การประกันภัยต่อและความอ่อนไหวของการเจริญเติบโตของทุนของเครือบริษัทประกันภัยในช่วงก่อนและหลังกฎหมายซาร์บานส์-ออกซ์ลีย์

Reinsurance and Capital Growth Sensitivities within the Group Insurance in the Pre- and Post- Sarbanes-Oxley Periods

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บทคัดย่อ

งานศึกษานี้ใช้กฎหมายซาร์บานส์-ออกซ์ลีย์เป็นเหตุการณ์อิสระจากภายนอกเพื่อศึกษาการจัดสรรเงินทุนภายในเครือบริษัทประกันภัย และศึกษาบทบาทความสำคัญของนักคณิตศาสตร์ประกันภัยและผู้ตรวจสอบบัญชีต่อการจัดสรรเงินทุนดังกล่าว ผู้วิจัยพบว่ากฎหมายซาร์บานส์-ออกซ์ลีย์ช่วยลดความอ่อนไหวของอัตราการเจริญเติบโตของการจัดสรรเงินทุนภายในต่ออัตราการเจริญเติบโตของเบี้ยประกันภัยในบรรดาบริษัทประกันภัยขนาดเล็ก ซึ่งแสดงให้เห็นว่าต้นทุนของการเคลื่อนย้ายเงินทุนเพิ่มขึ้นอันเป็นผลมาจากการเพิ่มขึ้นของกระบวนการสอดส่องดูแลของบริษัท นอกจากนั้นคุณภาพของนักคณิตศาสตร์ประกันภัยและคุณภาพของผู้ตรวจสอบบัญชีมีผลต่อกระบวนการดังกล่าว

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Abstract

This study utilizes SOX as an external shock to investigate how insurers allocate capital among affiliated companies and whether the roles of actuaries and auditors are important. I found that SOX decreased the sensitivity of the internal capital transaction growth to premiums growths among smaller insurers, which suggests that the costs of internal capital transaction increased due to an enhanced monitoring mechanism. Quality actuaries and auditors are crucial in the process.

Keywords: Insurance Holding Company, Reinsurance, Corporate Governance, Financial Reporting.

Introduction

This study utilizes Sarbanes-Oxley Act of 2002 ("SOX") as an external shock event to investigate how insurers allocate capital among affiliated companies and whether the roles of actuaries and auditors are important. I adapt the two-step regression methodology from Wurgler (Wurgler, 2000). In the first stage, the internal capital allocation sensitivity is measured by transaction channel, pre- and post-SOX, as well as by insurance group. Later, the sensitivity measure in stage one is regressed with control variables using a seemingly unrelated regression model to capture the variation of the sensitivity among different groups. The 'difference-in-differences' approach is used in the second stage to capture the impact of SOX among those in the SOX-compliance insurance group.

I have found that the sensitivity of internal capital transaction growth to premiums growths among smaller insurers reduces post-SOX. The results indicate that the costs of internal capital transaction rose after SOX due to the effective monitoring mechanism. The interaction variable with SOX, quality actuaries and quality auditors are also significant, which suggests that actuaries and auditors are the main factors and are crucial in the process.

This work also extends the existing body of literature regarding internal capital transfers among affiliates. Previous literature has pointed out that internal transactions among insurers are not a perfect substitute to the capital from external sources (Powell et al, 2007), and that internal capital allocation is efficient (Powell et al, 2008) and can be used to reach a targeted capital structure (Fier et al, 2013). The conventional wisdom as suggested by the previous literature is that insurers are efficiently allocating capital via internal capital markets. However, the heterogeneity among different subgroups has not yet been explored. This paper provides important evidence regarding the differences among insurance groups and that an external factor, i.e. SOX in this case, could disrupt the internal capital market.

Research Objectives

Study the effect of SOX on sensitivities of capital allocation among insurance holding companies in the United States.

Methodology

To estimate the effect of SOX on the sensitivity of internal capital transaction to premiums growth, this research adapts a methodology used in Wurgler (Wurgler, 2000) and later in Morck et al. (Morck et al, 2011). The methodology calls for a two-stage regression.

For the first stage, each insurance group g and each transaction type c, I first estimate the internal capital sensitivity measure η using the following equation:

$$log\left(\frac{S_{it-1}+C_{igct}}{S_{it-1}}\right)=\alpha_{gc}+\eta_{1,gc}log\left(\frac{P_{it}}{P_{it-1}}\right)+\eta_{2,gc}D_{post}log\left(\frac{P_{it}}{P_{it-1}}\right)+\epsilon_{igct}$$

Sigt-1 is the levels of surplus of insurer i at year t-1. The index g denotes that the insurer is affiliated with an insurance group g. Cigct is the internal capital provided to (or paid from) insurer i's affiliated companies within the same insurance group g. The subscript c in this variable indicates the channel of the internal capital transactions within the group, i.e. through reinsurance channel (reinsurance recoverable or reinsurance credit) or through other channels. Therefore, log Sit-1+Cigct Sit-1 is the surplus growth of insurer i at year t through channel c allocated by others affiliated within group g. log Pit Pit-1 is insurer i's premiums growth. Dpost is an indicator variable equal to 1 if the year is 2005 or after. Using OLS to estimate this equation by insurance group g and by internal capital transaction c, the coefficients $\eta_{1,gc}$, $\eta_{1,gc} + \eta_{2,gc}$ and their standard errors $\sigma\eta_{1,gc}$, $\sigma\eta_{1,gc+}\eta_{2,gc}$ are obtained. The coefficient $\eta_{1,gc}$ represents the sensitivity of the internal capital allocation to premiums growth before SOX, and the sum of $\eta_{1,gc}$ and $\eta_{2,gc}$ captures the post-SOX sensitivity. I then construct a panel data of the sensitivity measure, now called η^*_{gcs}, by group g, by internal capital transaction c and by pre- and post-SOX time periods s. When estimating the first-stage regression, the observations in year 2003 and 2004 are dropped to be consistent with the other SOX literature.

For all the five internal capital transaction channels denoted in the previous section, I simultaneously estimate the following equation of all five channels using the seemingly unrelated regression model with insurance group fixed effect:

$$
\begin{aligned}
\hat{\eta}^*_{gcs} =& \beta_0 + \beta_1 Post_s + \beta_2 Treated_g + \beta_3(Post_s x Treated_g) + \\
& \beta_4 Actuary_{gs} + \beta_5(Actuary_{gs} x Post_s) + \beta_6(Actuary_{gs} x Treated_g) + \\
& \beta_7(Actuary_{gs} x Post_s x Treated_g) + \\
& \beta_8 Auditor_{gs} + \beta_9(Auditor_{gs} x Post_s) + \beta_{10}(Auditor_{gs} x Treated_g) + \\
& \beta_{11}(Auditor_{gs} x Post_s x Treated_g) + \Sigma_k \beta_k X_{gs} + \gamma_g + \epsilon_{gcs} \\
& \forall c \in \{\text{Rein.Recov, Rein.Credit, Total Rein., Total Other Capital, Total Capital}\}
\end{aligned}
$$

A seemingly unrelated regression (SUR) model is used to estimate Equation 3 for all the five internal capital transaction channels since estimating the parameters β_k by OLS per equation is consistent but inefficient if the error terms for the different insurance group establish contemporaneous correlation, as noted by Zellner (Zellner, 1962). Another important econometrics issue potentially arises since $\hat{\eta}^*_{gcs}$ are estimated in the first stage regression. According to Saxonhouse (Saxonhouse, 1976) and Hornstein and Greene (Hornsteinand Greene, 2012), each observation must be weighted with the estimated standard errors from the first-stage regression $\sigma\eta_{1,gc}$ and $\sigma\eta_{1,gc+}\eta_{2,gc}$ because the heterogeneity should be explicitly accounted for when the dependent variables in the second-stage regression are estimated.

Among the variables of interest is Posts, which is an indicator variable equal to one if year is after or in 2005. Treatedg is equal to one if insurance group g is a SOX-compliant group, i.e. that insurance group has one or more of its subsidiaries or affiliates trading in the NYSE or the NASDAQ between 2002 and 2009. Actuarygs and Auditorgs are actuarial service quality variable and audit service quality variable, respectively. $\beta 3$ captures the overall effect of SOX on the capital allocation sensitivity. $\beta 7$ and $\beta 11$ indicate the effect of actuary and auditor quality post-SOX. Xgs and γg are control variables and an insurance group's fixed effect, respectively.

I follow the NAIC's suggestion regarding an analysis of insurance holding companies to select control variables. All control variables are calculated at the group level. For each year, each variable will be calculated at the individual level (if applicable) then weighted by the share of total asset within the insurance group. Afterwards, I take an average across years pre- (1998 - 2002) and post-SOX (2005 - 2009). Actuary is a group weighted average of quality of actuarial service provided to an insurer as measured by the percentile of the actuary's clients' premiums share. Such premiums share and the Big Four indicator variable, which equals to one if the actuary is one of the big four companies, are also used for a robustness purpose. Auditor is a group weighted average of quality of audit service provided to the insurer as measured by the percentile of the auditor's clients' premiums share. The auditor's clients' premiums share and the Big Four indicator variable, which equals to one if the actuary is one of the big four companies, are also used for a robustness purpose.

Group's characteristic variables are as follows. Mutual is a group weighted average of an indicator variable equal to one if the insurer is a mutual company; Bank Affiliated is a group weighted average of an indicator variable equal to one if the insurer is affiliated with a bank; CEO/President Herfindahl is the group Herfindahl Index measuring the concentration of firms with a common CEO/President, i.e. if an insurance group are controlled by only one CEO/President across different companies, the index will equal 10000. The insurer's total asset is used to calculate the share of companies with the same CEO/President. CEO/Chair Duality is a group weighted average of an indicator variable equal to 1 if the insurer's CEO and Chair of the board of directors is the same person. And Access to Capital Market is a group weighted average of an indicator variable equal to 1 if the insurer is affiliated with a public company.

Other group's characteristic variables include the following. Log of Group Asset is a log of total group asset. Vol. of Net Income/Asset: Life/Health is a standard deviation of the group's net income divided by group total asset, but only life/health insurers are included in the calculation. Vol. of Net Income/Asset: Property/Casualty is a standard deviation of the group's net income divided by group total asset, but only property/casualty insurers are included in the calculation. Property/Casualty is a group weighted average of an indicator variable equal to 1 if the insurer is identified as a property/casualty insurer by the NAIC. Investment in Affiliates is a group weighted average of percentage investment in affiliates per total asset. Lastly, Reinsurance in Affiliates is a group weighted average of the percentage reinsurance ceded to the affiliates per total reinsurance ceded.

To identify which insurers belong to which group, I use 'NAIC Group Code' as recorded in the NAIC regulatory statements. Note that an insurer's group may change each year due to mergers and acquisitions among other reasons; however, since the unit of analysis in this paper is insurance group, not individual company, I will not disregard companies that may 'join the group' in later years. Both property/casualty (P/C) insurers and life/health (L/H) insurers are considered. All data are obtained from the NAIC regulatory annual statements and the SNL database from 1996 to 2009. The relevant time in Equation 2 is from 1998 to 2009, but two lags (1996 - 1997) are used to estimate Equation 2 for a robustness test purpose.

The internal capital transactions Cigct are collected from the Schedule Y Part 2 from the regulatory annual statements. Schedule Y Part 2 records an insurer's transactions among the members of an insurance holding company system. It is intended to demonstrate the scope and direction of major fund and/or surplus flows throughout the system. This schedule is prepared on an accrual basis. All recorded transactions must be larger than one-half of one percent or more than the largest insurer's admitted assets as of December 31. Schedule Y does not include transactions between non-insurers that do not involve an affiliated insurer and transactions with the non-insurers that are of a routine nature (e.g. the purchase of insurance coverage).

Schedule Y records internal capital transactions through eight different channels: (1) shareholder dividends; (2) capital contributions; (3) purchases, sales or exchanges of loans, securities, real estate, mortgage loans or other investments; (4) income (disbursements) incurred in connection with guarantees or undertakings for the benefit of any affiliate(s); (5) management agreements and service contracts; (6) income (disbursements) incurred under reinsurance agreements; (7) any other material activity not in the ordinary course of the insurer's business, and; (8) Reinsurance recoverable (payable) on losses and/or reserve credit taken (liability). The term 'other capital' used in this paper refers to the sum of transactions (1) to (7), and the term 'total reinsurance' refers to the transaction (8). These transactions will be positive if insurer i receives the capital contribution in year t (and negative otherwise if paid to other affiliates), and these transactions are recorded on the net basis, i.e. zero transactions do not mean no transaction occurred from and to insurer i that year.

Table 1 reports the summary statistics of the estimated coefficients from Equation 2 and all control variables. According to the table, the values of dependent variables η^* are positive on average. This is in line with the results reported by Powell et al. (Powell et al. 2008), who suggested that the intragroup transactions were 'efficient' in a sense that there was a positive relationship between a reinsurance inflow and the profitability of the ceding company. In my case, it appears that the reinsurance growth is positively associated with the premiums growth (0.03), which could be positively related to the bottom-line profitability. The average sensitivity for the 'Total Other Capital' growth to the premiums growth, however, is negative (-0.01). Nevertheless, simple average is used in Table 1; therefore, the smaller groups are potentially over-represented.

The methodology used in this research allows me to directly observe the heterogeneity of intragroup transaction practices. The result in Table 2 shows that not every group has a positive sensitivity between the intragroup transaction growth and the premiums growth. This could suggest that some groups may exhibit a winner-picking motive while some may show a diversification motive.

More notable observations can be inferred from Table 2. The insurance groups in my sample appointed highly-qualified actuaries and auditors on average; however, the quality of the appointed actuaries appears to be more disperse across groups. There are a fair proportion of mutual groups and bank affiliated groups in the sample. Most of the groups in the sample are property and casualty, which should not be surprising since there are a higher number of property and casualty insurers than life and health insurers. Lastly, insurance groups are more deeply connected through the affiliated reinsurance channel than the affiliated investment channel.

Table 1: Summary Statistics

	Mean	Std.Dev.	Min	Max	Obs.
Dependent Variables (η^*)					
(1) Reinsurance Recoverable	0.05	0.22	-0.64	2.34	286
(2) Reinsurance Credit	0.02	0.24	-1.37	1.36	286
(3) Total Reinsurance (1)+(2)	0.03	0.21	-0.54	1.48	286
(4) Total Other Capital	-0.01	0.26	-1.22	2.95	286
(5) Total Capital (3)+(4)	0.02	0.30	-1.31	2.63	286
Control Variables					
(6) Actuary	0.80	0.16	0.15	0.99	281
(7) Auditor	0.97	0.05	0.56	0.99	286
(8) Mutual	0.23	0.35	0.00	1.00	286
(9) Bank Affliated	0.39	0.49	0.00	1.00	286
(10) CEO/President Herfindahl	7817.78	2548.03	1573.93	10000.00	286
(11) CEO/President Dualilty	0.17	0.38	0.00	1.00	286
(12) Access to Capital Market	0.44	0.50	0.00	1.00	286
(13) Log of Group Asset	7.14	0.84	5.08	9.43	286
(14) Vol. of Net Income/Asset: Life/Health	0.02	0.15	0.00	2.48	286
(15) Vol. of Net Income/Asset: Property/Casualty	0.04	0.06	0.00	0.42	286
(16) Property/Casualty	0.78	0.32	0.00	1.00	286
(17) Investment in Affiliates	0.05	0.05	0.00	0.38	286
(18) Reinsurance with Affliates	0.65	0.31	0.00	1.00	286

Table 2 shows a cross tabulation results by comparing pre- and post-SOX as well as control and SOX-compliant insurance groups. It is worth noting that the differences between the average η of the treatment and control samples are significant, especially among the reinsurance transactions. It appears that the treatment group may reduce the reinsurance growth sensitivity to premiums growth post-SOX. However, the difference-in-differences, as reported in the last column, is not significant. As for the control variables, the treatment group insurers (the SOX-compliant groups) consistently appear to be larger, have less mutual firms within the groups, have more affiliations with banks, and are likely to have more than just one CEO/President overlooking the groups (a more democratic structure). Meanwhile, the actuarial and auditing service quality did not establish a clear change pattern over time.

Results

The main results are shown in Table 3. Without controlling for actuary or audit quality (identifications 1,4,7,10 and 13), SOX appears to have a significantly negative impact on the sensitivity of reinsurance credit growth to premiums growth; however, the impact on reinsurance recoverables and the total other capital appears to be insignificant. The overall sensitivity of the total reinsurance is negative and significant but not for the total capital. Once controlled for the actuary quality and audit quality interaction terms (identifications 3,6,9,12 and 15), the significance of the overall SOX disappears; none among $\beta 3$, $\beta 7$ and $\beta 11$ shows a statistical significance, which suggeststhat each factor (SOX, auditor quality and actuary quality) does not appear to significantly contribute to the reduction of the intragroup transaction growth sensitivity. However, the results suggest that the negative $\beta 3$ in identifications (4) and (7) could be driven by the actuary quality variables. The interaction variable between actuary quality and the treated ($\beta 6$) improves the sensitivity of other capital growths, and reduces the reinsurance credit growth. The auditor quality variable, once interacted with SOX-related variables, appears to be insignificant except for the variable Post x Auditor which has a positive effect on the total capital growth sensitivity. I further investigate the effect of SOX by considering the subpopulation i.e. small insurance groups (Table 4). The definition of a 'small' insurance group is that the total asset of the group is below the median group.

The results from Table 4 support the hypothesis that SOX increases the costs of internal transaction to exceed its benefits since the monitoring effort within the insurance group has been enhanced post-SOX. The effect of SOX only appears among the groups with smaller assets, suggesting that the smaller insurance groups may not have strictly complied with the model laws regarding internal transactions especially the reinsurance credit takens and other capital transactions (except reinsurance recoverables). After SOX was enforced, the monitoring mechanism has been strengthened especially through the quality actuary and auditors, which should not be surprising especially in the case of auditors since the audit partner rotation rule has been enforced post-SOX and they are subject to additional regulations by the PCAOB. The overall costs of raising capital through affiliated companies have increased, which potentially reduced groups' profitability at least over the period of study.

Table 2: Summary Statistics Pre- and Post-SOX

	Pre-SOX					Post-SOX					Difference
	Control	Obs	Treated	Obs	Control - Treated (1)	Control	Obs	Treated	Obs	Control - Treated (2)	(2) - (1)
Dependent Variables (η^*)											
(1) Reinsurance Recoverable	0.01	77	0.08	66	-0.06	0.06	77	0.06	66	0.00***	0.06
(2) Reinsurance Credit	-0.01	77	0.05	66	-0.06	0.01	77	0.01	66	0.00*	0.06
(3) Total Reinsurance (1)+(2)	0.05	77	0.04	66	0.01	0.01	77	0.01	66	0.00**	-0.01
(4) Total Other Capital	0.02	77	-0.04	66	0.06	-0.01	77	-0.01	66	0.00	0.06
(5) Total Capital	0.07	77	0.02	66	0.05	-0.00	77	-0.00	66	0.00***	0.06
Control Variables											
(6) Actuary	0.77	75	0.81	65	-0.04	0.79	76	0.82	65	-0.03	
(7) Auditor	0.97	77	0.98	66	-0.01	0.97	77	0.98	66	-0.02	
(8) Mutual	0.37	77	0.06	66	0.31***	0.39	77	0.07	66	0.32***	
(9) Bank Affliated	0.19	77	0.53	66	-0.34***	0.25	77	0.65	66	-0.40***	
(10) CEO/President Herfindahl	8909.86	77	6563.37	66	2346.49***	8883.98	77	6554.20	66	2329.77***	
(11) CEO/President Dualilty	0.09	77	0.23	66	-0.14*	0.16	77	0.24	66	-0.09	
(12) Access to Capital Market	0.00	77	1.00	66	-1.00	0.09	77	0.79	66	-0.70***	
(13) Log of Group Asset	6.64	77	7.48	66	-0.83***	6.89	77	7.69	66	-0.80***	
(14) Vol. of Net Income/Asset: Life/Health	0.01	77	0.01	66	-0.00	0.00	77	0.04	66	-0.04	
(15) Vol. of Net Income/Asset: Property/Casualty	0.05	77	0.06	66	-0.01	0.02	77	0.02	66	-0.00	
(16) Property/Casualty	0.84	77	0.70	66	0.15**	0.85	77	0.71	66	0.14*	
(17) Investment in Affiliates	0.05	77	0.05	66	0.00	0.05	77	0.04	66	0.01	
(18) Reinsurance with Affliates	0.60	77	0.61	66	-0.01	0.69	77	0.69	66	-0.00	

The variable description can be found in Table 1. *Pre-SOX* period is between 1998 - 2002; *Post-SOX* period is between 2005 - 2009. *Treated* indicates a SOX-compliant insurance group and *Control* indicates a group of private insurers.

[2] Significance levels are indicated by *, ** and *** for 10%, 5%, and 1%, respectively.

Table 3: Main Results

	Rein. Recoverable			Rein. Credit			Total Reinsurance			Other Capital			Total Capital		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Post	0.060		0.432	0.051**		-0.046	0.046**		-0.082	0.033		-0.443	-0.012		-0.443**
	(0.111)		(0.605)	(0.020)		(0.213)	(0.023)		(0.219)	(0.054)		(0.711)	(0.036)		(0.216)
Treated	0.131		0.322	0.051		0.758	0.062		1.026	-0.302		-1.626	-0.173		-1.202
	(0.129)		(1.468)	(0.053)		(1.652)	(0.050)		(1.812)	(0.244)		(1.511)	(0.153)		(2.174)
Post x Treated	-0.113		-0.029	-0.068***		0.092	-0.058**		0.094	-0.071		1.923	-0.045		1.801
	(0.147)		(2.128)	(0.024)		(0.311)	(0.026)		(0.337)	(0.066)		(1.332)	(0.037)		(1.132)
Actuary		-0.355**	-0.415**		-0.298***	-0.117*		-0.237**	-0.083		0.973**	0.324*		0.847***	0.340***
		(0.176)	(0.178)		(0.103)	(0.070)		(0.106)	(0.071)		(0.489)	(0.173)		(0.314)	(0.127)
Post x Actuary			-0.359			0.114			0.099			-0.054			-0.314*
			(0.714)			(0.115)			(0.118)			(0.328)			(0.185)
Treated x Actuary			0.118			-0.434***			-0.370**			1.637**			1.455***
			(0.131)			(0.134)			(0.160)			(0.818)			(0.395)
Post x Treated x Actuary			-0.023			-0.040			0.078			-0.238			-0.271
			(0.781)			(0.187)			(0.198)			(0.992)			(0.448)
Auditor		0.721***	0.840***		0.399**	0.264**		0.387**	0.277**		-1.514**	-1.060**		-1.520***	-0.866***
		(0.236)	(0.262)		(0.175)	(0.115)		(0.183)	(0.138)		(0.706)	(0.477)		(0.507)	(0.290)
Post x Auditor			-0.043			-0.007			0.041			0.501			0.724**
			(0.992)			(0.251)			(0.246)			(0.826)			(0.285)
Treated x Auditor			-0.203			-0.354			-0.671			0.178			-0.068
			(1.502)			(1.678)			(1.848)			(1.255)			(2.108)
Post x Treated x Auditor			-0.080			-0.109			-0.208			-1.939			-1.696
			(2.370)			(0.340)			(0.343)			(1.420)			(1.228)
Constant	0.367	0.131	-0.115	0.232	0.159	-0.134	-0.053	-0.011	-0.287	0.100	0.833	1.563	0.210	0.513	1.115***
	(0.478)	(0.580)	(0.607)	(0.208)	(0.139)	(0.190)	(0.251)	(0.154)	(0.224)	(0.850)	(0.799)	(1.093)	(0.473)	(0.423)	(0.411)
R^2	0.051	0.182	0.192	0.268	0.393	0.503	0.175	0.293	0.385	0.329	0.512	0.592	0.409	0.634	0.766
Observations	286	281	281	286	281	281	286	281	281	286	281	281	286	281	281

[1] Significance levels are indicated by *, ** and *** for 10%, 5%, and 1%, respectively. [2] Regression models for stage one and two are:

$$log\left(\frac{S_{it-1}+C_{igct}}{S_{it-1}}\right) = \alpha_{gc} + \eta_{1,gc}log\left(\frac{P_{it}}{P_{it-1}}\right) + \eta_{2,gc}D_{post}log\left(\frac{P_{it}}{P_{it-1}}\right) + \epsilon_{igct}$$

$$\hat{\eta}^{*}_{gcx} = \beta_0 + \beta_1 Post_x + \beta_2 Treated_g + \beta_3(Post_x x Treated_g) + \beta_4 Actuary_{gx} + \beta_5(Actuary_{gx} x Post_x) + \beta_6(Actuary_{gx} x Treated_g) + \beta_7(Actuary_{gx} x Post_x x Treated_g) + \beta_8 Auditor_{gx} +$$

$$\beta_9(Auditor_{gx} x Post_x) + \beta_{10}(Auditor_{gx} x Treated_g) + \beta_{11}(Auditor_{gx} x Post_x x Treated_g) + \Sigma_k \beta_k X_{gx} + \gamma_g + \epsilon_{gcx}$$

$\forall c \in$ {Reinsurance Recoverable, Reinsurance Credit, Total Reinsurance, Total Other Capital, Total Capital} $\hat{\eta}^{*}_{gcx} = \eta_{1,gc}$(Pre-SOX); $\eta_{1,gc} + \eta_{2,gc}$(Post-SOX)

[3] Variables of interest are $Post_x$, which is an indicator variable equal to one if year is after or in 2005. $Treated_g$ is equal to one if insurance group g is a SOX-compliant group i.e. that insurance group has one or more of its subsidiaries or affiliates trading in NYSE or NASDAQ between 2002 and 2009. $Actuary_{gx}$ and $Auditor_{gx}$ actuarial service quality variable and audit service quality variable, respectively.β_3 captures the overall effect of SOX on capital allocation sensitivity. β_7 and β_{11} indicate the effect of actuary and auditor quality post-SOX. X_{gx} and γ_g are control variables and insurance group fixed effect, respectively.

Table 4: Main Results with Small Insurers Subsample

	Rein. Recoverable			Rein. Credit			Total Reinsurance			Other Capital			Total Capital		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Post	-0.166		-2.723	0.030		-0.311	0.034		-0.547*	0.078*		-0.534	0.037*		-0.143
	(0.229)		(2.276)	(0.019)		(0.279)	(0.020)		(0.293)	(0.043)		(0.504)	(0.021)		(0.217)
Treated	0.493		-7.327	0.129**		3.116**	0.138***		2.610*	-1.203***		2.547	-0.623***		3.421*
	(0.469)		(6.272)	(0.052)		(1.492)	(0.051)		(1.488)	(0.169)		(2.073)	(0.085)		(1.732)
Post x Treated	0.463		-7.543	-0.087*		0.616	-0.096**		0.565	0.321*		0.452	0.225***		-0.459
	(0.309)		(8.271)	(0.044)		(0.494)	(0.046)		(0.379)	(0.189)		(1.312)	(0.083)		(0.976)
Actuary		-0.896**	-0.645*		-0.065	0.043		-0.039	0.087		1.174***	0.483***		0.756***	0.329**
		(0.396)	(0.344)		(0.103)	(0.131)		(0.095)	(0.115)		(0.235)	(0.162)		(0.131)	(0.125)
Post x Actuary			0.093			-0.037			0.199			-0.049			-0.184
			(0.970)			(0.152)			(0.172)			(0.260)			(0.144)
Treated x Actuary			-0.665			-0.600			-0.584			2.556**			0.978**
			(1.125)			(0.650)			(0.352)			(1.072)			(0.446)
Post x Treated x Actuary			-0.703			0.022			-0.038			-2.313*			-1.145**
			(1.528)			(0.488)			(0.332)			(1.369)			(0.566)
Auditor		-0.364	-0.509		-0.023	-0.094		0.173	0.210		-0.401	-0.477		0.198	0.007
		(0.475)	(0.503)		(0.118)	(0.138)		(0.251)	(0.274)		(0.480)	(0.416)		(0.367)	(0.229)
Post x Auditor			2.911			0.378			0.441			0.647			0.317
			(2.299)			(0.315)			(0.319)			(0.591)			(0.284)
Treated x Auditor			8.291			-2.593*			-2.051			-5.208**			-4.621**
			(7.461)			(1.371)			(1.566)			(2.284)			(1.956)
Post x Treated x Auditor			7.959			-0.660*			-0.618*			1.472			1.498
			(7.373)			(0.345)			(0.339)			(1.684)			(1.207)
Constant	-0.095	-0.983	-1.214	-0.015	0.097	-0.147	-0.008	0.115	-0.034	0.689	1.037**	-0.088	0.935***	0.928***	0.662**
	(1.113)	(1.145)	(1.314)	(0.157)	(0.152)	(0.236)	(0.194)	(0.185)	(0.290)	(0.465)	(0.512)	(0.401)	(0.233)	(0.270)	(0.265)
R^2	0.320	0.628	0.684	0.777	0.751	0.805	0.674	0.669	0.745	0.931	0.922	0.965	0.952	0.939	0.972
Observations	144	139	139	144	139	139	144	139	139	144	139	139	144	139	139

[1] Significance levels are indicated by *, ** and *** for 10%, 5%, and 1%, respectively. [2] Regression models for stage one and two are:

$$log\left(\frac{S_{it-1}+C_{igct}}{S_{it-1}}\right) = \alpha_{gc} + \eta_{1,gc} log\left(\frac{P_{it}}{P_{it-1}}\right) + \eta_{2,gc} D_{post} log\left(\frac{P_{it}}{P_{it-1}}\right) + \epsilon_{igct}$$

$$\hat{\eta}^{*}_{gcs} = \beta_0 + \beta_1 Post_s + \beta_2 Treated_g + \beta_3 (Post_s x Treated_g) + \beta_4 Actuary_{gs} + \beta_5 (Actuary_{gs} x Post_s) + \beta_6 (Actuary_{gs} x Treated_g) + \beta_7 (Actuary_{gs} x Post_s x Treated_g) + \beta_8 Auditor_{gs} +$$

$$\beta_9 (Auditor_{gs} x Post_s) + \beta_{10} (Auditor_{gs} x Treated_g) + \beta_{11} (Auditor_{gs} x Post_s x Treated_g) + \Sigma_k \beta_k X_{gs} + \gamma_g + \epsilon_{gcs}$$

$\forall c \in$ {Reinsurance Recoverable, Reinsurance Credit, Total Reinsurance, Total Other Capital, Total Capital} $\hat{\eta}^{*}_{gcs} = \eta_{1,gc}$(Pre-SOX); $\eta_{1,gc} + \eta_{2,gc}$(Post-SOX)

[3] Variables of interest are $Post_s$, which is an indicator variable equal to one if year is after or in 2005. $Treated_g$ is equal to one if insurance group g is a SOX-compliant group i.e. that insurance group has one or more of its subsidiaries or affiliates trading in NYSE or NASDAQ between 2002 and 2009. $Actuary_{gs}$ and $Auditor_{gs}$ actuarial service quality variable and audit service quality variable, respectively. β_3 captures the overall effect of SOX on capital allocation sensitivity. β_7 and β_{11} indicate the effect of actuary and auditor quality post-SOX. X_{gs} and γ_g are control variables and insurance group fixed effect, respectively.

Conclusion and Discussions

This paper utilizes SOX as an external shock event to investigate how insurers allocate capital among affiliated companies and whether the roles of actuaries and auditors are important. I have found that SOX decreased the sensitivity of internal capital transaction growth to premiums growths among smaller insurers, which suggests that the costs of internal capital transactions increased due to the effective monitoring mechanism. Quality actuaries and auditors are crucial in the process. I have also documented that the results among the under-reserving insurers are different, i.e. SOX increased the sensitivity of an internal capital transaction growth to premiums growths. The possible driver behind this phenomenon is that the benefits of using internal capital exceed the costs; the under-reserving insurers tend to be in a relatively poor financial condition and have a strong motive for earnings management. Raising capital through the external sources could incur larger costs. Hence, the insurers need to finance the unexpected losses by raising capital through affiliated companies.

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