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The MPL Industry Unpaid-Claim Reserve:

The Whole May Be Greater than the Sum of the Parts

The medical professional liability (MPL) insurance industry has seen lower overall claim costs, driven by a recent decline in the number of MPL claims. The unexpected magnitude and duration of the decline in claim frequency have precipitated a favorable runoff in unpaid-claim reserves, since 2005.

Some industry observers believe that there continues to be an industry-wide redundancy in unpaid claim reserves at this point. For one, A.M. Best has projected an industry-wide redundancy of $3.0 billion on a statutory basis (i.e., relative to the undiscounted reserve requirement) as of December 31, 2011. However, we would urge caution when translating this apparent redundancy, which shows up at the industry-wide level, down to the level of individual companies.

In theory, the industry-wide reserve clearly does equal the sum of the individual-company reserves. However, when you take into account the statistical properties and inherent risk in company-level claims experience, the whole may in fact be greater than the sum of its parts.

This is so because the statistical properties of unpaid-claim liabilities at the company level, where reserving decisions are made, differ from those of the industry as a whole. Favorable reserve developments should not lead to a conclusion that reserves are being set too high. This article shows that if individual companies set reasonable claim reserves, we may still find that the industry's total reserve will develop favorably more often than not.

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MPL reserve runoff

Volatile claim costs have made MPL a particularly precarious line of business for insurers. This is because unpaid-claim liabilities generally comprise the largest entries on MPL insurers' balance sheets, accounting for more than 70% of the total liabilities for MPL specialty writers. Furthermore, the complexity of MPL cases and the lengthy period of time it takes to resolve claims exacerbate the difficulty in establishing those liability reserves.

As depicted in Figure 1, industry claim reserves have developed adversely in five of the last 22 years. This tendency towards favorable development may seem surprising, given the volatile nature of MPL claim costs. However, this article will explain why this might be expected from a statistical point of view.

Figure 1 also shows how quickly MPL reserve levels can deteriorate, as happened from1997 to 2004. This was a period of great market turmoil. It led to insolvencies and the withdrawal of St. Paul Insurance Companies from the MPL insurance market in 2001, based on concerns about whether the company could regain and maintain long-term profitability. At the time, St. Paul was the largest writer of MPL insurance coverage in the United States. This in turn led to a shortage of available commercial coverage in certain markets and an approximate doubling of overall rate levels.

Estimating the unpaid-claim liability: technical considerations

Future unpaid claim liabilities are uncertain and must be estimated. The selected reserve is an amount that represents one point estimate on an unknown statistical distribution of possible outcomes. There is no specific point estimate that represents the

perfect (exactly accurate) amount to use as the unpaid claim liability reserve.

An actuary may project a specific point estimate directly, without attempting the more challenging task of estimating the probability distribution of outcomes. However, in order to understand the nature of MPL reserves and put context to what is meant by a "reasonable" reserve level, we do need to think in terms of the probability distribution. The fact that not all actuaries use stochastic reserving models does not eliminate the need for this discussion.

A probability distribution represents the stochastic (random) variability in the final cost of unpaid-claim liabilities. However, it is important to note that the true, underlying probability distribution can never be known with certainty. The actuary needs to assume a model, and then make a series of assumptions, to estimate the mathematical parameters of that model. In addition to random variability of unpaid-claim liabilities (or process risk), these assumptions introduce both parameter and model risk.

These risks are especially high for MPL, because claim costs are extremely variable and exhibit a probability distribution that is highly skewed to the right side of the curve (Figure 2). The shape of this distribution represents the asymmetrical nature of the risk that MPL insurers face. A bad year generated by large claims, a higher number of claims, or both, has the potential to be much worse than expected. However, the improvement seen in a good year will likely be of a lesser magnitude. In other words, when claim experience goes bad, it can be very bad, but there is a limit on how good it can get.

Suppose Figure 2 represents the model for the unpaid-claim-liability distribution of an MPL insurer. From this assumed distribution, we now need to select the point estimate to book. The "mode" of the distribution is the most likely outcome, and it is represented by the highest point on the curve. Even though this is the most probable outcome, few actuaries would argue that it represents a reasonable reserve amount for a liability whose distribution is skewed. In this sort of distribution, the mode is less than the 50th percentile (or "median"), which implies that there is a greater than 50% chance that the actual liabilities will exceed the mode estimate.

The median is the point estimate within the distribution where there is a 50% chance that the actual claim liabilities will come in lower, and a 50% chance that they will come in higher. One could argue that this is a reasonable amount to carry on the balance sheet. However, the median number does not account for the fact that the expected average size of an *adverse* reserve development is greater than the expected average size of a *favorable* development. If a company uses the median amount as its reserve, then the expected value of the reserve development would be adverse. From this perspective, the median represents an estimate that may be biased on the low side.

The fact that the expected value (or "mean") exceeds the 50th percentile is typical of this type of asymmetrical distribution. The mean is weighted in such a way that it takes into account the potential size of the reserve development, in addition to its probability, so the mean may be a more appropriate number to book for a skewed distribution. If the mean of the distribution is used, then the expected reserve development is $0.

However, reserving to the estimated mean may be more precarious for some companies than for others. The mean for the unpaid-claim liability of a larger MPL insurer might actually correspond to the 55th percentile. This implies that if the company books to the mean, there is a 55% chance that the reserves will be adequate and a 45% chance that the reserves will prove to be inadequate. For a smaller company, or one that has more variable claim costs, the expected value might in fact correspond to the 65th percentile. If this company uses the mean estimate for setting its reserves, it will have a 65% chance of having adequate reserves and a 35% chance of inadequate reserves.

In short, estimating the unpaid-claim liability and establishing the reserve is not an exact science with a single, precise answer. This is why actuaries say that there is a range of reasonable esti-

Figure 1 MPL Net One-Year Reserve Development ($000)

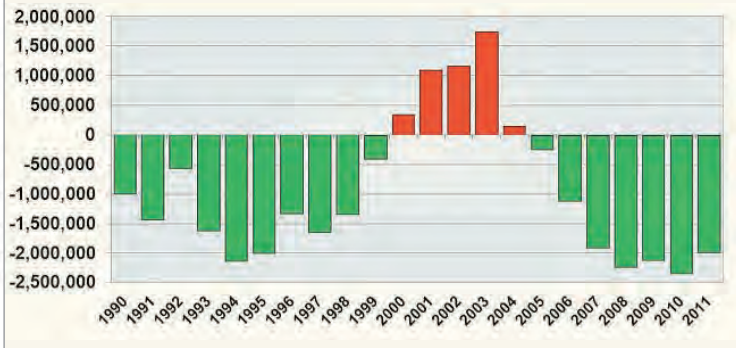
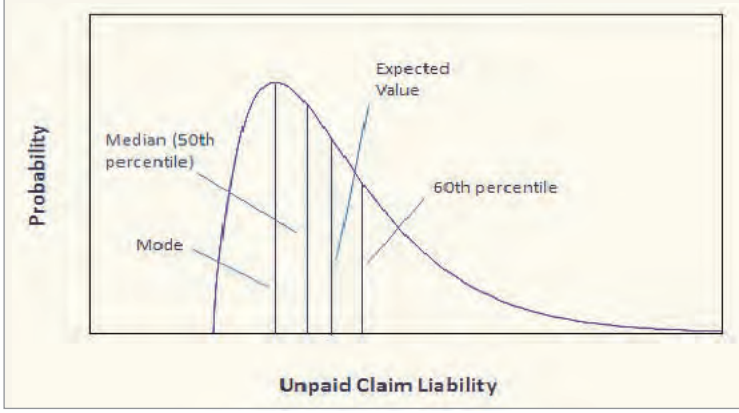


Figure 2 Hypothetical MPL Writer



mates that can be used for establishing the liability reserve.

The industry compounding effect

What might be a prudent approach to reserving by individual companies can compound to produce an apparent reserve redundancy at the industry level. This is because claim costs, and thus reserve developments, are only partially correlated across MPL writers. Various factors influence each company's claim costs differently. In addition to random chance, these might include changes in the legal environment, loss control and litigation strategies, excess policy limits claims, or clash claim exposures, to name a few. Favorable claim-cost developments for one company might be offset by adverse developments that impact another. Likewise, improving claim-cost conditions in one state might be offset by deteriorating costs in another. This implies that the aggregated industry-wide distribution of unpaid-claim costs is actually "narrower" than the sum of the individual company distributions.

Let's assume that, when companies book reserves, they are targeting the mean unpaid-claim liability as the most reasonable reserve amount. As we have shown, the mean for a skewed distribution falls at a probability level that is greater than the 50th percentile. For the sake of discussion, assume that, on average, for MPL specialty writers the mean corresponds to the 55th percentile.

Figure 3 Hypothetical MPL Writer

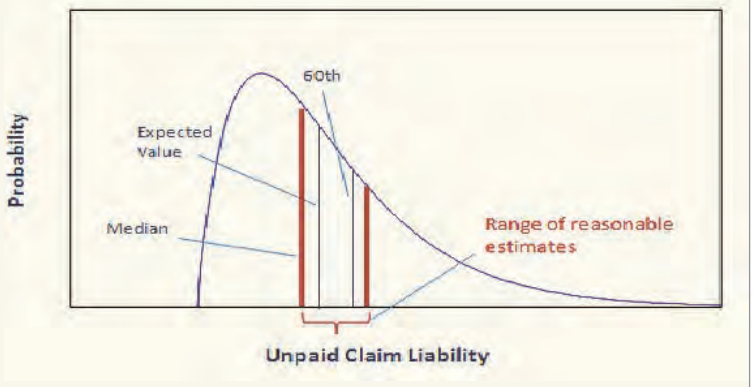
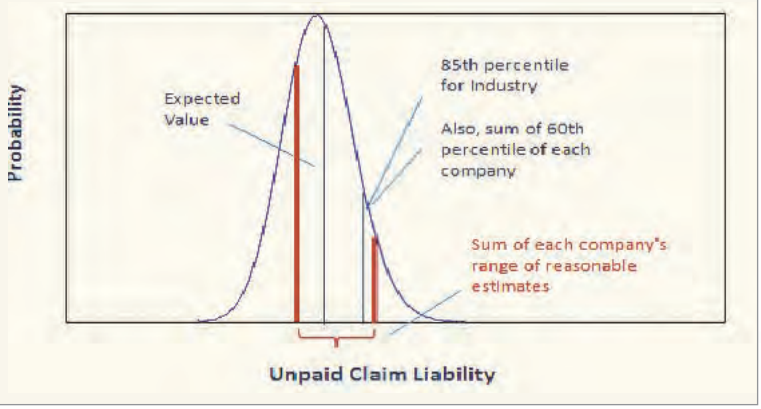


Figure 4 Hypothetical MPL Industry



However, the actual probability distribution is unknown, so the mean has to be estimated. Any bias in the estimation of the mean would alter the location of the number of the booked reserve on the actual, but unknown, probability distribution. In highly variable and skewed lines such as MPL insurance, there is a greater likelihood that the estimated mean will exceed the actual mean. For the sake of discussion, let's assume that the actual mean would correspond to the 55th percentile, while the estimated mean would fall on the 60th percentile.

Now watch what happens. When these 60th percentile reserves are aggregated across all companies, the reserve level for the whole industry ends up at a much higher probability level—perhaps, the 85th percentile. This implies that industry reserves would be adequate 85 times out of 100, and would fall short only 15 times out of 100. This might seem excessively conservative, but in fact, it is not. It is simply a reflection of the asymmetrical nature of the unpaid-claim liabilities, combined with the diversification effect that occurs when the individual company estimates are added up.

The compounding effect is demonstrated in Figures 3 and 4. Figure 3 presents a typical claim-liability distribution of an MPL insurance company. As discussed, it is wide and highly skewed, reflecting a wide range of possible outcomes and the potential for extremely adverse results. The section outlined in red represents what might be considered a reasonable range of estimates to use as the liability reserve.

Figure 4 displays a hypothetical industry distribution of unpaid-claim liabilities. It reflects the aggregation of all the company distributions that look like those in Figure 3. A comparison of the figures shows that the industry-wide distribution becomes narrower and less skewed. If, for example, we assume that all of the companies establish their reserves at the 60th percentile level, and we then sum those reserves, the industry booked reserve ends up at a much higher probability level. Depending on the assumed correlation between companies, the aggregate of company reserves set at the 60th percentile might correspond to the 85th percentile on the industry-wide probability distribution.

It is important to note that the red bars in Figure 4 represent the sum of the reasonable range endpoints of the individual company reserves. They do not represent what might be considered a reasonable range for the industry when examined as a whole. For example, suppose we consider the 50th percentile to be the low end of the reasonable range for the individual companies. This is below the mean because of the skewed distributions. If all companies were to book the 50th percentile estimate, then the industry reserve level would be at a much lower percentile, perhaps the 40th percentile. This would produce an industry reserve that will more

likely develop adversely than favorably. With this knowledge, we might once again question whether the 50th percentile estimate is an appropriate reserve for an MPL writer.

Two significant reserve risks

An increase in claim frequency poses a significant risk to the adequacy of the claim reserves. As discussed, the recent industry buildup in claim reserves came about because of the prudently cautious acceptance of the decline in claims frequency.

Alternatively, an unanticipated rise in claim frequency can deteriorate claim reserve adequacy. While it is not likely that we will see claim frequency return to the levels seen at the beginning of this century, early evidence suggests that the low point may have already been reached.

Higher than expected inflation in claim costs, another substantial risk, prompted the reserve increases between 2000 and 2004 depicted in Figure 1. The combination of an increase in claim frequency *and* higher than expected claim-cost inflation can have a devastating impact on the unpaid-claim liabilities of a company.

Conclusion

While it may be more likely that MPL industry reserve levels will run off favorably than adversely, this statement cannot be used as evidence that the reserve level in the industry is unreasonably high or, more particularly, that any one company's reserves are unreasonable.

The industry-wide number for reserves is in some respects an artificial notion. As noted before, reserves must be set at the company level, where estimates of the unpaid-claim liabilities are highly uncertain. The asymmetrical nature of the unpaid-claim-liability distribution quite naturally leads to a prudent approach in setting liability reserves by individual companies. When added together, these can compound into an industry-wide reserve redundancy—when in fact, the company-level reserves are not unreasonably high. PIAA

For related information, see www.milliman.com.

References

1. "Medical Professional Liability Outperforms, But Is This Sustainable?", May 1, 2012, *Best's Special Report*, A.M. Best Company, Inc.
2. *A.M. Best Aggregates & Averages* (1983 through 2011 editions), A.M. Best Company, Inc.
3. *Process risk:* Uncertainty that arises from the random nature of insured loss events, assuming that the distribution of possible outcomes is known. *Parameter risk:* Uncertainty that arises from the selection of parameters within a modeled distribution, assuming that the form of the distribution is known. *Model risk:* The chance that the modeled distribution does not accurately describe the distribution of possible outcomes.