Performance Analyses of U.S. Property-Liability Reinsurance Companies

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Abstract: This paper examines the performance of property and liability reinsurance companies in the United States. It shows that these reinsurers have higher mean values than primary insurers in the following financial ratios: net operating income to net premium earned (NOI/PE), yield on invested assets (YIA), and loss reserves to net premium written (LR/NPW). Primary insurers, on the other hand, have higher mean values in the combined ratio (CRAD), the return to policyholders' surplus (RPHS), and net premiums written to policyholders' surplus (NPW/PHS). A further study using least square regression analyses indicates that being a professional reinsurer significantly raises a firm's combined ratio and lowers its return to policyholders' surplus. On the other hand, being a reinsurer has no significant effect on net operating income, yield on invested assets, change in policyholders' surplus, change in premium written, or current liquidity.

INTRODUCTION

This paper examines the performance of property-liability reinsurance companies in the United States. The reinsurance business is still dominated worldwide primarily by reinsurers in western European countries. Although U.S. reinsurers have been expanding their operation, they are unable at the present time to absorb the total demand for reinsurance in the United States. More than 20% of reinsurance in the United States is written by non-licensed alien reinsurers.

Reinsurance is different from primary insurance in several ways. For instance, the volume of coverage under each reinsurance contract is usually

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extremely large, and the reinsurance contract often involves very high risks or highly uncertain risks. Also, reinsurers usually are very skillful in risk management (including identifying potential risks and estimating the probabilities and losses of these risks). Therefore, reinsurers should earn a higher risk premium and thus should have a higher underwriting profit rate than primary insurers. Because reinsurers deal with only few customers (primary insurers), they are expected to have low underwriting expenditures.

In view of the above statements, it would be interesting to see whether there is any significant difference in performance between primary insurers and professional reinsurers. The comparison between the two groups of insurers focuses on certain financial measures that assess the overall operating performance of each group and their ability to meet assumed underwriting obligations. Such a comparison, to the extent that it is carried out in this paper, has not been done before. Thus, the current writing fills an informational void. It should be reinforced that the primary purpose of the paper is only to provide the comparison. An explanation of the differences that may be uncovered later between reinsurers and primary insurers (for example, in the combined ratio that measures underwriting profitability, or in the yield on invested assets, or in the change in policyholders' surplus that affects policyholders' security) is beyond the scope of this paper.

In this paper, a primary insurer is defined as an insurance company that sells to the public. A professional reinsurer, on the other hand, is an insurance company that does not have any direct premium written and sells insurance only to other insurance companies. Comparison of certain characteristics such as ownership structures, sizes, and lines of insurance between primary insurers and reinsurers will be dealt with in the next section. Section 3 illustrates the performance of primary insurers and reinsurers. It provides the summary statistics and reports the t-test results. Section 4 uses Ordinary Least Square (OLS) estimates to further examine the difference in performance between primary insurers and reinsurers. The last section provides some concluding remarks.

COMPARISON OF REINSURERS AND PRIMARY INSURERS

Data used in this study are from the Property-Liability Edition of Best's *Key Rating Guide for 1996*, containing performances over a five-year period, from 1991 to 1995 inclusive. Totally, there are 1784 companies; among them, 158 companies are professional reinsurers and 1626 are primary

Table 1. Business Lines of Reinsurers and Primary Insurers

Line	Reinsurers	Insurers	t-value	p-value
General liability	.11(.31)	.09(.29)	.52	.61
Fire	.10(.30)	.05(.21)	2.19	.03**
Auto–liability	.08(.27)	.30(.46)	−8.69	.00*
Commercial lines	.05.(21)	.09(.29)	−2.35	.02**
Auto–physical	.04(.20)	.07(.25)	−1.67	.10***
Workers' Comp	.03(.18)	.10(.31)	−4.35	.00*
Inland-marine	.03(.16)	.03(.16)	.03	.97
Allied lines	.03(.16)	.01(.12)	.90	.36
Homeowners	.02(.14)	.11(.31)	−6.27	.00*
Surety	.01(.11)	.03(.16)	−1.38	.17

(1) The t-value is calculated under the assumption that two samples have different variances. (2) Parentheses are standard deviations. (3) *, **, and *** are significant (two-tailed) at 1%, 5%, and 10%, respectively.

insurers. Among reinsurers, 91 percent are stock companies, whereas only 6 percent are mutuals. Among primary insurers, 67 percent are stock firms and 26 percent are mutuals.

The mean value of admitted assets of the reinsurers in the sample is about $319 million, while the corresponding mean value of admitted assets for primary insurers is close to $213 million. Thus, the size of reinsurers on average is much larger than that of primary insurers.

The degree of business affiliation is higher among reinsurers than among primary insurers. On average, 74 percent of reinsurers are affiliated or grouped with other reinsurers, while only 64 percent of primary insurers are affiliated or grouped together. As to the distribution systems employed, the sample reveals that 26 percent of reinsurers adopt the agency distribution system, 30 percent use the direct-writer system, and 40 percent employ the brokers system. At the same time, 70 percent of primary insurers use the agency distribution system, 23 percent employ the direct writer system, and 4 percent adopt the brokers system. Thus, the agency distribution system is more prevalent among primary insurers and the brokers distribution system is more widely used by reinsurers.

Table 1 gives the ten major lines of insurance in which reinsurers and primary insurers are involved. Most reinsurers are concentrated (i.e., do most of their business) in lines of general liability (i.e., all except auto), fire,

and auto-liability while primary insurers are mostly focused on auto-liability, homeowners, general liability, and commercial multi-peril coverages. The t-test shows that primary insurers are more concentrated in lines of homeowners, auto-liability, workers compensation, and commercial multi-peril than reinsurers—a finding that is significant at 5%. Reinsurers, however, are more concentrated than primary insurers only in the line of fire insurance (significant at 5%). The simple conclusion from this is that reinsurers' activities are more equally distributed among the various lines of insurance.

SUMMARY STATISTICS OF PERFORMANCE OF PRIMARY INSURERS AND REINSURERS

Different variables are used to demonstrate the performance of insurance firms, including Combined Ratio After Dividends (CRAD), Net Operating Income/Net Premium Earned (NOI/PE), Yield on Invested Assets (YIA), Return to Policyholders' Surplus (RPHS), Loss Reserve/Net Premium Written (LR/NPW), Current Liquidity (CL), Change in Policyholders' Surplus (CPHS), and Change in Premium Written (CP). Table 2 reports the summary statistics of these variables for both primary insurers and reinsurers.

Table 2 shows that the mean values for NOI/PE, YIA, and LR/NPW are significantly higher for reinsurers than for primary insurers. In other words, reinsurers perform better in these items. On the other hand, primary insurers perform better in other aspects, such as CRAD (lower value), RPHS, and NPW/PHS. In addition, professional reinsurers tend to cede more premiums than primary insurers. On average from 1991 through 1995, 38 percent of reinsurers' premiums were ceded to other insurers, while only 31 percent of primary insurers' premiums were ceded.

REGRESSION ANALYSES OF THE PERFORMANCE OF REINSURERS

The above summary gives a brief picture of the performance of reinsurers and primary insurers, but the previous analysis does not control for other factors that may influence the results. In this section, Ordinary Least Square estimates are used to examine the performance of reinsurers. The procedure requires inclusion of a dummy variable denoted by **Rein-Dummy**, which equals 1 if a firm is a professional reinsurer and 0 other

Table 2. Performance of Reinsurers and Primary Insurers

Variable	Reinsurers (n = 158)	Insurers (n = 1,626)	t-value	p-value
Insolvency	.04(.20)	.06(.28)	−1.42	.16
CRAD	132.1(110.7)	110.2(48.6)	2.29	.02**
NOI/PE	36.59(108.50)	19.18(55.03)	1.84	.07***
YIA	7.72(92.17)	7.37(2.12)	1.81	.07***
RPHS	3.54(16.92)	6.33(20.59)	−1.88	.06***
NPW/PHS	.78(.75)	1.75(8.12)	−4.52	.00*
A/PHS	4.58(11.16)	3.71(16.71)	.88	.38
LR/NPW	3.06(11.05)	1.45(2.85)	1.77	.08***
CL	160.4(89.4)	164.9(126.7)	−.57	.57
Bond	2.75(5.29)	2.26(4.32)	.72	.47
CHPS95	8.60(36.90)	9.97(30.95)	−.43	.66
CPHS94	27.18(98.22)	14.51(33.73)	1.57	.12
CPHS93	18.86(31.63)	19.06(45.69)	−.07	.95
AverCPHS	18.27(35.52)	14.46(21.69)	1.26	.21
CP95	18.41(70.56)	13.18(60.64)	.86	.39
CP94	4.91(48.03)	16.25(66.30)	−2.55	.01*
CP93	8.86(83.11)	21.09(78.11)	−1.63	.11
AverCP	11.70(38.28)	14.95(37.30)	−.92	.36
Rein95	.37(.34)	.30(.28)	2.51	.01*
Rein94	.37(.33)	.30(.27)	2.51	.01*
Rein93	.32(.29)	.30(.27)	1.08	.28
AverRein	.35(.29)	.30(.26)	1.76	.08***
Recov95	91.8(150.5)	126.1(179.5)	−2.30	.02**
Recov94	93.7(149.1)	124.5(176.5)	−2.10	.04**
Recov93	108.4(164.7)	120.1(176.9)	−.71	.48
AverRecov	92.2(130.2)	119.7(155.6)	1.99	.05**

(1) **Insolvency** is a dummy variable that equals 1 if an insurer is insolvent in 1996 or 1997. **Bond** is the ratio of low grading bonds to the total bonds. **Rein** is the ratio of ceded reinsurance to the total premiums written; numbers 95, 94, and 93 denote relative years. **Aver** is the average of three years (1993–1995). (2) Parentheses are standard deviations. (3) *, **, and *** are significant (two-tailed) at 1%, 5%, and 10%, respectively.

Table 3. Reinsurers and Combined Ratios
(OLS—Percentage)

Variable	Parameter Estimate	t-value	p-value
Intercept	117.91(8.22)	14.34	.00*
Stock	1.52(3.02)	.50	.61
Group	5.08(3.04)	1.67	.09***
Direct-writer	5.26(3.12)	1.69	.09***
LogAsset	−1.96(.78)	−2.50	.01*
Rein95	29.48(4.73)	6.23	.00*
ReinDummy	21.82(4.94)	4.42	.00*
Commercial lines	−.89(4.79)	−.19	.85
Workers' comp	6.07(4.75)	1.23	.20
General liability	−14.29(4.70)	−3.04	.00*
Short-tail	−2.48(2.97)	−.83	.40
R-square	.04		
Adj R-square	.04		
F-value	7.85		.00*

(1) Short-tail is defined as the total premiums written in the short-tailed lines divided by the total premiums written in all lines. In this paper, automobile physical damage and homeowners insurance are considered short-tailed lines, consistent with the definition used by A. M. Best Company. (2) Parentheses are standard deviations. (3) * and *** are significant (two-tailed) at 1% and 10%, respectively.

wise. The purpose of the estimates is to find if the regression coefficient of **ReinDummy** is significantly different from zero.

Reinsurers and Combined Ratios

In Table 3, the coefficient of the **ReinDummy** from the regression of CRAD is 21.82%, significant at 1%, which implies that reinsurers have a significantly higher combined ratio (CRAD) than primary insurers. A few other control variables also seem to affect significantly the reinsurers' combined ratios. For example, the bigger the firm, denoted by **LogAsset**, the lower is its combined ratios. Also, a company that uses more reinsurance, denoted by **Rein95**, tends to have a higher combined ratio. Reinsurers whose business is concentrated in the general liability line tend to have lower combined ratios.

Table 4. Reinsurers and Net Operating Incomes (OLS—Percentage)

Variable	Parameter Estimate	t-value	p-value
Intercept	59.52(8.83)	6.74	.00*
Stock	9.58(3.25)	2.95	.00*
Group	4.79(3.26)	1.47	.14
Direct-Writer	16.07(3.35)	4.80	.00*
LogAsset	−3.85(.84)	−4.59	.00*
Rein95	−.37(5.11)	−.07	.94
ReinDummy	7.71(5.30)	1.46	.15
Commercial Lines	−13.84(5.15)	−2.69	.01*
Workers' Comp	−11.42(5.09)	−2.25	.02*
General Liability	.74(5.04)	.15	.88
Short-Tail	−22.34(3.19)	−7.00	.00*
R-Square	.07		
Adj R-square	.07		
F-value	12.89		.00*

(1) Parentheses are standard deviations. (2) * is significant at 1%.

Reinsurers and Net Operating Incomes

Table 4 shows that being a reinsurer does not significantly influence the firm's NOI/PE. On the other hand, the ownership structure, size of the firm, and lines of insurance affect a reinsurer's NOI/PE ratio.

Reinsurers and Yields on Invested Assets

Table 5 is the estimated results for yields on invested assets (YIA). The coefficient of the **ReinDummy** is not significantly different from zero. In other words, reinsurers' YIA is not significantly different from those for primary insurers when other factors are controlled. On the other hand, the ownership structure, the distribution system, and ceded reinsurance are major factors affecting a reinsurer's YIA.

Reinsurers and Return to Policyholders' Surplus

In Table 6, the estimated coefficient for the **ReinDummy** is −5.4, significant at 1%. This indicates that professional reinsurers have a lower rate of return to policyholders' surplus. In addition, the table shows that

Table 5. Reinsurers and Yields on Invested Assets (OLS—Percentage)

Variable	Parameter Estimate	t-value	p-value
Intercept	7.10(.33)	21.77	.00*
Stock	.78(.12)	6.50	.00*
Group	−.09(.12)	−.72	.47
Direct-writer	.48(.12)	3.89	.00*
LogAsset	−.01(.03)	−.29	.77
Rein95	−.59(.18)	−3.22	.00*
ReinDummy	.13(.19)	.69	.49
Commercial lines	−.04(.19)	−.19	.85
Workers' comp	.29(.19)	1.53	.13
General liability	.22(.19)	1.17	.24
Short-tail	−.15(.12)	−1.24	.21
R-square	.05		
Adj R-square	.04		
F-value	8.71		

(1) Parentheses are standard deviations. (2) * is significant at 1%.

the size of the firm, ceded reinsurance, and lines of business all affect a reinsurer's return to policyholders' surplus significantly.

Changes in Policyholders' Surplus and in Premiums Written for Reinsurers

Tables 7 and 8 show that being a reinsurer does not significantly affect either the change in policyholders' surplus (CPHS) or the change in premiums written (CP) of the insurer. On the other hand, ownership and ceded reinsurance influence the firm's CPHS, and ownership and the size of the firm affect its PW.

Reinsurers and Current Liquidity

Table 9 reports the estimated results for current liquidity(CL). It shows that being a professional reinsurer has no effect on the firm's CL. However, the distribution system, the size of the firm, ceded reinsurance, and lines of business affect its CL significantly.

Table 6. Reinsurers and Return to Policyholders' Surplus
(OLS—Percentage)

Variable	Parameter Estimate	t-value	p-value
Intercept	1.11(3.08)	.36	.72
Stock	.84(1.13)	.74	.46
Group	−.10(1.14)	−.09	.93
Direct-writer	−.12(1.16)	−.01	.82
LogAsset	.92(.29)	3.14	.00*
Rein95	−6.47(1.75)	−3.70	.00*
ReinDummy	−5.70(1.79)	−3.00	.00*
Commercial lines	−4.73(1.80)	−2.64	.01*
Workers' comp	−3.61(1.78)	−2.03	.04**
General liability	1.10(1.75)	.63	.53
Short-tail	−5.29(1.11)	−4.75	.00*
R-square	.03		
Adj R-square	.03		
F-value	6.07		.00*

(1) Parentheses are standard deviations. (2) * and ** are significant at 1% and 5%, respectively.

CONCLUSIONS

In this paper, property-liability insurance data obtained from Best's *Key Rating Guide* for the year 1996 were used to examine the financial performance of professional reinsurance companies in the United States. The study shows that reinsurers have higher mean values than primary insurers in yield on invested assets (YIA), net operating income to net premium earned (NOI/PE), and loss reserves to net premium written (LR/NPW), while primary insurers perform better in the return to policyholders' surplus (RPHS), combined ratio (CRAD), and net premiums written to policyholders' surplus (NPW/PHS).

The return to policyholders' surplus ratio measures a company's overall profitability from both underwriting and investment activities. The combined ratio on the other hand, measures the underwriting profitability only. As stated before, primary insurers have higher mean values than reinsurers in both of these ratios. However, reinsurers, again as mentioned earlier, have higher mean values than primary insurers in both the YIA ratio, which measures a company's performance on its invested assets, and the ratio of net operating income to premiums earned, which measures the

Table 7. Reinsurers and Change in Policyholders' Surplus
(OLS—Percentage)

Variable	Parameter Estimate	t-value	p-value
Intercept	12.41(4.86)	2.56	.01*
Stock	5.45(1.78)	3.06	.00*
Group	1.59(1.78)	.89	.37
Direct-writer	2.39(1.82)	1.32	.19
LogAsset	−.45(.46)	−.98	.33
Rein95	−5.87(2.73)	−2.15	.03**
ReinDummy	−3.04(2.80)	−1.08	.28
Commercial lines	−1.30(2.82)	−.46	.65
Workers' comp	−.26(2.81)	−.09	.93
General liability	1.72(2.75)	.62	.53
Short-tail	−2.81(1.75)	−1.60	.11
R-square	.01		
Adj R-square	.01		
F-value	2.52		.01*

(1) Parentheses are standard deviations. (2) * and ** are significant at 1% and 5%, respectively.

operational profitability of a company from both its investment and underwriting activities. One possible conclusion that can be drawn from the above statements is that primary insurers realize a higher rate of return from underwriting than from investment, while the reverse is true for reinsurers.

Net premiums written to policyholders' surplus reveals a company's underwriting exposure. As a ratio it measures a company's underwriting leverage. A higher ratio means a higher underwriting risk—that is, a greater exposure to pricing error relative to current business. Primary insurers, as indicated earlier, have higher mean value in this ratio than reinsurers. However, when it comes to the ratio of loss reserves to net premiums earned, which measures the adequacy of such reserves relative to premium growth, reinsurers have higher mean value than primary insurers. The above statements suggest that reinsurers have a higher degree of redundancy in their loss reserves than primary insurers who underwrite a higher volume of business relative to their policyholders' surplus.

A further study using least square regression analyses indicates that being a professional reinsurer significantly raises firm's combined ratio

Table 8. Reinsurers and the Change in Premium Written
(OLS—Percentage)

Variable	Parameter Estimate	t-value	p-value
Intercept	41.21(9.69)	4.25	.00*
Stock	8.11(3.56)	2.28	.02**
Group	3.65(3.57)	1.02	.31
Direct-writer	−2.54(3.65)	−.70	.49
LogAsset	−3.57(.92)	−3.89	.00*
Rein95	.38(5.56)	.07	.95
ReinDummy	7.81(5.67)	1.38	.17
Commercial lines	5.44(5.63)	.97	.33
Workers' comp	5.73(5.70)	1.00	.32
General liability	10.34(5.53)	1.87	.06***
Short-tail	1.01(3.50)	.29	.77
R-square	.02		
Adj R-square	.01		
F-value	2.66		.00*

(1) Parentheses are standard deviations. (2) * , **, and *** are significant (two-tailed) at 1%, 5%, and 10%, respectively.

and lowers its return to policyholders' surplus. At the same time, being a reinsurer has no significant effect on other financial aspects, such as net operating incomes, yield on invested assets, change in policyholders' surplus, and changes in the premium written or current liquidity.

The least square regression analyses show also that professional reinsurers in the United States do not perform financially as well as primary insurers. One possible explanation for this finding is that the reinsurance market in the United States may be more competitive than the primary insurance market.

Professional reinsurance firms were not formed in the United States until the early 1900s, while in most European countries they were set up as early as 1850s. Many foreign reinsurance firms are doing business in the United States because the demand for reinsurance is so large and because domestic U.S. reinsurers lack the capacity to absorb all of this demand. Foreign reinsurance firms, therefore, are major competitors in the American reinsurance market, while the competition in the primary insurance market happens mainly among domestic insurers. Another explanation for the degree of foreign reinsurer presence in the U.S. market is that American primary insurers prefer doing business with foreign reinsurers rather than

Table 9. Reinsurers and Current Liquidity (OLS)

Variable	Parameter Estimate	t-value	p-value
Intercept	463.58(18.54)	25.01	.00*
Stock	−9.87(6.54)	−1.51	.13
Group	9.45(6.55)	1.44	.15
Direct-writer	26.26(6.71)	3.92	.00*
LogAsset5	−24.50(1.73)	−14.15	.00*
Rein90	−64.60(10.14)	−6.37	.00*
ReinDummy	6.21(10.28)	.60	.55
Commercial lines	−16.52(10.27)	−1.61	.11
Workers' comp	−34.28(10.18)	−3.37	.00*
General liability	−17.07(10.03)	−1.70	.09***
Short-tail	−37.31(6.45)	−5.79	.00*
R-square	.16		
Adj R-square	.15		
F-value	31.60		.00*

(1) Parentheses are standard deviations. (2) * and *** are significant at 1% and 10%, respectively.

with domestic reinsurers. This biased preference toward foreign reinsurers is related to the idea of risk diversification. Ceding premiums to a foreign reinsurer, rather than to a domestic reinsurer, makes a primary insurer feel safer because the foreign reinsurer presumably, through its worldwide operations, has a better capability of diversifying its underwriting risk.

Explaining the reasons for the differences uncovered in this paper between primary insurers and reinsurers is a suitable focus of future research.

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