The Consideration of Loss Timing for Risk Transfer Analysis

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Summary

- Introduction
- Background (Information and Support)
  - –Financial Accounting Standards No. 113 Requirements
  - –Expected Reinsurer Deficit (ERD) Statistic
  - –Actual Payment Pattern Timing Example
  - –Correlation Analysis
  - –Simulated Payment Pattern Example
- Illustrative ERD Results
- Conclusions

Introduction

- *Motivation:* An important consideration in a risk transfer analysis is the potential variability of loss timing. By excluding this variability, a risk transfer analysis could lead to materially different results, thereby causing users to draw different conclusions about risk transfer.
- This paper specifically illustrates the variation in payment patterns commonly found in paid loss and allocated loss adjustment expense development patterns (payment patterns) then provides an example of one method that can be used to model this payment pattern volatility.
- The impact of modeling this payment pattern volatility is illustrated with ERD results under a hypothetical reinsurance structure.
- Important model considerations also reflected are correlation and discount rate assumptions.
- The ERD test is also used to illustrate the sensitivity of these modeled assumptions.

Background: Requirements for Risk Transfer

Timing of losses is a fundamental component of the "significant insurance risk" requirement under the guidance in the Statement of Financial Accounting Standards No. 113 (FAS 113). To summarize FAS 113: There are two requirements that must be met for a short duration contract to be considered as "indemnifying the cedant".

1. Reinsurer assumes significant insurance risk under the reinsured portions of insurance contracts; and
2. It is reasonably possible that the reinsurer may realize significant loss from the transaction.

Background: Requirements for Risk Transfer

- To evaluate requirement (1), there must be a possibility of significant variation in the amount or timing of cash flows between assuming and ceding companies.
  - When developing a stochastic loss model to evaluate the variation in the amount or timing of cash flows, consideration should be given to the distribution of probable loss outcomes and the timing of losses ceded to the reinsurer.
- To evaluate requirement (2), the present value of all cash flows between the reinsurer and the cedant under reasonably possible scenarios must be evaluated.

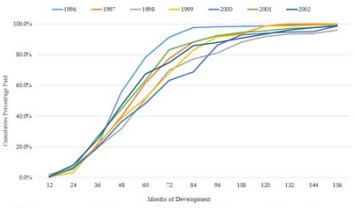
Background: ERD Test

- The ERD test statistic reflects the probability of a net present value underwriting loss for the reinsurer multiplied by the net present value of the average severity of the underwriting loss.
  - A commonly accepted but not endorsed ERD threshold is 1% where an indicated ERD % greater than 1% passes risk transfer.
  - This is consistent with the 10-10 test's 10% probability times a 10% underwriting loss (i.e., at least a 10% chance of an underwriting loss ratio of at least 110%), however the ERD test also considers severity of underwriting loss.
- It is important to note "ERD has not been explicitly endorsed by any professional body. While the CAS Working Party paper stopped short of endorsing the ERD, they prefer its use as the de facto standard over the 10-10 rule." (D. Freihaut and P. Vendetti, "Common Pitfalls and Practical Considerations in Risk Transfer Analysis," Casualty Actuarial Society E-Forum, Spring 2009.)
- Once one considers the timing risk associated with the potential variation in paid loss and ALAE the conclusions of risk transfer could potentially change.

Background: Timing Difference in Historical Cumulative Loss Patterns

- The variation in payment timing can be better understood after an investigation of historical data that has had time to develop to full maturity.
- Consider the following cumulative paid loss and ALAE percentages (as a percentage of ultimate loss and ALAE) *
- Now lets consider Correlation

Exhibit 1
Cumulative Paid Loss & ALAE Pattern (as a % of Ultimate Loss & ALAE)
Professional Liability as of 12/31/2012



The above payment patterns are based on accendent year loss and allocated loss adjustment expense development triangles in a rate filing for American Casualty Company of Reading - PA.

* Based on a Medical Malpractice rate filing for American Casualty Company of Reading – PA.

Background: Correlation of Loss & ALAE Payment Timing and Ultimate Loss and ALAE Data

- The indicated correlation between selected ultimate loss & ALAE and the payment pattern timing is not highly negative or positive based on the professional liability rate filing data* illustrated in Exhibit 2.
- It is likely that the duration of the payment pattern generally has a small positive correlation to ultimate loss and ALAE.
- As an enhancement to this analysis one could use loss ratios instead of ultimate loss & ALAE if premium information is available.

Exhibit 2
Correlation of Payment Pattern Timing
and Ultimate Loss and ALAE

Loss Year	Selected Ultimate Loss & ALAE	Cumulative Paid Loss & ALAE at 60 Months of Dev	Cumulative Paid Loss & ALAE % at 60 Months of Dev [1]	Duration [2] of Paid Loss & ALAE (in Years)
1996	16,893	13,216	78.2%	4.0
1997	22,113	13,600	61.5%	4.6
1998	27,316	14,004	51.3%	5.3
1999	29,292	15,121	51.6%	4.9
2000	32,160	15,292	47.6%	5.3
2001	45,879	29,124	63.5%	4.5
2002	50,889	34,397	67.6%	4.6
2003	66,981	43,100	64.3%	4.7
2004	58,066	34,926	60.1%	4.9
			Correlation to Ult Loss & ALAE	Correlation to Ult Loss & ALAE
		Correlation '96'-02'	-4.6%	10.4%
		Correlation '96'-03'	7.6%	5.5%
		Correlation '96'-04'	6.1%	9.5%

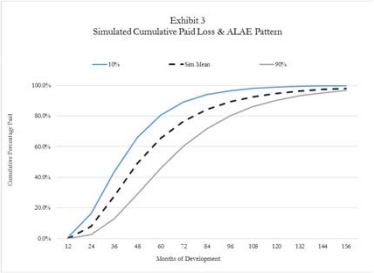
(1) As a percentage of Ultimate Loss & ALAE
(2) Duration is based on a discount rate of 2% and payments occurring mid-year

* Based on a Medical Malpractice rate filing for American Casualty Company of Reading – PA.

Background: Fitted Payment Pattern

- Exhibit 3 shows the simulated cumulative paid loss percentages by maturity at the 10th percentile, mean and 90th percentile.
- These percentages are fitted to the professional liability filing loss patterns previously shown.
- Represents 80% of simulated loss and ALAE payment patterns in the risk transfer analysis example.

Exhibit 3
Simulated Cumulative Paid Loss & ALAE Pattern



Illustrative Example of ERD Results

To illustrate the potential impact of timing risk under various assumptions of payment pattern timing, correlations, and discount rates, first consider the following hypothetical captive reinsurance program and set of assumptions.

- The primary insurer cedes $260,000 in premium on January 1, 2014 to the captive reinsurer with a 30% ceding commission;
- The captive reinsurance program attaches on an aggregate excess of loss basis where primary insurer loss and ALAE for policy year 2014 above $475,000 is covered by the reinsurance policy and reinsures loss and ALAE up to a limit of $225,000. This equates to a maximum underwriting loss ratio to the reinsurer of approximately 16.5% (i.e., [($225,000 + 30% x $260,000) / ($260,000)] -1;
- Coverage is provided on an occurrence basis for policy year 2014 for professional liability;
- Direct ultimate policy-year losses of the primary insurer follow a lognormal loss distribution with an expected loss of $550,000 and a coefficient of variation of 40%;
- Based on the correlation analyses in Exhibit 2 above, a 0% correlation is assumed when modeling the correlation between the duration of simulated paid loss and ALAE and ultimate paid loss and ALAE;
- The timing of paid loss and ALAE is modeled with a lognormal distribution using a fitted mean and standard deviation; and
- A discount rate of 2% is selected based on current U.S. treasury yields. Discussion of the interest rate selection is beyond the scope of the paper.

Illustrative Example of ERD Results

Exhibit 4 shows ERD results under the assumptions above based on 10,000 Monte Carlo simulated trials:

Exhibit 4
ERD Test Cash Flow and Results
(Discount: 2.0%, Simulated Payment Pattern, Correlation: 0.0%)

Cumulative Probability Distribution %	Present Value Ceded Loss	Present Value Ceding Commission	Present Value Ceded Premium	Underwriting Deficit
99%	$ 210	$ 78	$ 260	10.74%
98%	$ 209	$ 78	$ 260	10.32%
95%	$ 207	$ 78	$ 260	9.46%
90%	$ 203	$ 78	$ 260	8.13%
80%	$ 192	$ 78	$ 260	3.78%
70%	$ 132	$ 78	$ 260	0.00%
60%	$ 75	$ 78	$ 260	0.00%
50%	$ 31	$ 78	$ 260	0.00%
Average Underwriting Deficit (ERD Ratio)				1.64%

Illustrative Example of ERD Results

After considering the prior results let us now consider the sensitivity of the ERD ratio in assuming a fixed payment pattern (i.e., not simulating the payment pattern).

Exhibit 5
ERD Test Results Under Various Scenarios [1]

Correlation[2]	Discount Rate	ERD % Simulated Payment Pattern	ERD % Fixed Payment Pattern
0%	2%	1.64%	1.53%
25%	2%	1.50%	1.53%
50%	2%	1.36%	1.53%
0%	4%	0.32%	0.14%
25%	4%	0.21%	0.14%
50%	4%	0.11%	0.14%

(1) The above results illustrate how the results of the ERD test are sensitive to modeled assumptions of correlation, discount rates, and variability in payment pattern timing.
(2) Reflects correlation between simulated ultimate loss and ALAE and the average duration of the simulated payment pattern. Correlation assumption does not affect the ERD results for the fixed payment pattern.

Illustrative Example of ERD Results

- Exhibit 5 illustrates how the ERD result is sensitive to the assumptions of payment pattern timing, correlation, and discount rate.
- Other reinsurance structures are likely more or less sensitive to these assumptions depending on the contractual terms, economic environment, line of business reinsured, etc.
- The variability in the timing of losses is affected by numerous events, including but not limited to government moratoriums, economic trends, claims practice changes, changes in TPA, changes in reserving practices, and changes in the distribution of business written.
- Reinsurance contractual features sensitive to the timing risk component of risk transfer such as commutation options, fixed coverage periods, and working covers should also be considered.

Conclusions

- Modeling this variation in loss timing is important for a broad spectrum of actuarial analyses. This includes pro forma analyses, risk transfer analyses, and premium deficiency reserve analyses.
- When evaluating reinsurance risk transfer statistics it is important to keep in mind features that are sensitive to the variation of loss payment timing, particularly when the ERD result is near a threshold where risk transfer is questionable.
- In addition to payment pattern timing, discount rate and correlation are assumptions that can have a material impact on the result of the modeled ERD statistic.
- It is important to understand the sensitivity of those assumptions as they may change under different economic environments, reinsurance structures and lines of business reinsured.
- The loss variation may have a significant impact on the amount of losses ceded to a reinsurer.
- At the very least, the variation in timing will have an impact on the present value of losses used in the ERD test statistic, particularly with larger discount rates.

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ANY QUESTIONS?