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Discretionary Accounting for Loss Reserves in the Korean Property-Casualty Insurance Industry

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Abstract

This study examines whether property-casualty insurance companies exercise accounting discretion when reporting the claim loss reserves, in response to their financial strength. Specifically, we test if there is evidence of directional overstatement or understatement in the original loss reserves, in relation to financial strength measured by several financial ratios and rating scores for each company prepared by the insurance regulatory body's financial scores. The study period includes fiscal years 1993 through 1995, and takes measurements of reserve error after two years of loss development. Empirical results provide statistical evidence of a tendency for financially weak insurers to understate the value of claim loss reserves while financially strong insurers tend toward overvaluation of the reserves.

I. Introduction

Management's potential to intentionally misstate the value of property-casualty loss reserves has received considerable attention in the United States. Anderson (1971), Smith (1980), Weiss (1985), and Grace (1990) attempted to provide evidence of systematic reserve errors in support of the income smoothing hypothesis. Petroni (1992) and Penalva (1997) provided evidence

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of a tendency for financially weak U.S. insurers to understate loss reserves in order to appear themselves financially sound. Penalva (1997) also showed that financially strong insurers tend to overstate loss reserves to mitigate taxes. More recently, Petroni, Ryan and Whalen (1998) offered evidence that discretionary overstatements and understatements of loss reserves are linked to future profitability, firm risk, and market to book ratios.

In contrast to the U.S. insurance market, investigations of the loss reserving behavior of Korean property-casualty insurers are relatively new. Kim, Lee and Son (1998) investigated loss reserve reporting behavior in relation to insurers' financial condition, and provided evidence that insurers' financial condition was linked to a tendency toward understatement or overstatement of the loss reserve. Specifically, they found that financially weaker Korean insurers were more likely to understate loss reserves.

The exercise of management discretion in establishing the value of the reserve reported in the insurer's financial statements is an issue of some importance. Intentional overstatements of the reserve have the corresponding effect of reducing reported income for the period by the same amount disregarding taxes. Consequently, conclusions drawn from commonly used profitability measures are potentially biased by any intentional misstatements of reserve value. As the largest component of insurer liabilities, loss reserves are central to the analysis of insurer financial strength. Understatement of the reserves translates directly into corresponding overstatements of equity through an overstatement of policyholders' surplus. This one-to-one correspondence has the potential to bias many of the financial ratios employed in the analysis of insurer financial statements. The effects are particularly important with respect to the evaluation of an insurer's solvency margin, where intentional reserve understatements will overstate the insurer's capital adequacy and can even obscure potential financial distress.

The primary purpose of this study is to investigate whether the tendency of Korean property-liability insurers to overstate or underestimate the liability associated with future claims is a function of the individual insurer's financial strength. Ideally, the degree of overstatement or understatement of the claim loss

reserve can be accurately measured only after all claims are reported and settled for insurance policies written as of a given valuation date. In reality, however, loss reserves set aside for certain long-tailed lines of insurance policies including bodily injury and workers compensation are highly suspectible to accurate estimation and only become clear as time passes.[1] Thus, the longer time span the loss development uses, the more valid the measure of reserve error becomes.

This paper extends Kim, Lee and Son (1998) where limited data required that reserve error be measured after only one year of loss development, at which time about 50% of loss amounts are realized. Here, we measure reserve error after two years of loss development, at which time approximately 70 percent of ultimate claims will have been settled. Thus, the measure of loss reserve used in this paper is more valid than that of Kim, Lee and Son (1998). It also extends the analysis period from two years to three years starting 1993, and refine certain financial condition variables affecting loss reserve reporting behavior.

Ideally, the reported claim loss reserve represents an insurer's best unbiased estimates of all amounts to be paid in satisfaction of policyholders' claims. In reality, the reported amount is an estimate that is subject to future revision. With the passage of time, additional information becomes available regarding the losses attributable to policies written in prior periods, and estimates of the incurred losses are revised to reflect the emergence of this additional information. Amounts associated with revised claim loss reserves are concurrently charged to operations in a manner consistent with accounting for a 'change in accounting estimate.' At any given financial statement date, the difference between value of the reported reserve and the value of the previously reported reserve provides a measure of reserve error. This measurement method implies that the re-estimated reserve amount is, in fact, correct with respect to the ultimate amounts that will be paid.

This study measures reserve error using two years of loss development. Kazenski, Feldhaus and Schneider (1992) have

1) The losses attributable to insurance policies are chronologically incurred, reported, settled, and finally paid. All losses not yet settled are subject to estimation. The most uncertain element of loss reserves is that created by losses which have been incurred but not reported(IBNR).

previously shown that a two to three year measurement horizon was sufficient to detect statistically significant reserve errors within samples of U.S. insurers. The remainder of this paper is organized as follows. In section 2, we develop our research hypothesis. In section 3, we describe the sample data and statistical methods used in our study. We present the empirical results in section 4. Finally, we conclude in section 5 with a summary and implications from this study.

II. Research Hypothesis

Solvency surveillance is one of the primary responsibilities of insurance regulators. For insurers, maintaining the company's financial condition within regulatory requirements is of critical importance. A weak financial profile can invite regulatory intervention ranging from increased supervision to the involuntary termination of operations and liquidation of the enterprise. Given the potential costs of non-compliance, managers of financially weak insurers have strong incentives to maintain the appearance of financial solidity, particularly with respect to regulatory minimum solvency margin requirements. For example, Korean insurers were subject to a regulatory constraint that limited the annual amount of net written premiums up to 500 percent of its amount of the regulatory solvency margin throughout the period under study.[2)]

Under-valuation of the claims reserve can be a particularly effective tactic to avoid increased regulatory scrutiny and the associated costs of compliance with above-normal regulatory demands. The methods for establishing the value of the claims loss reserves are complex, and require the exercise of considerable professional judgment. Proper application of these methods generally requires reliance on actuarial expertise. Independent auditors charged with expressing an opinion on an insurer's financial statements are responsible for assessing the

2) As of now, according to the Regulations on Supervision of Insurance Business recently amended in August 2002 by Korean Financial Supervisory Commission(FSC), if the solvency margin amount of an insurer is lower than the regulatory solvency margin requirement, the insurer is subject to a number of prompt corrective actions by the FSC.

reasonableness of the estimates, but are not required to validate the details of the estimation process itself.

Based upon the foregoing, we argue that the presence of solvency margin requirement regulation increases the benefits of employing management discretion to understate the reported reserves of financially weak insurers. This suggests, more specifically, that management's incentives to overstate the firm's solvency margin through intentional under-valuation of the claims loss reserve is inversely related to the insurer's financial strength. This study focuses, therefore, on testing the following hypothesis:

H1: Managers of financially weak property-casualty insurers exhibit a bias toward understating estimates of claim loss reserves, relative to managers of financially strong property-casualty insurers.

III. Data and Statistical Methods

3.1. Data

This study uses the reserve error as a dependent variable that is affected by an insurer's financial strength. Financial strength is partly proxied for by the Korean Insurance Supervisory Board's evaluation rating of property-casualty insurance firms operating in Korea from 1993 to 1997.[3] Other financial statements variables are also used to represent financial strength of insurers.

Data for this study are drawn from the financial reports of Korean property-casualty insurance firms during the period 1993 through 1997. Defining reserve error as the difference between the originally reported reserve and the re-estimated

3) The Korean Insurance Supervisory Board is merged into the Koran Financial Supervisory Commission (FSC) in April 1998, an integrated financial institution supervisor in Korea, as a result of the 1997 financial crisis. Further, the annual evaluation ratings previously made by the Board had been replaced by the management performance evaluation system established by the FSC, basically common to all types of financial institutions, beginning 2000. This new management performance evaluation system is sometimes called CAMEL (Capital, Asset, Management, Earnings, and Liquidity).

reserve after two years of loss development permits the calculation of reserve errors for each of the years 1993, 1994, and 1995. Data collection excludes foreign insurers on the basis that observed reserve behavior could be confounded by regulations in force in the foreign insurer's home country. Also excluded from the analysis are insurers specializing in bond guarantee or reinsurance.

Data concerning the originally reported reserve and the reported value of the reserve two years later are collected to provide the information necessary to construct the dependent variable, reserve error or reserve deficiency. The measurement of the reserve deficiency here is made for a fixed group of policies as of original estimation date. For instance, the reserve deficiency in 1997 is calculated for policies being written as of the 1995 fiscal year-end.[4)]

In addition to the information necessary to calculate reserve error, data on nine additional variables were collected. Four of the variables relate to the Korean Insurance Supervisory Board's evaluations of individual insurers. The Board grades insurers' overall financial condition and assigns a rating of AA (best), A, B, or C to each insurer. This rating is a composite of scores along four financial dimensions: growth, productivity, profitability, and stability.[5)] For the purpose of this study, both the summary class variables and the raw scores along each of the four dimensions are used as independent variables in the analyses.

Five financial statements variables are also included as independent variables in statistical analyses. These variables are selected representing the financial condition of firms, typically used in a bulk of financial distress literature. Four variables are related to premiums, equity, expenses, and investments. Data are collected in order to construct financial ratios. Finally, insurer size is measured by total asset (billion Korean Won).

The operational definition for the dependent variable and each

4) If during the two years the original and re-estimated reserves experience changes as a result of policies being newly opened or expired, then the reserve deficiency measure taken in this study may not reliably reflect the management discretion.

5) The weights on each dimension are as follows; growth-5, productivity-10, profitability-30, and stability-40. The remaining 15 point is given to the publicity, the score of which for each insurer is determined by a committee.

of the financial statement independent variables is given in Figure 1. The meaning of each variable is mostly self-explanatory. The measure of reserve error, dependent variable in this study, is constructed such that a positive value of reserve error represents under-estimation of original loss reserve after two years of loss development. The investment ratio variable and premium-to-capital variable measure the return on investment and the productivity of revenue generating activity relative to capital amount, respectively. The loss ratio variable measures what portion of insurance premium is paid or expected to be paid for insurance claims. The expense ratio represents the extent to which underwriting, maintenance, and collection espenses are incurred in order to underwrite insurance contracts, the main source of revenues for insurers.

Financial data on individual companies are taken from the Insurance Statistics Yearbook. Additional qualitative and quantitative data are taken from Insurers' Annual Management Evaluation Data prepared by the Korean Insurance Supervisory

Figure 1. Operational Definitions of Variables

Variable Name	Definition
Reserve Error (dependent variable)	[1-(Original Reserve ÷ Re-estimated Reserve)] × 100 (see note 1)
Investment Ratio	Investment Profit ÷ Invested Assets
Premiums to Capital	Net Written Premiums ÷ (Paid-in Capital + Policyholders' Surplus)
Loss Ratio	Incurred Losses ÷ Earned Premium (see note 2)
Expense Ratio	Net Operating Expense ÷ Net Written Premiums (see note 2)
Size	Total Assets

Note 1: Re-estimated Reserve = (remaining unpaid claim reserve + claims paid to date) for a fixed group of policies as of the original reserve estimation date.

Note 2: Earned premium, the sales figure for insurance company, is net written premium subtracted by the increase in unearned premium. Net written premium, in turn, is the premium income minus premiums paid for reinsurance.

Board. This latter source includes financial ratings based on financial statement disclosures and supplemental data collected by the Korean Insurance Supervisory Board.

In total, 33 observations are available for analysis. These observations are taken on 11 Korean property-liability insurers for each of the three years 1993 through 1995. Descriptive statistics are provided in table 1, and Pearson correlation coefficients are given in table 2.

The reserve error has a positive mean value of 3.62% with high standard deviation, which indicates that property-casualty insurance companies, on average, tend to understate the claim loss reserve to appear themselves financially sound, with high degree of variability across firms. The average return on investment is 10.79%, and approximately 87% and 23% of insurance premiums are paid for insurance claims and for operating expenses, respectively. From the table 1, we can notice one insurer has the capital impaired causing from the takeover of a troubled automobile insurance company, resulting in the negative value of premiums-to-capital variable.

By looking at the table 2, we can argue that the correlation among explanatory variables are not serious, although certain variables are highly correlated each other. We can notice that the higher the profitability rating, the lower growth rating and the higher the productivity rating. This relation implies some insurers are somewhat selective in accepting new clients in order to protect their profitability. It is plausible that the insurer

Table 1. Descriptive Statistics

Variable(unit or weight)	Mean	Maximum	Minimum	Standard Deviation
Reserve Error(%)	3.62	65.6	-30.1	20.73
Growth(5)	4.42	5.0	1.6	0.95
Productivity(10)	8.61	10.0	5.9	1.3
Profitability(30)	16.96	18.7	1.7	3.2
Stability(40)	23.01	37.0	12.0	7.12
Investment Ratio(%)	10.79	14.5	7.5	1.76
Premiums to Capital	9.31	43.04	-25.41	10.97
Loss Ratio(%)	87.41	109.7	76.5	7.75
Expense Ratio(%)	22.58	27.3	20.0	1.60
Size(billion Korean Won)	758	2,460	204	482

Table 2. Pearson Correlation Coefficients

Variable	Productivity	Profitability	Stability	Investment Ratio	Premium To Capital	Loss Ratio	Expense Ratio	Size
Growth	-0.02	-0.40*	0.31	-0.15	0.12	-0.35*	-0.29	0.31
Productivity		0.62*	-0.22	0.36*	0.10	0.45*	-0.20	0.27
Profitability			-0.24	0.46*	0.11	0.50*	-0.05	0.02
Stability				0.29	0.38	-0.59*	0.31	0.51*
Investment Ratio					0.32	0.19	0.20	0.40*
Premiums to Capital						0.02	0.16	0.41*
Loss Ratio							-0.11	-0.32
Expense Ratio								-0.18

*: significant at 5% level.

yielding high rate of return on investment receives high ratings on productivity and profitability, as indicated by significantly positive correlation of investment ratio with productivity and profitability. Finally, it turns out that the larger the insurer, the more financially strong it becomes. This conjecture is made by observing the size variable is overall positively correlated with sound financial indicators in table 2.

3.2. Statistical Methods

In order to provide a point of direct comparison to Kim, Lee and Son (1998), the data are dichotomized into upper and lower half, for each of the five financial ratio variables and the summary ratings of insurers. The data for each variable are then subjected to a t-test to determine if there are statistically significant differences in the reserve error between the two groups.

Preliminary analysis to determine the existence of a statistically significant relationship between insurer financial strength and reserve error is conducted using ANOVA. The ANOVA analysis employs the class variables corresponding to the Korean Insurance Supervisory Board's summary rating of

the insurer (AA, A, B, or C) against the continuous reserve error dependent variable.

Finally, a model is constructed that hypothesizes reserve error to be a function of financial condition of insurers. This model is subject to statistical test using a multiple linear regression model, which includes the Supervisory Board ratings score for each of four dimensions, rather than the summary ratings used in the above ANOVA, in addition to five financial variables presented above.

VI. Empirical Results

Differences in reserve error for each of the five financial ratios and the Supervisory Board rating independent variables are presented in Table 3. Again, each test involves dividing the data into two groups of upper and lower half, and applying a t-test to determine if the difference in observed reserve errors between the two groups is statistically significant.

Table 3 shows that financial weak group for each of all independent variables has generally higher reserve error than financially strong group, although some variables showing statistically not significant. The observed reserve error over two year horizon differs significantly for two of the six variables, investment ratio and the Insurance Supervisory Board rating. In both cases, financially strong insurers tend toward reserve

Table 3. t-Tests for Statistical Differences in Reserve Error, by Variable

Variable	Mean Reserve Error		P-value (H_0: Means are equal)
	Financially Strong	Financially Weak	
Size (billion Korean Won)	3.32	3.95	0.93
Loss Ratio	2.83	4.37	0.84
Expense Ratio	-0.99	8.53	0.19
Investment Ratio	-3.99	11.71	0.03**
Premium to Capital	0.57	6.50	0.72
Supervisory Board Rating*	-6.85	10.43	0.02**

*: Financially Strong rated AA or A, Financially Weak rated B or C
**: significant at 5% level

Table 4. ANOVA Results for Reserve Error versus 4-Group Supervisory Board Ratings

Source	Sum of Squares	Mean Square	F Value	P-value
Rating	5,635.32	1,878.44	6.71	0.00
Error	8,119.40	280.00		
Totals	13,754.72			
Reserve Error Mean: 3.62 R-Square: 0.4097				

overstatement while financially weak insurers tend toward reserve understatement. These results confirm those reported in Kim, Lee and Son (1998).

Next, we examine the statistical relationship between observed reserve error and the Korean Insurance Supervisory Board's company summary rating, using ANOVA. In contrast to the dichotomized t-test reported above, this analysis uses the four possible summary ratings (AA, A, B and C) as treatment levels. The statistical results of this ANOVA analysis are reported in Table 4.

This model confirms a statistically significant inverse relationship between observed reserve error and insurer financial strength as measured by the Supervisory Board's summary rating of the insurer. The model R^2 of .41 is statistically significant at less than 0.001 level of significance. This result strongly implies that the loss reserve reporting behavior of insurers is associated with the summary ratings made by the Korean Insurance Supervisory Board based on which various levels of regulatory intervention could be taken.

Finally, table 5 reports the parameter estimates, statistical significance and summary model statistics resulting from the estimation of the multiple regression model.[6] With the exception of the productivity, profitability, loss ratio and size, all variables are statistically significant at α = .10 level. Though not apparent due to rounding, size variable marginally fails the test of significance at α = .10 with a p-value of 0.1029. With the

6) The model is also estimated including the year dummies to capture possible year effects. The coefficients on these year dummies, though not presented here, are not statistically significant.

Table 5. Multiple Linear Regression Analysis Results

Source	Sum of Squares	Mean Square	F Value	P-value
Regression	9,486.89	1,054.10	5.68	< 0.001
Error	4,267.83	185.56		
Totals	13,754.72			

R-Square: 0.6897
Adj. R-square: 0.5683

Variable	Expected Sign	Parameter Estimate	Standard Error	P-value
Intercept	?	283.03	69.84	0.00
Growth	-	-6.38	3.42	0.07*
Productivity	-	2.23	2.86	0.45
Profitability	-	-0.81	1.21	0.51
Stability	-	-1.02	0.58	0.09*
Investment Ratio	-	-4.77	2.00	0.03*
Premiums to Capital	+	0.88	0.27	0.00*
Loss Ratio	+	-0.67	0.51	0.31
Expense Ratio	-	-5.35	2.00	0.01*
Size	?	-14.221×10^{-6}	0.00	0.10

*: significant at 10% level.

exception of productivity and loss ratio, neither of which are statistically significant, the signs of the regression coefficients generally confirm expectations that financially weak insurers tend to understate the loss reserve.

The insignificant, although negative as expected, result of the coefficient for the profitability, one of Korean Insurance Supervisory Board rating variables, may be due to the fact that the model includes investment ratio and expense ratio, each of which is related to the profitability dimension, and both of which turn out to be statistically significant in the regression model. In fact, although not reported here, the regression coefficient of profitability turns out to be significantly negative with investment ratio and expense ratio being excluded from the regression model. This result indicates insurers with low profitability in itself actually understate the loss reserves.

V. Summary and Conclusions

This study provides statistical evidence that financially weak Korean insurers exhibit a bias to understate their estimates of claim loss reserves relative to financially strong insurers. Analysis of variance confirms expectations that the tendency to under-value claim loss reserves is greater for insurers receiving lower (weaker) summary ratings from the Korean Insurance Supervisory Board. Confirming evidence is provided by the estimation of a multiple regression model that includes the Supervisory Board's ratings score in addition to five financial variables relating the profitability and size. Year effects are found to be not statistically significant.

These results generally confirm to those reported in studies of insurer reserving behavior in the U.S. property-liability insurance market. One major point of difference between this study and those of U.S. insurers is the relative lack of loss development data for Korean insurers. In the United States, both the National Association of Insurance Commissioners and the Securities and Exchange Commission require that ten years of loss development data be provided in the financial statements for total reserves and liability lines of insurance. Data for this study was limited to two years of loss development, which may affect the accuracy of the reserve error measurements used as the dependent variable.

The results reported here are potentially important to regulators. The presence of minimum solvency margin requirements is intended to assure the integrity of the insurance market and afford an additional measure of protection to policyholders. However, regulatory constraints generate incentives to bias the amounts reported in the financial statements in order to avoid regulatory intervention. It is conceivable that binding constraints may provide sufficient incentives for a financially weak insurer to undertake inordinate risks while masking its true financial condition through the use of discretion in reporting its reserve estimates. In such a case, the presence of overly restrictive regulation might actually facilitate the financial failure that was originally intended to

avoid.

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