continue doing the risk-taking activities while increasing the risk as they did in a flat-rate system. The weak SBs with the higher rate of +0.004%p will increase the risk directly. However

the healthy SBs are predicted to reduce the risk. It can infer that this difference results from the different range of differential rates on the same conditions of other factors. Specifically, the severely reduced differential rate for the weak SBs is too small to motivate them. This accounts for the reason why the RBIP does not work for all SBs, the healthy SBs are better to reduce the risk than the weak SBs.

As long as the weak SBs do not respond to reduce the risk, the RBIP cannot be successful. So, specifically the current differential rates for the weak SBs should be expanded because it does not work for them.

5. Limitations

This study period contains just two years after the implementation of the RBIP. It may be so early to examine the effect of it, and an observation period may be too short to estimate the effect. Because of the short observation period, it appears that the strong time effect interferes with the effect on the RBIP. In the future, more studies will be expected to examine the effect of the RBIP after ending the soft landing period set by the KDIC. And I cannot access the individual premium rate which is determined for each SBs, because its release is not allowed by the law. If it can be used, it is possible to examine how the premium rate affects the risk in each SB.

In this study, I depend on the BIS ratio as a proxy for the risk. It contains the credit risk, and insolvency risk. Besides them, there are lots of risks in the SBs such as market risk, interest risk, and liquidity risk.

6. Conclusion and Recommendation

The purpose of my study was to test whether the RBIP in Korea has an impact on reducing the risk of the SBs during the current period. The RBIP has little impact on reducing the risk, or even increases the risk for weaker banks. Based on past research, one main reason is that the current differential rate in the current RBIP is too small to impact on motivating the SBs.

The recommendation from this test result is that the KDIC needs to expand the differential rate for the weak SBs at least, if it wants to achieve the goal of restricting the risks of the SBs.

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Appendix

a. The Result for the Validity Test (Model1)

Hausman Test Result

Ho: difference in coefficients not systematic
$$\text{chi2 (13)} = (\mathbf{b}-\mathbf{B})' [(\mathbf{V}_b-\mathbf{V}_B)^{-1}] (\mathbf{b}-\mathbf{B})$$
$$= 34.77$$
$$\text{Prob}>\text{chi2} = 0.0009$$

($\mathbf{V}_b-\mathbf{V}_B$ is not positive definite)

The Validity Test Result about IV

Underidentification test (Anderson canon. corr. LM statistic): 100.348
Chi-sq (2) P-val = 0.0000

Weak identification test (Cragg-Donald Wald F statistic): 62.531
Stock-Yogo weak ID test critical values: 10% maximal IV size 19.93
15% maximal IV size 11.59
20% maximal IV size 8.75
25% maximal IV size 7.25

Source: Stock-Yogo (2005). Reproduced by permission.

Sargan statistic (overidentification test of all instruments): 0.420
Chi-sq (1) P-val = 0.5172

b. The Result for the Validity Test (Model 2)

Hausman Test Result

Ho: difference in coefficients not systematic
$$\chi^2(13) = (b-B)'[(V_b - V_B)^{-1}](b-B)$$
$$= 98.85$$
$$\text{Prob} > \chi^2 = 0.0000$$

($V_b - V_B$ is not positive definite)

The Validity Test Result about IV

Underidentification test (Anderson canon. corr. LM statistic): 100.385
Chi-sq (2) P-val = 0.0000

Weak identification test (Cragg-Donald Wald F statistic): 62.278
Stock-Yogo weak ID test critical values: 10% maximal IV size 19.93
15% maximal IV size 11.59
20% maximal IV size 8.75
25% maximal IV size 7.25

Source: Stock-Yogo (2005). Reproduced by permission.

Sargan statistic (overidentification test of all instruments): 0.295
Chi-sq (1) P-val = 0.5870
