

Measuring Underwriting Results Under Changing Reinsurance Conditions

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1. Introduction

1.1 The insurance product manager responsible for a product operates in a constantly changing environment. He or she needs to know which factors are having which effect on profitability. There is a need for underwriting measures which separate the different components of underwriting results, and which are representative of what is actually happening.

1.2 Over the past few years the cost of reinsurance has risen dramatically, primarily in the property classes. The Insurance and Superannuation Commissioner in his 92-93 Annual Report says of general insurance "the ability of insurers to reinsure their policy risks was severely affected by the rising cost and declining availability of reinsurance worldwide". Direct insurers have been faced not only with the task of meeting higher reinsurance premiums, but also with restructuring their reinsurance programs. There has been a period of instability in the relationship between gross results and results net of reinsurance. It is my belief that traditional underwriting ratios have not been truly representative of underlying factors, due to the effect of changing reinsurance situations. This paper proposes a different way of measuring underwriting results which are not distorted by rapidly changing reinsurance costs.

2. The Problem With Current Industry Practice

2.1 Current industry practice is to present two sets of results - gross and net of reinsurance. The net results are calculated by subtracting the reinsurance results from the gross, calculated as follows:

net premiums = gross premiums less reinsurance premiums
net claims = gross claims less reinsurance recoveries
net commission = gross commission less exchange commission

It makes sense to subtract reinsurance results from gross results if you are measuring exposure. The more reinsurance you have, the less exposure you have. Similarly, when measuring solvency, you wish to measure free reserves against exposure. But how should reinsurance be treated for underwriting / pricing purposes?

2.2 When monitoring underwriting results the main factors to be quantified are:

- Claims cost
- Commission / acquisition cost
- Underwriting cost
- Claims handling cost
- Reinsurance cost

Claims cost is often further broken down into frequency and average claims cost, but this paper will look primarily at the financial ratios, rather than the statistical. Factors outside the control of underwriting, such as investment income, have not been considered. These costs are generally measured as a ratio to premiums, and are expressed as a percentage of premiums. Thus we have the measures:

Cost	Measure
Claims	Loss Ratio
Commission / Acquisition	Commission Ratio
Underwriting	Underwriting Expense Ratio
Claims Handling	Claims Handling Expense Ratio

In common practice, reinsurance is not expressed as a ratio. Rather, reinsurance is allowed for by expressing these ratios on net results.

SCENARIO ONE

2.3 Imagine an insurance company which for every one hundred dollars premium received, has cash flows:

Non-Catastrophe Claims	\$60
Claims Expenses	\$5
Commissions	\$15
Underwriting Expenses	\$15
Catastrophe Claims	\$0
Catastrophe Reinsurance Premiums	\$10

This company has only one form of reinsurance, a catastrophe excess of loss cover with a retention of \$2.50, and costing \$10. Conventional reporting would present the results of this company as follows:

Scenario 1	Gross	Catastrophe Reinsurance	Net
Premiums	100.0	10.0	90.0
Claims Cost	60.0	0.0	60.0
Claims Expenses	5.0	0.0	5.0
Commissions	15.0	0.0	15.0
Underwriting Expenses	15.0	0.0	15.0
Catastrophes	0.0	0.0	0.0
Result	5.0	10.0	-5.0

Conventionally the underwriting ratios would be calculated against the net values. For example, the loss ratio is calculated by dividing the net claims (\$60) by the net premiums (\$100 less \$10), giving us a ratio of 66.7%. So the following underwriting ratios are obtained:

Loss Ratio	66.7%
Claims Expenses	5.6%
Commissions	16.7%
Underwriting Expenses	16.7%
Catastrophes	0.0%
Reinsurance Cost	Not Applicable
Combined Ratio	105.6%

2.4 Now, imagine that in its next year of operation this insurance company faced increased catastrophe reinsurance premiums. This could easily be the case if the reinsurance market lost capacity, or reviewed its perception of the underlying risk.

Scenario 1 Year Two	Gross	Catastrophe Reinsurance	Net Year 2	Net Year 1
Premiums	100.0	20.0	80.0	90.0
Claims Cost	60.0	0.0	60.0	60.0
Claims Expenses	5.0	0.0	5.0	5.0
Commissions	15.0	0.0	15.0	15.0
Underwriting Expenses	15.0	0.0	15.0	15.0
Catastrophes	0.0	0.0	0.0	0.0
Result	5.0	20.0	-15.0	-5.0

The cost of the catastrophe reinsurance has doubled to \$20 per \$100 of premium. No other factors have changed. Claims levels have not changed. Commissions paid to agents have not changed. Yet conventional reporting shows underwriting ratios that have changed.

Underwriting Ratio	Year 1	Year 2
Loss Ratio	66.7%	75.0%
Claims Expenses	5.6%	6.3%
Commissions	16.7%	18.8%
Underwriting Expenses	16.7%	18.8%

2.5 Every underwriting ratio value (other than catastrophe claims which in this example is zero) has changed from year one to year two. The loss ratio has risen, yet the amount paid in claims has not changed. The claims and underwriting expense ratios have risen, but the same amount of expenses have been incurred. Commissions have not increased, yet the commission ratio has. Unless the product manager understands numbers sufficiently to adjust for the effects of increased reinsurance costs, he or she may come to the incorrect conclusion that claims, expense and commission costs had risen and were the cause of the company's problems.

Consider this: Is it useful and meaningful for claim, expense and commission ratios to change when their costs have not?

SCENARIO TWO

2.6 Imagine an insurer much like that in scenario one, but with the added complexity of a quota share reinsurance in addition to the catastrophe reinsurance. It has catastrophe insurance premiums of 12.5% of premiums charged. Furthermore, the insurer has a surplus reinsurance arrangement for 300/0 of the risk, paying an exchange commission of 22.5%. In the second year of its operation, commissions and underwriting expenses are lower. This would give cash flows as follows:

Year 1	Gross	Surplus Reinsurance	Catastrophe Reinsurance	Net
Premiums	100.0	30.0	12.3	57.8
Claims Cost	60.0	18.0	0.0	42.0
Claims Expenses	5.0	0.0	0.0	5.0
Commissions	15.0	6.8	0.0	8.3
Underwriting Expenses	15.0	0.0	0.0	15.0
Catastrophes	0.0	0.0	0.0	0.0
Result	5.0	5.3	12.3	-12.5

Then in the second year:

Year 2	Gross	Surplus Reinsurance	Catastrophe Reinsurance	Net
Premiums	100.0	30.0	12.3	57.8
Claims Cost	60.0	18.0	0.0	42.0
Claims Expenses	5.0	0.0	0.0	5.0
Commissions	5.0	6.8	0.0	-1.8
Underwriting Expenses	10.0	0.0	0.0	10.0
Catastrophes	0.0	0.0	0.0	0.0
Result	20.0	5.3	12.3	2.5

If the underwriting ratios were used to compare the two situations only two of the ratios would give truly comparable values.

Underwriting Ratio	Year 1	Year 2
Loss Ratio	72.7%	72.7%
Claims Expenses	8.7%	8.7%
Commissions	14.3%	-3.0%
Underwriting Expenses	26.0%	17.3%

The loss and claims expense ratios calculated by conventional methods are the same, reflecting the fact that claims cost and claims expense outlay are identical. However, the commission ratio in year 2 is negative! This is because conventional methods effectively treat reinsurance exchange commissions as negative commission. Exchange commissions, in practice, are determined by the factors of expected loss ratio, the reinsurer's expenses, and the reinsurer's profit margin. Commissions paid by the direct underwriter to agents have only a very indirect effect upon exchange commissions (by changing the targeted loss ratio).

So why are two essentially unrelated numbers added together? What can an insurer learn from the nonsense of a negative commission ratio?

SCENARIO THREE

2.7 Imagine an insurance company using a surplus treaty which has an exchange commission which is a function of the gross loss ratio. Year 2 would then represent the situation if the company had a good year for claims. Year 3 would represent the situation if the company had a bad year for claims. The cash flows would be as follows:

Year 1	Gross	Surplus Reinsurance	Catastrophe Reinsurance	Net
Premiums	100.0	30.0	12.3	57.8
Claims Cost	60.0	18.0	0.0	42.0
Claims Expenses	5.0	0.0	0.0	5.0
Commissions	15.0	6.8	0.0	8.3
Underwriting Expenses	15.0	0.0	0.0	15.0
Catastrophes	0.0	0.0	0.0	0.0
Result	5.0	5.3	12.3	-12.5

In year two, since the loss ratio is low, the reinsurer has paid a higher exchange commission of \$30.

Year 2	Gross	Surplus Reinsurance	Catastrophe Reinsurance	Net
Premiums	100.0	30.0	12.3	57.8
Claims Cost	50.0	15.0	0.0	35.0
Claims Expenses	5.0	0.0	0.0	5.0
Commissions	15.0	9.0	0.0	6.0
Underwriting Expenses	15.0	0.0	0.0	15.0
Catastrophes	0.0	0.0	0.0	0.0
Result	5.0	6.0	12.3	-3.3

In year three, since the loss ratio is high, the reinsurer has not paid an exchange commission at all.

Year 3	Gross	Surplus Reinsurance	Catastrophe Reinsurance	Net
Premiums	100.0	30.0	12.3	57.8
Claims Cost	90.0	27.0	0.0	63.0
Claims Expenses	5.0	0.0	0.0	5.0
Commissions	15.0	9.0	0.0	15.0
Underwriting Expenses	15.0	0.0	0.0	15.0
Catastrophes	0.0	0.0	0.0	0.0
Result	-25.0	3.0	12.3	-40.3

By conventional methods, these three years of results are measured as:

Underwriting Ratio	Year 1	Year 2	Year 3
Loss Ratio	72.7%	60.6%	109.1%
Claims Expenses	8.7%	8.7%	8.7%
Commissions	14.3%	10.4%	26.0%
Underwriting Expenses	26.0%	26.0%	26.0%

Note that the only factor to change is the amount of claims paid out. In each year the claims expense and underwriting expense ratios are unchanged, reflecting the stable expense payments. However, both the loss ratios and the commission ratios calculated using conventional methods have changed. One would prefer that only the loss ratio changed if the claim payments changed.

Consider this: Should a commission ratio measure the commission paid out to agents for obtaining gross premiums, or should it be subject to changes in loss ratio and reinsurance arrangements?

SCENARIO FOUR

2.8 Imagine the differences which would occur in the underwriting results of our insurance company with and without a \$30 catastrophe. Conventional methods would either group the cost of the catastrophe in with the loss ratio, or might treat it as an extraordinary item, and list it separately. In this

example, the latter approach has been taken. The insurer has a surplus treaty for 30% of the risk, with an exchange commission which is a function of the loss ratio (for year 1 this will be 22.5%, and for year 2 it will be 0%). A catastrophe reinsurance program costing 17.5% of premiums (net of the surplus treaty), with a retention of \$2.5, is also in place. The cash flows would be:

Year 1	Gross	Surplus Reinsurance	Catastrophe Reinsurance	Net
Premiums	100.0	30.0	12.3	57.8
Claims Cost	60.0	18.0	0.0	42.0
Claims Expenses	5.0	0.0	0.0	5.0
Commissions	15.0	6.8	0.0	8.3
Underwriting Expenses	15.0	0.0	0.0	15.0
Catastrophes	0.0	0.0	0.0	0.0
Result	5.0	5.3	12.3	-12.5

Year two includes a catastrophe event:

Year 2	Gross	Surplus Reinsurance	Catastrophe Reinsurance	Net
Premiums	100.0	30.0	12.3	57.8
Claims Cost	60.0	18.0	0.0	42.0
Claims Expenses	5.0	0.0	0.0	5.0
Commissions	15.0	0.0	0.0	15.0
Underwriting Expenses	15.0	0.0	0.0	15.0
Catastrophes	30.0	9.0	18.5	2.5
Result	-25.0	5.3	-6.3	-21.8

Conventional methods would calculate the underwriting ratios as follows:

Underwriting Ratio	Year 1	Year 2
Loss Ratio	72.7%	72.7%
Claims Expenses	8.7%	8.7%
Commissions	14.3%	26.0%
Underwriting Expenses	26.0%	26.0%
Catastrophes	0.0%	4.3%

Since reinsurance is netted out, the catastrophe loss ratio is calculated as \$2.50 divided by \$57.80, i.e. 4.3%. Once again the surplus treaty has been assumed to have an exchange commission dependent upon the gross loss ratio. So the commission ratio, using conventional methods, has increased from 14.3% to 26.0%.

Consider this: Shouldn't the catastrophe claims ratio be the only value to change is a catastrophe occurs?

SCENARIO FIVE

2.9 Imagine a situation in which an insurer passes on its entire risk using a 100% quota share treaty. This situation will sometimes occur when one company within a group does the underwriting and claims handling processes, while another company within the group accepts the risk. The net premiums will be nil as shown below:

Risk Fully Reinsured	Gross	Surplus Reinsurance	Catastrophe Reinsurance	Net
Premiums	100.0	100.0	0.0	0.0
Claims Cost	60.0	60.0	0.0	0.0
Claims Expenses	5.0	0.0	0.0	5.0
Commissions	15.0	22.5	0.0	-7.5
Underwriting Expenses	15.0	0.0	0.0	15.0
Catastrophes	0.0	0.0	0.0	0.0
Result	5.0	17.5	0.0	-12.5

In such a situation conventional methods fail completely. Since all premium is reinsured, there is zero net premium. This gives a denominator of zero for the underwriting ratios, making each of the ratios undefined. A new approach must be taken when net premiums are zero.

How can an insurer measure results for the purpose of setting prices, when the risk is fully insured?

3. A New Approach to Reinsurance

3.1 The purpose of this paper is the treatment of reinsurance. For this reason the calculation of other ratios has been relegated to Appendix A. The approach taken in the rest of this paper is to treat reinsurance as an expense item rather than negative insurance.

3.2 Consider how a loss ratio is usually managed: A product manager does not manage the loss ratio as such. What he or she actually manages are the three components of the loss ratio – premium levels, claims frequency and average claim size. The loss ratio is the net result of managing these three factors. So these three components are measured separately.

3.3 Similarly, a product manager is responsible for the net underwriting profit, but does not actually manage the net. He or she manages gross insurances by setting gross premiums, paying commission on gross premiums, and setting expenses. The reinsurance program is managed by setting retention levels and negotiating reinsurance premiums with reinsurers. The net result of these two areas is the net of reinsurance underwriting result. Treating reinsurance as an expense factor does not change the net result. It changes the way in which results are presented, so that those factors which are controlled separately are measured separately.

3.4 Furthermore, the measurement of underwriting ratios needs to be free of unnecessary variability. For example, catastrophes are often measured separately to non-catastrophe claims, in order that loss ratios are more stable. Measuring ratios from net numbers means that they will vary with changes in reinsurance conditions, as shown in section 2 above. This variation is unnecessary and unwelcome to the product manager who wishes to know that underlying values of the factors in his or her control.

4. Loss Ratios

4.1 The purpose of a loss ratio is to tell whether, and by how much, claims costs are rising or falling. While reinsurance arrangements affect the net cost of claims to an insurer, it is preferable to separate changes in reinsurance to changes in gross results, in order to obtain a comparable historical series of ratios. For example, if an insurer is unable to obtain sufficient catastrophe reinsurance to cover its estimated maximum loss, it will need to reduce its exposure by other reinsurance arrangements, such as quota share reinsurance. The addition of a quota share treaty causes a discontinuity in the historical series of loss ratios calculated by conventional techniques. This is because the reinsurance nets off both the numerator and the denominator of the ratio under conventional techniques.

4.2 Similarly, a catastrophe event causes a discontinuity in the time series of loss ratios. The product manager is interested in movements in the underlying claims cost, and would prefer the effects of catastrophes to be measured separately. This can be dealt with by showing 2 separate loss ratios – one without catastrophes and one just for catastrophes. When a catastrophe event occurs, it will not affect the non-catastrophe loss ratio. So any trends in this measure are underlying, rather than the short term discontinuities of catastrophe. Reinsurance recoveries incurred from catastrophes will coincide with gross catastrophe claims incurred, so net catastrophe claims are used for the denominator as well.

4.3 For small portfolios, large claims may cause discontinuities in much the same way as catastrophes. For instance, a commercial fire portfolio may experience two total losses costing \$2 million each, against a total portfolio size of \$30 million. This would cause a temporary change in the loss ratio that is not “typical”. By separating the large claims to a separate ratio, the underlying ratio becomes more stable, and therefore more useful to the product manager trying to measure the sufficiency of current prices.

4.4 Claims exposure follows earned premiums rather than written premiums. Since we wish to have ratio values independent of reinsurance premiums, gross earned premiums will be used for the denominator.

4.5 Thus the ratios will be calculated as:

$$\text{Loss Ratio} = \frac{\text{Gross Claims Incurred (Net of Catastrophes)}}{\text{Gross Earned Premiums}}$$

$$\text{Catastrophe Loss Ratio} = \frac{\text{Net Catastrophe Claims Incurred}}{\text{Gross Earned Premiums}}$$

5. Reinsurance Ratios

5.1 The purpose of this ratio is to measure the cost of reinsurance programs. It should reflect changes not only in reinsurance premium rates, but also changes in the extent of reinsurance programs undertaken. The numerator will therefore include reinsurance premiums paid. Less clarity surrounds the treatment of reinsurance claims recovery and exchange commissions.

5.2 As mentioned in section 2, in practice exchange commissions are determined by the factors of expected loss ratio (sometimes by the actual loss ratio in those cases where a sliding exchange commission is used), the reinsurer's expenses, and the reinsurer's profit margin. Looking at this a different way, they are the manner in which the reinsurer sets the cost of a proportional reinsurance program. For this reason, I believe that exchange commissions should be subtracted from the reinsurance premiums ceded.

5.3 One way of looking at proportional treaties is to consider them as the insurer buying a reduction in exposure. Looking at reinsurance in this manner, we can see that the cost to the direct insurer is what is left of the proportional reinsurance premiums after exchange commission and reinsurance recoveries. For measurement purposes I believe that only non catastrophe reinsurance claim recoveries should be netted from reinsurance premiums, so that catastrophe events do not cause unnecessary variability in the reinsurance ratio.

5.4 The denominator of the ratio should reflect the exposure to reinsurance costs (as defined above). Gross premiums should be used, as this is the exposure to reinsurance. Now exposure to proportional reinsurance is usually in proportion to earned premiums, while exposure to catastrophe reinsurance is usually in proportion to written premiums. This leaves us with the problem of which denominator to use. A complex hybrid of these two values may be used, weight by exposure to each, but in my experience either proportional reinsurance or catastrophe reinsurance dominates, allowing a simple approximation using only earned or written premiums. For example, in insurer writing householders business has catastrophe reinsurance costing 15% of gross premiums, plus a 10% quota share treaty to further reduce exposure. At first glance it may appear that neither dominates (15% versus 10%). But it must be remembered that a quota share reinsurance cost (as defined above) is reinsurance premiums less exchange commission less reinsurance claim recoveries. This means that the quota share cost is of the magnitude of 1% of gross premiums. The catastrophe cover dominates, and written premiums can be used for the denominator.

5.5 Thus the reinsurance ratio should be calculated as:

$$\text{Reinsurance Ratio} = \frac{\text{Reinsurance Premiums} - \text{Exchange Commissions} - \text{Non Catastrophe Reinsurance Claims Recoveries}}{\text{Gross Written or Earned Premiums}}$$

5.6 When calculated as proposed, the reinsurance ratios becomes the balancing item to the net underwriting result. The net result is still the same dollar amount in both conventional and proposed techniques.

6. Combined Ratio

6.1 As with conventional techniques, the proposed underwriting ratios can be added to create a combined ratio which measure total underwriting outgoings for each unit of premium income. The ratios can be added despite the fact that the denominators are a mixture of earned and written premiums. This ratio will indicate underwriting loss or profit per unit of gross premium charged to policyholders.

7. A Return to the Scenarios

7.1 If we return to the five scenarios of section two in this paper we will see the advantage of using gross ratios plus a reinsurance expense item.

SCENARIO ONE

7.2 Scenario 1 present the situation where the reinsurance premiums for catastrophe insurance doubled. Using the gross techniques proposed in this paper, the underwriting ratios are:

Underwriting Ratio	Year One	Year Two
Loss Ratio	60.0%	60.0%
Claims Experience	5.0%	5.0%
Commissions	15.0%	15.0%
Underwriting Expenses	15.0%	15.0%
Catastrophes	0.0%	0.0%
Reinsurance	10.0%	20.0%
Combined Ratio	105.0%	115.0%

Note that the only variation in the ratios is to the reinsurance ratio. The gross techniques have successfully separated changes in reinsurance from changes in other factors affecting the bottom line net result. The combined ratios are not the same as those resulting from conventional techniques because they measure the net underwriting profit as a percentage of gross premiums.

SCENARIO TWO

7.3 Scenario two presented a situation in which the commissions and underwriting expenses each dropped in the second year. Using gross techniques the underwriting ratios would be:

Underwriting Ratio	Year One	Year Two
Loss Ratio	60.0%	60.0%
Claims Expenses	5.0%	5.0%
Commissions	15.0%	5.0%
Underwriting Expenses	15.0%	10.0%
Catastrophes	0.0%	0.0%
Reinsurance	17.5%	17.5%
Combined Ratio	112.5%	97.5%

The only factors to vary are commissions and underwriting expenses – which were the only factors varied. The reinsurance ratio has not varied, as no variation to reinsurance arrangements was made. Commissions show a positive ratio in year two, unlike that of conventional methods.

SCENARIO THREE

7.4 Scenario three presented an insurer who had an average year followed by a good and a bad year for claims costs. Gross underwriting ratio techniques show the following ratios:

Underwriting Ratio	Year One	Year Two	Year Three
Loss Ratio	60.0%	50.0%	90.0%
Claims Expenses	5.0%	5.0%	5.0%
Commissions	15.0%	15.0%	15.0%
Underwriting Expenses	15.0%	15.0%	15.0%
Catastrophes	0.0%	0.0%	0.0%
Reinsurance	17.5%	18.3%	15.3%
Combined Ratio	112.5%	103.3%	140.3%

Only the loss ratio and the reinsurance ratios have changed. In year 2, the reinsurance ratio has increased because the change in exchange commission has not been sufficient to balance the change in reinsurance recoveries. Remember that exchange commissions are determined by expected loss ratio and the reinsurer's expenses. Changes in loss ratio should affect the exchange commission, and thus the cost of the reinsurance program. In year 3 the reverse has occurred. Both the loss ratio and the reinsurance ratio have changed. No other ratio has changed, as no other factor has changed.

SCENARIO FOUR

7.5 Scenario four presented the results of an insurer with and without a catastrophe event. Gross underwriting ratios for this scenario would be:

Underwriting Ratio	Year One	Year Two
Loss Ratio	60.0%	60.0%
Claims Expenses	5.0%	5.0%
Commissions	15.0%	15.0%
Underwriting Expenses	15.0%	15.0%
Catastrophes	0.0%	2.5%
Reinsurance	17.5%	24.3%
Combined Ratio	112.5%	121.8%

Only the catastrophe and reinsurance ratios have changed. The reinsurance ratio has changed due to the exchange commission movement against the loss ratio, as discussed above. No other ratio has changed as no other factor as changed.

SCENARIO FIVE

7.6 Scenario five presented a situation in which an insurer reinsured its entire risk with a 100% quota share treaty. Unlike conventional net techniques, the gross technique can calculate ratios:

Underwriting Ratio	Year One
Loss Ratio	60.0%
Claims Expenses	5.0%
Commissions	15.0%
Underwriting Expenses	15.0%
Catastrophes	0.0%
Reinsurance	17.5%
Combined Ratio	112.5%

For the direct insurer this is a great improvement. Now the product manager can see the profitability of the product, and the components which contribute to this. A time series of the values can be created to show trends. The reinsurance ratio represents the cost to the direct insurer of removing its risk entirely.

8. Conclusion

8.1 Reinsurance has conventionally been treated as negative amounts of insurance. While this is appropriate for measuring exposure, this paper has demonstrated some problems in such an approach for underwriting results. As an alternative, it is proposed that reinsurance be treated as an expense

item, except for reinsurance claim recoveries on catastrophe events, which should be netted from the gross catastrophe claims cost. This approach prevents discontinuities in historical series of underwriting ratios and measures more independently the effect of reinsurance and catastrophe events on underwriting results.

8.2 The advantages of the gross underwriting ratios described in this paper are:

- Gross and reinsurance factors are separated – in the same way decisions are separated
- Ratios do not experience unnecessary variability due to changes in reinsurance
- Ratios are only affected by the factors that they measure, and so become more meaningful
- All reinsurance situations can be catered for (including 100% quota share)
- The ratios total to the net result

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APPENDIX A

A1. Commission Ratios

A1.1 This measure should tell a person how much of the premium is being paid out to obtain the business. It should not be affected by the extent of reinsurance taken by the insurer since the extent of reinsurance is irrelevant to the cost of obtaining business. Nor should the pricing of reinsurance programs affect this measure, for the same reason. The denominator of the commission ratio should reflect the insurer's exposure to commission payments, so that the ratio will not fluctuate unless commission rates change.

A1.2 As mentioned in section 2 of the main paper, exchange commissions in practice are determined by the factors of expected loss ratio (sometimes by the actual loss ratio in those cases where a sliding scale is used), the reinsurer's expenses, and the reinsurer's profit margin. Commissions paid by the direct underwriter to agents have only a very indirect effect upon exchange commissions in that the higher commissions - become, the lower the loss ratio that a product should be price to in order to meet the same profitability targets. It therefore reduces the value of a commission measure to subtract exchange commission from gross commission.

A1.3 Commission payments are usually paid as a percentage of written premiums. Occasionally a commission payment may be a flat dollar amount per written policy. Since ratios usually measure costs against premium income, it makes sense to use gross written premiums as the denominator for the commission ratio.

A1.4 Thus I propose that the commission ratio be calculated as:

$$\text{Commission Ratio} = \frac{\text{Gross Commission Payments}}{\text{Gross Written Premiums}}$$

A2. Underwriting Expense Ratios

A2.1 This measure should tell a person how much of the premium is being used for the expenses of administration (other than claims), underwriting proposals, marketing, agency support and product design. These costs are not materially affected by the extent or pricing of reinsurance taken by the insurer. The denominator of the underwriting expense ratio should reflect the insurer's exposure to underwriting expenses, so that the ratio will not unnecessarily fluctuate.

A2.2 The numerator of the underwriting expense ratio will be gross underwriting expenses (which equals net underwriting expenses). If an insurer decided to cease writing new business and offering renewals, almost all of its underwriting expenses would cease. For example, the company would no longer require schedules and wordings to be sent out to policyholders, nor would it require account executives to service agents. The only remaining

underwriting expenses would be statutory e.g. accounting, and would be quite small in relation to the underwriting expenses of an insurer who continues to write business. For this reason I believe that the denominator of the underwriting expense ratio should be written premiums rather than earned premiums.

A2.3 Thus I propose that the underwriting expense ratio be calculated as:

$$\text{Underwriting Expense Ratio} = \frac{\text{Underwriting Expenses}}{\text{Gross Written Premiums}}$$

A3. Claims Handling Expense Ratios

A3.1 This measure should tell a person how much of the premium is being used for the expenses of claims. These costs are not materially affected by the extent or pricing of reinsurance taken by the insurer. The denominator of the claims handling expense ratio should reflect the insurer's exposure to claims expenses, so that the ratio will not unnecessarily fluctuate.

A3.2 The numerator of the claims handling expense ratio will be gross claims handling expenses (which equals net claims handling expenses). Like the loss ratio, an insurer's exposure to claims handling expenses follows earned premium rather than written premiums. The denominator should gross earned premiums because reinsurance arrangements do not alter exposure to claims handling expenses.

A3.3 Thus I propose that the claims handling expense ratio be calculated as:

$$\text{Claims Handling Expense Ratio} = \frac{\text{Claims Handling Expenses}}{\text{Gross Earned Premiums}}$$